# 3RD VIRP ANNUAL PROGRESS REPORT
# MERCER UNIVERSITY TRIANGLE
# HSI #10779
# 1535 MONTPELIER AVE
# MACON, BIBB COUNTY, GEORGIA
# GEC JOB NO. 090698.340

**PREPARED FOR**

**MERCER UNIVERSITY**
**1400 COLEMAN AVE**
**MACON, GEORGIA 31207**

**SUBMITTED TO**

**MR. JASON METZGER**
**GEORGIA DEPARTMENT OF NATURAL RESOURCES**
**ENVIRONMENTAL PROTECTION DIVISION**
**HAZARDOUS SITES RESPONSE PROGRAM**
**2 MARTIN LUTHER KING, JR. DRIVE, SE**
**SUITE 1462, EAST TOWER**
**ATLANTA, GEORIGA 30334**

**AUGUST 26, 2016**

**PREPARED BY**

**GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.**
**514 HILLCREST INDUSTRIAL BOULEVARD**
**MACON, GEORGIA 31204**

GEC

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GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

**August 26, 2016**

Mr. Jason Metzger
Georgia Environmental Protection Division
Response and Remediation Program
2 Martin Luther King, Jr. Drive S.E.
Suite 1462 East Tower
Atlanta, GA 30334

**SUBJECT:** **3RD VIRP Annual Progress Report**
**Mercer University Triangle**
**HSI #10779**
1535 Montpelier Ave
Macon, Bibb County, Georgia
GEC Job No.: 090698.340

**Dear Mr. Metzger:**

In accordance with the Voluntary Investigation and Remediation Program (VIRP) for the Mercer University Triangle site in Macon, Georgia, dated September 30, 2013, Geotechnical & Environmental Consultants, Inc. (GEC) is submitting this Semi-annual Progress Report. This report summarizes monitoring activities conducted at the site on January 27-29, 2016 and June 2016 and the sampling results from the groundwater monitoring vapor sampling events. This report also addresses the comments provided by EPD regarding the previously submitted VIRP Progress Report.

Sincerely,
**GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.**

Paige Sforzo, E.I.T
Project Engineer

Jason A. Cooper, P.E.
Project Manager
Georgia Reg. No. 31694

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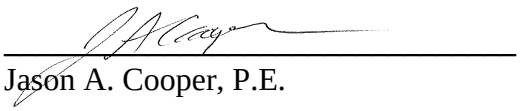
## APPENDICES



GEC

**GROUNDWATER SCIENTIST CERTIFICATION STATEMENT**

I certify that I am a qualified groundwater scientist who has received a baccalaureate or post-graduate degree in the natural sciences or engineering, and have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments regarding ground water monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or by a qualified subordinate working under my direction.



Jason A. Cooper, P.E.

8/26/16

Date



GEC

## 1.0 SITE DESCRIPTION

The subject property, known as the Mercer Triangle, consists of a single building housing various businesses, including restaurants, retail space and Mercer University offices. The primary source of contamination is located on the western side of the property under a sidewalk and Linden Avenue. No significant changes have occurred at the site since the last sampling event in July 2015. The Mercer University Campus is located south of the subject property with Mercer offices and buildings located west and southwest. Residential properties are still located north of the subject site with residential property and a public park located east of the site.

No new potential receptors were noted during the sampling event, as development around the site has remained essentially the same since the July 2015 event.

## 2.0 SUMMARY OF WORK PERFORMED AT SITE

Since the last progress report submitted on August 20, 2015, GEC has performed two (2) groundwater sampling events at the subject property, in accordance with the semi-annual sampling schedule set forth in the VIRP application submitted on September 30, 2013. GEC has also performed a soil gas vapor intrusion sampling event, where eight (8) soil gas samples were collected in four (4) different locations at the property.

Following the submittal the August 2015 progress report, GEC received a comment letter from the Georgia Department of Natural Resources, Environmental Protection Division (Ga EPD) dated March 11, 2016. This report addresses the comments made by Ga EPD as well as the sampling methodologies and analytical results from the sampling events performed at the property.

## 3.0 SEMI-ANNUAL GROUNDWATER SAMPLING

### 3.1 Summary of Groundwater Sampling Protocol

On January 27-29, 2016 and June 9-10, 2016, GEC was on site to perform groundwater sampling at the Mercer Triangle. The following wells were to be sampled: MWA-1, MWA-2, MWA-3, MWB-4, MWA-5, MWD-6, MWA-8, MW-9, MW-10, MW-12, MW-13, MW-14, MW-15, and MW-16.

GEC arrived at the subject facility to collect groundwater levels from the above-noted wells. Following the measurement of the groundwater depth, a required volume of water to be purged from each well was calculated specifically for the individual well. The wells were then slow-purged of a required volume determined specifically for each well utilizing a Proactive S.S. Hurricane centrifugal pump to minimize turbidity, which is equipped with an adjustable flow controller for low flow purging and sampling. The pump was placed at or near the mid-point of the water column during purging. Field parameters (pH, turbidity, conductivity, dissolved oxygen, oxidation/reduction potential (ORP), and temperature) were continually analyzed during the purging process utilizing a flow cell connected to a Horiba Water Quality Monitoring probe, which utilizes a hand-held computer for rapid, accurate measurement and display of the water quality parameters. The groundwater was pumped through the flow cell, and the field parameters were continually analyzed by the Horiba. Readings were recorded at least three times on five to six-minute intervals before

sample collection began. Following the purging of each well, the well was sampled for volatile organic compounds (VOCs) through the pump or with a dedicated disposable PVC bailer. The VOC samples were immediately placed in a cooler with ice. The Horiba instrument was field calibrated each day prior to use. The water quality instruments, parameter measurement containers, and Hurricane pump were thoroughly cleansed with Liquinox soap solution and then rinsed with deionized water in preparation for the next monitoring point. Samples were collected as per EPD protocol as outlined in EPA Region 4 Field Branches Quality System and Technical Procedures, science and Ecosystem Support Division (SESD Ops), "Procedure SESDPROC-301-R3, Groundwater Sampling," effective date March 6, 2013.

Following the completion of all sampling, the samples were transported back to the GEC office and placed into refrigeration. The following day, the samples were packed in ice and shipped overnight to Analytical Environmental Services Laboratory in Atlanta, Georgia with a corresponding chain of custody form. Copies of the laboratory analytical results and field parameter sheets for each sampling event are included in Appendix D.

### 3.2 Summary of Field and Hydrogeologic Parameters [1/27-29/16]

Field parameters were measured at each well until stabilization of parameters was achieved. The turbidity in each sample was found to be above 10 NTU in every sample, due to the cloudy nature of the groundwater. Also, the pH was found to range between 3 and 6, which is likely a result of residual sodium persulfate in the groundwater. The readings for ORP, dissolved oxygen, and conductivity did not indicate conditions that would be uncommon for the site. Please refer to Appendix D for the field parameter sheets from each sampling event.

Based on groundwater levels measured during the January 2016 sampling event, the groundwater elevations remained relatively the same since the previous sampling event in July 2015. Groundwater levels in six (6) of the wells showed an increase and two (2) of the wells remained essentially the same, indicating an overall increasing groundwater elevation trend. The groundwater elevations are summarized on Table 3 in Appendix B.

### 3.3 Groundwater Sampling [1/27-29/16]

On January 27, 28 and 29, 2015, GEC performed groundwater sampling at the subject facility. The following wells were sampled for Appendix I VOCs: MWA-1, MWA-2, MWB-4, MWA-5, MWD-6, MWA-8, MW-9, MW-10, MW-12, MW-13, MW-14, MW-15, and MW-16. Once the samples were collected, the groundwater samples were placed in laboratory-supplied, vapor and fluid tight containers, labeled, preserved on ice, and delivered to Analytical Environmental Services Laboratory in Atlanta, Georgia for analytical testing. Proper chain of custody procedures and documentation were observed. The water samples were analyzed for the Appendix I VOCs using EPA Method 8260B.

The analytical data indicated that tetrachloroethene (PCE) and trichloroethene (TCE) are still present above their respective MCLs. However, the highest PCE and TCE concentrations continue to persist in well MWA-1, MWA-2 and MWD-6. PCE and TCE concentrations continue to exhibit stable

concentrations below the historical high concentrations for each well, with the exception of MWA-2, MWD-6 and MW-13 where PCE and TCE concentrations were reported at the highest historical concentrations. Monitoring well MWA-5 continues to be the only well with detections of chloromethane, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, 1,2-trichloroethane, and methylene chloride. These compounds were first detected in MWA-5 in April 2012. Since that sampling event, the concentrations for each of the above-noted compounds have decreased substantially, with methylene chloride's concentrations decreasing from 600 to 36 µg/L and 1,2-dichloroethane decreasing from 28 to less than 5.0 µg/L. The January 2016 sampling event shows that these compounds have all decreased to less than 5.0 µg/L with the exception of Methylene Chloride which has continued to decrease from 40 µg/L in July 2015 to 36 µg/L in January 2016. The presence of these compounds may be the result of degradation of PCE and TCE.

Only five (5) of the 13 monitoring wells sampled (MWA-2, MWA-5, MWD-6, MW-10 and MW-13) had increases in PCE and TCE concentrations in the latest sampling event. Although five (5) of the sampled wells showed an increase in PCE and TCE concentrations, other than MWA-2, MWD-6, and MW-13, the concentration values are lower than the historically highest values. The results for volatile organic compound analysis are included on Table 2 in Appendix B.

### 3.4 Summary of Field and Hydrogeologic Parameters [6/9-10/16]

In the Ga EPD comment letter dated March 11, 2016, comment 4 discussed groundwater sampling techniques. During the June 2016 sampling event, GEC adjusted the pump speed in order to limit drawdowns to less than 0.33 feet. Monitoring wells were also purged until turbidity readings were reported below 10 NTUs. The turbidity in each sample was found to be below 10 NTUs in every sample, except for MW-10 and MW-16. This is likely due to the lack of recharge during purging. Also, pH readings were found to range between 3 and 5, likely a result of residual sodium persulfate in the groundwater. The readings for ORP, dissolved oxygen, and conductivity still do not indicate conditions that would be uncommon for the site. Please refer to Appendix D for the field parameter sheets from each sampling event.

Based on groundwater levels measured during the June 2016 sampling event, the groundwater elevations have increased overall since the previous sampling event in January 2016. Groundwater levels showed an increase in nine (9) of the 14 wells sampled. Both the January 2016 and June 2016 sampling event showed and overall increasing groundwater elevation trend. The groundwater elevations are summarized on Table 3 in Appendix B.

### 3.5 Groundwater Sampling [6/9-10/16]

On June 9 and 10, 2016, GEC collected groundwater samples from the following wells: MWA-1, MWA-2, MWB-4, MWA-5, MWD-6, MWA-8, MW-9, MW-10, MW-12, MW-13, MW-14, MW-15, and MW-16. Once the samples were collected, the groundwater samples were placed in laboratory-supplied, vapor and fluid tight containers, labeled, preserved on ice, and delivered to Analytical Environmental Services Laboratory in Atlanta, Georgia for analytical testing of Appendix I VOCs. Proper chain of custody procedures and documentation were observed. The water samples were analyzed for the Appendix I VOCs using EPA Method 8260B.

The analytical data indicated that tetrachloroethene (PCE) and trichloroethene (TCE) are still present above their respective MCLs. However, the highest PCE and TCE concentrations continue to persist in well MWA-1, MWA-2 and MWD-6. PCE and TCE concentrations continue to exhibit stable concentrations below the historical high concentrations for each well, with the exception of MWD-6 where PCE and TCE concentrations were reported at the highest historical concentrations. Monitoring well MWA-5 continues to be the only well with detections of chloromethane, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, 1,2-trichloroethane, and methylene chloride. These compounds were first detected in MWA-5 in April 2012. Since that sampling event, the concentrations for each of the above-noted compounds have decreased substantially, with methylene chloride's concentrations decreasing from 600 to 19 µg/L and 1,2-dichloroethane decreasing from 28 to less than 5.0 µg/L. The June 2016 sampling event shows that these compounds have all decreased to less than 5.0 µg/L with the exception of Methylene Chloride which has continued to decrease from 36 µg/L in January 2016 to 19 µg/L in June 2016. The presence of these compounds may be the result of degradation of PCE and TCE.

Only four (4) of the 13 monitoring wells sampled (MWA-5, MWD-6, MW-12 and MW-13) had increases in PCE and TCE concentrations in the latest sampling event. Although four (4) of the sampled wells showed an increase in PCE and TCE concentrations, other than MWD-6, the concentration values are lower than the historically highest values. The results for volatile organic compound analysis are included on Table 2 in Appendix B.

Historical data has indicated that the groundwater contamination has been delineated to respective MCLs in all directions with the addition of MW-16 to the southwest on February 23, 2015. A copy of the soil boring log is included in Appendix D. The groundwater contamination continues to follow historical trends. There are signs of increases for PCE and TCE above historically high concentrations, which could be a result of increasing groundwater elevations.

### 3.6 Historical Groundwater Trends

GEC created trend graphs for monitoring wells MWA-1, MWA-2, MWD-6, MW-10, MW-12 and MW-13 by plotting PCE and TCE historical concentrations over time. Sample dates following ISCO treatments at the site are noted on each trend graph. Review of historical PCE and TCE data indicates an overall decreasing trend for the property. While concentrations in monitoring wells MWA-2 and MWD-6 appear to show no distinct trend due to varying concentrations, the remaining monitoring wells investigated indicate a decreasing trend. Please refer to Appendix C for the trend graphs.

## 4.0 VAPOR INTRUSION INVESTIGATION

### 4.1 Summary of Vapor Sampling Protocol

In order to address the potential vapor intrusion risk pathway, GEC collected soil gas samples in four (4) locations on the property. Prior to mobilizing to the site, GEC notified the Utilities Protection Center to ensure that underground utilities were identified within the proposed investigation areas.

GEC mobilized to the site on June 10, 2016, along with a drilling crew from GeoLab Drilling. The soil gas borings were advanced via direct push technology utilizing a track-mounted GeoProbe. Two (2) nested soil gas probes were installed in four (4) locations on the subject property. One was installed in the source area and the other three were installed near the residential and commercial structures on the property. Probes were installed at a depth of 5 feet below ground surface (bgs) and directly above the groundwater table.

Sampling probes were constructed of 1.0-inch diameter aquarium grade sandstone used as the screen and Teflon-lined tubing. The Teflon tubing was attached to the sandstone screen and extended to the surface for sampling. A sand pack was placed in the annulus of the boring approximately 0.5-feet above the top of the sandstone screen. A hydrated granular bentonite seal was placed on top of the sand pack and at the surface around the Teflon tubing to ensure the boring was properly sealed. Per the Office of Solid Waste and Emergency Response (OSWER) Technical Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (dated June 2015) leak detection was performed following installation of the sampling probes, utilizing a helium tracer gas shroud. Leak detection was performed to ensure that the boring was properly sealed with acceptable results. Following the leak detection, the borings were left to equilibrate prior to sampling.

GEC returned to the property on June 13, 2016 to perform the soil gas sampling. Soil gas samples were collected using 1.4L vacuum-pressurized metal canisters and quick-connect restrictors. Eight (8) soil gas samples were collected along with two (2) ambient air samples for comparison. The ambient air samples were collected using 6L vacuum-pressurized metal Summa canisters and 8- hour flow controllers.

Following sample collection, the canisters were sealed and transported via FedEx to Analytical Environmental Services Laboratory in Atlanta, Georgia for analysis of VOCs on a standard turnaround time. Proper chain-of-custody was maintained at all times.

### 4.2 Vapor Sampling [6/13/16]

GEC submitted the vapor samples for VOC analysis utilizing EPA Method TO-15. VOC analysis was limited to chemicals of concern (COCs) only detected in the groundwater; Cis-1,2-Dichloroethene, Methylene Chloride, Tetrachloroethene and Trichloroethene. GEC utilized the EPA Vapor Intrusion Screening Level (VISL) calculator to analyze the analytical results for vapor intrusion risk. The EPA VISL Calculator worksheet for sub-slab or exterior soil gas concentrations to indoor air concentrations, and indoor air concentration to IAC-Risk were utilized to evaluate each constituent's carcinogenic risk and/or vapor intrusion hazards. Review of the VISL worksheets indicated that all constituents were reported below the target risk for carcinogens (TRC), $10^{-5}$, and/or the target hazard quotient (THQ) for Non-Carcinogens, 1, in all of the samples with the exception of VS-1 5', using a commercial scenario. This sample had an exceedance of both the TRC and THQ for PCE and TCE, indicating a vapor intrusion hazard for the subject property.

Soil gas sample VS-1, was collected in the source area of the subject property. Subsequent soil gas samples (VS-2, VS-3 and VS-4) were collected near the commercial and residential areas of the

property; and none of the samples collected exhibited exceedances of the TRC or THQ, indicating that the vapor intrusion pathway is incomplete for the subject property. Since the only area with an apparent vapor intrusion risk is the source area, GEC is of the opinion that the vapor intrusion risk pathway is incomplete for the property as long as the source area remains undeveloped and covered with pavement and sidewalks. GEC recommends that an environmental covenant be put in place for this area to prevent future construction and/or require vapor mitigation if the area is to be developed. Copies of the VISL Calculator worksheets are presented in Appendix F.

## 5.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) is intended to establish a common knowledge base about the property and its environmental condition, to facility the development of basic remedial action objectives appropriate for the property, and to allow an informed decision regarding possible remedial action measures for the property. This section discusses the CSM schematics depicted on Figures 7, 7A and 7B. More specifically, this section describes the surface and subsurface features of the property, discusses the fate and transport of dissolved PCE in the groundwater, and discusses the potential receptors and exposure pathways associated with the contaminates at the property.

### 5.1 Elements of the Conceptual Site Model

Figures 7, 7A and 7B are plan view and profile diagrams depicting the approximate extend of VOCs in the subsurface and the potential exposure pathways and receptors. The subsurface is segregated into three (3) zones – fill (to a depth ranging from approximately near ground surface to six feet below ground surface (bgs)), vadose zone residual soils (to a depth of approximately 30-70 feet bgs), and saturated zone residual soils (approximately 35-80 feet bgs). The approximate extend of VOCs, as well as potential receptors and exposure pathways, is depicted in the figures. Based on the layout of the site and the source of the contamination, GEC does not feel that potential exposure to the contamination at the site is an issue. The source area soils, which are located under a median between Coleman Avenue and Montpelier Avenue, under paved roadways and paved sidewalks, have been treated with chemical oxidation. No detections above Type 1 RRS were made during GEC's sampling of the soils in February 2012. Furthermore, the soils are in an area that is not typically accessed by people, and potential exposure to soils in this area is extremely limited.

### 5.2 Ground Surface Features

While Mercer University Campus contains some hills and inclines, the overall slope of the campus is down towards the southwest. The university campus contains multiple administrative offices, classroom buildings, athletic buildings, dorms and apartments, and other buildings related to an academic setting. Multiple streets, both public and private, traverse around and through the campus. Much of the campus is grassed or unpaved, with walkways and sidewalks along the roadways. There are also multiple parking lots on the campus.

The general slope of the school property appears to be to the southeast, towards an unnamed tributary of the Ocmulgee River, that runs from the downtown area to a swampy area located on the east side of downtown Macon, near the Ocmulgee River.

### 5.3 Subsurface Features

The upper portion of Figure 7A and 7B represents a layer of fill material ranging from the near surface to approximately six (6) feet below the existing ground surface. The fill material appears to consist primarily of sand with varying silt and clay content or clay with varying sand content. The fill at the site is underlain by residual soils extending to maximum depths explored. The residual soils consisted of sand with varying silt and clay content and silts with varying sand and clay content. Some borings encountered clay with varying sand content.

### 5.4 Potential Receptors and Exposure Pathways

The property includes multiple lots owned by Mercer University. The adjacent properties included businesses located around the Mercer Triangle, loft apartments, offices, and the Mercer University campus. The campus includes multiple administrative buildings, classroom buildings, athletic buildings, dorms and apartments, and other buildings related to an academic setting. The source area soils, which are located under a median between Coleman Avenue and Montpelier Avenue, under paved roadways and sidewalks, have been treated with chemical oxidation. No detections above Type 1 RRS were made during GECs sampling of the soils in February 2012. Furthermore, the soils are in an area that is not typically accessed by people, and potential exposure to soils in this area is extremely limited.

The adjoining properties are used for residential or commercial purposes and also include a public park, located to the east of the subject site. The majority of the area near the Mercer Triangle is zoned for residential or commercial property. The nearest residential area is located along Coleman Avenue, which runs past the triangle area. The Mercer University campus and surrounding areas are serviced by public drinking water systems. The Macon Water Authority and the City of Macon are not aware of any drinking water wells in the vicinity of the subject property. GEC interviewed the Mercer University administration, which noted that one well is located on the subject property, at the medical school, and is used for supplying water to a cooling tower. However, the staff noted that the well could be taken out of commission if needed. GEC has conducted multiple potential receptor surveys of the area through the years, and the well used for the medical school cooling tower is the nearest well to the source area and plume, and is located approximated 2,000 feet from the source area and approximately 1,200 feet from the edge of the dissolved PCE plume. The nearest surface water is located southeast of the subject property, approximately 3,100 feet from the Mercer Triangle.

The PCE release has impacted surface soil only in a small area (relative to the size of the property), which is mostly covered by pavement and sidewalks. Sampling in this area has not identified soil contamination above Type 1 RRS since remediation. The sampling indicates that any potential exposure and risk for current and potential future receptors from PCE in soils is significantly limited.

Several current and/or potential future human receptors have been identified. These potential receptors are listed below, along with a brief discussion of the rationale behind their identification and the pathways through which they could potentially be exposed to VOCs associated with the PCE release. Each of the human exposure scenarios are on-sire scenarios. There are no potential groundwater receptors.

- *Future Construction Worker:* There are no current workers in the source area at the Mercer Triangle. However, should future roadwork or work in the median of Coleman Avenue be needed, workers could potential be exposed to VOCs. It should be noted again that no VOCs were detected in the source area above Type 1 RRS during the sampling in February 2012. Vapor encroachment at the site is not considered to be a major concern due to the relatively low levels of soil contamination and depth of the groundwater plume at the site.

- *Current/Future Groundskeeper:* The median of the roadway near the Triangle, is occasionally maintained by a grass cutting crew. The soils that area in the median of the roadway consist primarily of fill that was brought in for landscaping. It is not anticipated that grounds crew will be exposed to significant levels of VOCs while cutting grass and weed eating.

- *Future Adolescent Trespasses:* Access to the source area is currently limited by the presence of roadways. Trespassing to the median is highly unlikely due to traffic in the area and constant surveillance by campus security and Macon Police

The source area is mostly covered by pavement, walkways, and a roadway median. The grass in this area is moved on a regular basis. The area does not represent quality habitat for wildlife as is lack natural vegetative cover, structure, and diversity and is unlikely to have substantial vegetative cover in the future, due to ongoing maintenance activities. Disturbance from vehicles, facility operations, and mowing likely have disturbed and will continue to disturb wildlife and cause animals to seek less frequently disturbed areas.

### 5.5 Fate and Transport Modeling

The PCE appears to have been released from a mixture of surface dumping and leaking underground storage tanks used to store PCE at a drycleaner the previously operated in the Mercer Triangle; now located under a roadway and median. Based on reviewed historical information, it appears that the drycleaner operated between 1969 and 1996. Soil sampling of the area showed that the PCE concentrations in the soil have not migrated beyond the source area around the Mercer Triangle.

The PCE likely migrated downward through the subsurface environmental over the years before reaching the groundwater table located between 30 and 75 feet below the ground surface, forming a dissolved-phase plume of PCE and certain daughter products, namely TCE. Sampling of the groundwater wells near the source area does not indicate significant vertical migration of the PCE plume indicates that the plume has extended over 600 feet to well MW-14 located southeast of the source area. Lateral thickness of the plume based on detection is groundwater wells, indicates the plume is between 200 and 300 feet wide.

GEC utilized the Biochlor Natural Attenuation Decision Support System to determine the viability of natural attenuation for this site. Two different models were run by changing the model area length, representing the extents of the current investigation and the distance Mercer University's property

extends down-gradient from the source area. Both scenarios were run using current groundwater field data from the June 2016 sampling event as well as historically high concentrations from January 18, 2008. GEC utilized default parameters for dispersion, adsorption, and biotransformation. Site specific advection data was obtained from slug testing and June 2016 groundwater elevations. Source data and field data were obtained from the June 2016 and January 18, 2008 sampling events. The Biochlor input sheets and center line result sheets are included in Appendix E. Model inputs and supporting documentation are also included in Appendix E.

While groundwater concentrations appear to be increasing at the property, model analysis indicates that natural attenuation will effectively remediate the plume, which is still on Mercer University property, even with historically high concentrations.

### 5.6 Vapor Intrusion Modeling

Currently, the groundwater contaminant plume underlies a number of buildings within the project area. Therefore, the potential complete risk pathway for vapor intrusion is a concern. GEC utilized the EPA Vapor Intrusion Screening Levels Calculator (VISL), groundwater concentration to indoor air concentration spreadsheet, to evaluate this concern. The VISL spreadsheet was utilized to evaluate the potential for vapor intrusion because it is routinely revised with updated Regional Screening Levels (RSLs), toxicity, and parameter changes, which makes it more suitable for evaluation of the VOCs detected at the site.

In accordance with worst-case potential vapor intrusion pathway scenarios originally modeled by EPD, GEC utilized the most recent (June 2016) groundwater sampling data for PCE and TCE concentrations in monitoring wells MWA-1, MWA-2 and MWD-6, to evaluate potential commercial exposure scenarios. Similarly, the most recent PCE and/or TCE groundwater concentrations in monitoring wells MW-10, MW-13, and MW-14, were utilized to conservatively evaluate the potential for residential exposures (i.e. on-campus student residences). Note: Groundwater concentrations for cis-1,2-dichloroethene (CAS #156-59-2) identified MWA-1, MWA-2, MWD-6, and MW-13, were not included in the VISL calculation, because the chemical does not have toxicity data, and is therefore not listed.

GEC also modified the default VISL parameters where site-specific information was available, including revision of the water temperature parameter from the default of 25°C to 20°C and revision of the groundwater attenuation factor from 0.001 to 0.0005, based upon soil conditions. GEC also revised the Target Risk for Carcinogens from $1.00E^{-06}$ to $1.00E^{-05}$ (per Ga EPD guidance), and set exposure scenarios at commercial for monitoring wells located in the area of the triangle, and at residential for monitoring wells located near on-campus residential buildings.

<u>Commercial Vapor Intrusion Evaluation</u>

Review of the VISL worksheets indicated that calculated indoor air concentrations (based upon June 2016, MWA-1, MWA-2, MWD-6 groundwater data) indicated the following:

- Concentrations of PCE in air were calculated below the Target Risk for Carcinogens (TRC 1.00 x $10^{-5}$) and the Target Hazard Quotient for Non-Carcinogens (THQ 1) for all three monitoring wells.
- Concentrations of TCE in indoor air were calculated below the conservative Target Risk for Carcinogens for all three monitoring wells.
- Concentrations of TCE in indoor air ***exceeded*** the Target Hazard Quotient for Non-Carcinogens in MWA-2 and MWD-6.

Residential Vapor Intrusion Evaluation

Review of the VISL worksheets indicated that calculated indoor air concentrations (based upon June 2016, MW-10, MW-13, and MW-14 groundwater data) indicated the following:

- MW-10 and MW-14: Indoor concentrations of PCE and TCE in air were calculated below the conservative Target Risk for Carcinogens and the Target Hazard Quotient for Non-Carcinogens.
- MW-13: Concentrations of TCE in indoor air ***exceeded*** the Target Risk for Carcinogens and Target Hazard Quotient for Non-Carcinogens.

Based upon the results of VISL calculations, it appears that TCE groundwater concentrations represent a potential vapor intrusion risk under both commercial and residential scenarios.

In order to further assess the potential vapor intrusion risk pathway, GEC collected eight (8) soil gas samples in four (4) different locations throughout the subject property, and analyzed the results using the EPA VISL Calculator. GEC utilized the default VISL parameters on the exterior soil gas concentration to indoor air concentration calculator spreadsheet. GEC revised the Target Risk for Carcinogens from $1.00E^{-06}$ to $1.00E^{-05}$ (per Ga EPD guidance), and set exposure scenarios at commercial for soil gas samples located in the area of the triangle (VS-1 and VS-2), and at residential for soil gas samples located near on-campus residential buildings (VS-3 and VS-4).

Soil Gas Evaluation

Review of the VISL worksheets indicated that calculated indoor air concentrations (based upon soil gas data collected in June 2016) indicated the following:

- VS-1 5': Indoor concentrations of PCE in air ***exceeded*** the Target Risk for Carcinogens and the Target Hazard Quotient for Non-Carcinogens and indoor concentrations of TCE in air ***exceeded*** the Target Hazard Quotient for Non-Carcinogens.
- VS-1 GW, VS-2, VS-3 and VS-4: Indoor concentrations of PCE and TCE in air were calculated below the conservative Target Risk for Carcinogens and the Target Hazard Quotient for Non-Carcinogens.

Since soil gas sample VS-1 5' was the only sample to exhibit vapor intrusion risk, and since none of the subsequent soil gas samples (VS-2, VS-3 and VS-4) collected near the commercial and residential areas of the property exhibited exceedances of the TRC or THQ, GEC is of the opinion

that the vapor intrusion pathway is incomplete for the subject property. While current groundwater data identified a potential TCE vapor intrusion risk, the depth of groundwater at the property and clayey soils above the groundwater table limit the vapor intrusion risk to the property, as proven by the collected soil gas samples. Since the only area with an apparent vapor intrusion risk is the source area, GEC is of the opinion that the vapor intrusion risk pathway is incomplete for the property as long as the source area remains undeveloped and covered with pavement and sidewalks. GEC recommends that an environmental covenant be put in place for this area to prevent future construction and/or require vapor mitigation if the area is to be developed. Copies of the VISL data sheets for all iterations are included in Appendix F.

## 6.0 CONCLUSION

Based upon the observance of increasing PCE and TCE concentrations, GEC proposes to continue semi-annual groundwater sampling to monitor the biodegradation of the groundwater plume, and reporting per the approved VIRP application.

GEC will complete another semi-annual monitoring event, which will include the full groundwater monitoring network. The next submittal will include updated BIOCHLOR analysis utilizing the new groundwater data, to monitor the natural attenuation of the groundwater plume.

## 7.0 PROJECTED MILESTONE SCHEDULE

GEC submitted with the VIRP application on September 30, 2013, a project milestone schedule. To this date the following items have been completed:

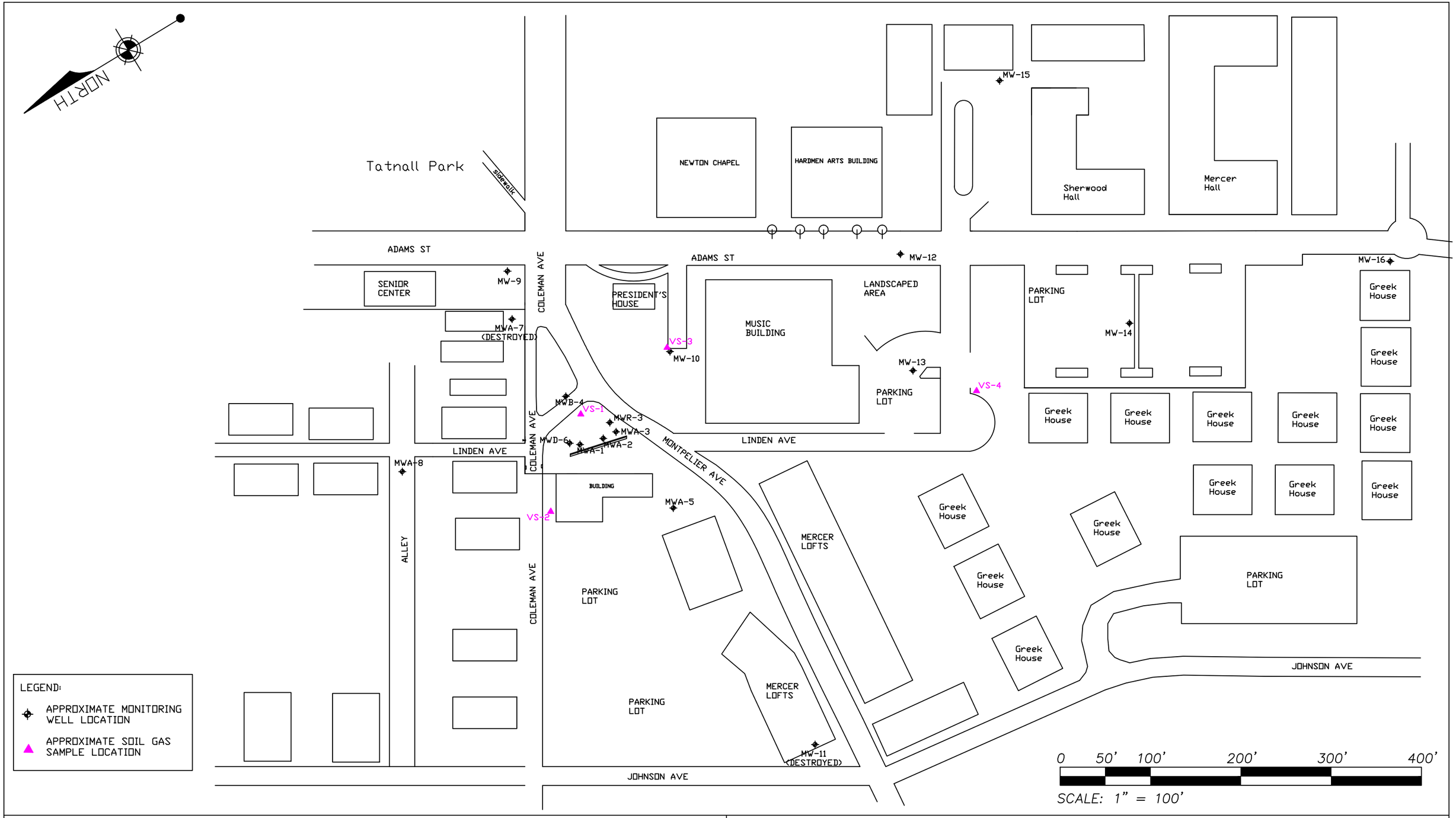
- ✓ Groundwater Delineation (on-site and off-site)-horizontal delineation was completed with the installation of monitoring well MW-16 on February 23, 2015.
- ✓ Updated CSM submittal and vertical delineation – an updated CSM has been included with this report and will be updated with each additional progress report.

GEC proposes to continue semi-annual groundwater sampling and annual reporting throughout the VRP process. GEC plans to submit the Compliance Status Report within 60 months of enrollment, tentatively scheduled for September 30, 2018.

# APPENDIX A

FIGURES

GEC




GEC
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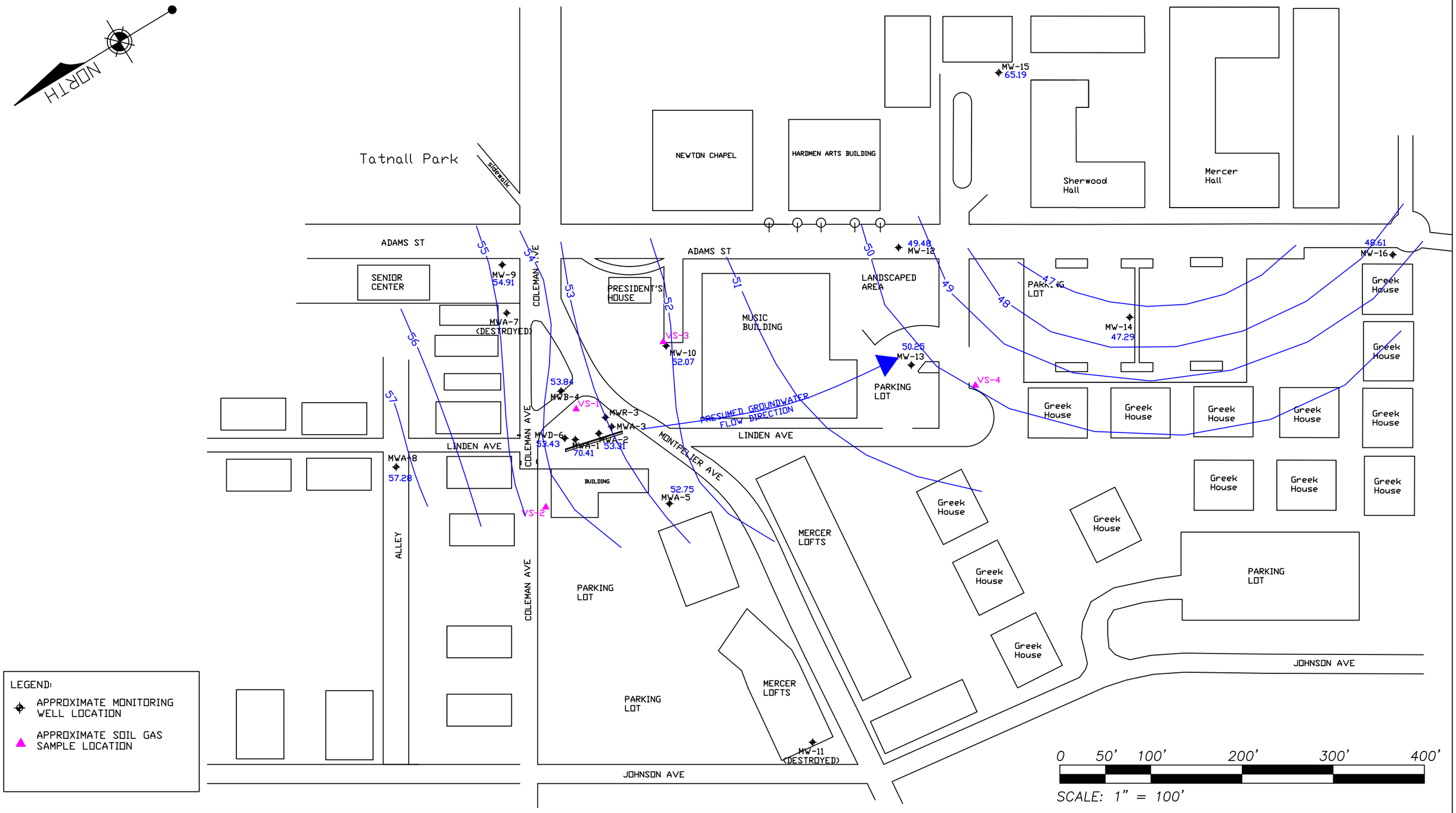
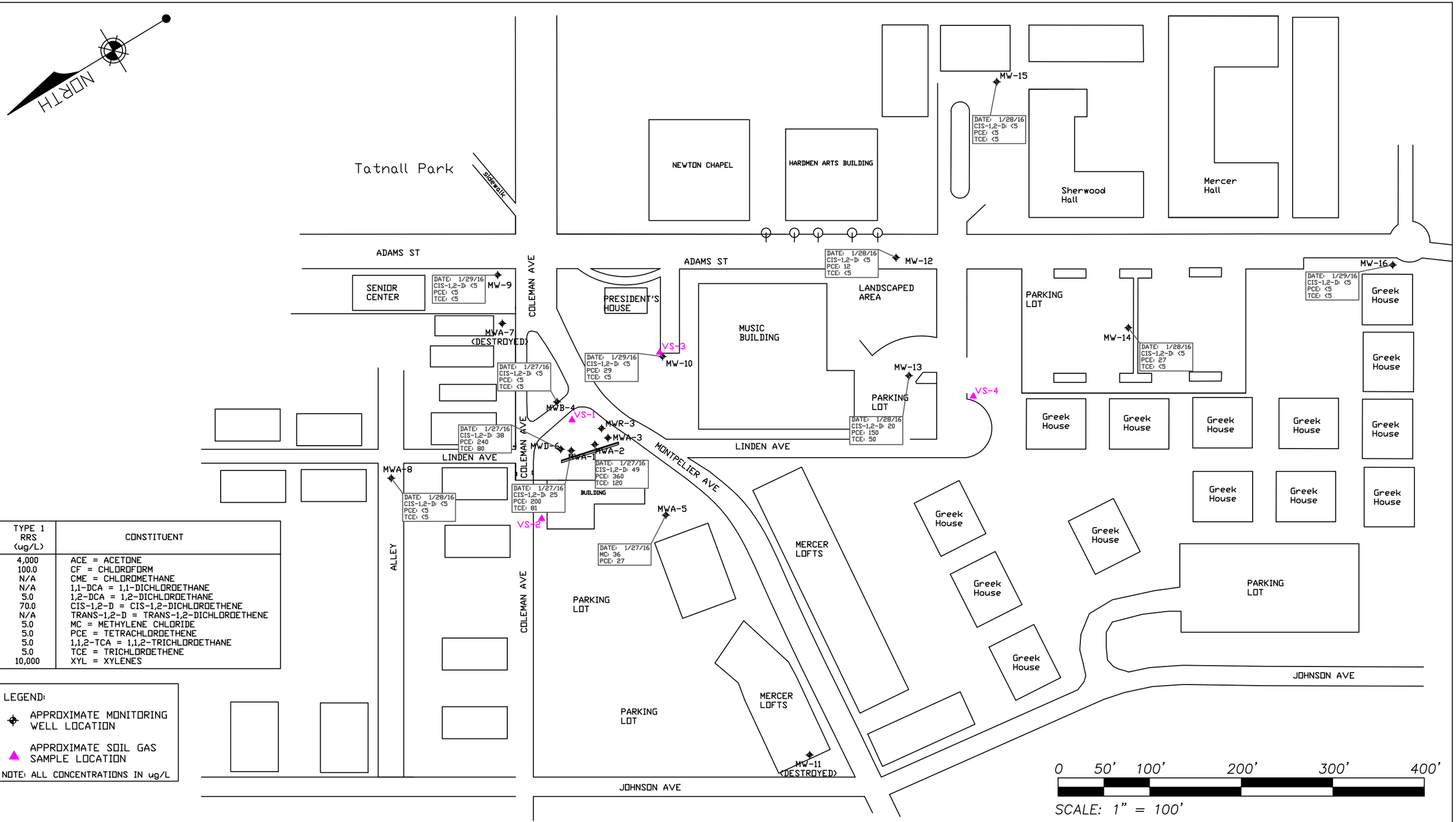
CONSULTANTS

FIGURE 1
SITE MAP
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210




GEC
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS

FIGURE 2
POTENTIOMETRIC CONTOUR MAP, JUNE 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210




| TYPE 1 RRS (ug/L) | CONSTITUENT |
|---|---|
| 4,000 | ACE = ACETONE |
| 100.0 | CF = CHLOROFORM |
| N/A | CME = CHLOROMETHANE |
| N/A | 1,1-DCA = 1,1-DICHLOROETHANE |
| 5.0 | 1,2-DCA = 1,2-DICHLOROETHANE |
| 70.0 | CIS-1,2-D = CIS-1,2-DICHLOROETHENE |
| N/A | TRANS-1,2-D = TRANS-1,2-DICHLOROETHENE |
| 5.0 | MC = METHYLENE CHLORIDE |
| 5.0 | PCE = TETRACHLOROETHENE |
| 5.0 | 1,1,2-TCA = 1,1,2-TRICHLOROETHANE |
| 5.0 | TCE = TRICHLOROETHENE |
| 10,000 | XYL = XYLENES |

LEGEND:

- APPROXIMATE MONITORING WELL LOCATION
- APPROXIMATE SOIL GAS SAMPLE LOCATION

NOTE: ALL CONCENTRATIONS IN ug/L

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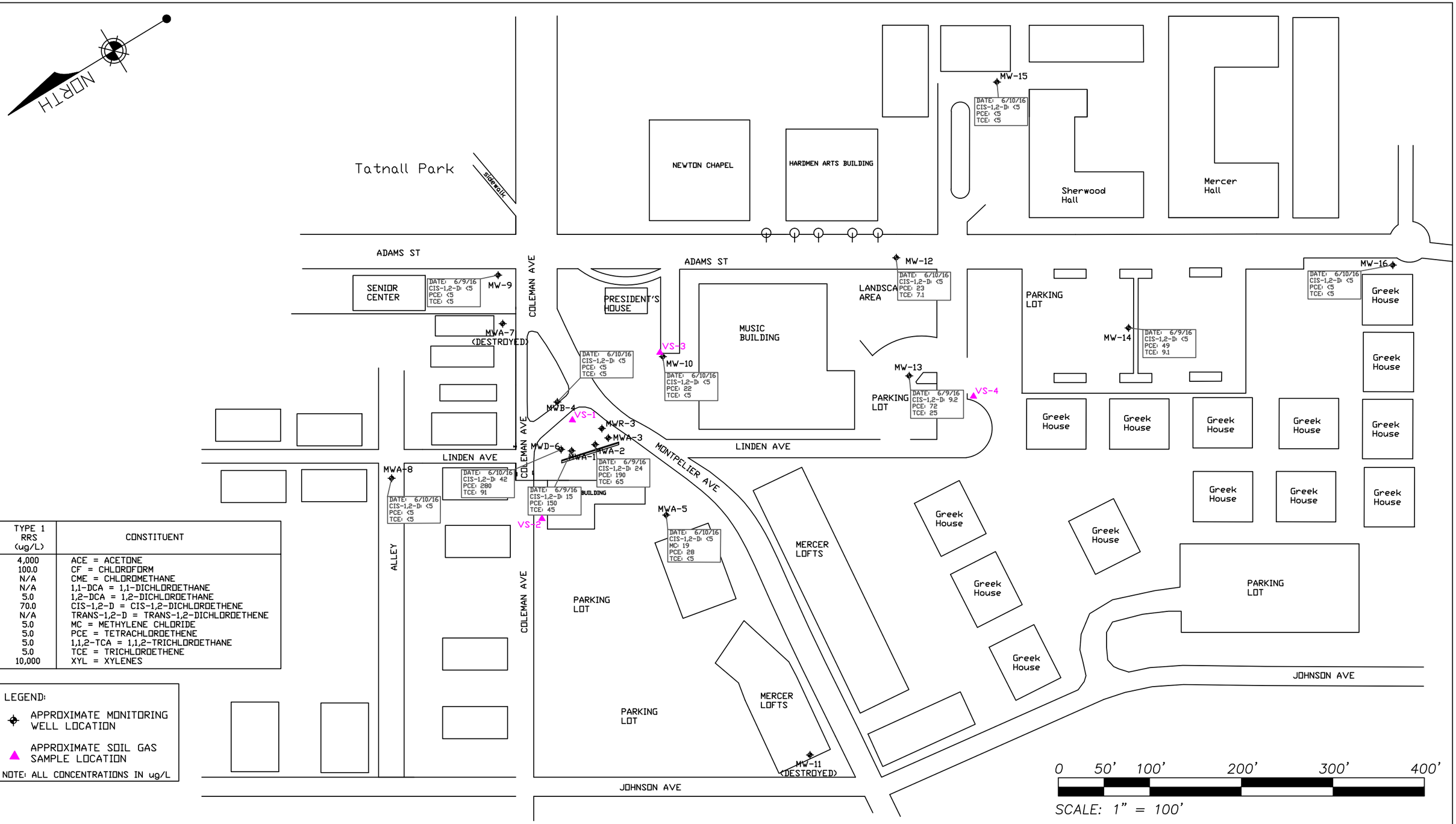
FIGURE 3A
GROUNDWATER QUALITY MAP JANUARY 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210




| TYPE 1 RRS (ug/L) | CONSTITUENT |
|---|---|
| 4,000 | ACE = ACETONE |
| 100.0 | CF = CHLOROFORM |
| N/A | CME = CHLOROMETHANE |
| N/A | 1,1-DCA = 1,1-DICHLOROETHANE |
| 5.0 | 1,2-DCA = 1,2-DICHLOROETHANE |
| 70.0 | CIS-1,2-D = CIS-1,2-DICHLOROETHENE |
| N/A | TRANS-1,2-D = TRANS-1,2-DICHLOROETHENE |
| 5.0 | MC = METHYLENE CHLORIDE |
| 5.0 | PCE = TETRACHLOROETHENE |
| 5.0 | 1,1,2-TCA = 1,1,2-TRICHLOROETHANE |
| 5.0 | TCE = TRICHLOROETHENE |
| 10,000 | XYL = XYLENES |

LEGEND:

- APPROXIMATE MONITORING WELL LOCATION
- APPROXIMATE SOIL GAS SAMPLE LOCATION

NOTE: ALL CONCENTRATIONS IN ug/L

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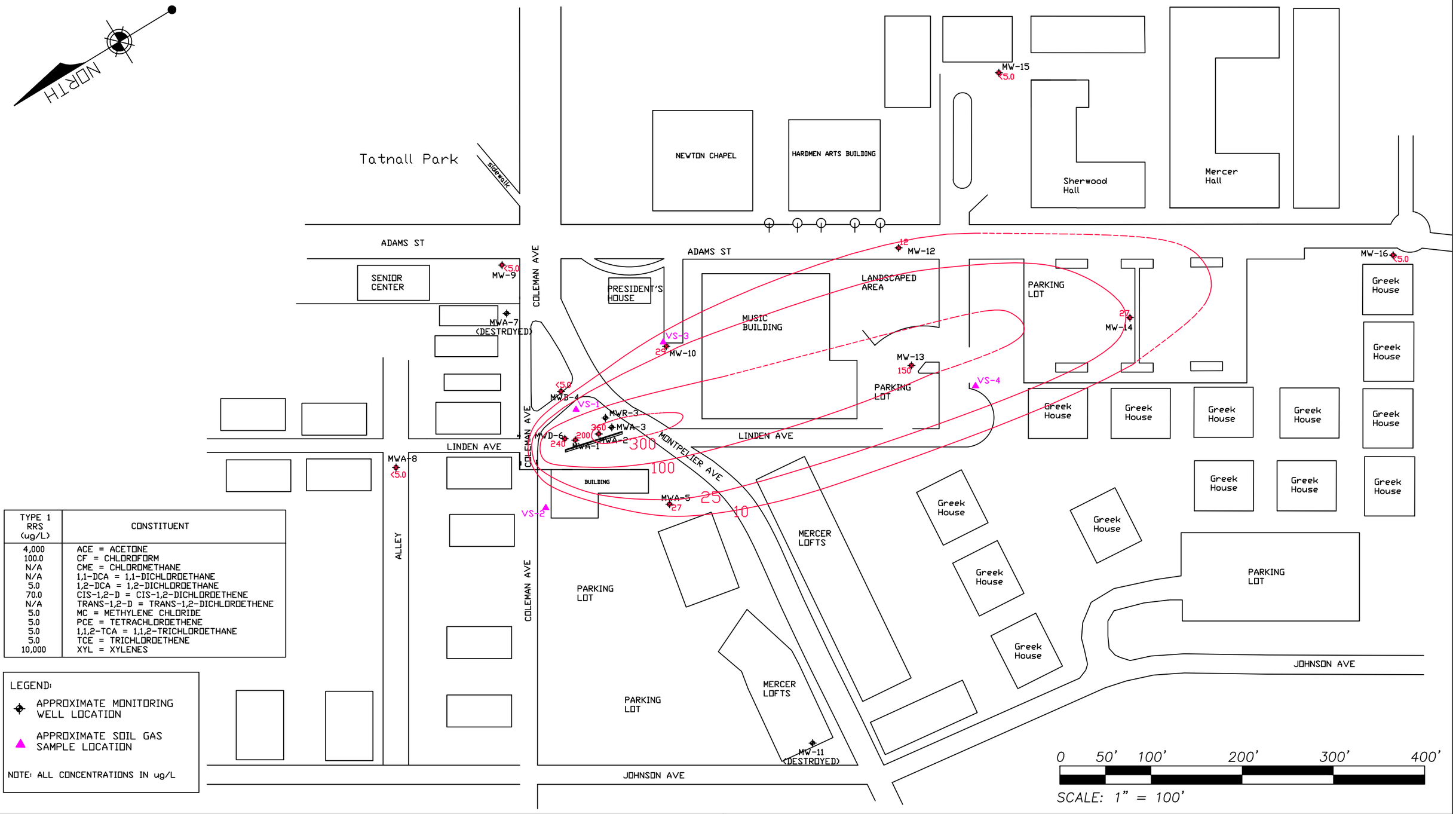
FIGURE 3B
GROUNDWATER QUALITY MAP JUNE 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210




| TYPE 1 RRS (ug/L) | CONSTITUENT |
|---|---|
| 4,000 | ACE = ACETONE |
| 100.0 | CF = CHLOROFORM |
| N/A | CME = CHLOROMETHANE |
| N/A | 1,1-DCA = 1,1-DICHLORDETHANE |
| 5.0 | 1,2-DCA = 1,2-DICHLORDETHANE |
| 70.0 | CIS-1,2-D = CIS-1,2-DICHLORDETHENE |
| N/A | TRANS-1,2-D = TRANS-1,2-DICHLORDETHENE |
| 5.0 | MC = METHYLENE CHLORIDE |
| 5.0 | PCE = TETRACHLORDETHENE |
| 5.0 | 1,1,2-TCA = 1,1,2-TRICHLORDETHANE |
| 5.0 | TCE = TRICHLORDETHENE |
| 10,000 | XYL = XYLENES |

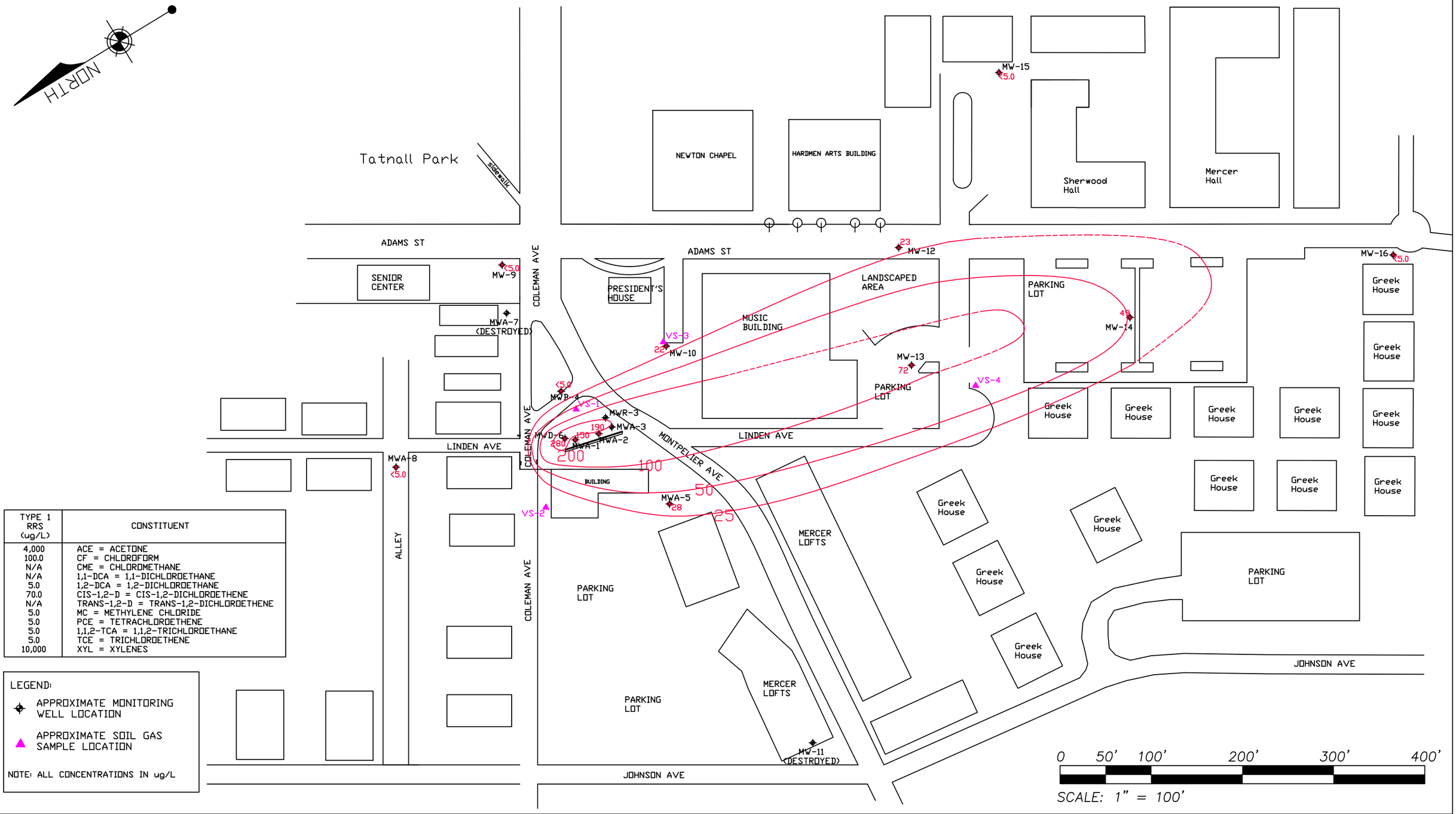
LEGEND:

- APPROXIMATE MONITORING WELL LOCATION
- APPROXIMATE SOIL GAS SAMPLE LOCATION

NOTE: ALL CONCENTRATIONS IN ug/L

**GEC**
**GEOTECHNICAL & ENVIRONMENTAL**
CONSULTANTS

FIGURE 4A
PCE ISOCONTOUR MAP, JANUARY 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210




| TYPE 1 RRS (ug/L) | CONSTITUENT |
|---|---|
| 4,000 | ACE = ACETONE |
| 100.0 | CF = CHLOROFORM |
| N/A | CME = CHLOROMETHANE |
| N/A | 1,1-DCA = 1,1-DICHLORDETHANE |
| 5.0 | 1,2-DCA = 1,2-DICHLORDETHANE |
| 70.0 | CIS-1,2-D = CIS-1,2-DICHLORDETHENE |
| N/A | TRANS-1,2-D = TRANS-1,2-DICHLORDETHENE |
| 5.0 | MC = METHYLENE CHLORIDE |
| 5.0 | PCE = TETRACHLORDETHENE |
| 5.0 | 1,1,2-TCA = 1,1,2-TRICHLORDETHANE |
| 5.0 | TCE = TRICHLORDETHENE |
| 10,000 | XYL = XYLENES |

LEGEND:

- APPROXIMATE MONITORING WELL LOCATION
- APPROXIMATE SOIL GAS SAMPLE LOCATION

NOTE: ALL CONCENTRATIONS IN ug/L

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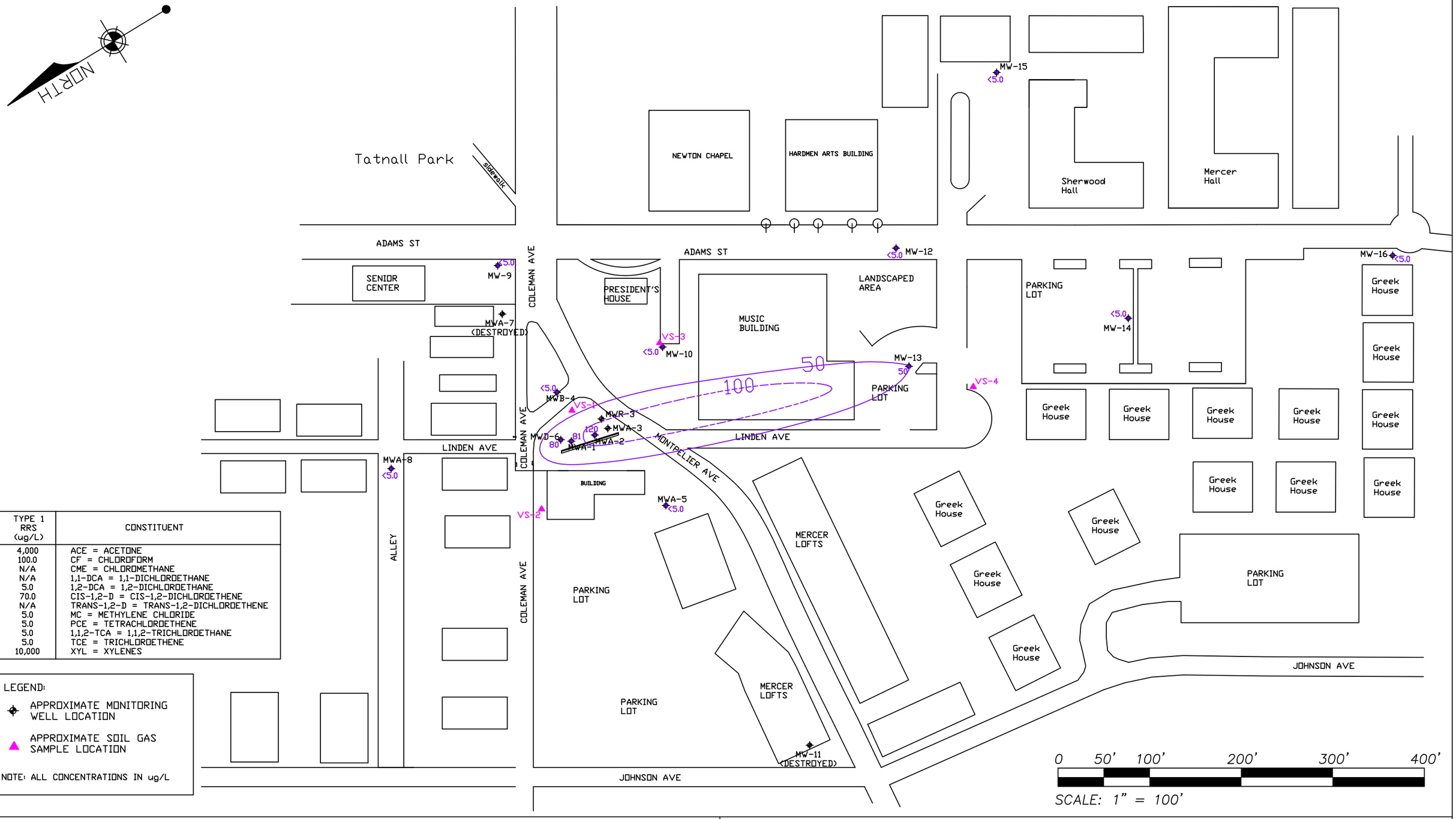
FIGURE 4B
PCE ISOCONTOUR MAP, JUNE 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210




| TYPE 1 RRS (ug/L) | CONSTITUENT |
|---|---|
| 4,000 | ACE = ACETONE |
| 100.0 | CF = CHLOROFORM |
| N/A | CME = CHLOROMETHANE |
| N/A | 1,1-DCA = 1,1-DICHLORDETHANE |
| 5.0 | 1,2-DCA = 1,2-DICHLORDETHANE |
| 70.0 | CIS-1,2-D = CIS-1,2-DICHLORDETHENE |
| N/A | TRANS-1,2-D = TRANS-1,2-DICHLORDETHENE |
| 5.0 | MC = METHYLENE CHLORIDE |
| 5.0 | PCE = TETRACHLORDETHENE |
| 5.0 | 1,1,2-TCA = 1,1,2-TRICHLORDETHANE |
| 5.0 | TCE = TRICHLORDETHENE |
| 10,000 | XYL = XYLENES |

LEGEND:

- APPROXIMATE MONITORING WELL LOCATION
- APPROXIMATE SOIL GAS SAMPLE LOCATION

NOTE: ALL CONCENTRATIONS IN ug/L

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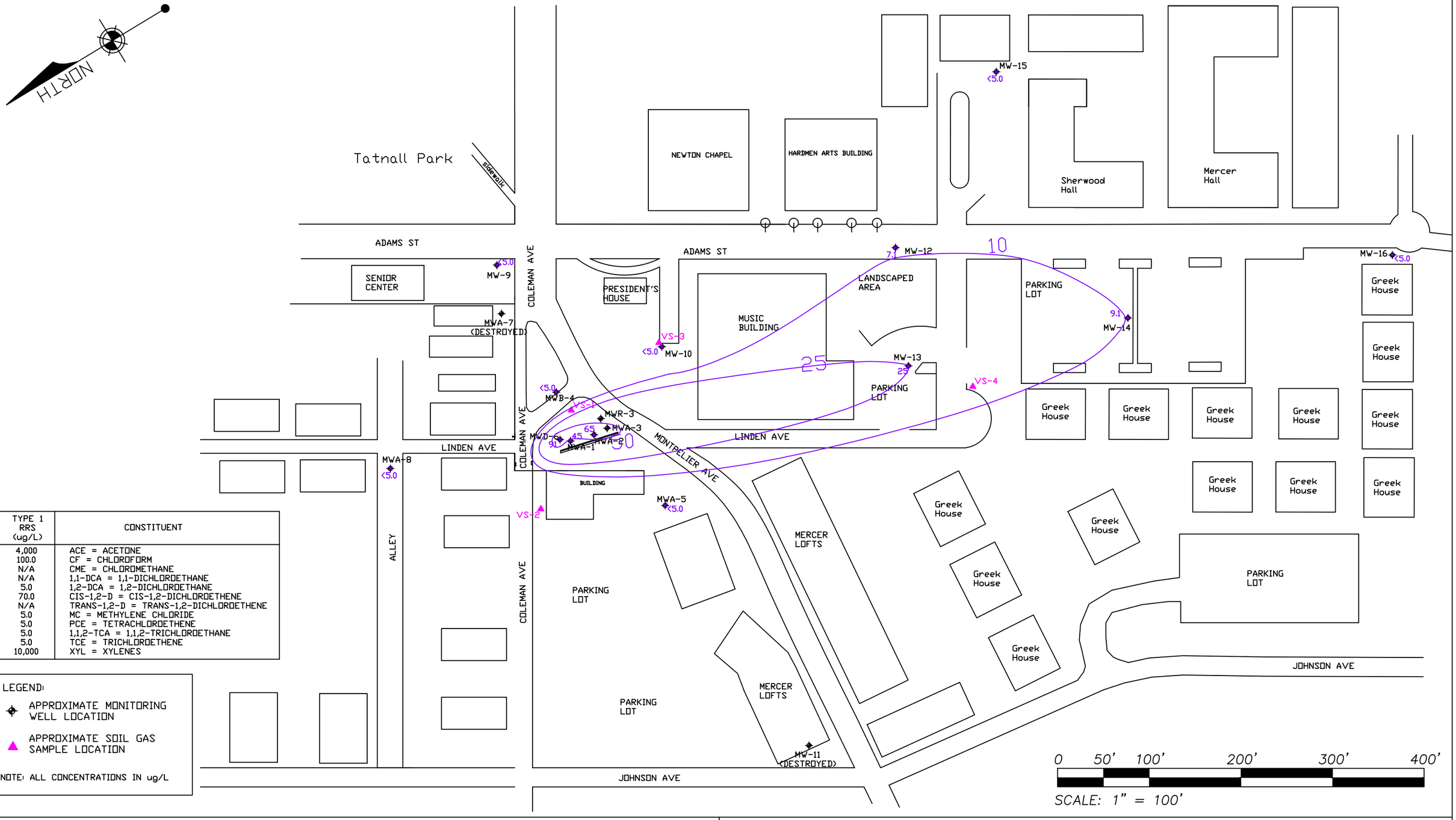
CONSULTANTS

FIGURE 5A
TCE ISOCONTOUR MAP, JANUARY 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210




| TYPE 1 RRS (ug/L) | CONSTITUENT |
|---|---|
| 4,000 | ACE = ACETONE |
| 100.0 | CF = CHLOROFORM |
| N/A | CME = CHLOROMETHANE |
| N/A | 1,1-DCA = 1,1-DICHLORDETHANE |
| 5.0 | 1,2-DCA = 1,2-DICHLORDETHANE |
| 70.0 | CIS-1,2-D = CIS-1,2-DICHLORDETHENE |
| N/A | TRANS-1,2-D = TRANS-1,2-DICHLORDETHENE |
| 5.0 | MC = METHYLENE CHLORIDE |
| 5.0 | PCE = TETRACHLORDETHENE |
| 5.0 | 1,1,2-TCA = 1,1,2-TRICHLORDETHANE |
| 5.0 | TCE = TRICHLORDETHENE |
| 10,000 | XYL = XYLENES |

LEGEND:

- APPROXIMATE MONITORING WELL LOCATION
- APPROXIMATE SOIL GAS SAMPLE LOCATION

NOTE: ALL CONCENTRATIONS IN ug/L

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FIGURE 5B
TCE ISOCONTOUR MAP, JUNE 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210

NORTH

Tatnall Park

Sidewalk

NEWTON CHAPEL

HARDMEN ARTS BUILDING

Sherwood Hall

Mercer Hall

MW-15

ADAMS ST

SENIOR CENTER

MW-9

COLEMAN AVE

PRESIDENT'S HOUSE

MW-12

LANDSCAPED AREA

MW-16

PARKING LOT

MW-14

MUSIC BUILDING

MWA-7 (DESTROYED)

DEPTH: GW
DATE: 6/13/16
CIS-1,2-D: 5.4
MC: <3.5
PCE: 58
TCE: 9.9

DEPTH: 5'
DATE: 6/13/16
CIS-1,2-D: <400
MC: <350
PCE: 21,000
TCE: 560

DEPTH: 5'
DATE: 6/13/16
CIS-1,2-D: <4.0
MC: <3.5
PCE: 160
TCE: <5.4

VS-3

MW-10

DEPTH: GW
DATE: 6/13/16
CIS-1,2-D: <4.0
MC: <3.5
PCE: 280
TCE: <5.4

MW-13

PARKING LOT

VS-4

DEPTH: 5'
DATE: 6/13/16
CIS-1,2-D: <4.0
MC: <3.5
PCE: 28
TCE: <5.4

DEPTH: GW
DATE: 6/13/16
CIS-1,2-D: <4.0
MC: <3.5
PCE: 75
TCE: <5.4

MWB-4

VS-1

MWR-3

MWA-3

MWA-2

MWD-6

MWA-1

LINDEN AVE

MONTPELIER AVE

Greek House

MWA-8

BUILDING

MWA-5

VS-2

DEPTH: GW
DATE: 6/13/16
CIS-1,2-D: <4.0
MC: <3.5
PCE: 25
TCE: <5.4

DEPTH: 5'
DATE: 6/13/16
CIS-1,2-D: <4.0
MC: <3.5
PCE: 340
TCE: 11

ALLEY

PARKING LOT

MERCER LOFTS

JOHNSON AVE

MW-11 (DESTROYED)

LEGEND:

- APPROXIMATE MONITORING WELL LOCATION
- APPROXIMATE SOIL GAS SAMPLE LOCATION

NOTE: ALL CONCENTRATIONS IN ug/m3

0 50' 100' 200' 300' 400'

SCALE: 1" = 100'

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CONSULTANTS

FIGURE 6
SOIL GAS SAMPLING RESULT, JUNE 2016
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210

# APPENDIX B

TABLES

GEC

Table 1
Risk Reduction Standards

| Soil | |
|---|---|
| Constituent | Type 1 and/or 4 RRS (mg/kg) |
| Tetrachloroethene | 0.5 |
| Trichloroethene | 0.5 |
| Cis 1,2-Dichloroethene | 7 |
| Trans 1,2-Dichloroethene | 10 |
| Acetone | 400 |
| Benzene | 0.5 |
| Toluene | 100 |
| Ethylbenzene | 70 |
| Xylenes | 1,000 |
| Naphthalene | 100 |
| 1,2 Dichlorobenzene | 60 |
| Vinyl Chloride | 0.2 |
| Groundwater | |
| Constituent | Type 1 and/or 4 RRS (ug/L) |
| Tetrachloroethene | 5 |
| Trichloroethene | 5 |
| Cis 1,2-Dichloroethene | 70 |
| Trans 1,2-Dichloroethene | 100 |
| Benzene | 5 |
| Toluene | 1,000 |
| Ethylbenzene | 700 |
| Xylenes | 1,0000 |
| Naphthalene | 20 |
| 1,2 Dichlorobenzene | 600 |
| Vinyl Chloride | 2 |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

## TABLE 2: GROUNDWATER ANALYTICAL RESULTS
(VOLATILE ORGANIC COMPOUNDS)

| Well Number | Date Sampled | Acetone | Benzene | Toluene | Ethylbenzene | Xylenes | cis-1,2-Dichloroethene | Trans-1,2-Dichloroethene | Naphthalene | Tetrachloroethene | Trichloroethene | 1,2-Dichloro benzene | Di-isopropyl ether | p-Isopropyltoluene | Chloromethane | Chloroform | Carbon Disulfide | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1,2-Trichloroethane | Methylene Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1* | 10/11/2002 | <10.0 | **190** | **510** | **130** | **470** | **10** | <1.0 | **25** | **180** | **14** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| MW-2* | 10/11/2002 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| MWA-1 | 12/18/2002 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **23** | <1.0 | <1.0 | **550** | **30** | **1.1** | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 3/24/2006 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **120** | **2.4** | <5.0 | **560** | **240** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **150** | **4.1** | <5.0 | **1200** | **340** | **1.5** | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 2/21/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **190** | <1.0 | <5.0 | **760** | **400** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/14/2009 | <10.0 | <20 | <100 | <20 | <60 | **72** | <20 | <100 | **500** | **240** | <20 | <20 | <20 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 7/29/2010 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **30** | **2.6** | <5.0 | **200** | **86** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/15/2011 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **95** | **2.6** | <5.0 | **590** | **230** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/11/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **45** | **2.6** | <5.0 | **210** | **78** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/4/2012 | **19.5** | <1.0 | <5.0 | <1.0 | <3.0 | **64.3** | **3.78** | <5.0 | **522** | **155** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | **76** | **7.8** | NT | **350** | **200** | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 10/16/2013 | <50 | <5 | <5 | <5 | <10 | **37** | <5.0 | NT | **380** | **140** | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/23/2014 | <50 | <1.0 | <5 | <1.0 | <3.0 | **16** | **1.6** | <5 | **63** | **41** | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/16/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **45** | <5.0 | NT | **260** | **120** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/27/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **25** | <5.1 | NT | **200** | **81** | <5.1 | NT | NT | <10.1 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/9/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **15** | <5.1 | NT | **150** | **45** | <5.1 | NT | NT | <10.1 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MWA-2 | 12/18/2002 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **2.2** | <1.0 | <5.0 | **110** | **3.6** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 3/24/2006 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **55** | **1.1** | <5.0 | **330** | **110** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **6.8** | <1.0 | <5.0 | **200** | **21** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 2/21/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **4.7** | <1.0 | <5.0 | <1.0 | **12** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/14/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **70** | **2.6** | <5.0 | **350** | **150** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 7/29/2010 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **9.7** | **1.4** | <5.0 | **69** | **28** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/16/2011 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **33** | **4.1** | <5.0 | **190** | **71** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/11/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **3.6** | <1.0 | <5.0 | **32** | **7.9** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/4/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **3.39** | <1.0 | <5.0 | **47.7** | **9.38** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | **7.4** | <5 | NT | **89** | **18** | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 10/17/2013 | <50 | <5 | <5 | <5 | <5 | **35** | <5 | NT | **240** | **100** | 20 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/23/2014 | <50 | <1.0 | <5 | <1.0 | <5 | **9.9** | <1.0 | <5 | **65** | **26** | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/16/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **48** | <5.0 | NT | **290** | **130** | <5.0 | NT | NT | <10.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/27/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **49** | <5.0 | NT | **360** | **120** | <5.0 | NT | NT | <10.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/9/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **24** | <5.0 | NT | **190** | **65** | <5.0 | NT | NT | <10.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | <5.0 |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

## TABLE 2: GROUNDWATER ANALYTICAL RESULTS
(VOLATILE ORGANIC COMPOUNDS)

| Well Number | Date Sampled | Acetone | Benzene | Toluene | Ethylbenzene | Xylenes | cis-1,2-Dichloroethene | Trans-1,2-Dichloroethene | Naphthalene | Tetrachloroethene | Trichloroethene | 1,2-Dichloro benzene | Di-isopropyl ether | p-Isopropyltoluene | Chloromethane | Chloroform | Carbon Disulfide | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1,2-Trichloroethane | Methylene Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MWA-3 | 12/18/2002 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NT | NT | NS | NS | NS | NS | NS | NS | NS |
| | 3/24/2006 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NT | NT | NS | NS | NS | NS | NS | NS | NS |
| | 4/13/2012 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| MWR-3 | 7/29/2010 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 16 | 2.2 | <5.0 | **89** | **40** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/16/2011 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 44 | 4.3 | <5.0 | **190** | **92** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/13/2012 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| | 10/4/2012 | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry |
| | 4/30/2013 | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry |
| MWB-4 | 12/18/2002 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **11** | <1.0 | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 3/28/2006 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **31** | **3.4** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **4.1** | <1.0 | <5.0 | **69** | **15** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 2/21/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **4.9** | <1.0 | <5.0 | **45** | **14** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/14/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **3** | <1.0 | <5.0 | **36** | **13** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 7/29/2010 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **7.9** | **2.8** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/11/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **1.5** | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/4/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **6.83** | **3.51** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | <5 | <5 | NT | <5 | <5 | <5 | NT | NT | <10 | <5 | **8.4** | <5 | <5 | <5 | <5 |
| | 10/17/2013 | <50 | <5 | <5 | <5 | <10 | <5 | <5 | NT | **5.6** | <5 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/23/2014 | <50 | <1.0 | <5 | <1.0 | <3.0 | <1.0 | <1.0 | <5 | **2.9** | **1.6** | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/16/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **5** | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/29/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/10/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MWA-5 | 8/24/2006 | NT | NT | NT | NT | NT | <1.0 | <1.0 | NT | **27** | <1.0 | <1.0 | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **20** | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/15/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **26** | **1.4** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 7/30/2010 | <10.0 | **12** | **81** | **5.2** | **16** | **3** | <1.0 | <5.0 | **66** | **8.6** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/16/2011 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **26** | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/13/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **9** | <1.0 | <1.0 | <1.0 | <1.0 | **490** | **16** | <1.0 | **11** | **28** | **16** | **600** |
| | 10/4/2012 | **18** | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **28.7** | **1.09** | <1.0 | <1.0 | <1.0 | **65.6** | **6.09** | <1.0 | **1.49** | **6.44** | **4.37** | **56.7** |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | <5 | <5 | NT | **26** | <5 | <5 | NT | NT | **19** | <5 | <5 | <5 | <5 | <5 | **56** |
| | 10/17/2013 | <50 | <5 | <5 | <5 | <10 | <5 | <5 | NT | **24** | <5 | <5 | NT | NT | **29** | <5 | <5 | <5 | <5 | <5 | **25** |
| | 6/23/2014 | <50 | <5 | <25 | <5 | <15 | <5 | <5 | <25 | **16** | <5 | <5 | <5 | <5 | **44** | <5 | NT | **5** | **9.8** | **12** | **210** |
| | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **24** | <5.0 | <5.0 | NT | NT | **10** | <5.0 | <5.0 | <5.0. | <5.0 | <5.0 | **40** |

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| Well Number | Date Sampled | Acetone | Benzene | Toluene | Ethylbenzene | Xylenes | cis-1,2-Dichloroethene | Trans-1,2-Dichloroethene | Naphthalene | Tetrachloroethene | Trichloroethene | 1,2-Dichloro benzene | Di-isopropyl ether | p-Isopropyltoluene | Chloromethane | Chloroform | Carbon Disulfide | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1,2-Trichloroethane | Methylene Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1/27/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | 27 | <5.0 | <5.0 | NT | NT | 10 | <5.0 | <5.0 | <5.0. | <5.0 | <5.0 | 36 |
| | 6/10/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | 28 | <5.0 | <5.0 | NT | NT | 10 | <5.0 | <5.0 | <5.0. | <5.0 | <5.0 | 19 |
| MWD-6 | 8/24/2006 | NT | NT | NT | NT | NT | <1.0 | <1.0 | NT | 5 | <1.0 | <1.0 | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 11 | <1.0 | <5.0 | 47 | 16 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/14/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 28 | 1.2 | <5.0 | 150 | 74 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 7/30/2010 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 2.1 | <1.0 | <5.0 | 17 | 5.3 | <1.0 | <1.0 | <1.0 | 8.9 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/16/2011 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 1.6 | <1.0 | <5.0 | 5 | 1.7 | <1.0 | <1.0 | <1.0 | 25 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/11/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 4.8 | <1.0 | <5.0 | 13 | 6.9 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/4/2012 | 88.8 | <1.0 | <1.0 | <1.0 | 2.1 | 5.01 | <1.0 | NT | 17 | 7.5 | <1.0 | NT | NT | <1.0 | 1.22 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | 80 | <5 | <5 | <5 | <5 | 32 | <5 | NT | 94 | 46 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 10/17/2013 | 88 | <5 | <5 | <5 | <10 | 47 | <5 | NT | 200 | 87 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/24/2014 | <50 | <1.0 | <5 | <1.0 | <10 | 14 | <1.0 | <5 | 56 | 20 | <1.0 | <1.0 | <1.0 | 2.6 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | 17 | <5.0 | NT | 86 | 35 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/28/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | 38 | <5.0 | NT | 240 | 80 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/10/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | 42 | <5.0 | NT | 280 | 91 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MWA-7 | 8/24/2006 | NT | NT | NT | NT | NT | 7.6 | <1.0 | NT | 14 | 16 | <1.0 | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 2 | <1.0 | <5.0 | 7.7 | 3.1 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/14/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 1.8 | <1.0 | <5.0 | 8.7 | 2 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/11/2012 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| MWA-8 | 9/22/2006 | NT | NT | NT | NT | NT | <1.0 | <1.0 | NT | <1.0 | <1.0 | <1.0 | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/16/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/16/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | <5 | <5 | NT | <5 | <5 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/24/2014 | <50 | <1.0 | <5 | <1.0 | <3.0 | <1.0 | <1.0 | <5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/16/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/28/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/10/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 10/17/2007 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | 5.1 | 1 | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | 4 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/15/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 1.1 | <1.0 | <5.0 | 6.2 | 1.1 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 7/30/2010 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | 5.6 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/15/2011 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | 3.5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

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| Well Number | Date Sampled | Acetone | Benzene | Toluene | Ethylbenzene | Xylenes | cis-1,2-Dichloroethene | Trans-1,2-Dichloroethene | Naphthalene | Tetrachloroethene | Trichloroethene | 1,2-Dichloro benzene | Di-isopropyl ether | p-Isopropyltoluene | Chloromethane | Chloroform | Carbon Disulfide | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1,2-Trichloroethane | Methylene Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-9 | 4/13/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **3.5** | <1.0 | <1.0 | <1.0 | <1.0 | **<1.0** | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/4/2012 | <10.0 | <1.0 | <1.0 | <1.0 | **2.1** | <1.0 | <1.0 | NT | **4.33** | <1.0 | <1.0 | NT | NT | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | <5 | <5 | NT | <5 | <5 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 10/17/2013 | <50 | <5 | <5 | <5 | <10 | <5 | <5 | NT | <5 | <5 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/24/2014 | <50 | <1.0 | <5 | <1.0 | <3 | <1.0 | <1.0 | <5 | **1.9** | <1.0 | <5 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/16/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **8.8** | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/29/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/9/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MW-10 | 10/17/2007 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **12** | <1.0 | <5.0 | **71** | **11** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **8.8** | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | **4.7** | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/16/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **2.5** | <1.0 | <5.0 | **50** | **6.5** | <1.0 | **1.1** | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/19/2011 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **25** | **3.7** | <1.0 | **1.1** | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/13/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **11** | **1.9** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/4/2012 | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry |
| | 10/17/2013 | <50 | <5.0 | <5.0 | <5.0 | <10 | <5.0 | <5.0 | NT | **35** | <5.0 | <5.0 | NT | NT | <10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/24/2014 | <50 | <1.0 | <5.0 | <1.0 | <3.0 | **1.1** | <1.0 | <5.0 | **30** | 4.9 | <1.0 | <1.0 | <1.0 | <2.5 | <5.0 | NT | <1.0 | <1.0 | <1.0 | <5.0 |
| | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **20** | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/29/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **29** | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/10/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **22** | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MW-11 | 10/17/2007 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/15/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/13/2012 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| MW-12 | 11/19/2007 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **21** | <1.0 | <5.0 | **180** | **43** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **4.4** | <1.0 | <5.0 | **46** | **9.4** | <1.0 | <1.0 | **54** | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/15/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **1.5** | <1.0 | <5.0 | **37** | **5.1** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/13/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | **6.5** | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | <5 | <5 | NT | **5.3** | <5 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/24/2014 | <50 | <1.0 | <5 | <1.0 | <3.0 | <1.0 | <1.0 | <5 | **7.2** | **1.1** | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **15** | **5.2** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/28/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **12** | **<5.0** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/10/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **23** | **7.1** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 11/19/2007 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **3.1** | <1.0 | <5.0 | **41** | **6.5** | <1.0 | NT | NT | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

## TABLE 2: GROUNDWATER ANALYTICAL RESULTS
(VOLATILE ORGANIC COMPOUNDS)

| Well Number | Date Sampled | Acetone | Benzene | Toluene | Ethylbenzene | Xylenes | cis-1,2-Dichloroethene | Trans-1,2-Dichloroethene | Naphthalene | Tetrachloroethene | Trichloroethene | 1,2-Dichloro benzene | Di-isopropyl ether | p-Isopropyltoluene | Chloromethane | Chloroform | Carbon Disulfide | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1,2-Trichloroethane | Methylene Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-13 | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **19** | <1.0 | <5.0 | **150** | **47** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/14/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **10** | <1.0 | <5.0 | **82** | **26** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/13/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | **7.9** | **1.3** | <5.0 | **83** | **22** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <1.0 | <3 | <5 | <5 | NT | **15** | <5 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/24/2014 | <50 | <1.0 | <5 | <1.0 | <3 | **6.6** | <1.0 | <5.0 | **36** | **13** | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **15** | <5.0 | NT | **120** | **40** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/28/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **20** | <5.0 | NT | **150** | **50** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/9/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | **9.2** | <5.0 | NT | **72** | **25** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MW-14 | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 2.1 | <1.0 | <5.0 | **71** | **40** | <1.0 | 2 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/16/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 9.5 | <1.0 | <5.0 | **79** | **25** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/11/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | 1.4 | <1.0 | <5.0 | **40** | **5.7** | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | <5 | <5 | NT | **30** | **6** | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 | <5 |
| | 6/23/2014 | <50 | <1.0 | <5 | <1.0 | <3 | 8.1 | <1.0 | <5 | **55** | **18** | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **29** | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/28/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **27** | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/9/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | **49** | **9.1** | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MW-15 | 1/18/2008 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/15/2009 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/11/2012 | <10.0 | <1.0 | <5.0 | <1.0 | <3.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 4/30/2013 | <50 | <5 | <5 | <5 | <5 | <5 | <5 | NT | <5 | <5 | <5 | <5 | NT | NT | <10 | <5 | <5 | <5 | <5 | <5 |
| | 6/24/2014 | <50 | <1.0 | <5 | <1.0 | <3.0 | <1.0 | <1.0 | <5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <2.5 | <5 | NT | <1.0 | <1.0 | <1.0 | <5 |
| | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/28/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/10/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| MW-16 | 7/17/2015 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 1/29/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | 6/10/2016 | <50 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NT | <5.0 | <5.0 | <5.0 | NT | NT | <10.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Type 1 Risk Reduction Standards (ug/l) | | 4000 | -- | -- | 700 | 10,000 | 70 | | 20 | 5 | 5 | 600 | -- | -- | | 100 | | | 5 | 5 | 5 |
| Type 4 Risk Reduction Standards (ug/l) | | -- | 8.8 | 5241 | -- | -- | 1020 | 161 | -- | -- | 34.5 | -- | -- | -- | 861 | | | 29000 | | | |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

## TABLE 2: GROUNDWATER ANALYTICAL RESULTS
(VOLATILE ORGANIC COMPOUNDS)

| Well Number | Date Sampled | Acetone | Benzene | Toluene | Ethylbenzene | Xylenes | cis-1,2-Dichloroethene | Trans-1,2-Dichloroethene | Naphthalene | Tetrachloroethene | Trichloroethene | 1,2-Dichloro benzene | Di-isopropyl ether | p-Isopropyltoluene | Chloromethane | Chloroform | Carbon Disulfide | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1,2-Trichloroethane | Methylene Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

NOTE: All units reported in ug/l (ppb)
NOTE: NS = Not Sampled due to insufficient recharge; NT = Not Tested.
NOTE: * Only initial boring and sample locations, only temporary wells were used at MW-1 or MW-2
NOTE: The higher value between Type 1 and Type 4 RRS were used for determining whether or not the RRS had been exceeded.

Indicates exceedance of Type 1 RRS
7/30/2010 indicates dates after ISCO treatment

Please see laboratory results in Appendix C for full listing of QC Qualifiers

**Mercer Triangle**
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## TABLE 3: GROUNDWATER ELEVATIONS

| Well Number | Date Measured | Ground Surface Elev. (ft) | Top of Casing Elev. (ft) | Depth of Screen Interval (ft) | Water Depth (ft) | Groundwater Elev. (ft) |
|---|---|---|---|---|---|---|
| MWA-1 | 5/9/2003 | 101.41 | 101.56 | 25-40’ | 31.26 | 70.30 |
| | 10/25/2006 | | | | 32.49 | 68.92 |
| | 11/19/2007 | | | | 32.73 | 68.83 |
| | 1/18/2008 | | | | 33.32 | 68.24 |
| | 4/11/2012 | | | | 33.20 | 68.36 |
| | 10/4/2012 | | | | 31.45 | 70.11 |
| | 4/30/2013 | | | | 31.10 | 70.46 |
| | 10/16/2013 | | | | 29.45 | 72.11 |
| | 6/23/2014 | | | | 30.90 | 70.66 |
| | 7/16/2015 | | | | 31.56 | 70.00 |
| | 1/27/2016 | | | | 30.83 | 70.73 |
| | 6/9/2016 | | | | 31.15 | 70.41 |
| MWA-2 | 5/9/2003 | 101.74 | 101.89 | 35-60’ | 49.61 | 52.28 |
| | 10/25/2006 | | | | 50.09 | 51.80 |
| | 11/19/2007 | | | | 51.64 | 50.25 |
| | 1/18/2008 | | | | 50.85 | 51.04 |
| | 4/11/2012 | | | | 51.05 | 50.84 |
| | 10/4/2012 | | | | 51.29 | 50.60 |
| | 4/30/2013 | | | | 51.03 | 50.86 |
| | 10/17/2013 | | | | 48.44 | 53.45 |
| | 6/23/2014 | | | | 47.87 | 54.02 |
| | 7/16/2015 | | | | 49.43 | 52.46 |
| | 1/27/2016 | | | | 49.19 | 52.70 |
| | 6/9/2016 | | | | 48.58 | 53.31 |
| MWA-3 | 5/9/2003 | 102.1 | 102.26 | 33-53’ | 50.40 | 51.86 |
| | 10/25/2006 | | | | DRY | DRY |
| | 11/19/2007 | | | | DRY | DRY |
| | 1/18/2008 | | | | 50.20 | 52.06 |
| | 10/17/2013 | | | | DRY | DRY |
| | 6/23/2014 | | | | 48.40 | 53.86 |
| | 7/16/2015 | | | | DRY | DRY |
| | 1/27/2016 | | | | DRY | DRY |
| | 6/9/2016 | | | | DRY | DRY |
| MWB-4 | 5/9/2003 | 100.44 | 100.59 | 40-55’ | 47.55 | 53.04 |
| | 10/25/2006 | | | | 48.43 | 52.16 |
| | 11/19/2007 | | | | 49.38 | 51.21 |
| | 1/18/2008 | | | | 49.60 | 50.99 |
| | 4/11/2012 | | | | 49.30 | 51.29 |
| | 10/4/2012 | | | | 49.56 | 51.03 |
| | 4/30/2013 | | | | 49.25 | 51.34 |
| | 10/17/2013 | | | | 46.45 | 54.14 |
| | 6/23/2014 | | | | 45.85 | 54.74 |
| | 7/16/2015 | | | | 47.65 | 54.61 |
| | 1/29/2016 | | | | 47.75 | 52.84 |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

## TABLE 3: GROUNDWATER ELEVATIONS

| Well Number | Date Measured | Ground Surface Elev. (ft) | Top of Casing Elev. (ft) | Depth of Screen Interval (ft) | Water Depth (ft) | Groundwater Elev. (ft) |
|---|---|---|---|---|---|---|
| | 6/9/2016 | | | | 46.75 | 53.84 |
| MWA-5 | 8/12/2006 | 103.94 | 103.65 | 40-65’ | 42.36 | 61.29 |
| | 10/25/2006 | | | | 51.98 | 51.67 |
| | 11/19/2007 | | | | 52.45 | 51.20 |
| | 1/18/2008 | | | | 52.68 | 50.97 |
| | 4/11/2012 | | | | 52.77 | 50.88 |
| | 10/4/2012 | | | | 53.22 | 50.43 |
| | 4/30/2013 | | | | 53.20 | 50.45 |
| | 10/17/2013 | | | | 51.45 | 52.20 |
| | 6/23/2014 | | | | 50.35 | 53.30 |
| | 7/17/2015 | | | | 51.51 | 52.14 |
| | 1/27/2016 | | | | 51.60 | 52.05 |
| | 6/10/2016 | | | | 50.90 | 52.75 |
| MWD-6 | 8/12/2006 | | 101.13 | 63-73’ | 68.32 | 32.81 |
| | 10/25/2006 | | | | 51.48 | 49.65 |
| | 11/19/2007 | | | | 49.41 | 51.72 |
| | 1/18/2008 | | | | 49.52 | 51.61 |
| | 4/11/2012 | | | | 49.81 | 51.32 |
| | 10/4/2012 | | | | 49.90 | 51.23 |
| | 4/30/2013 | | | | 51.80 | 49.33 |
| | 10/17/2013 | | | | 47.23 | 53.90 |
| | 6/24/2014 | | | | 46.75 | 54.38 |
| | 7/17/2015 | | | | 48.62 | 52.51 |
| | 1/28/2016 | | | | 48.74 | 52.39 |
| | 6/9/2016 | | | | 47.70 | 53.43 |
| MW-7 | 8/12/2006 | 100.13 | 99.9 | 5-20’ | 8.47 | 91.43 |
| | 10/25/2006 | | | | 10.88 | 89.02 |
| | 11/19/2007 | | | | 18.78 | 81.12 |
| | 1/18/2008 | | | | 13.28 | 86.62 |
| MWA-8 | 9/20/2006 | 98.13 | 97.96 | 45-60’ | 51.63 | 46.33 |
| | 10/25/2006 | | | | 42.76 | 55.20 |
| | 11/19/2007 | | | | 42.3 | 55.66 |
| | 1/18/2008 | | | | 42.48 | 55.48 |
| | 4/11/2012 | | | | 42.49 | 55.47 |
| | 4/30/2013 | | | | 41.85 | 56.11 |
| | 6/24/2014 | | | | 40.03 | 57.93 |
| | 7/16/2015 | | | | 41.57 | 56.39 |
| | 1/28/2016 | | | | 41.42 | 56.54 |
| | 6/9/2016 | | | | 40.68 | 57.28 |
| | 10/26/2007 | | | | 44.96 | 52.85 |
| | 11/19/2007 | | | | 44.83 | 52.98 |
| | 1/18/2008 | | | | 45.10 | 52.71 |
| | 4/11/2012 | | | | 45.13 | 52.68 |
| | 10/4/2012 | | | | 45.27 | 52.54 |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

## TABLE 3: GROUNDWATER ELEVATIONS

| Well Number | Date Measured | Ground Surface Elev. (ft) | Top of Casing Elev. (ft) | Depth of Screen Interval (ft) | Water Depth (ft) | Groundwater Elev. (ft) |
|---|---|---|---|---|---|---|
| MW-9 | 4/30/2013 | 98.22 | 97.81 | 35-50’ | 44.71 | 53.10 |
| | 10/17/2013 | | | | 42.35 | 55.46 |
| | 6/24/2014 | | | | 41.92 | 55.89 |
| | 7/16/2015 | | | | 44.02 | 53.79 |
| | 1/18/2015 | | | | 43.86 | 53.95 |
| | 6/9/2015 | | | | 42.9 | 54.91 |
| MW-10 | 10/26/2007 | 112.85 | 112.67 | 50-65’ | 61.43 | 51.24 |
| | 11/19/2007 | | | | 62.05 | 50.62 |
| | 1/18/2008 | | | | 62.19 | 50.48 |
| | 4/11/2012 | | | | 63.10 | 49.57 |
| | 10/4/2012 | | | | DRY | DRY |
| | 10/17/2013 | | | | 60.75 | 51.92 |
| | 6/24/2014 | | | | 59.88 | 52.79 |
| | 7/17/2015 | | | | 61.41 | 51.26 |
| | 1/29/2016 | | | | 61.42 | 51.25 |
| | 6/10/2016 | | | | 60.60 | 52.07 |
| MW-11 | 10/26/2007 | 111.93 | 111.7 | 55-70’ | 58.89 | 52.81 |
| | 11/19/2007 | | | | 58.88 | 52.82 |
| | 1/18/2008 | | | | 59.60 | 52.10 |
| MW-12 | 11/19/2007 | 118.32 | 118.09 | 68-83’ | 71.30 | 46.79 |
| | 1/18/2008 | | | | 71.49 | 46.60 |
| | 4/11/2012 | | | | 71.17 | 46.92 |
| | 4/30/2013 | | | | 72.60 | 45.49 |
| | 6/24/2014 | | | | 68.21 | 49.88 |
| | 7/17/2015 | | | | 69.35 | 48.74 |
| | 1/28/2016 | | | | 69.50 | 48.59 |
| | 6/10/2016 | | | | 68.61 | 49.48 |
| MW-13 | 11/19/2007 | 115.99 | 115.72 | 60-75' | 67.72 | 48.00 |
| | 1/18/2008 | | | | 68.00 | 47.72 |
| | 4/11/2012 | | | | 67.97 | 47.75 |
| | 4/30/2013 | | | | 69.35 | 46.37 |
| | 6/24/2014 | | | | 65.38 | 50.34 |
| | 7/17/2015 | | | | 66.01 | 49.71 |
| | 1/28/2016 | | | | 66.34 | 49.38 |
| | 6/10/2016 | | | | 65.47 | 50.25 |
| MW-14 | 1/18/2008 | 118.58 | 118.39 | 70-85' | 72.80 | 45.59 |
| | 4/11/2012 | | | | 72.40 | 45.99 |
| | 4/30/2013 | | | | 74.38 | 44.01 |
| | 6/23/2014 | | | | 69.93 | 48.46 |
| | 7/17/2015 | | | | 70.47 | 45.25 |
| | 1/28/2016 | | | | 70.75 | 47.64 |
| | 6/10/2016 | | | | 71.10 | 47.29 |
| | 1/18/2008 | | | | 57.02 | 57.62 |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

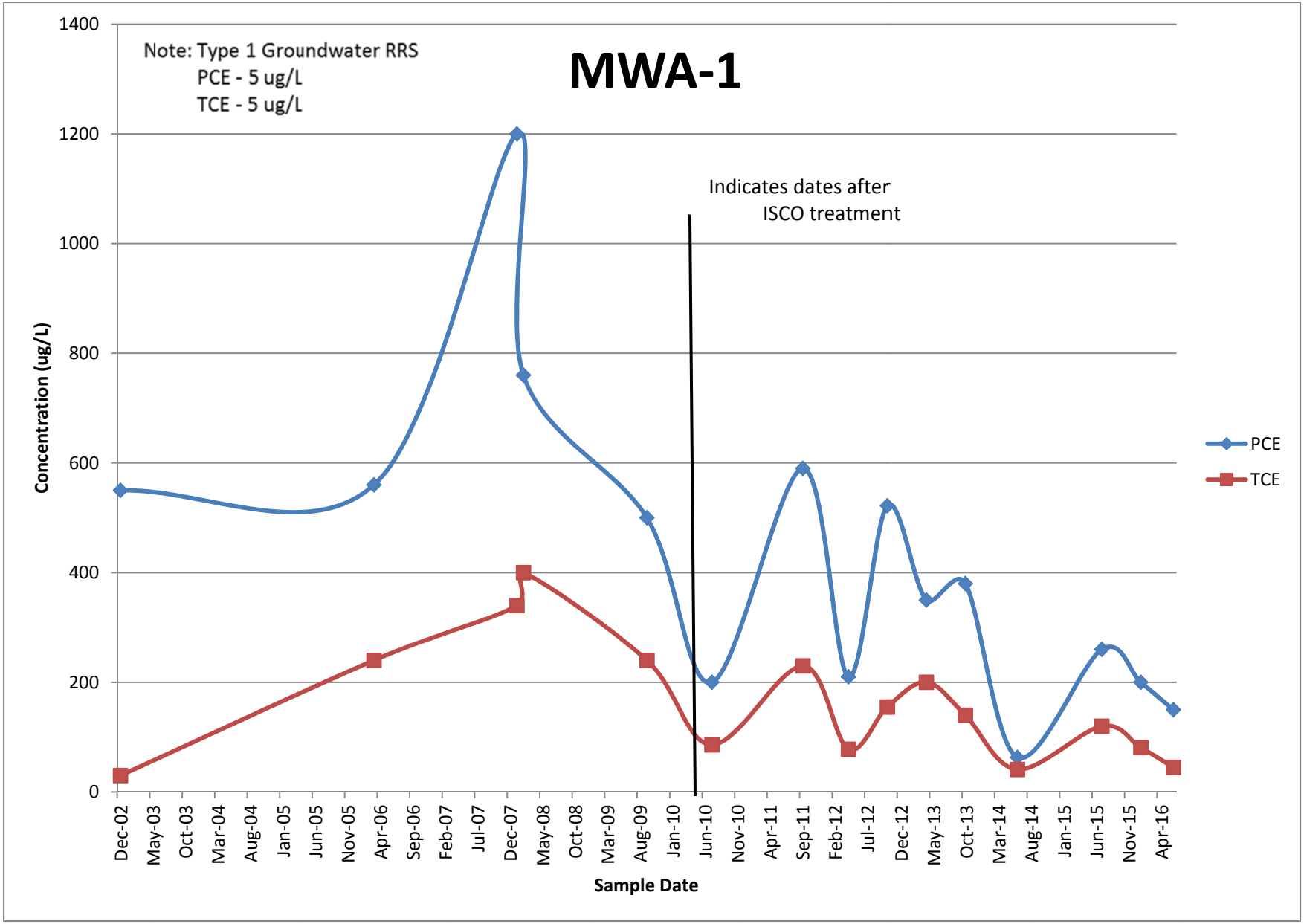
## TABLE 3: GROUNDWATER ELEVATIONS

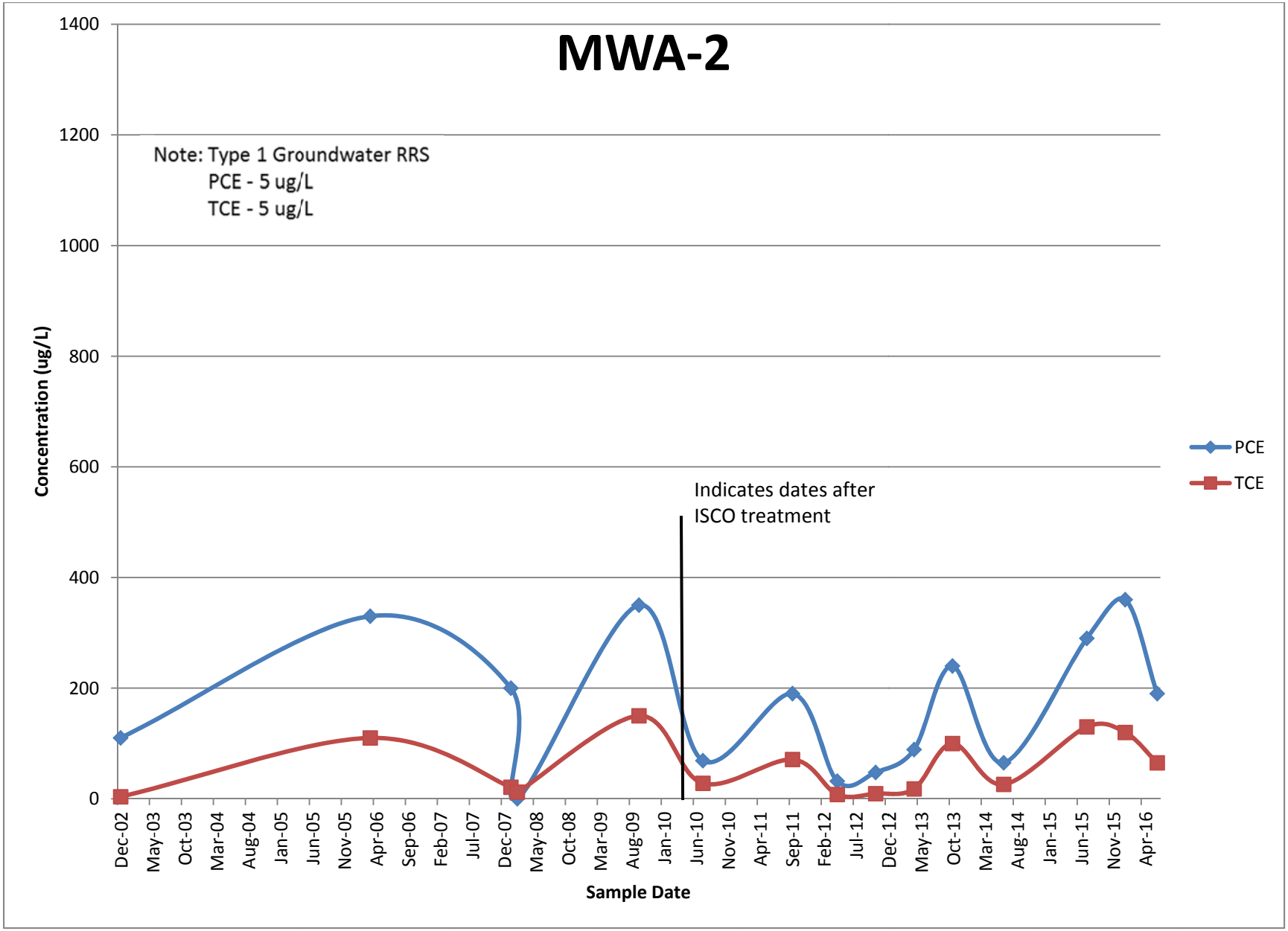
| Well Number | Date Measured | Ground Surface Elev. (ft) | Top of Casing Elev. (ft) | Depth of Screen Interval (ft) | Water Depth (ft) | Groundwater Elev. (ft) |
|---|---|---|---|---|---|---|
| MW-15 | 4/11/2012 | 115.04 | 114.64 | 50-65' | 53.25 | 61.39 |
| | 4/30/2013 | | | | 50.83 | 63.81 |
| | 6/24/2014 | | | | 49.7 | 64.94 |
| | 7/17/2015 | | | | 50.78 | 67.61 |
| | 1/28/2016 | | | | 48.76 | 65.88 |
| | 6/10/2016 | | | | 49.45 | 65.19 |
| MW-16 | 7/17/2015 | 106.26 | 106.03 | 45-60' | 56.56 | 49.47 |
| | 1/29/2016 | | | | 54.52 | 51.51 |
| | 6/10/2016 | | | | 57.42 | 48.61 |

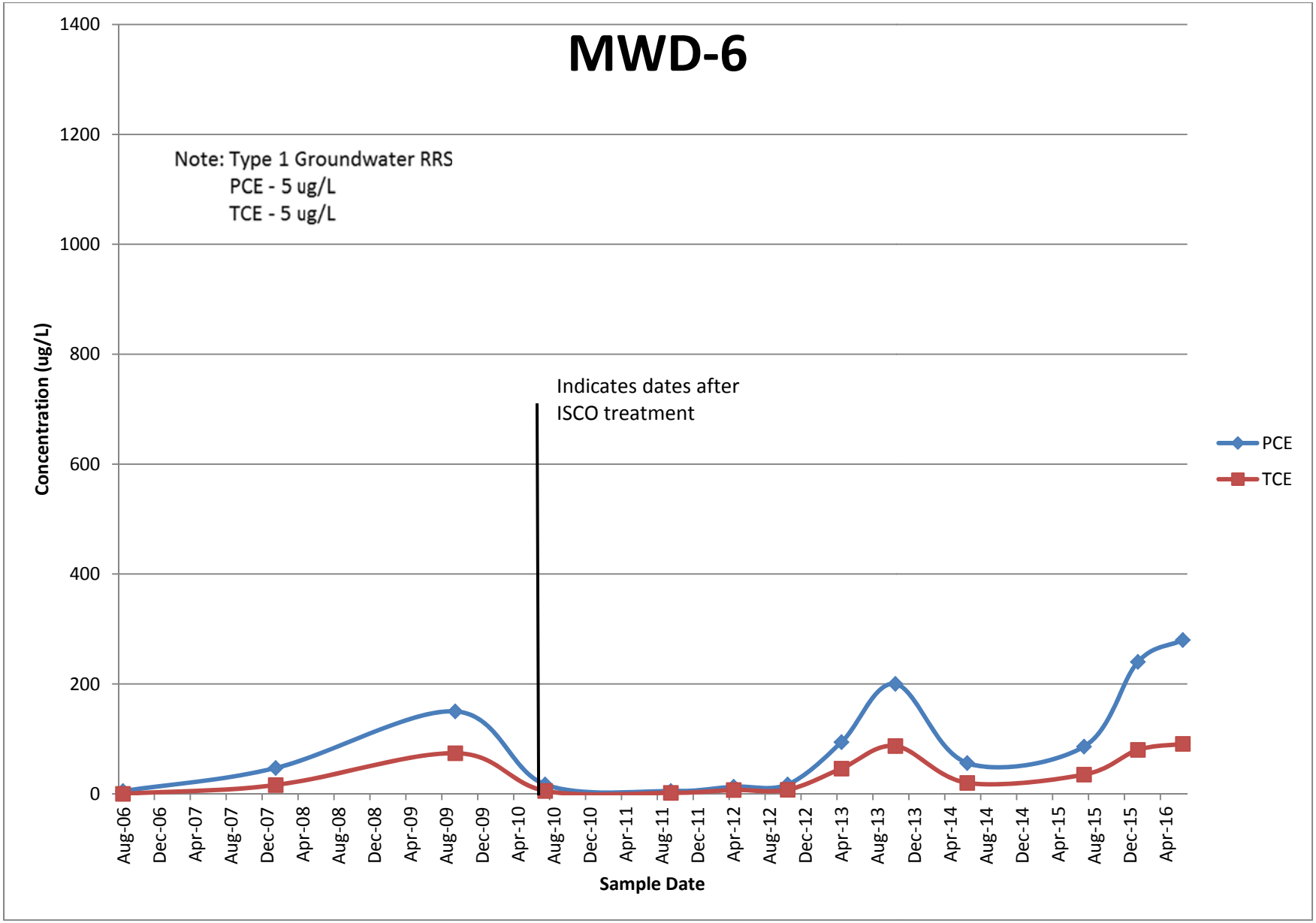
# APPENDIX C

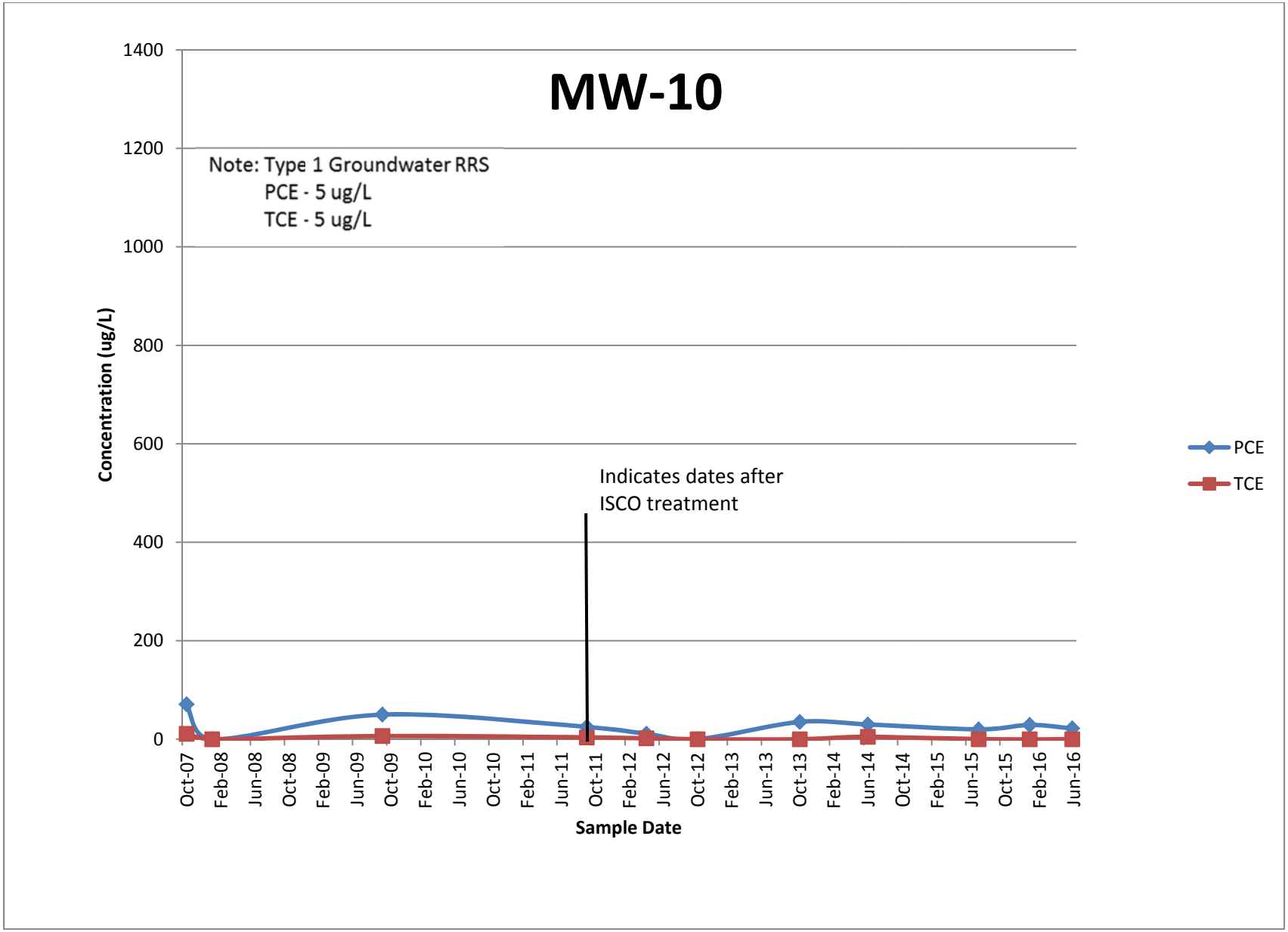
TREND GRAPHS

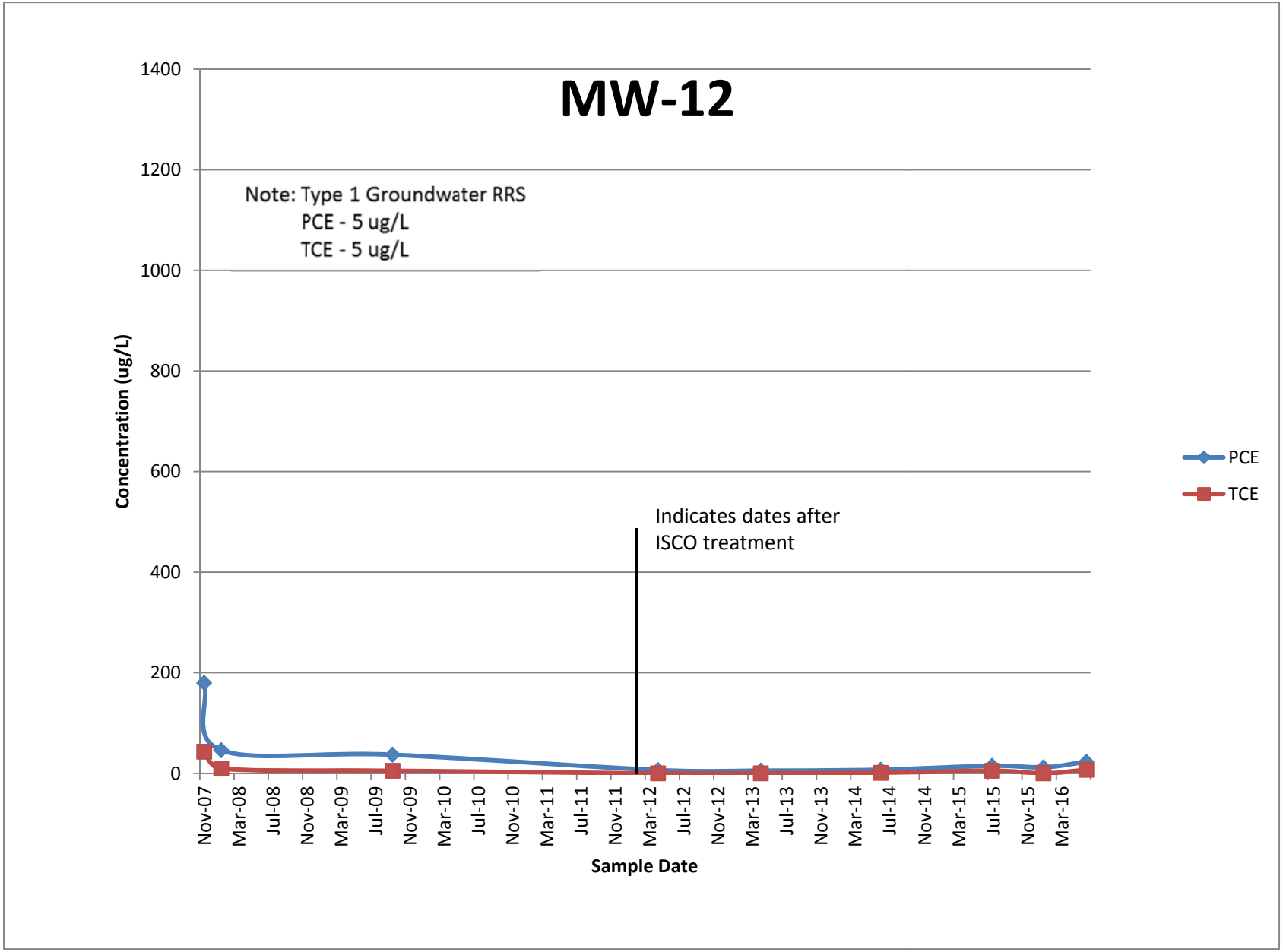
GEC

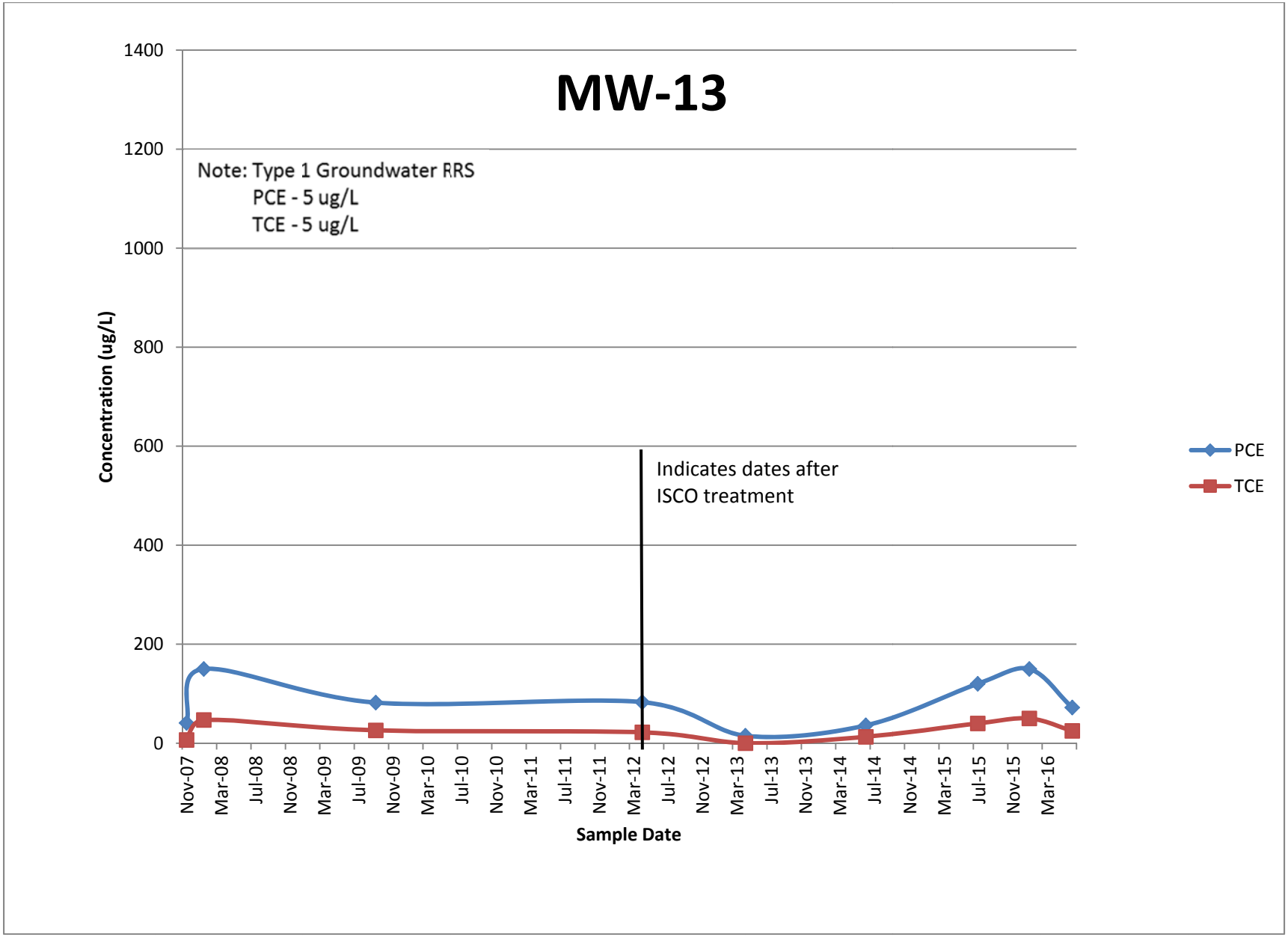

MWA-1
Note: Type 1 Groundwater RRS
PCE - 5 ug/L
TCE - 5 ug/L
Indicates dates after
ISCO treatment
Concentration (ug/L)
Sample Date
PCE
TCE
1400
1200
1000
800
600
400
200
0
Dec-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10
Nov-10
Apr-11
Sep-11
Feb-12
Jul-12
Dec-12
May-13
Oct-13
Mar-14
Aug-14
Jan-15
Jun-15
Nov-15
Apr-16


MWA-2
Note: Type 1 Groundwater RRS
PCE - 5 ug/L
TCE - 5 ug/L
Indicates dates after
ISCO treatment
Concentration (ug/L)
Sample Date
PCE
TCE
1400
1200
1000
800
600
400
200
0
Dec-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10
Nov-10
Apr-11
Sep-11
Feb-12
Jul-12
Dec-12
May-13
Oct-13
Mar-14
Aug-14
Jan-15
Jun-15
Nov-15
Apr-16


MWD-6
Note: Type 1 Groundwater RRS
PCE - 5 ug/L
TCE - 5 ug/L
Indicates dates after
ISCO treatment
Concentration (ug/L)
1400
1200
1000
800
600
400
200
0
Aug-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10
Aug-10
Dec-10
Apr-11
Aug-11
Dec-11
Apr-12
Aug-12
Dec-12
Apr-13
Aug-13
Dec-13
Apr-14
Aug-14
Dec-14
Apr-15
Aug-15
Dec-15
Apr-16
Sample Date
PCE
TCE


MW-10
Note: Type 1 Groundwater RRS
PCE - 5 ug/L
TCE - 5 ug/L
Indicates dates after
ISCO treatment
Concentration (ug/L)
1400
1200
1000
800
600
400
200
0
Oct-07
Feb-08
Jun-08
Oct-08
Feb-09
Jun-09
Oct-09
Feb-10
Jun-10
Oct-10
Feb-11
Jun-11
Oct-11
Feb-12
Jun-12
Oct-12
Feb-13
Jun-13
Oct-13
Feb-14
Jun-14
Oct-14
Feb-15
Jun-15
Oct-15
Feb-16
Jun-16
Sample Date
PCE
TCE


MW-12
Note: Type 1 Groundwater RRS
PCE - 5 ug/L
TCE - 5 ug/L
Indicates dates after
ISCO treatment
Concentration (ug/L)
1400
1200
1000
800
600
400
200
0
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Jul-09
Nov-09
Mar-10
Jul-10
Nov-10
Mar-11
Jul-11
Nov-11
Mar-12
Jul-12
Nov-12
Mar-13
Jul-13
Nov-13
Mar-14
Jul-14
Nov-14
Mar-15
Jul-15
Nov-15
Mar-16
Sample Date
PCE
TCE


MW-13
Note: Type 1 Groundwater RRS
PCE - 5 ug/L
TCE - 5 ug/L
Indicates dates after
ISCO treatment
Concentration (ug/L)
1400
1200
1000
800
600
400
200
0
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Jul-09
Nov-09
Mar-10
Jul-10
Nov-10
Mar-11
Jul-11
Nov-11
Mar-12
Jul-12
Nov-12
Mar-13
Jul-13
Nov-13
Mar-14
Jul-14
Nov-14
Mar-15
Jul-15
Nov-15
Mar-16
Sample Date
PCE
TCE

# APPENDIX D

FIELD PARAMETER LOGS & SOIL BORING LOGS

GEC

# SOIL BORING RECORD



| | |
|---|---|
| Project: **Mercer University Triangle**<br>Mercer University | Boring No: **MW-16**<br>Project No: 090698.340 |
| Location: **See Figure 1 - Site Map** | GS Elevation: |
| Driller/Equipment: J. Waddell & J. Daniel/ CME-55; 4.25" HSA | Drilling Date: February 23, 2015 |
| Water Level: 53.0 ft at time of boring | Engineer/Geologist: |

| Water Level ( ft) | Depth ( ft) | Soil Symbol | Soil Description | Sample Type | N-Value | PID (ppm) | Photo Ionization Detector Readings (ppm) 10 |
|---|---|---|---|---|---|---|---|
| | | | ; | | | | |
| | | | ; | | | | |
| | | | brownish-red, medium to fine; **SAND;** SC | | | | |
| | 10 | | | | | | |
| | | | ; | SS-0.0 | | | |
| | 20 | | white, medium to fine; **SAND;** SM | | | | |
| | | | ; | SS-0.0 | | | |
| | | | ; | SS-0.0 | | | |
| | 30 | | Multicolor, medium to fine; **SAND;** SM | | | | |
| | | | ; | SS-0.0 | | | |
| | | | white, medium to fine; **SAND;** SM | | | | |
| | | | ; | SS-0.0 | | | |
| | 40 | | | | | | |
| | | | ; | SS-0.0 | | | |
| | | | ; | SS-0.0 | | | |
| | 50 | | | | | | |
| ▽ | | | ; | SS-0.0 | | | |
| | 60 | | **BORING TERMINATED AT 60.0 ft** | | | | |

· Boring and sampling performed in accordance with ASTM D 1586.
· Depths are measured from existing ground surface at time of drilling.
· Depths are shown to illustrate general arrangements of the strata encountered at the boring location.
· Do not use depths for determinations of quantities or distances.

NOTES:

ENVIRONMENTAL 090698.340 MERCER HSRA MW-16.GPJ GEC.GDT 8/24/16

514 Hillcrest Industrial Blvd, Macon, GA 31204
5031 Milgen Court, Columbus , GA 31907

GEC
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSRA Sample Date: 1/27/16 Team Leader: _____
Well ID: GWA-1 MW A-1 Sample Time: _____ Team Number: _____
Sample ID: _____ Sample Team Members: _____

Purge Method: pump Changed Method: _____
Sample Method: bailer Changed Method: _____

Static Water Level: 30.83 ft. Does well purge dry? □ Yes □ No
Well Depth:* 40.26 ft. □ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 9.43 ft. **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 1.6 gals. ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (℃) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 1/27/16 | 11:37 | 31.8 | 0 | 4.04 | .176 | 15.43 | 220 | 6.19 | 265 |
| | 11:40 | 31.8 | 1.6 | 4.15 | .156 | 21.73 | 87.1 | 5.05 | 248 |
| | 11:43 | 31.8 | 3.2 | 4.16 | .155 | 21.75 | 102 | | 253 |
| | 11:47 | | 4.8 | 4.14 | .155 | 21.75 | 41 | 2.66 | 250 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____/_____/_____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB □ MS □
DUP □ MDS □

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Merck HSRA  Sample Date: 1/20/16  Team Leader: _____
Well ID: MW A-2  Sample Time: 2:35  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: Pump  Changed Method: _____
Sample Method: _____  Changed Method: _____

Static Water Level: 49.49 ft.  Does well purge dry? ☐ Yes ☐ No
Well Depth:* 60.3 ft.  ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 10.81 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 1.83/2 gals.  ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (℃) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | 2:10 | 49.6 | 0 | 4.42 | .133 | 17.83 | <800 | 7.04 | 382 |
| | 2:14 | 49.65 | 2 | 3.55 | .133 | 20.41 | 539 | 6.02 | 420 |
| | 2:18 | 49.65 | 4 | 3.42 | .148 | 21.23 | 122 | 6.05 | 423 |
| | 2:22 | 49.65 | 6 | 3.48 | .149 | 21.33 | 81.8 | 6.10 | 410 410 |
| | 2:26 | 49.65 | 8 | 3.56 | .149 | 21.41 | 43.2 | 5.75 | 398 |
| | 2:30 | 49.65 | 10 | 3.68 | .149 | 21.37 | 33.9 | 5.79 | 388 |
| | | | | | | | | | |
| | | Final Readings | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MDS ☐

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSRA Sample Date: 1/27/16 Team Leader: _____
Well ID: MBWR-3 Sample Time: _____ Team Number: _____
Sample ID: _____ Sample Team Members: _____

Purge Method: _____ Changed Method: _____
Sample Method: _____ Changed Method: _____

Static Water Level: _____ ft. Does well purge dry? □ Yes □ No
Well Depth:* _____ ft. □ * Check if well depth measured, no check if used previous measured well depth
Water Column:** _____ ft. **Water Column = Measured Well Depth – Static Water Level
Well Diameter: _____ in.
Well Volume: _____ gals. ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (℃) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | DRY | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____/_____/_____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB □ MS □
DUP □ MDS □

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: _____ Sample Date: 1/29 Team Leader: _____
Well ID: MWB-4 Sample Time: 3:37 Team Number: _____
Sample ID: _____ Sample Team Members: _____

Purge Method: _____ Changed Method: _____
Sample Method: _____ Changed Method: _____

Static Water Level: 47.75 ft. Does well purge dry? □ Yes □ No
Well Depth:* 55.7 ft. □ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 7.95 ft. **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 1.5 gals. ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 1/29 | 3:29 | 48.30 | 0 | 6.19 | .112 | 20.65 | >800 | 12.84 | 363 |
| | 3:31 | 48.71 | 1 | 6.07 | .111 | 21.39 | 451 | 9.15 | 389 |
| | 3:33 | 49.40 | 2 | 6.06 | .111 | 21.66 | 212 | 8.61 | 400 |
| ↓ | 3:35 | 49.38 | 3 | 6.11 | .113 | 21.78 | 208 | 8.24 | 399 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____/_____/_____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB □ MS □
DUP □ MDS □

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSRA  Sample Date: 1/27/16  Team Leader: _____
Well ID: MWA-5  Sample Time: 4:15  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: _____  Changed Method: _____
Sample Method: _____  Changed Method: _____

Static Water Level: 51.6 ft.  Does well purge dry? ☐ Yes ☐ No
Well Depth:* 62.91 ft.  ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 11.31 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 2 gals.  ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (℃) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 1/27/16 | 3:53 | 52.85 | 0 | 3.04 | .408 | 19.05 | 531 | 3.76 | 430 |
| | 3:56 | 53.3 | 2 | 3.20 | .400 | 20.68 | 396 | 2.07 | 439 |
| | 3:59 | 53.7 | 4 | 3.34 | .437 | 21.03 | 188 | 1.35 | 433 |
| | 4.02 | 54.1 | 6 | 3.44 | .436 | 21.49 | 145. | 1.09 | 414 |
| | 4.05 | 54.35 | 8 | 3.46 | .460 | 21.52 | 178 | .97 | 406 |
| | 4:08 | 54.80 | 10 | 3.43 | .489 | 21.72 | 106 | .87 | 405 |
| | | | | | | | | | |
| | Final Readings | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MDS ☐

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSRA Sample Date: 1/28/16 Team Leader: _____
Well ID: MW-6 Sample Time: ~~11:55~~ 8:50 Team Number: _____
Sample ID: _____ Sample Team Members: _____

Purge Method: Pump Changed Method: _____
Sample Method: Bailer Changed Method: _____

Static Water Level: 48.74 ft. Does well purge dry? ☐ Yes ☐ No
Well Depth:* 72.62 ft. ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 23.38 ft. **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 4.1 gals. ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 1/27 | 10:48 | 51.8 | 0 | 3.99 | 2.18 | 19.86 | <800 | 3.22 | 229 |
| | 10:52 | 56.8 | 4.1 | 3.96 | 2.43 | 21.50 | 738 | 1.10 | 178 |
| | 10:56 | 68.3 | 8.2 | 4.19 | 1.78 | 21.71 | 578 | .90 | 153 |
| | | | 12.3 | | | | | | |
| | | | | | | | | | |
| | Dry | | | | | | | | |
| | | | | | | | | | |
| 1/28/15 | 8:50 | 57.18 | — | 3.78 | 2.31 | 18.58 | 16.1 | 11.14 | 320 |
| | | Final Readings | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB ☐ MS ☐
DUP ☐ MDS ☐

GEC
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Project No.: Mercer HSRA  Sample Date: 1/28/16  Team Leader: _____
Well ID: MWA 8  Sample Time: 3:55  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: pump  Changed Method: _____
Sample Method: _____  Changed Method: _____

Static Water Level: 41.42 ft.  Does well purge dry? ☐ Yes ☐ No
Well Depth:* 58.85 ft.  ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 17.43 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 3 gals.

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

***Well Volume = Water Colum x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (℃) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 1/28/16 | 3:31 | 44.0 | 0 | 4.20 | .106 | 16.97 | 237 | 7.10 | 405 |
| | 3:36 | 45.8 | 3 | 3.79 | .093 | 19.96 | 171 | 6.86 | 390 |
| | 3:40 | 47.3 | 6 | 3.58 | .087 | 20.20 | 79 | 6.38 | 397 |
| | 3:44 | 48.16 | 9 | 3.67 | .088 | 20.30 | 59.3 | 5.91 | 392 |
| | 3:48 | 48.69 | 12 | 3.76 | .089 | 20.38 | 35.9 | 5.43 | 381 |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MDS ☐

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSPA Sample Date: 1/29 Team Leader: _____
Well ID: MW-9 Sample Time: 2:30 Team Number: _____
Sample ID: _____ Sample Team Members: _____

Purge Method: _____ Changed Method: _____
Sample Method: _____ Changed Method: _____

Static Water Level: 43.86 ft. Does well purge dry? □ Yes □ No
Well Depth:* 49.11 ft. □ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 5.25 ft. **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 1 gals. ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | 2:39 | 44.46 | 0 | 5.32 | .141 | 20.35 | >800 | 9.36 | 282 |
| | 2:41 | 44.75 | 1 | 4.88 | .139 | 21.69 | >800 | 6.11 | 363 |
| | 2:43 | 44.45 | 2 | 5.14 | .138 | 21.88 | 256 | 5.89 | 375 |
| | 2:45 | 44.52 | 3 | 5.12 | .135 | 22.22 | 160 | 5.72 | 382 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____/_____/_____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB □ MS □
DUP □ MDS □

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSRA  Sample Date: 1/29/16  Team Leader: _____
Well ID: MW-10  Sample Time: 2:05  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: Bailer  Changed Method: _____
Sample Method: Bailer  Changed Method: _____

Static Water Level: 61.42 ft.  Does well purge dry? ☑ Yes ☐ No
Well Depth:* 64.35 ft.  ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 2.93 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 1.5 gals.  ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 5.38 | .167 | 18.59 | >800 | 5.77 | 423 |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | Final Readings | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____/_____/_____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MDS ☐

GEC
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Project No.: Mercer HSRA  Sample Date: 1/28/16  Team Leader: _____
Well ID: MW 12  Sample Time: 4:45  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: _____  Changed Method: _____
Sample Method: _____  Changed Method: _____

Static Water Level: 69.5 ft.  Does well purge dry? □ Yes □ No
Well Depth:* 82.06 ft.  □ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 12.56 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 2.25 gals.  ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | 4:20 | 69.7 | 0 | 3.59 | .174 | 19.23 | <8 | 3.72 | 385 |
| | 4:25 | 70.24 | 2.25 | 3.42 | .164 | 21.50 | 565 | 4.12 | 344 |
| | 4:30 | 70.3 | 4.50 | 3.53 | .172 | 21.56 | 192 | 3.75 | 360 |
| | 4:35 | 70.45 | 6.75 | 3.66 | .172 | 21.44 | 240 | 3.72 | 367 |
| | 4:40 | 70.30 | 8 | 3.72 | .173 | 21.53 | 79.8 | 3.68 | 371 |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB □  MS □
DUP □  MDS □

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Project No.: Mercer HSPA  Sample Date: 1/28/16  Team Leader: _____
Well ID: MW-13  Sample Time: 10:10  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: pump  Changed Method: _____
Sample Method: Bailer  Changed Method: _____

Static Water Level: 66.34 ft.  Does well purge dry? ☐ Yes ☐ No
Well Depth:* 75.40 ft.  ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 9.06 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 1.5/2 gals.  ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 1/28 | 9:46 | 9:46 | 66.52 | 0 | 3.73 | .213 | 18.33 | 0 | 3.77 | 339 |
| | | 9:50 | 66.64 | 2 | 3.96 | .190 | 21.26 | <800 | 3.12 | 321 |
| | | 9:54 | 66.45 | 4 | 3.91 | .193 | 21.50 | <800 630 | 3.20 | 334 |
| | | 9:58 | 66.50 | 6 | 3.87 | .193 | 21.53 | 172 | 3.19 | 345 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Final Readings | | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____/_____/_____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MDS ☐

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSRA  Sample Date: 2 1/28/16  Team Leader: _____
Well ID: MW-14  Sample Time: 2:50  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: pump  Changed Method: _____
Sample Method: bailer  Changed Method: _____

Static Water Level: 70.75 ft.  Does well purge dry? ☐ Yes ☐ No
Well Depth:* 83.25 ft.  ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 12.5 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: 2.25 gals.  ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (℃) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | 2:31 | 71 | 0 | 3.48 | .167 | 21.42 | 280 | 3.54 | 400 |
| | 2:35 | 71 | 2.25 | 3.32 | .168 | 22.19 | 320 | 3.35 | 446 |
| | 2:40 | 71 | 4.5 | 3.49 | .171 | 22.31 | 111 | 3.16 | 500 |
| | 2:45 | 71 | 6.75 | 3.41 | .172 | 22.38 | 72.4 | 3.03 | 514 |
| | | | 9.0 | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MDS ☐

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: Mercer HSRA  Sample Date: 1/28/16  Team Leader: _____
Well ID: MW-15  Sample Time: 2:15  Team Number: _____
Sample ID: _____  Sample Team Members: _____

Purge Method: Pump  Changed Method: _____
Sample Method: Bailer  Changed Method: _____

Static Water Level: 48.76 ft.  Does well purge dry? ☐ Yes ☐ No
Well Depth:* 64.1 ft.  ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 15.34 ft.  **Water Column = Measured Well Depth – Static Water Level
Well Diameter: +2 in.
Well Volume: 2.6 | 3 gals.  ***Well Volume = Water Colum x Volume Factor

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 1/28/16 | 1:40 | 49.68 | 0 | 3.42 | .108 | 19.35 | <800 | 6.25 | 376 |
| | 1:45 | 51.1 | 3 | 3.34 | .105 | 20.95 | 344 | 5.66 | 387 |
| | 1:50 | 52.7 | 6 | 3.44 | .102 | 21.15 | 329 | 5.16 | 390 |
| | 1:55 | 54.3 | 9 | 3.62 | .100 | 21.21 | 277 | 5.42 | 384 |
| | 2:00 | 55.4 | 12 | 3.71 | .099 | 21.34 | 272 | 4.73 | 382 |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MDS ☐

GEC
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC

Project No.: _____ Sample Date: 1/29/16 Team Leader: _____
Well ID: MW-16 Sample Time: 1:30 Team Number: _____
Sample ID: _____ Sample Team Members: _____

Purge Method: _____ Changed Method: _____
Sample Method: _____ Changed Method: _____

Static Water Level: 54.52 ft. Does well purge dry? ☐ Yes ☐ No
Well Depth:* 59.20 ft. ☐ * Check if well depth measured, no check if used previous measured well depth
Water Column:** 4.68 ft. **Water Column = Measured Well Depth – Static Water Level
Well Diameter: 2 in.
Well Volume: _____ gals. ***Well Volume = Water Colum x Volume Factor
Total Purge Vol 2.4

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | Dry | | | | | |
| | | | | | | | | 10.7 | |
| 1/29/16 | 1:30 | | | 5.41 | .108 | 58.68 | <800 | 10.76 | 347 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Previous Measured Well Depth: _____ ft.
Constructed Well Depth: _____ ft.
Well Stickup Height: _____ ft.
Purge Flow Rate: _____ gal/min

Hach Ferrous Iron Result: _____ mg/L
Hach Dissolved Oxygen Result: _____ mg/L
Sample Mgmnt. Turbidity: _____ NTUs

Anticipated Volume Based on Readings from Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____/_____/_____

Purging/Sampling/Well Repair Comments:

_____
_____
_____
_____

Related QC Samples:
QC Sample ID: _____
EB ☐ MS ☐
DUP ☐ MDS ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer HSRA  Sample Date: 6/9/16  Team Leader: _____

Well ID: ~~MWA-1~~ MWA-1  Sample Time: 10:41  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method: | pump | Changed Method: |
| Sample Method: | bailer pump | Changed Method: |

Static Water Level: 31.15 ft  Does well purge dry? ☐ Yes ☑ No

Well Depth:* 40.26 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 9.11 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 1.5 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9/16 | 10:13 | 31.55 | 0 | 5.9 | 0.145 | 25.46 | 222 | 4.85 | 548 |
| | 10:20 | 31.72 | 1.5 | 4.21 | 0.145 | 23.78 | 616.5 | 4.14 | 448 |
| | 10:27 | 31.71 | 3 | 4.20 | 0.141 | 23.97 | 13.2 | 3.93 | 378 |
| | 10:34 | 31.71 | 4.5 | 4.1 | 0.140 | 24.016 | 11.8 | 4.00 | 344 |
| | 10:41 | 31.71 | 6 | 4.19 | 0.14 | 24.27 | 3.9 | 3.87 | 335 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Monroe HSRA  Sample Date : 6/9/16  Team Leader : _____

Well ID : MWA-2  Sample Time : 11:55  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | Pump | Changed Method: |
| Sample Method : | Pump | Changed Method: |

Static Water Level: 48.58 ft  Does well purge dry? ☐ Yes ☑ No

Well Depth:* 60.30 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 11.72 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 2 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9/16 | 11:22 | 48.70 | 0 | 5.13 | 0.127 | 28.25 | 135 | 6.67 | 445 |
| | 11:32 | 48.72 | 2 | 4.1 | 0.146 | 24.09 | 34 | 6.03 | 413 |
| | 11:42 | 48.71 | 4 | 4.05 | 0.147 | 24.15 | 6.2 | 5.33 | 390 |
| | 11:52 | 48.71 | 6 | 4.1 | 0.147 | 23.82 | 0 | 6.22 | 385 |
| | | | | | | | | | |
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| Final Readings | | | | | | | | | |

Previous Readings:

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|---|---|---|---|---|---|---|---|---|
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*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC

## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

6/9

Project No.: MercerHSRA  Sample Date : _____  Team Leader : _____

Well ID : MW-3  Sample Time : _____  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | _____ | Changed Method: _____ |
| Sample Method : | _____ | Changed Method: _____ |

Static Water Level: _____ ft.  Does well purge dry? ☐ Yes ☐ No

Well Depth:* 49.18 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** _____ ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: _____ in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** _____ gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9/16 | | | DRY | | | | | | |
| | | | | | | | | | |
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| Final Readings | | | | | | | | | |

Previous Readings:

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|---|---|---|---|---|---|---|---|---|
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*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC

## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer RSPA  Sample Date : 6/10/16  Team Leader : _____

Well ID : MWB-4  Sample Time : 2:00  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | pump | Changed Method: _____ |
| Sample Method : | pump | Changed Method: _____ |

Static Water Level: 46.75 ft  Does well purge dry? ☐ Yes ☑ No

Well Depth:* 55.92 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 9.17 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 1.5 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | 1:40 | 47.46 | 0 | 5.32 | 0.164 | 27.82 | 139 | 6.3 | 272 |
| | 1:46 | 47.60 | 1.5 | 5.51 | 0.147 | 23.50 | 41.4 | 5.33 | 270 |
| | 1:52 | 47.58 | 3 | 5.42 | 0.139 | 23.64 | 15.8 | 5.27 | 272 |
| | 1:58 | 47.61 | 4.5 | 5.37 | 0.133 | 23.36 | 4.5 | 5.37 | 273 |
| | | | | | | | | | |
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| Final Readings | | | | | | | | | |

Previous Readings:

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer  Sample Date : 6/10/16  Team Leader : _____

Well ID : MWA-5  Sample Time : 11:20  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | pump | Changed Method: |
| Sample Method : | pump | Changed Method: |

Static Water Level: 50.98 ft  Does well purge dry? ☐ Yes ☒ No

Well Depth:* 62.91 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 12.01 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 2 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/10/16 | 10:45 | 52.25 | 0 | 3.86 | 0.369 | 25.11 | 622 | 2.03 | 418 |
| | 10:53 | 52.95 | 2 | 3.46 | 0.436 | 23.31 | 133 | 0.96 | 401 |
| | 11:01 | 53.60 | 4 | 3.44 | 0.503 | 23.20 | 42.2 | 0.74 | 398 |
| | 11:09 | 53.70 | 6 | 3.37 | 0.487 | 23.36 | 23.5 | 0.71 | 397 |
| | 11:17 | 53.80 | 8 | 3.40 | 0.479 | 23.44 | 9.4 | 0.74 | 390 |
| | | | | | | | | | |
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| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

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|---|---|---|---|---|---|---|---|---|
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*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer HSRA  Sample Date: 6/10/16  Team Leader: _____

Well ID: MWD-6  Sample Time: 9:20  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method: | pump | Changed Method: |
| Sample Method: | bailer | Changed Method: |

Static Water Level: 47.70 ft  Does well purge dry? ☑ Yes ☐ No

Well Depth:* 72.82 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 25.12 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 4.27 | 4.5 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9/16 | 9:18AM | 50.75 | 0 | 4.2 | 1.94 | 21.8 | 314 | 3.25 | 281 |
| | 9:40 | 68.90 | 4.5 | 4.16 | 1.81 | 23.00 | >800 | 1.03 | 217 |
| | 9:45 | dry (dry) | 95.0 | 4.02 | 2.13 | 23.90 | >800 | 0.69 | 182 |
| 6/10/16 | 9:19 | 58.64 | — | 3.93 | 2.12 | 23.18 | 0 | 5.38 | 339 |
| | | | | | | | | | |
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| Final Readings | | | | | | | | | |

Previous Readings:

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer HSRA  Sample Date: 6/10/16  Team Leader: _____

Well ID: MWA-8  Sample Time: 3:17  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method: | Pump | Changed Method: _____ |
| Sample Method: | Pump | Changed Method: _____ |

Static Water Level: 40.68 ft  Does well purge dry? ☐ Yes ☒ No

Well Depth:* 58.85 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 18.17 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 3.08 / 3 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/10/16 | 2:48 | 43.30 | 0 | 4.65 | 0.107 | 23.54 | 112 | 11.02 | 357 |
| | 2:57 | 45.35 | 3 | 4.24 | 0.091 | 24.09 | 8.6 | 6.43 | 320 |
| | 3:06 | 46.30 | 6 | 4.24 | 0.087 | 24.30 | 0 | 6.29 | 320 |
| | 3:15 | 47.16 | 9 | 4.23 | 0.086 | 23.96 | 8.3 | 6.27 | 319 |
| | | | | | | | | | |
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| Final Readings | | | | | | | | | |

Previous Readings:

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer HSRA  Sample Date: 6/9/16  Team Leader: _____

Well ID: MW-9  Sample Time: 3:06  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method: | Pump | Changed Method: _____ |
| Sample Method: | Pump | Changed Method: _____ |

Static Water Level: 42.90 ft  Does well purge dry? ☐ Yes ☑ No

Well Depth:* 49.11 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 6.21 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 1.02/1 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9/16 | 2:50 | 43 | 0 | 4.9 | 0.141 | 27.34 | 437 | 5.87 | 350 |
| | 2:55 | 42.98 | 1 | 4.87 | 0.144 | 27.44 | 200 | 4.8 | 404 |
| | 3:00 | 42.98 | 2 | 4.73 | 0.147 | 26.40 | 29.4 | 5.14 | 371 |
| | 3:05 | 42.98 | 3 | 4.64 | 0.148 | 26.17 | 0.4 | 5.04 | 362 |
| | | | | | | | | | |
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| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: _____ Sample Date : 6/10/10 Team Leader : _____

Well ID : MW-10 Sample Time : 5:03 Team Number: _____

Sample ID: _____ Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | bailer | Changed Method: |
| Sample Method : | bailer | Changed Method: |

Static Water Level: 60.60 ft. Does well purge dry? ☑ Yes ☒ No

Well Depth:* 64.35 ft ☐ * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 3.75 ft ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 0.6 gals *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| | 10:02 | | 0 | 4.77 | 0.171 | 22.33 | 548 | 5.53 | 380 |
| | 10:07 | | ~~8.5~~ | 5.1 | 0.191 | 21.65 | 612 | 4.16 | 367 |
| | 10:10 | | 1 | 5.15 | 0.185 | 21.42 | 713 | 4.31 | 371 |
| | 10:13 | | 1.5 | 5.05 | 0.173 | 21.22 | >800 | 4.14 | 377 |
| | 10:16 | | 2 | 4.95 | 0.172 | 20.97 | >800 | 4.58 | 377 |
| | | | | DRY | | | | | |
| | 5:03 | 60.48 | | 5.13 | 0.148 | 26.53 | 30.6 | 4.98 | ~~382~~ |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐ MS ☐
DUP ☐ MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer BSRA  Sample Date : 6/10/16  Team Leader : _____

Well ID : MW-12  Sample Time : 4:30  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | Pump | Changed Method: _____ |
| Sample Method : | Pump | Changed Method: _____ |

Static Water Level: 68.61 ft  Does well purge dry? ☐ Yes ☑ No

Well Depth:* 82.06 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 13.45 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 2.3/2.5 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/10/16 | 4:12 | 69.85 | 0 | 4.04 | 0.153 | 23.90 | >800 | 5.01 | 329 |
| | 4:17 | 68.90 | 2.5 | 3.92 | 0.151 | 23.14 | 160 | 3.64 | 329 |
| | 4:22 | 68.95 | 5 | 3.91 | 0.153 | 22.96 | 16.4 | 3.54 | 335 |
| | 4:27 | 68.95 | 7.5 | 3.91 | 0.153 | 22.88 | 0 | 3.37 | 339 |
| | | | | | | | | | |
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| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer-HSP4 Sample Date : 6/9/16 Team Leader :

Well ID : MW-13 Sample Time : 2:09 Team Number:

Sample ID: Sample Team Members:

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | pump | Changed Method: |
| Sample Method : | pump | Changed Method: |

Static Water Level: 65.47 ft. Does well purge dry? ☐ Yes ☑ No

Well Depth:* 75.40 ft ☐ * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 9.93 ft ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 1.69/2 gals *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9 | 1:43 | 66.71 | 0 | 4.2 | 0.174 | 28.02 | 432 | 4.29 | 343 |
| | 1:52 | 66.71 | 2 | 3.89 | 0.182 | 23.25 | 82 | 3.44 | 356 |
| | 2:00 | 66.71 | 4 | 3.94 | 0.182 | 23.45 | 35.1 | 3.37 | 354 |
| | 2:08 | 66.71 | 6 | 3.83 | 0.182 | 23.08 | 5.5 | 3.32 | 365 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: ft Hach Ferrous Iron Result: mg/L

Constructed Well Depth: ft Hach Dissolved Oxygen Result: mg/L

Well Stickup Height: ft Sample Mgmnt. Turbidity: NTUs

Purge Flow Rate: gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
/ /

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID:
EB ☐ MS ☐
DUP ☐ MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer Hsey  Sample Date: 6/9/16  Team Leader: _____

Well ID: MW - 14  Sample Time: 4:52  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method: | Pump | Changed Method: _____ |
| Sample Method: | Pump | Changed Method: _____ |

Static Water Level: 71.1 ft  Does well purge dry? ☐ Yes ☑ No

Well Depth:* 83.25 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 12.15 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 2.07 | 2 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9/16 | 3:50 | 70.78 | 0 | 4.41 | 0.149 | 25.81 | 566 | 3.53 | 387 |
| | 3:56 | 70.33 | 2 | 4.26 | 0.159 | 24.41 | 320 | 3.27 | 451 |
| | 4:03 | 70.33 | 4 | 4.11 | 0.167 | 24.06 | 111 | 3.15 | 472 |
| | 4:10 | 70.33 | 6 | 3.94 | 0.169 | 23.93 | 54.4 | 3.04 | 500 |
| | 4:17 | 70.33 | 8 | 3.99 | 0.170 | 23.80 | 31.1 | 3.10 | 504 |
| | 4:24 | 70.33 | 10 | 3.93 | 0.170 | 23.82 | 25.7 | 3.04 | 506 |
| | 4:31 | 70.33 | 12 | 3.95 | 0.171 | 23.81 | 15.4 | 3.00 | 522 |
| | 4:38 | 70.33 | 14 | 4.02 | 0.171 | 23.84 | 12.5 | 2.88 | 525 |
| 4:45 | Final Readings | | 16 | 3.96 | 0.171 | 23.72 | 11.9 | 3.04 | 528 |
| Previous Readings: | 4:52 | | 18 | 4.06 | 0.171 | 23.64 | 9.4 | 3.00 | 531 |
| | | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC
## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: Mercer HSRA  Sample Date : 6/10/16  Team Leader : _____

Well ID : MW-15  Sample Time : 6:12  Team Number: _____

Sample ID: _____  Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | Pump | Changed Method: _____ |
| Sample Method : | Pump | Changed Method: _____ |

Static Water Level: 49.45 ft  Does well purge dry? ☐ Yes ☐ No

Well Depth:* 64.1 ft ☐  * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 14.65 ft  ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 1.98/2 gals  *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/10/16 | 5:43 | 50.28 | 0 | 3.78 | .108 | 22.83 | 233 | 5.50 | 363 |
| | 5.49 | 51.15 | 2 | 3.73 | .109 | 23.12 | 92.1 | 3.66 | 343 |
| | 5.55 | 51.70 | 4 | 3.75 | .108 | 23.45 | 34.1 | 1.20 | 364 |
| | 6.01 | 53.75 | 6 | 3.75 | .107 | 22.98 | 122 | 4.72 | 347 |
| | 6.07 | 54.61 | 8 | 3.76 | .108 | 23.05 | 55.3 | 4.20 | 352 |
| | 6.13 | 55.86 | 10 | 3.75 | .108 | 23.09 | 9.8 | 4.13 | 350 |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft  Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft  Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft  Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐  MS ☐
DUP ☐  MSD ☐

# GEC

## GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.

Project No.: _____ Sample Date : 6/10/16 Team Leader : _____

Well ID : MW-16 Sample Time : 3:40 ~~3:45~~ Team Number: _____

Sample ID: _____ Sample Team Members: _____

| | (planned method) | (note changes to planned method in comments section below) |
|---|---|---|
| Purge Method : | bailer | Changed Method: |
| Sample Method : | bailer | Changed Method: |

Static Water Level: 57.42 ft Does well purge dry? ☑ Yes ☐ No

Well Depth:* 59.20 ft ☐ * Check box if well depth measured, no check if used previous measured well depth

Water Column:** 1.78 ft ** Water Column = Measured Well Depth - Static Water Level

Well Diameter: 2 in

| Well Diameter (inches) | 1 | 2 | 4 | 6 | 10 | 12 |
|---|---|---|---|---|---|---|
| Volume Factor (gallons/feet) | 0.04 | 0.17 | 0.66 | 1.50 | 4.08 | 5.88 |

Well Volume:*** 0.3 gals *** Well Volume = Water Column x Volume Factor

| Date | Time | Depth to water (ft. TOC) | Volume Removed (gals) | pH | Specific Conductance (mS/cm) | Temperature (°C) | Turbidity (NTUs) | Dissolved Oxygen (mg/L) | Redox Potential (mV) |
|---|---|---|---|---|---|---|---|---|---|
| 6/9/16 | 9:43 | | 0 | 4.21 | 0.304 | 23.01 | >800 | 4.74 | 316 |
| | DRY | | 0.25 | DRY | | | | | |
| 6/9/16 | 3:40 | 57.05 | | 4.37 | 0.123 | 26.02 | 66.5 | 5.57 | 298 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Final Readings | | | | | | | | | |

Previous Readings:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

*Prev. Measured Well Depth: _____ ft Hach Ferrous Iron Result: _____ mg/L

Constructed Well Depth: _____ ft Hach Dissolved Oxygen Result: _____ mg/L

Well Stickup Height: _____ ft Sample Mgmnt. Turbidity: _____ NTUs

Purge Flow Rate: _____ gal/min

Anticipated Volume Based On Readings From Previous Year
Volume Factor/Well Volume/Minimum Purge (gal)
_____ / _____ / _____

Purging/Sampling/Well Repair Comments:

Related QC Samples:
QC Sample ID: _____
EB ☐ MS ☐
DUP ☐ MSD ☐

# APPENDIX E

BIOCHLOR GROUNDWATER MODELING
& SUPPORTING DOCUMENTATION

GEC

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

## TABLE E1: BIOCHLOR INPUT PARAMETERS

| BIOCHLOR Section | Parameter | | Value | Units | Source |
|---|---|---|---|---|---|
| 1. Advection | Hydraulic Conductivity | K | 1.6E-03 | cm/sec | Field generated value; See Table E2 |
| | Hydraulic Gradient | i | 0.009 | ft/ft | Field generated value; See Figure E1 |
| | Effective Porosity | n | 0.25 | - | Typical value for silts and sands; BIOCHLOR User's Manual |
| | Seepage Velocity | Vs | 53 | ft/yr | Calculated from above listed parameters |
| 2. Dispersion | Alpha x | | 78 | ft | Calculated from option 2 - Alpha x = 0.1*(Length of plume) |
| | (Alpha y) / (Alpha x) | | 0.1 | - | Default value; BIOCHLOR User's Manual |
| | (Alpha z) / (Alpha x) | | 1.0E-99 | - | Default value; BIOCHLOR User's Manual |
| 3. Adsorption | Soil Bulk Density | ρ | 1.7 | kg/L | Default value; BIOCHLOR User's Manual |
| | Fraction of Organic Carbon | foc | 1.00E-03 | - | Default value; BIOCHLOR User's Manual |
| | PCE Partition Coefficient | Koc | 426 | L/kg | Default value; BIOCHLOR User's Manual |
| | TCE Partition Coefficient | Koc | 130 | L/kg | Default value; BIOCHLOR User's Manual |
| | DCE Partition Coefficient | Koc | 125 | L/kg | Default value; BIOCHLOR User's Manual |
| | VC Partition Coefficient | Koc | 29.6 | L/kg | Default value; BIOCHLOR User's Manual |
| | ETH Partition Coefficient | Koc | 302 | L/kg | Default value; BIOCHLOR User's Manual |
| | Retardation Factor | R | 1.88 | - | Calculated from above listed parameters |
| 4. Biotransformation | PCE - TCE | λ | 0.242 | 1/yr | Rate constant calibrated using centerline field data and calculated using the Buschek/Alcantar Method |
| | TCE - DCE | λ | 0.300 | 1/yr | |
| | DCE - VC | λ | 0.100 | 1/yr | |
| | VC - ETH | λ | 0.400 | 1/yr | |
| 5. General | Simulation Time | t | 1000 | yr | Chosen for steady-state simulation |
| | Modeled Area Width | W | 500 | ft | Field generated value |
| | Modeled Area Length | L | 1200 | ft | Field generated value; 3000 ft used to simulate extent of Mercer University Property |
| | Zone 1 Length | | 1200 | ft | Only 1 biotransformation zone |
| | Zone 2 Length | | 0 | ft | Only 1 biotransformation zone |
| 6. Source Data | Source Thickness in Sat. Zone | | 45 | ft | Field generated value from monitoring well records |
| | Width | | Varies | ft | Field data obtained from sampling events in June 2016 and January 2008 |
| | Concentrations | | Varies | mg/L | Field data obtained from sampling events in June 2016 and January 2008 |
| 7. Field Data for Comparison | Contaminant Concentrations | | Varies | mg/L | Field data obtained from sampling events in June 2016 and January 2008 |

**Mercer Triangle**
**1535 Montpelier Ave**
**Macon, Bibb County, HSI # 10779**

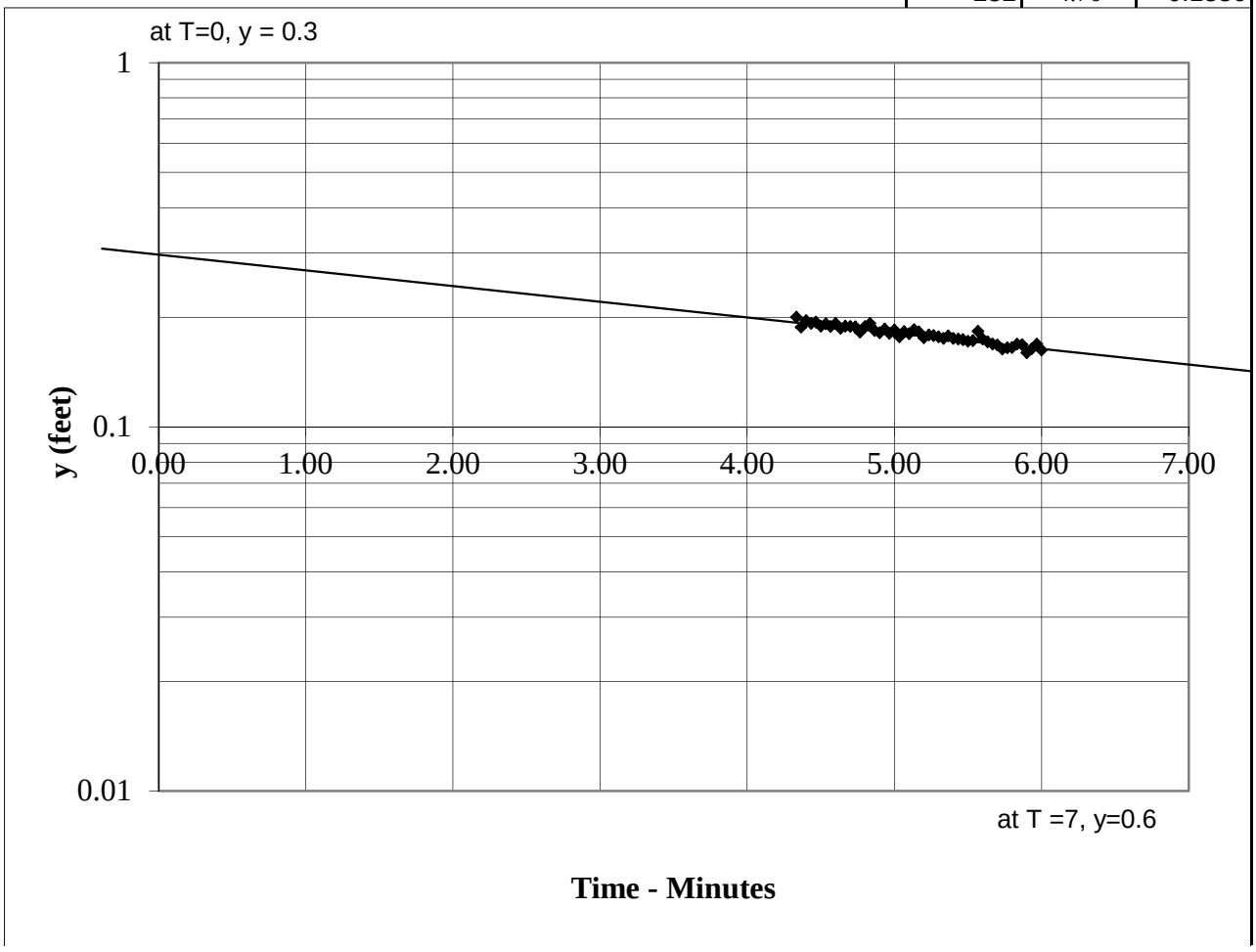
## TABLE E2: SLUG TESTING CALCULATION SUMMARY
(HYDRAULIC CONDUCTIVITY)

| Monitoring Well | Trial Number | Calculated Hydraulic Conductivity | |
|---|---|---|---|
| | | cm/sec | ft/day |
| MWA-1 | Trial 1 | 7.7E-04 | 2.19 |
| | Trial 2 | 8.8E-04 | 2.50 |
| | Trial 3 | 1.8E-03 | 5.15 |
| MW-14 | Trial 1 | 2.0E-03 | 5.53 |
| | Trial 2 | 2.1E-03 | 5.87 |
| | Trial 3 | 2.0E-03 | 5.54 |
| Average | | 1.6E-03 | 4.46 |

# SLUG TEST DATA SHEET

| | | | |
|---|---|---|---|
| Site Name | Mercer Triangle | | |
| Date of Test | August 18, 2015 | | |
| Monitoring Well ID: | MWA-1 (Trial 1) | | |
| Total Well Depth (TD): | 40.3 | feet | |
| Screen Length(L): | 15 | feet | |
| Depth to Water(DW): | 31.23 | feet | |
| Height of Water Column(H): | 9.07 | feet | |
| Well Diameter: | 2 | inches | |
| Borehole Diameter: | 8 | inches | |
| Depth to Confining Unit (BGS) | 50 | feet | |
| L/Rw = | 22.5 | | |
| (from graph) A= | 2.9 | | |
| B = | 0.55 | | |
| C = | 2.7 | | |
| (from plot) At T = 0, $y_0$ = | 0.3 | feet | |
| T = | 7 | minutes | |
| $y_T$ = | 0.6 | feet | |
| **Hydraulic Conductivity, k =** | **7.7E-04** | **cm/sec** | |
| | **2.19** | **ft/day** | |

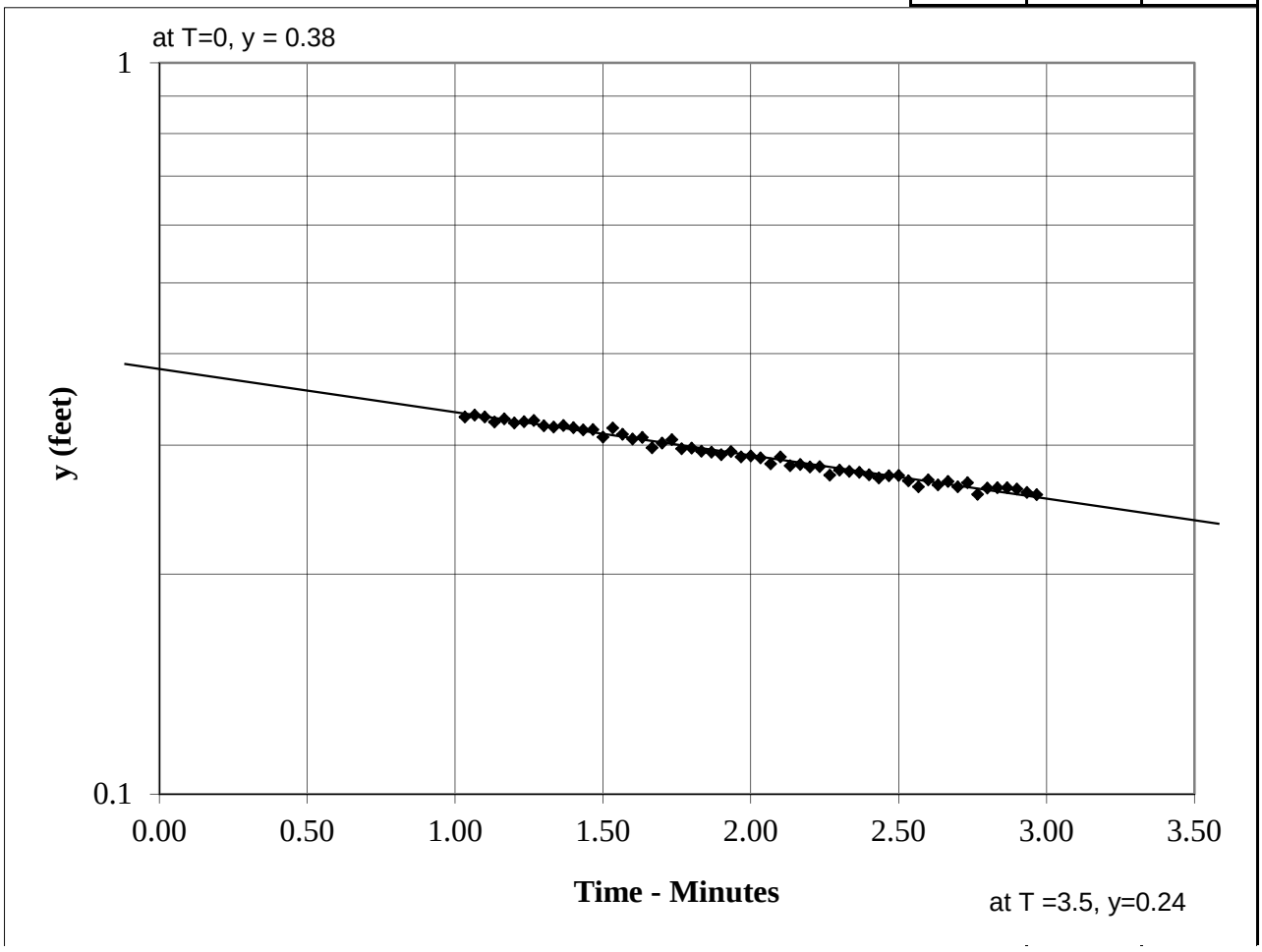
| FIELD DATA | | |
|---|---|---|
| **Time (secs)** | **Time (min)** | **Δy** |
| 240 | 4.00 | 0.19433 |
| 242 | 4.03 | 0.19439 |
| 244 | 4.07 | 0.19874 |
| 246 | 4.10 | 0.19821 |
| 248 | 4.13 | 0.19762 |
| 250 | 4.17 | 0.19184 |
| 252 | 4.20 | 0.19704 |
| 254 | 4.23 | 0.19256 |
| 256 | 4.27 | 0.19499 |
| 258 | 4.30 | 0.19292 |
| 260 | 4.33 | 0.20013 |
| 262 | 4.37 | 0.18766 |
| 264 | 4.40 | 0.19586 |
| 266 | 4.43 | 0.19241 |
| 268 | 4.47 | 0.19389 |
| 270 | 4.50 | 0.18904 |
| 272 | 4.53 | 0.19211 |
| 274 | 4.57 | 0.18874 |
| 276 | 4.60 | 0.19228 |
| 278 | 4.63 | 0.18634 |
| 280 | 4.67 | 0.18911 |
| 282 | 4.70 | 0.1886 |



# SLUG TEST DATA SHEET

| | | | |
|---|---|---|---|
| Site Name | | Mercer Triangle | |
| Date of Test | | August 18, 2015 | |
| Monitoring Well ID: | | MWA-1 (Trial 2) | |
| Total Well Depth (TD): | | 40 | feet |
| Screen Length(L): | | 15 | feet |
| Depth to Water(DW): | | 31.5 | feet |
| Height of Water Column(H): | | 8.5 | feet |
| Well Diameter: | | 2 | inches |
| Borehole Diameter: | | 8 | inches |
| Depth to Confining Unit (BGS) | | 50 | feet |
| L/Rw = | | 22.5 | |
| (from graph) | A= | 2.9 | |
| | B = | 0.55 | |
| | C = | 2.7 | |
| (from plot) | At T = 0, $y_0$ = | 0.36 | feet |
| | T = | 3.5 | minutes |
| | $y_T$ = | 0.24 | feet |
| **Hydraulic Conductivity, k =** | | **8.8E-04** | **cm/sec** |
| | | **2.50** | **ft/day** |

| FIELD DATA | | |
|---|---|---|
| **Time (secs)** | **Time (min)** | **Δy** |
| 62 | 1.03 | 0.327841 |
| 64 | 1.07 | 0.32975 |
| 66 | 1.10 | 0.327784 |
| 68 | 1.13 | 0.322567 |
| 70 | 1.17 | 0.325941 |
| 72 | 1.20 | 0.321691 |
| 74 | 1.23 | 0.32286 |
| 76 | 1.27 | 0.324401 |
| 78 | 1.30 | 0.318971 |
| 80 | 1.33 | 0.317511 |
| 82 | 1.37 | 0.319119 |
| 84 | 1.40 | 0.316851 |
| 86 | 1.43 | 0.314653 |
| 88 | 1.47 | 0.315228 |
| 90 | 1.50 | 0.30775 |
| 92 | 1.53 | 0.316624 |
| 94 | 1.57 | 0.310463 |
| 96 | 1.60 | 0.305905 |
| 98 | 1.63 | 0.307527 |
| 100 | 1.67 | 0.297632 |
| 102 | 1.70 | 0.302095 |
| 104 | 1.73 | 0.305264 |

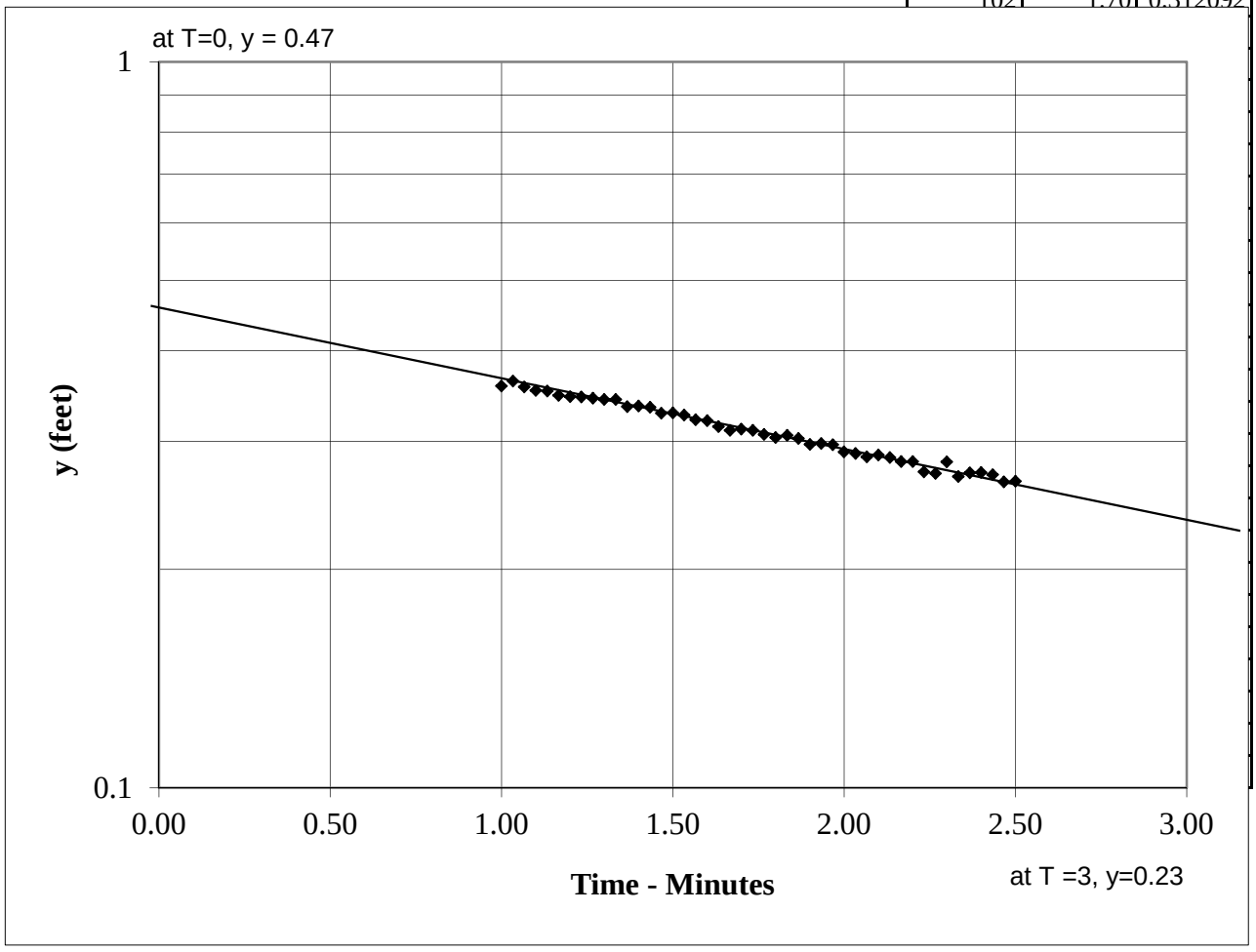


# SLUG TEST DATA SHEET

| | | | |
|---|---|---|---|
| Site Name | Mercer Triangle | | |
| Date of Test | August 18, 2015 | | |
| Monitoring Well ID: | MWA-1 (Trial 3) | | |
| Total Well Depth (TD): | 40 | feet | |
| Screen Length(L): | 15 | feet | |
| Depth to Water(DW): | 31.5 | feet | |
| Height of Water Column(H): | 8.5 | feet | |
| Well Diameter: | 2 | inches | |
| Borehole Diameter: | 8 | inches | |
| Depth to Confining Unit (BGS) | 50 | feet | |
| L/Rw = | 22.5 | | |
| (from graph) A= | 2.9 | | |
| B = | 0.55 | | |
| C = | 2.7 | | |
| (from plot) At T = 0, $y_0$ = | 0.47 | feet | |
| T = | 3 | minutes | |
| $y_T$ = | 0.23 | feet | |

| | | |
|---|---|---|
| **Hydraulic Conductivity, k =** | **1.8E-03** | **cm/sec** |
| | **5.15** | **ft/day** |

| FIELD DATA | | |
|---|---|---|
| **Time (secs)** | **Time (min)** | **Δy** |
| 60 | 1.00 | 0.357773 |
| 62 | 1.03 | 0.363225 |
| 64 | 1.07 | 0.356514 |
| 66 | 1.10 | 0.352722 |
| 68 | 1.13 | 0.351891 |
| 70 | 1.17 | 0.347062 |
| 72 | 1.20 | 0.345744 |
| 74 | 1.23 | 0.345607 |
| 76 | 1.27 | 0.3442 |
| 78 | 1.30 | 0.342729 |
| 80 | 1.33 | 0.342791 |
| 82 | 1.37 | 0.335031 |
| 84 | 1.40 | 0.335828 |
| 86 | 1.43 | 0.334522 |
| 88 | 1.47 | 0.328198 |
| 90 | 1.50 | 0.328583 |
| 92 | 1.53 | 0.326154 |
| 94 | 1.57 | 0.321449 |
| 96 | 1.60 | 0.320566 |
| 98 | 1.63 | 0.314634 |
| 100 | 1.67 | 0.31089 |
| 102 | 1.70 | 0.312092 |

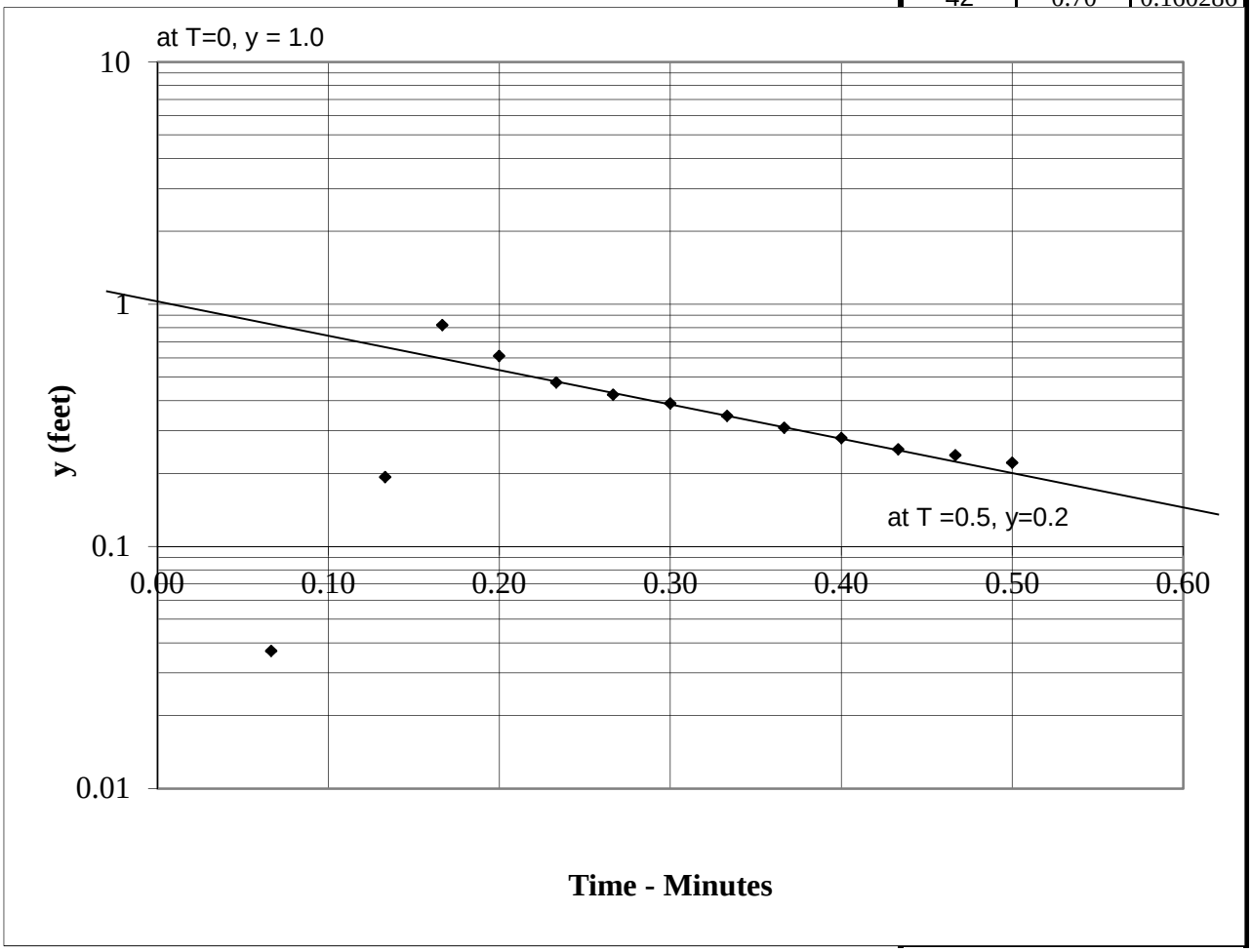


# SLUG TEST DATA SHEET

| | | | |
|---|---|---|---|
| Site Name | | Mercer Triangle | |
| Date of Test | | June 21,2016 | |
| Monitoring Well ID: | | MW-14 (Trial 1) | |
| Total Well Depth (TD): | | 85 | feet |
| Screen Length(L): | | 20 | feet |
| Depth to Water(DW): | | 70 | feet |
| Height of Water Column(H): | | 15 | feet |
| Well Diameter: | | 2 | inches |
| Borehole Diameter: | | 8 | inches |
| Depth to Confining Unit (BGS) | | 100 | feet |
| L/Rw = | | 30 | |
| (from graph) | A= | 2.9 | |
| | B = | 0.55 | |
| | C = | 2.7 | |
| (from plot) | At T = 0, $y_0$ = | 1.01 | feet |
| | T = | 0.5 | minutes |
| | $y_T$ = | 0.2 | feet |

| | | |
|---|---|---|
| **Hydraulic Conductivity, k =** | **2.0E-03** | **cm/sec** |
| | **5.53** | **ft/day** |

| FIELD DATA | | |
|---|---|---|
| **Time (secs)** | **Time (min)** | **Δy** |
| 0 | 0.00 | 0 |
| 2 | 0.03 | -0.00315 |
| 4 | 0.07 | 0.036983 |
| 6 | 0.10 | -0.00118 |
| 8 | 0.13 | 0.193158 |
| 10 | 0.17 | 0.81987 |
| 12 | 0.20 | 0.610671 |
| 14 | 0.23 | 0.475115 |
| 16 | 0.27 | 0.422917 |
| 18 | 0.30 | 0.389398 |
| 20 | 0.33 | 0.346082 |
| 22 | 0.37 | 0.308684 |
| 24 | 0.40 | 0.280159 |
| 26 | 0.43 | 0.251445 |
| 28 | 0.47 | 0.238252 |
| 30 | 0.50 | 0.221737 |
| 32 | 0.53 | 0.206293 |
| 34 | 0.57 | 0.192832 |
| 36 | 0.60 | 0.184819 |
| 38 | 0.63 | 0.173657 |
| 40 | 0.67 | 0.167482 |
| 42 | 0.70 | 0.160286 |

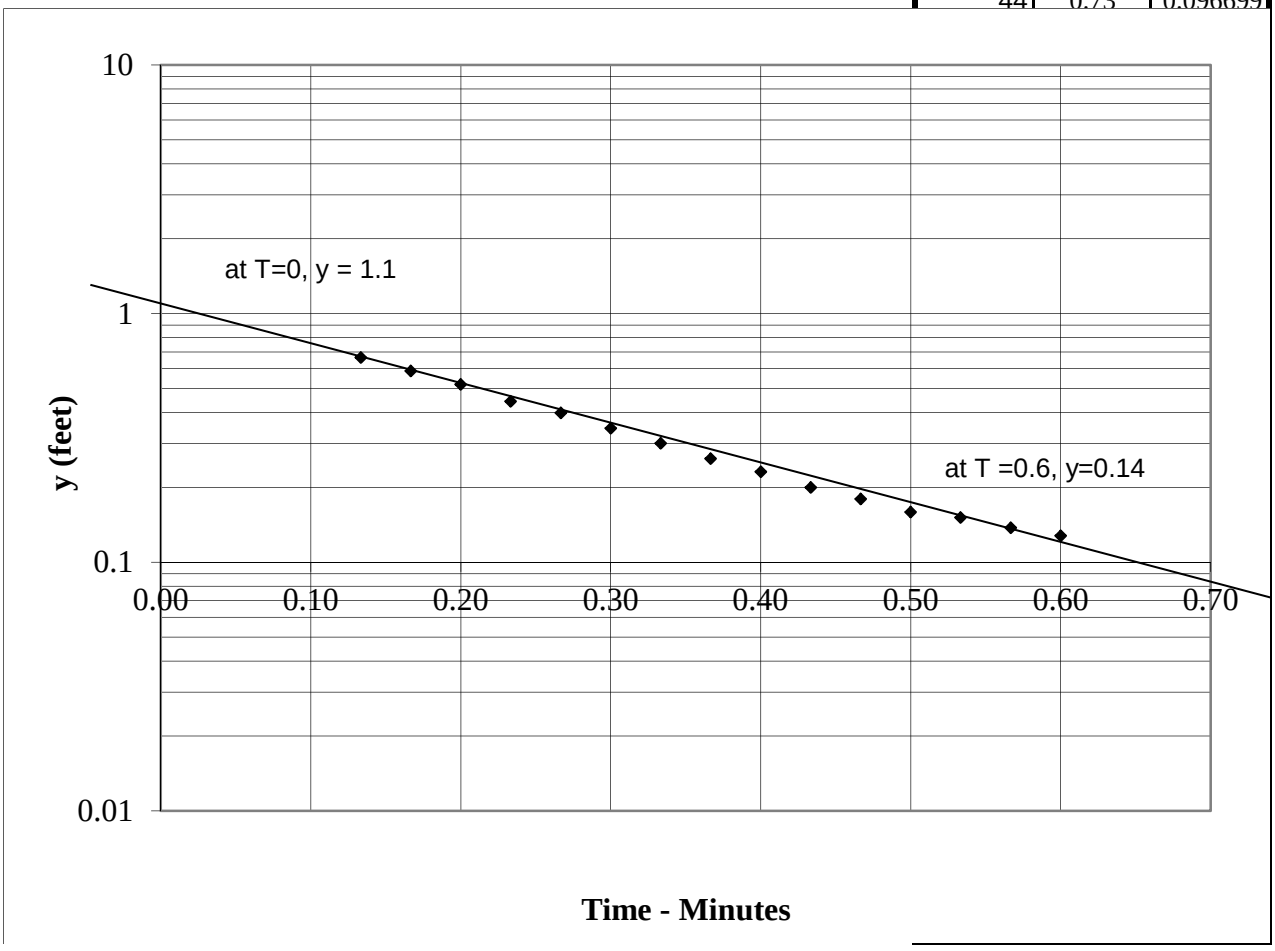


# SLUG TEST DATA SHEET

| | | | |
|---|---|---|---|
| Site Name | | Mercer Triangle | |
| Date of Test | | June 21,2016 | |
| Monitoring Well ID: | | MW-14 (Trial 2) | |
| Total Well Depth (TD): | | 85 | feet |
| Screen Length(L): | | 20 | feet |
| Depth to Water(DW): | | 70 | feet |
| Height of Water Column(H): | | 15 | feet |
| Well Diameter: | | 2 | inches |
| Borehole Diameter: | | 8 | inches |
| Depth to Confining Unit (BGS) | | 100 | feet |
| L/Rw = | | 30 | |
| (from graph) | A= | 2.9 | |
| | B = | 0.55 | |
| | C = | 2.7 | |
| (from plot) | At T = 0, $y_0$ = | 1.1 | feet |
| | T = | 0.6 | minutes |
| | $y_T$ = | 0.14 | feet |

| | | |
|---|---|---|
| **Hydraulic Conductivity, k =** | **2.1E-03** | **cm/sec** |
| | **5.87** | **ft/day** |

| FIELD DATA | | |
|---|---|---|
| **Time (secs)** | **Time (min)** | **Δy** |
| 0 | 0.00 | 0 |
| 2 | 0.03 | -0.0038 |
| 4 | 0.07 | 0.008473 |
| 6 | 0.10 | -0.04805 |
| 8 | 0.13 | 0.664847 |
| 10 | 0.17 | 0.587363 |
| 12 | 0.20 | 0.518689 |
| 14 | 0.23 | 0.443085 |
| 16 | 0.27 | 0.398528 |
| 18 | 0.30 | 0.345217 |
| 20 | 0.33 | 0.300778 |
| 22 | 0.37 | 0.260997 |
| 24 | 0.40 | 0.231307 |
| 26 | 0.43 | 0.199654 |
| 28 | 0.47 | 0.179593 |
| 30 | 0.50 | 0.158822 |
| 32 | 0.53 | 0.151066 |
| 34 | 0.57 | 0.137762 |
| 36 | 0.60 | 0.127875 |
| 38 | 0.63 | 0.118728 |
| 40 | 0.67 | 0.109884 |
| 42 | 0.70 | 0.106077 |
| 44 | 0.73 | 0.096699 |

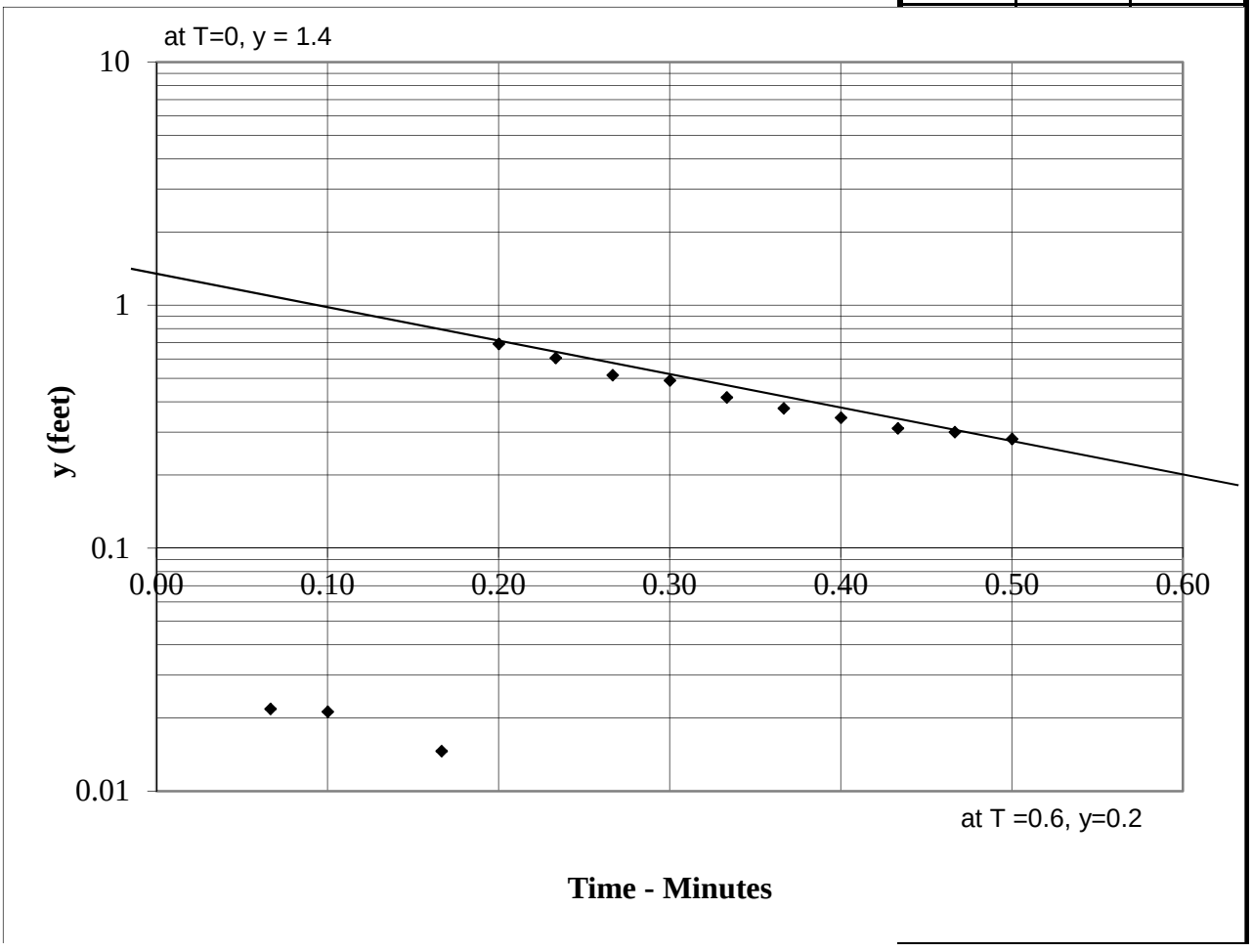


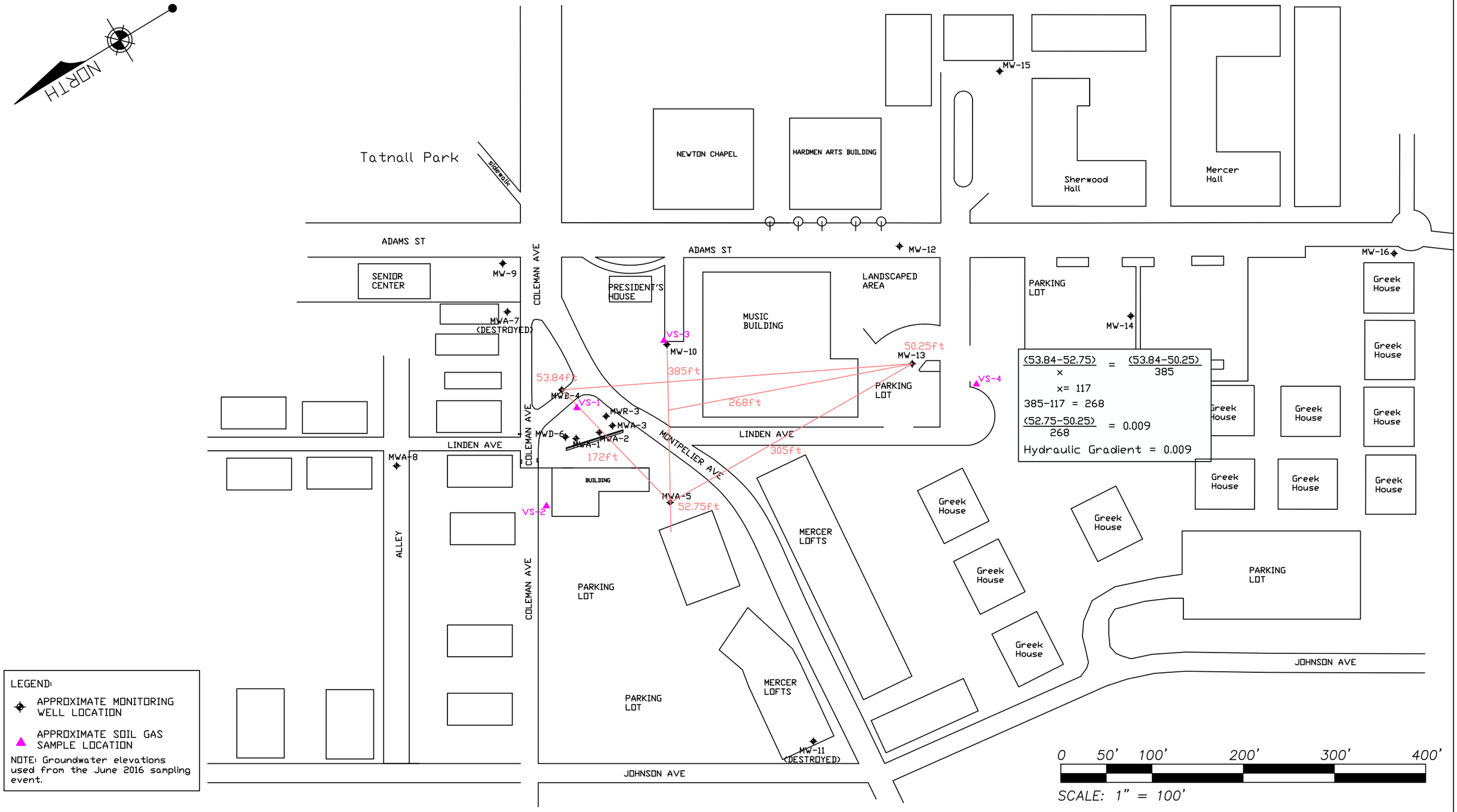
# SLUG TEST DATA SHEET

| | | | |
|---|---|---|---|
| Site Name | | Mercer Triangle | |
| Date of Test | | June 21,2016 | |
| Monitoring Well ID: | | MW-14 (Trial 3) | |
| Total Well Depth (TD): | | 85 | feet |
| Screen Length(L): | | 20 | feet |
| Depth to Water(DW): | | 70 | feet |
| Height of Water Column(H): | | 15 | feet |
| Well Diameter: | | 2 | inches |
| Borehole Diameter: | | 8 | inches |
| Depth to Confining Unit (BGS) | | 100 | feet |
| L/Rw = | | 30 | |
| (from graph) | A= | 2.9 | |
| | B = | 0.55 | |
| | C = | 2.7 | |
| (from plot) | At T = 0, $y_0$ = | 1.4 | feet |
| | T = | 0.6 | minutes |
| | $y_T$ = | 0.2 | feet |

| | | |
|---|---|---|
| **Hydraulic Conductivity, k =** | **2.0E-03** | **cm/sec** |
| | **5.54** | **ft/day** |

| FIELD DATA | | |
|---|---|---|
| **Time (secs)** | **Time (min)** | **Δy** |
| 0 | 0.00 | 0 |
| 2 | 0.03 | 0.007746 |
| 4 | 0.07 | 0.021782 |
| 6 | 0.10 | 0.021227 |
| 8 | 0.13 | 0.008843 |
| 10 | 0.17 | 0.014588 |
| 12 | 0.20 | 0.690784 |
| 14 | 0.23 | 0.605597 |
| 16 | 0.27 | 0.51448 |
| 18 | 0.30 | 0.489444 |
| 20 | 0.33 | 0.416755 |
| 22 | 0.37 | 0.375217 |
| 24 | 0.40 | 0.343239 |
| 26 | 0.43 | 0.310753 |
| 28 | 0.47 | 0.299508 |
| 30 | 0.50 | 0.28126 |
| 32 | 0.53 | 0.262719 |
| 34 | 0.57 | 0.253869 |
| 36 | 0.60 | 0.243238 |
| 38 | 0.63 | 0.23563 |
| 40 | 0.67 | 0.226119 |
| 42 | 0.70 | 0.218412 |






GEC
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS

FIGURE E1
HYDRAULIC GRADIENT CALCULATION
MERCER UNIVERSITY TRIANGLE, HSRA #10779
MACON, BIBB COUNTY, GEORGIA
GEC JOB #090698.210

# BIOCHLOR Natural Attenuation Decision Support System

*Version 2.2*
Excel 2000

Mercer Triangle
June 2016 Run 1
Run Name

**Data Input Instructions:**
115 → 1. Enter value directly....or
↑ or
0.02 → 2. Calculate by filling in gray cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button )
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

## 1. ADVECTION

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 59.6 | (ft/yr) |
| ***or*** | | | |
| Hydraulic Conductivity | K | 1.6E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.009 | (ft/ft) |
| Effective Porosity | n | 0.25 | (-) |

## 2. DISPERSION

| | | |
|---|---|---|
| Alpha x* | 78 | (ft) |
| (Alpha y) / (Alpha x)* | 0.1 | (-) |
| (Alpha z) / (Alpha x)* | 1.E-99 | (-) |

Calc.

## 3. ADSORPTION

Retardation Factor* → R
***or***

| | Koc | | R | |
|---|---|---|---|---|
| Soil Bulk Density, rho | 1.7 | (kg/L) | | |
| FractionOrganicCarbon, foc | 1.0E-3 | (-) | | |
| Partition Coefficient | | | | |
| PCE | 426 | (L/kg) | 3.90 | (-) |
| TCE | 130 | (L/kg) | 1.88 | (-) |
| DCE | 125 | (L/kg) | 1.85 | (-) |
| VC | 30 | (L/kg) | 1.20 | (-) |
| ETH | 302 | (L/kg) | 3.05 | (-) |
| **Common R (used in model)* =** | | | **1.88** | |

## 4. BIOTRANSFORMATION

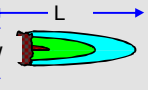
-1st Order Decay Coefficient*

| Zone 1 | λ (1/yr) | half-life (yrs) | Yield |
|---|---|---|---|
| PCE → TCE | 0.242 | | 0.79 |
| TCE → DCE | 0.300 | | 0.74 |
| DCE → VC | 0.100 | | 0.64 |
| VC → ETH | 0.400 | | 0.45 |
| **Zone 2** | λ (1/yr) | half-life (yrs) | |
| PCE → TCE | 0.000 | | |
| TCE → DCE | 0.000 | | |
| DCE → VC | 0.000 | | |
| VC → ETH | 0.000 | | |

λ HELP

## 5. GENERAL

| | | |
|---|---|---|
| Simulation Time* | 1000 | (yr) |
| Modeled Area Width* | 500 | (ft) |
| Modeled Area Length* | 1200 | (ft) |
| Zone 1 Length* | 1200 | (ft) |
| Zone 2 Length* | 0 | (ft) |




Zone 2= L - Zone 1

## 6. SOURCE DATA

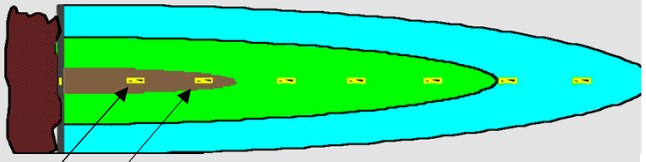
TYPE: Continuous Spatially-Varying

Source Options

Source Thickness in Sat. Zone* 45 (ft)

| | Y1 | Y2 | Y3 | |
|---|---|---|---|---|
| Width* (ft) | 25 | 75 | 150 | |
| Conc. (mg/L)* | C1 | C2 | C3 | $k_s$* (1/yr) |
| PCE | .28 | 0.072 | 0.049 | 0 |
| TCE | .091 | 0.025 | 0.009 | 0 |
| DCE | .042 | 0.009 | | 0 |
| VC | | | | 0 |
| ETH | | | | 0 |

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PCE Conc. (mg/L) | .28 | .19 | .072 | .049 | | | | | | | |
| TCE Conc. (mg/L) | .091 | .065 | .025 | .009 | | | | | | | |
| DCE Conc. (mg/L) | .042 | .024 | .009 | | | | | | | | |
| VC Conc. (mg/L) | | | | | | | | | | | |
| ETH Conc. (mg/L) | | | | | | | | | | | |
| Distance from Source (ft) | 0 | 30 | 380 | 640 | | | | | | | |
| Date Data Collected | 2016 | | | | | | | | | | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

**RUN CENTERLINE** | **RUN ARRAY** | ***Help*** | Restore | RESET | ***SEE*** | Paste

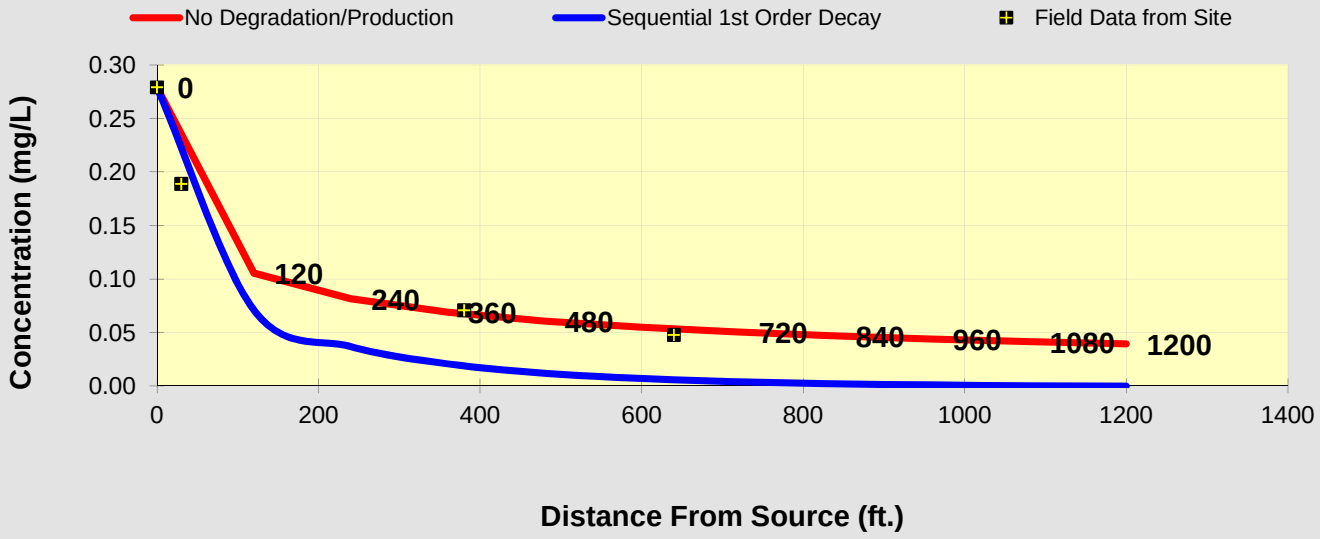
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| PCE | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.280 | 0.106 | 0.082 | 0.070 | 0.062 | 0.056 | 0.051 | 0.048 | 0.045 | 0.043 | 0.041 |
| Biotransformation | 0.2800 | 0.072 | 0.038 | 0.022 | 0.013 | 0.008 | 0.005 | 0.003 | 0.002 | 0.001 | 0.001 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.280 | 0.190 | 0.072 | 0.049 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

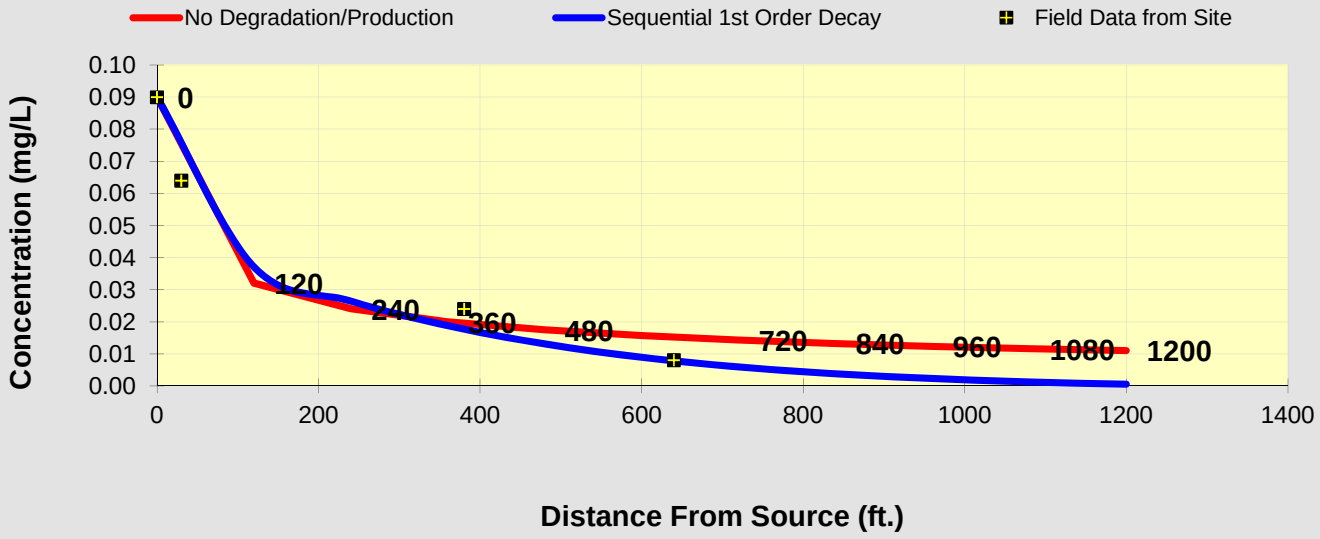
To All

To Array

## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

| TCE | Distance from Source (ft) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
| No Degradation | 0.091 | 0.033 | 0.025 | 0.021 | 0.018 | 0.017 | 0.015 | 0.014 | 0.013 | 0.013 | 0.012 |
| Biotransformation | 0.0910 | 0.038 | 0.027 | 0.020 | 0.014 | 0.010 | 0.007 | 0.005 | 0.003 | 0.002 | 0.002 |

| | Monitoring Well Locations (ft) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 380 | 640 | | | | | | | |
| Field Data from Site | 0.091 | 0.065 | 0.025 | 0.009 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

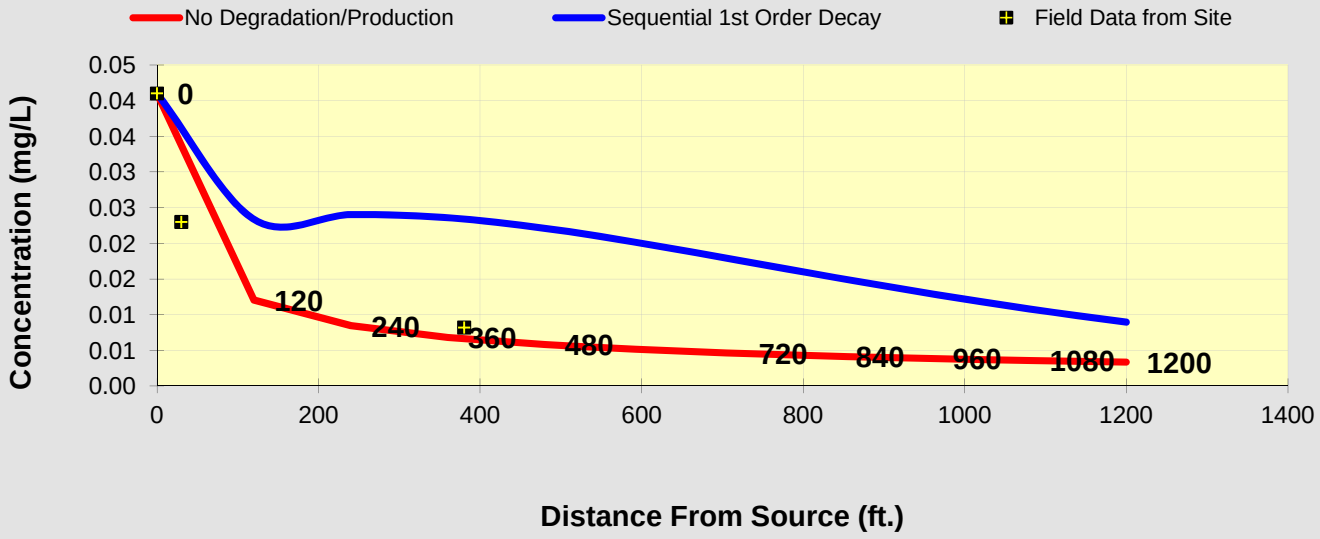
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| DCE | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.042 | 0.013 | 0.009 | 0.008 | 0.007 | 0.006 | 0.006 | 0.005 | 0.005 | 0.005 | 0.004 |
| Biotransformation | 0.0420 | 0.024 | 0.025 | 0.025 | 0.023 | 0.021 | 0.019 | 0.016 | 0.014 | 0.012 | 0.010 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.042 | 0.024 | 0.009 | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

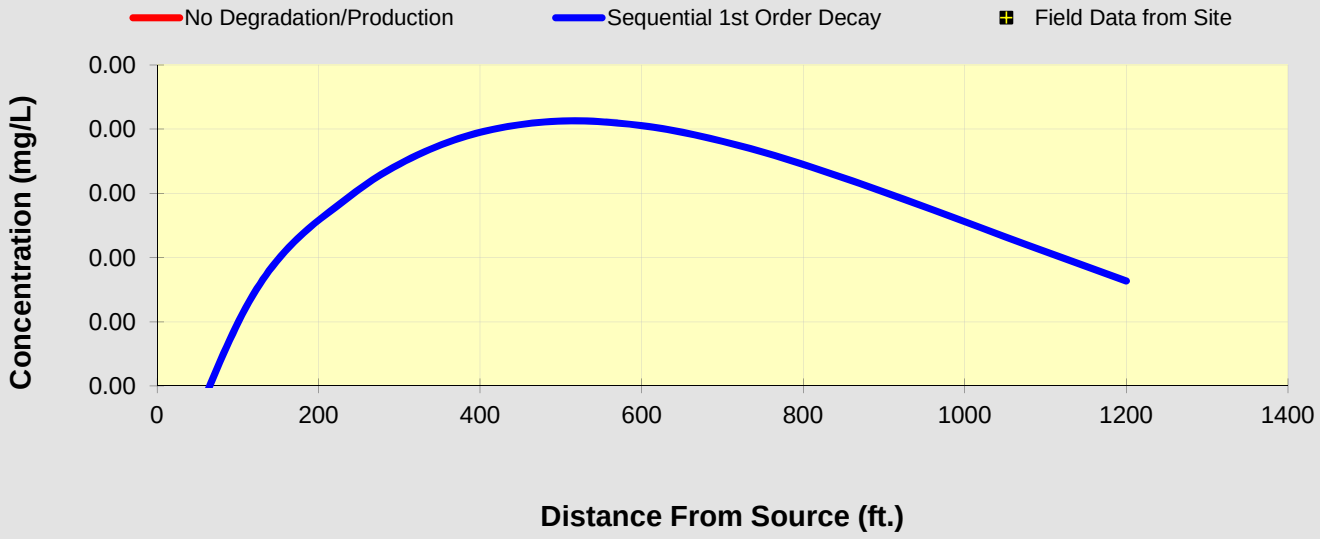
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| VC | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.002 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

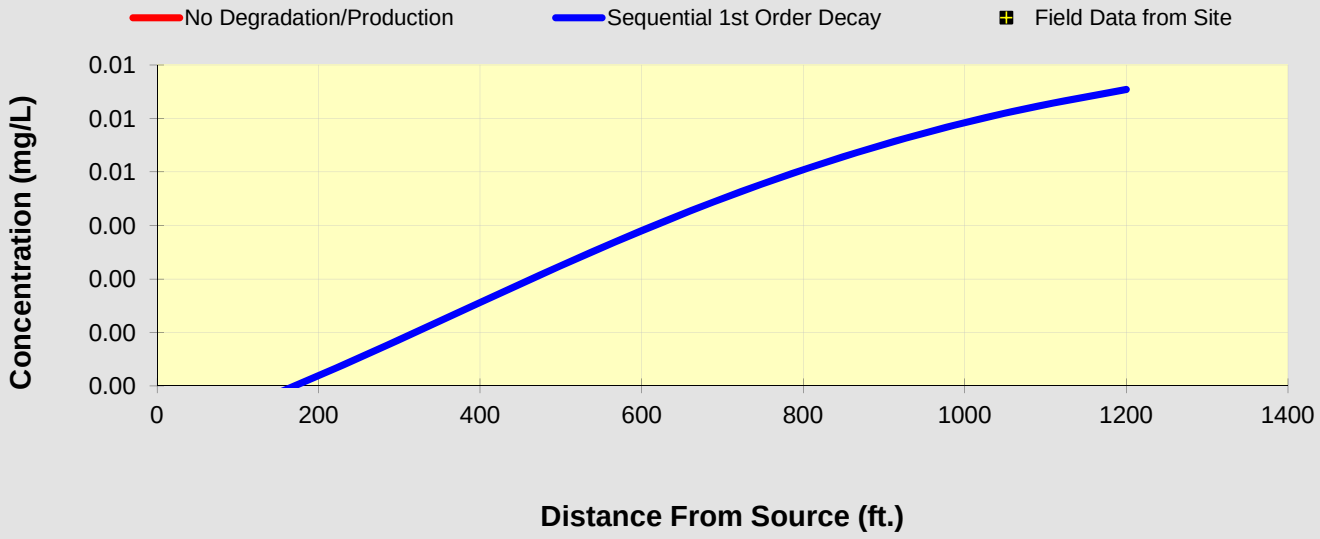
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| ETH | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.001 | 0.001 | 0.002 | 0.003 | 0.004 | 0.005 | 0.005 | 0.006 | 0.006 | 0.007 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

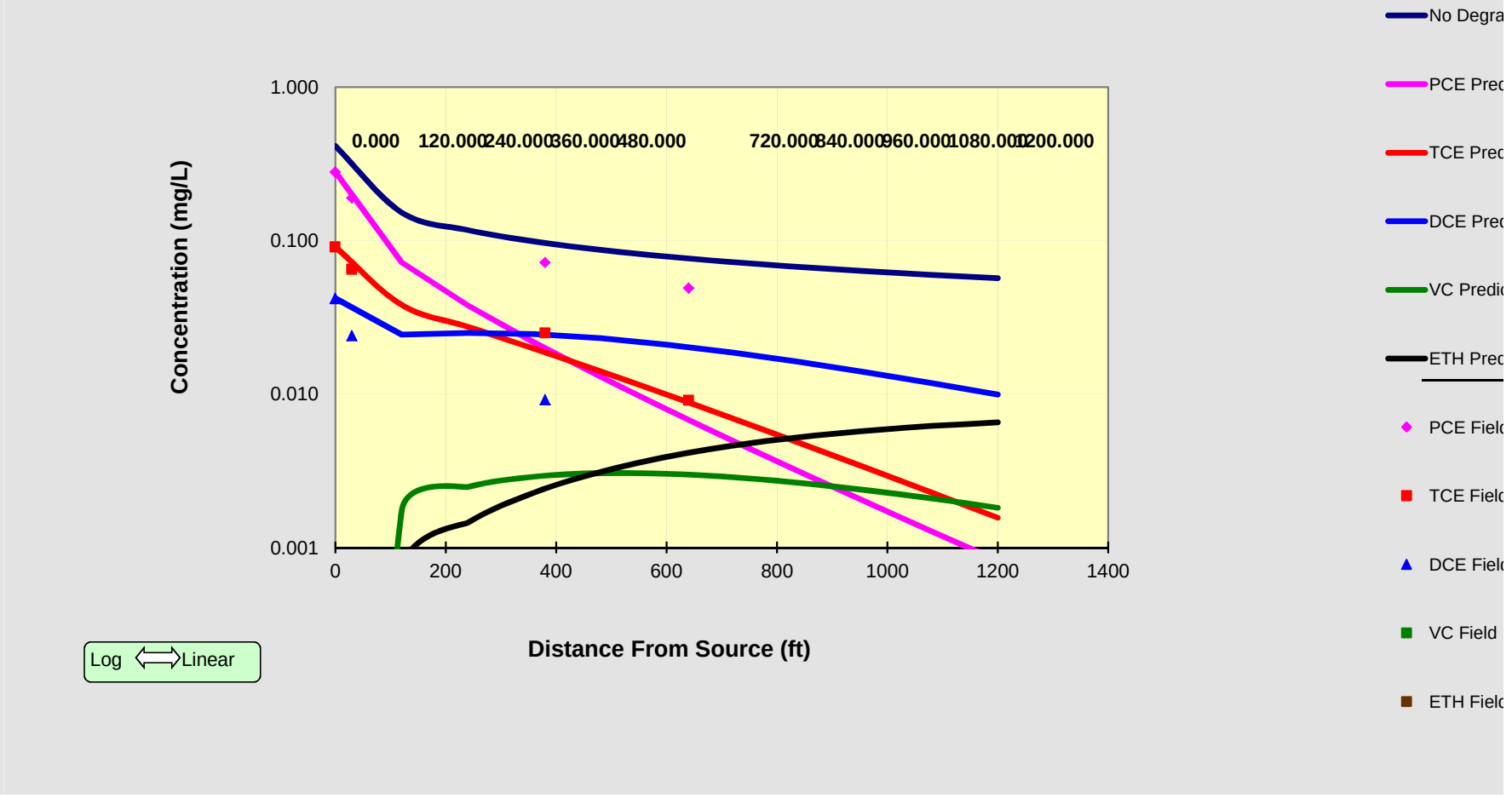
Log ⟺ Linear

Return to Input

To All

To Array

## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE



Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

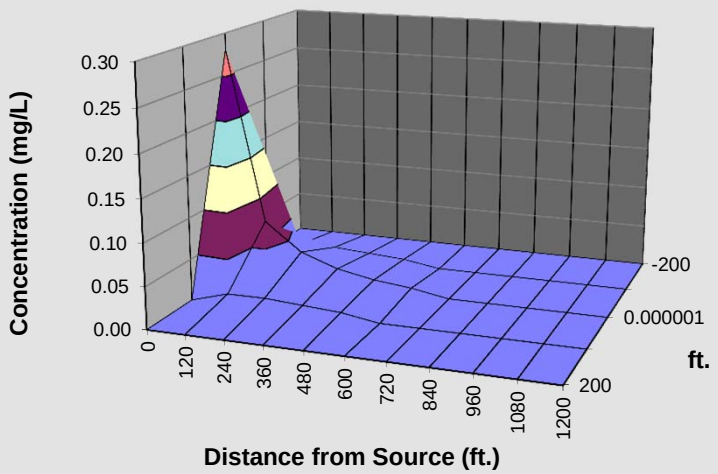
| Transverse Distance (ft) ↓ / Distance from Source (ft) → | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 |
| 100 | 0.000 | 0.013 | 0.013 | 0.010 | 0.007 | 0.005 | 0.003 | 0.002 | 0.001 | 0.001 | 0.001 |
| 0 | 0.280 | 0.072 | 0.038 | 0.022 | 0.013 | 0.008 | 0.005 | 0.003 | 0.002 | 0.001 | 0.001 |
| -100 | 0.000 | 0.013 | 0.013 | 0.010 | 0.007 | 0.005 | 0.003 | 0.002 | 0.001 | 0.001 | 0.001 |
| -200 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 |
| ***MASS RATE*** (mg/day) | 1.5E+3 | 5.1E+2 | 3.4E+2 | 2.3E+2 | 1.6E+2 | 1.0E+2 | 7.0E+1 | 4.7E+1 | 3.1E+1 | 2.1E+1 | 1.4E+1 |

Show No

Show

Displayed Compound

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **Biotransformation**  **PCE**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation 11.1 (Kg)

- Plume Mass If Biotransformation/Production 3.1 (Kg)

Mass Removed 7.9 (Kg)

If "Can't Calc.", make model area longer

**% Biotransformed = +71.8%**

**% Change in Mass Rate = 99.0 %** (source to edge)

See acre-ft

Current Volume of Ground Water in Plume 14.14 MGal

Flow Rate of Water Through Source Area 0.002 MGD

Compare to Pump and Treat

Pumping Rate (gpm)

# Pore Volumes Removed Per Yr. 0.00

# Pore Volumes to Clean-Up

Clean-Up Time (yr)

Plot All Data  **Plot Data > Target**

Mass HELP  **To Centerline**  **Return to Input**

Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

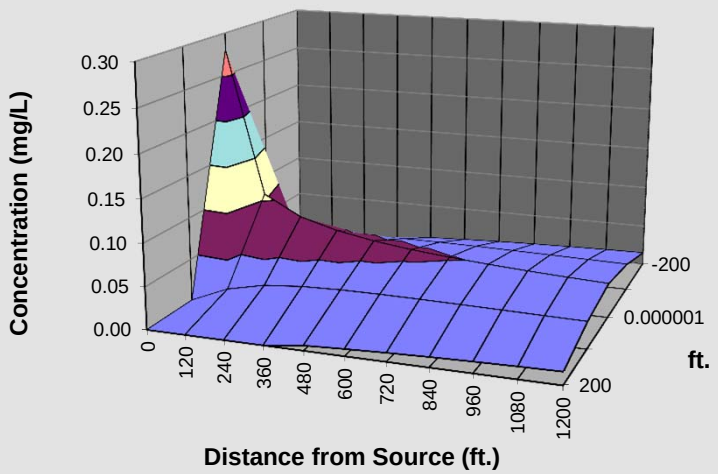
## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

| Transverse Distance (ft) ↓ / Distance from Source (ft) → | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.000 | 0.001 | 0.003 | 0.006 | 0.008 | 0.010 | 0.012 | 0.013 | 0.014 | 0.015 |
| 100 | 0.000 | 0.019 | 0.029 | 0.033 | 0.034 | 0.035 | 0.034 | 0.034 | 0.033 | 0.032 | 0.031 |
| 0 | 0.280 | 0.106 | 0.082 | 0.070 | 0.062 | 0.056 | 0.051 | 0.048 | 0.045 | 0.043 | 0.041 |
| -100 | 0.000 | 0.019 | 0.029 | 0.033 | 0.034 | 0.035 | 0.034 | 0.034 | 0.033 | 0.032 | 0.031 |
| -200 | 0.000 | 0.000 | 0.001 | 0.003 | 0.006 | 0.008 | 0.010 | 0.012 | 0.013 | 0.014 | 0.015 |
| **MASS RATE** (mg/day) | 1.5E+3 | 7.5E+2 | 7.4E+2 | 7.4E+2 | 7.4E+2 | 7.3E+2 | 7.3E+2 | 7.2E+2 | 7.1E+2 | 7.0E+2 | 6.9E+2 |

Show No

Show

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **No Degradation**  Displayed Compound: **PCE**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation: 11.1 (Kg)

- Plume Mass If Biotransformation/Production: 3.1 (Kg)

Mass Removed: 7.9 (Kg)

If "Can't Calc.", make model area longer

**% Biotransformed = +71.8%**

**% Change in Mass Rate = 52.5 %** (source to edge)

See acre-ft

Current Volume of Ground Water in Plume: Can't Calc. MGal

Flow Rate of Water Through Source Area: 0.002 MGD

Compare to Pump and Treat

Pumping Rate: (gpm)

# Pore Volumes Removed Per Yr.:

# Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | **Plot Data > Target** | **Mass HELP** | **To Centerline** | **Return to Input**

# BIOCHLOR Natural Attenuation Decision Support System

*Version 2.2*
Excel 2000

Mercer Triangle
June 2016 Run 2
Run Name

**Data Input Instructions:**
115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in gray cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button )
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

## 1. ADVECTION

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 59.6 | (ft/yr) |
| ***or*** | | | |
| Hydraulic Conductivity | K | 1.6E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.009 | (ft/ft) |
| Effective Porosity | n | 0.25 | (-) |

## 2. DISPERSION

| | | |
|---|---|---|
| Alpha x* | 78 | (ft) |
| (Alpha y) / (Alpha x)* | 0.1 | (-) |
| (Alpha z) / (Alpha x)* | 1.E-99 | (-) |

Calc.

## 3. ADSORPTION

Retardation Factor* → R
***or***

| | Koc | | R | |
|---|---|---|---|---|
| Soil Bulk Density, rho | 1.7 | (kg/L) | | |
| FractionOrganicCarbon, foc | 1.0E-3 | (-) | | |
| Partition Coefficient | | | | |
| PCE | 426 | (L/kg) | 3.90 | (-) |
| TCE | 130 | (L/kg) | 1.88 | (-) |
| DCE | 125 | (L/kg) | 1.85 | (-) |
| VC | 30 | (L/kg) | 1.20 | (-) |
| ETH | 302 | (L/kg) | 3.05 | (-) |
| **Common R (used in model)* =** | | | **1.88** | |

## 4. BIOTRANSFORMATION

**-1st Order Decay Coefficient***

| | λ (1/yr) | | half-life (yrs) | Yield |
|---|---|---|---|---|
| **Zone 1** | | | | |
| PCE → TCE | 0.242 | ← | | 0.79 |
| TCE → DCE | 0.300 | ← | | 0.74 |
| DCE → VC | 0.100 | ← | | 0.64 |
| VC → ETH | 0.400 | ← | | 0.45 |
| **Zone 2** | λ (1/yr) | | half-life (yrs) | |
| PCE → TCE | 0.000 | ← | | |
| TCE → DCE | 0.000 | ← | | |
| DCE → VC | 0.000 | ← | | |
| VC → ETH | 0.000 | ← | | |

λ HELP

## 5. GENERAL

| | | | |
|---|---|---|---|
| Simulation Time* | 1000 | (yr) | |
| Modeled Area Width* | 500 | (ft) | W |
| Modeled Area Length* | 3000 | (ft) | L |
| Zone 1 Length* | 3000 | (ft) | |
| Zone 2 Length* | 0 | (ft) | Zone 2= L - Zone 1 |

## 6. SOURCE DATA

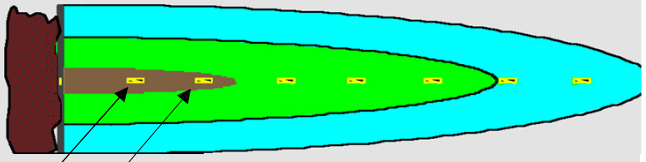
TYPE: Continuous Spatially-Varying

Source Options

Source Thickness in Sat. Zone* 45 (ft)

| | Y1 | Y2 | Y3 | |
|---|---|---|---|---|
| Width* (ft) | 25 | 75 | 150 | |
| Conc. (mg/L)* | C1 | C2 | C3 | $k_s$* (1/yr) |
| PCE | .28 | 0.072 | 0.049 | 0 |
| TCE | .091 | 0.025 | 0.009 | 0 |
| DCE | .042 | 0.009 | | 0 |
| VC | | | | 0 |
| ETH | | | | 0 |

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PCE Conc. (mg/L) | .28 | .19 | .072 | .049 | | | | | | | |
| TCE Conc. (mg/L) | .091 | .065 | .025 | .009 | | | | | | | |
| DCE Conc. (mg/L) | .042 | .024 | .009 | | | | | | | | |
| VC Conc. (mg/L) | | | | | | | | | | | |
| ETH Conc. (mg/L) | | | | | | | | | | | |
| Distance from Source (ft) | 0 | 30 | 380 | 640 | | | | | | | |
| Date Data Collected | 2016 | | | | | | | | | | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

**RUN CENTERLINE** | **RUN ARRAY** | ***Help*** | Restore | RESET | ***SEE*** | Paste

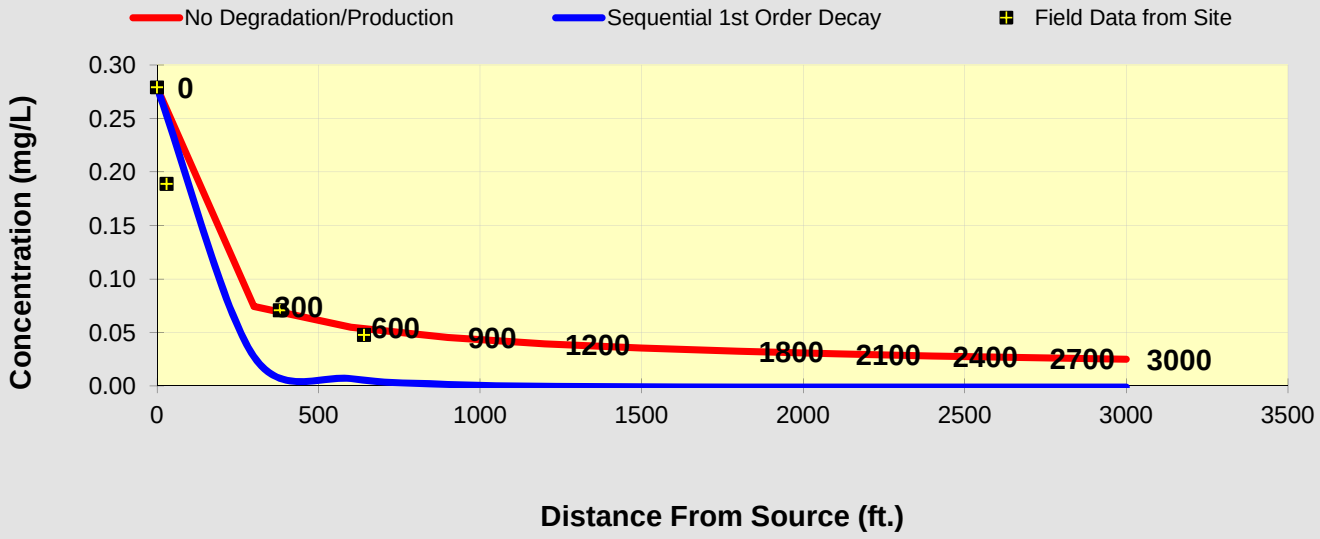
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| PCE | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.280 | 0.075 | 0.056 | 0.046 | 0.041 | 0.036 | 0.033 | 0.031 | 0.029 | 0.027 | 0.026 |
| Biotransformation | 0.2800 | 0.028 | 0.008 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.280 | 0.190 | 0.072 | 0.049 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

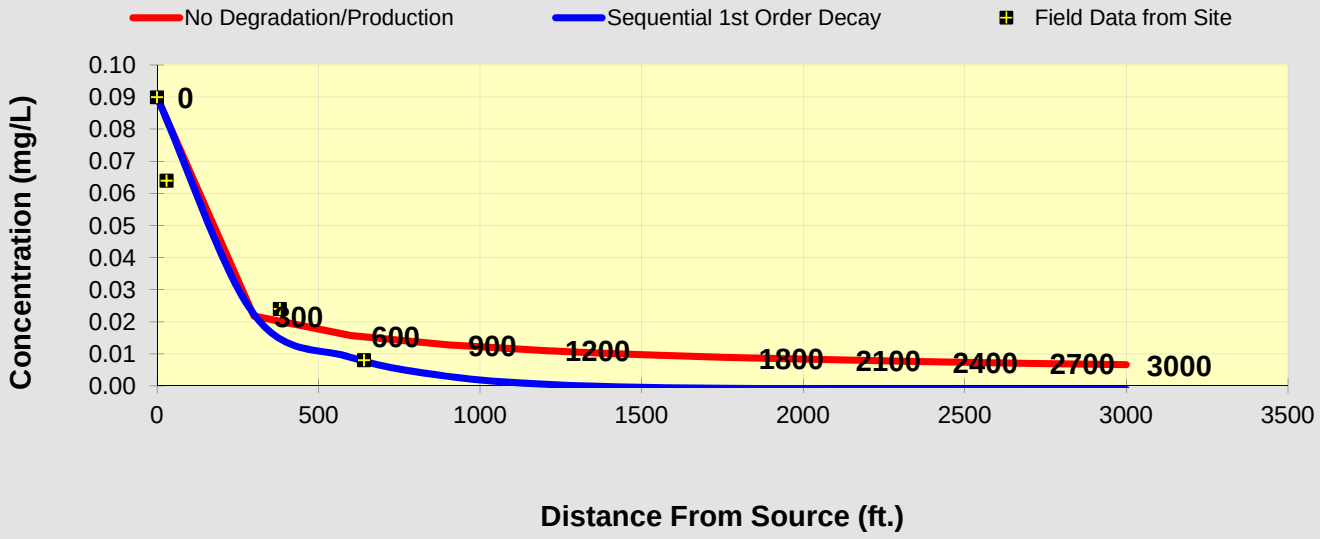
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| TCE | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.091 | 0.023 | 0.017 | 0.014 | 0.012 | 0.011 | 0.010 | 0.009 | 0.009 | 0.008 | 0.008 |
| Biotransformation | 0.0910 | 0.023 | 0.010 | 0.004 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.091 | 0.065 | 0.025 | 0.009 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

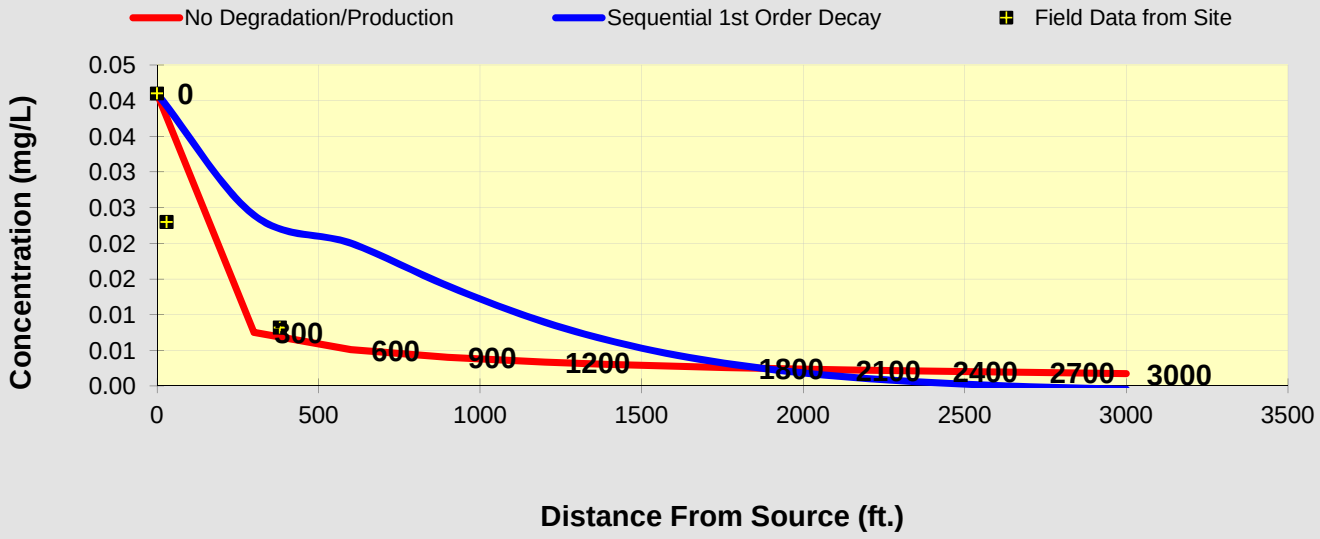
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| DCE | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.042 | 0.009 | 0.006 | 0.005 | 0.004 | 0.004 | 0.004 | 0.003 | 0.003 | 0.003 | 0.003 |
| Biotransformation | 0.0420 | 0.025 | 0.021 | 0.015 | 0.010 | 0.006 | 0.004 | 0.002 | 0.001 | 0.001 | 0.001 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.042 | 0.024 | 0.009 | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

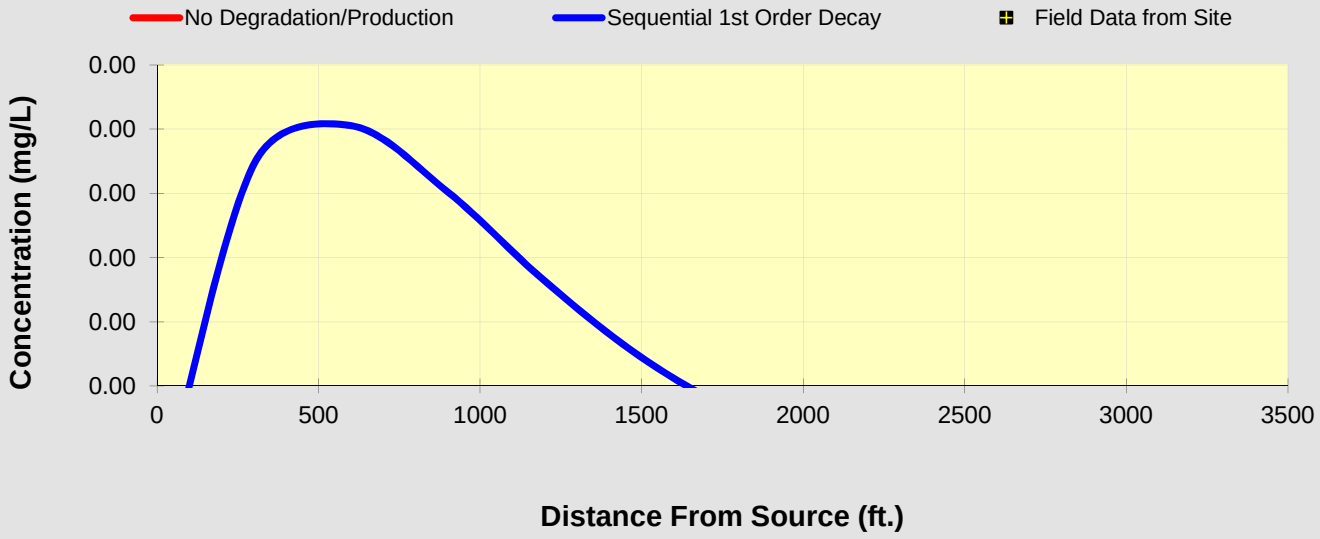
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| VC | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.003 | 0.003 | 0.003 | 0.002 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

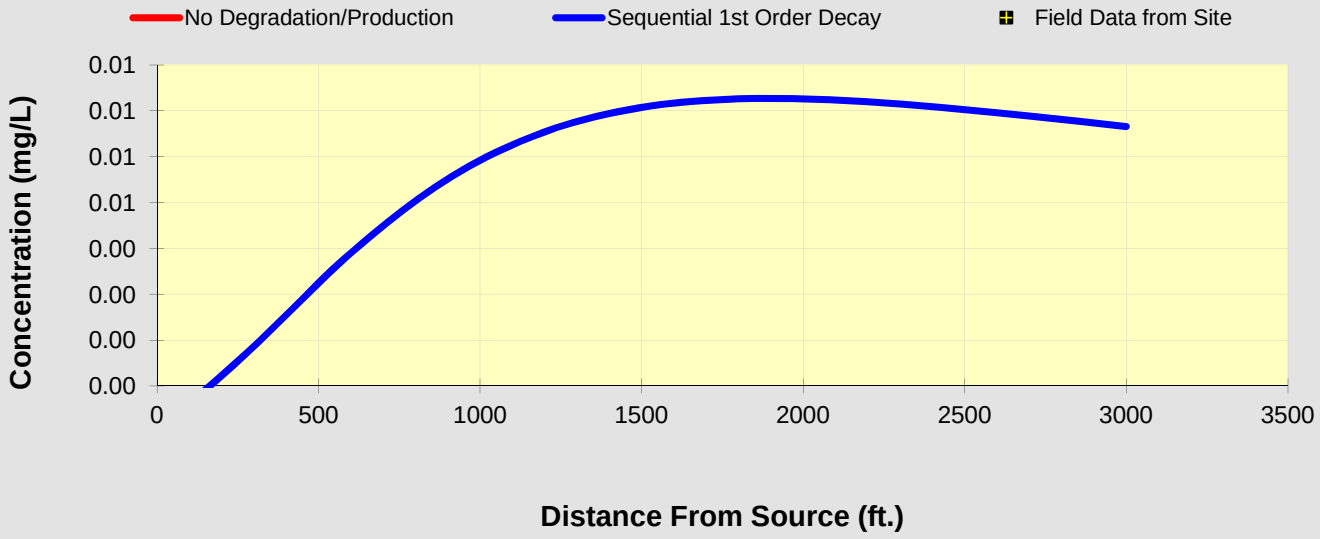
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| ETH | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.002 | 0.004 | 0.006 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

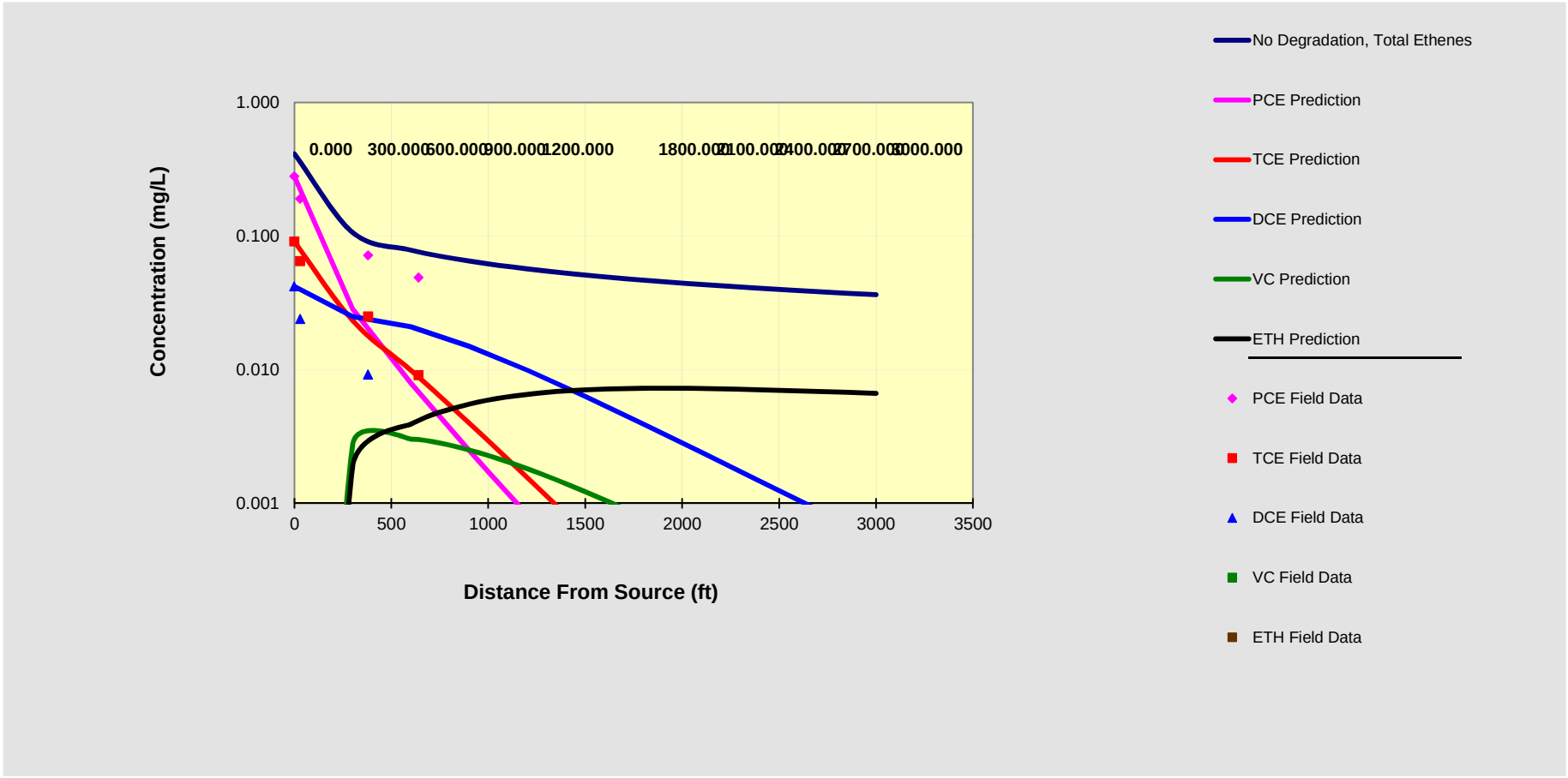
Log ⟺ Linear

Return to Input

To All

To Array

Centerline Output



Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

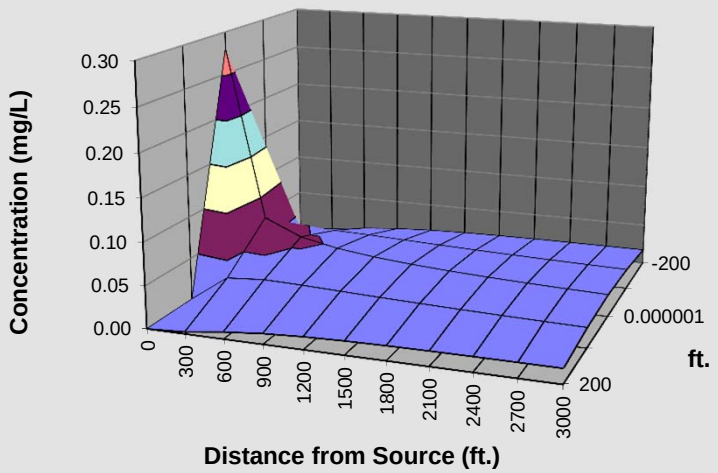
| Transverse Distance (ft) ↓ / Distance from Source (ft) → | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.002 | 0.008 | 0.012 | 0.015 | 0.016 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 |
| 100 | 0.000 | 0.031 | 0.035 | 0.033 | 0.031 | 0.030 | 0.028 | 0.027 | 0.025 | 0.024 | 0.023 |
| 0 | 0.280 | 0.075 | 0.056 | 0.046 | 0.041 | 0.036 | 0.033 | 0.031 | 0.029 | 0.027 | 0.026 |
| -100 | 0.000 | 0.031 | 0.035 | 0.033 | 0.031 | 0.030 | 0.028 | 0.027 | 0.025 | 0.024 | 0.023 |
| -200 | 0.000 | 0.002 | 0.008 | 0.012 | 0.015 | 0.016 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 |
| ***MASS RATE*** (mg/day) | 1.5E+3 | 7.4E+2 | 7.3E+2 | 7.2E+2 | 6.9E+2 | 6.7E+2 | 6.4E+2 | 6.2E+2 | 6.0E+2 | 5.8E+2 | 5.6E+2 |

Show No

Show

Displayed Compound: **PCE**

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **No Degradation**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation: 25.1 (Kg)

- Plume Mass If Biotransformation/Production: 4.1 (Kg)

Mass Removed: 21.1 (Kg)

If "Can't Calc.", make model area longer

**% Biotransformed = +83.8%**

**% Change in Mass Rate = 61.7 %** (source to edge)

See acre-ft

Current Volume of Ground Water in Plume: Can't Calc. MGal

Flow Rate of Water Through Source Area: 0.002 MGD

Compare to Pump and Treat

Pumping Rate: (gpm)

# Pore Volumes Removed Per Yr.:

# Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input

Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

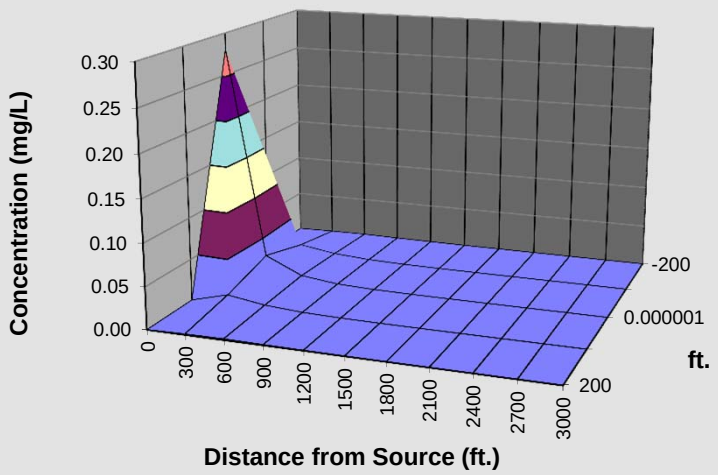
## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

| *Transverse Distance (ft)* ↓ / *Distance from Source (ft)* → | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 100 | 0.000 | 0.012 | 0.005 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0 | 0.280 | 0.028 | 0.008 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| -100 | 0.000 | 0.012 | 0.005 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| -200 | 0.000 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| ***MASS RATE*** (mg/day) | 1.5E+3 | 2.8E+2 | 1.0E+2 | 3.8E+1 | 1.4E+1 | 5.1E+0 | 1.9E+0 | 6.8E-1 | 2.5E-1 | 9.0E-2 | 3.3E-2 |

Show No

Show

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **Biotransformation**  Displayed Compound: **PCE**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

| | | |
|---|---|---|
| Plume Mass If No Degradation | 25.1 | *(Kg)* |
| - Plume Mass If Biotransformation/Production | 4.1 | *(Kg)* |
| Mass Removed | 21.1 | *(Kg)* |
| **% Biotransformed =** | **+83.8%** | |
| **% Change in Mass Rate =** | **100.0 %** | (source to edge) |

If "Can't Calc.", make model area longer

See acre-ft

| | | |
|---|---|---|
| Current Volume of Ground Water in Plume | 12.62 | *MGal* |
| Flow Rate of Water Through Source Area | 0.002 | *MGD* |

Compare to Pump and Treat

| | | |
|---|---|---|
| Pumping Rate | | *(gpm)* |
| # Pore Volumes Removed Per Yr. | 0.00 | |
| # Pore Volumes to Clean-Up | | |
| Clean-Up Time | | *(yr)* |

Plot All Data  Plot Data > Target

Mass HELP  To Centerline  Return to Input

# BIOCHLOR Natural Attenuation Decision Support System

*Version 2.2*
Excel 2000

Mercer Triangle
January 2008 Run 1
Run Name

**Data Input Instructions:**
115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in gray cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button )
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

## 1. ADVECTION

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 59.6 | (ft/yr) |
| ***or*** | | | |
| Hydraulic Conductivity | K | 1.6E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.009 | (ft/ft) |
| Effective Porosity | n | 0.25 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Alpha x* | 78 | (ft) | Calc. |
| (Alpha y) / (Alpha x)* | 0.1 | (-) | |
| (Alpha z) / (Alpha x)* | 1.E-99 | (-) | |

## 3. ADSORPTION

Retardation Factor* → R
***or***

| | | | | |
|---|---|---|---|---|
| Soil Bulk Density, rho | 1.7 | (kg/L) | | |
| FractionOrganicCarbon, foc | 1.0E-3 | (-) | | |
| Partition Coefficient | Koc | | | |
| PCE | 426 | (L/kg) | 3.90 | (-) |
| TCE | 130 | (L/kg) | 1.88 | (-) |
| DCE | 125 | (L/kg) | 1.85 | (-) |
| VC | 30 | (L/kg) | 1.20 | (-) |
| ETH | 302 | (L/kg) | 3.05 | (-) |
| **Common R (used in model)* =** | | | **1.88** | |

## 4. BIOTRANSFORMATION

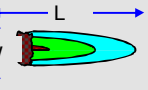
-1st Order Decay Coefficient*

| Zone 1 | λ (1/yr) | half-life (yrs) | Yield |
|---|---|---|---|
| PCE → TCE | 0.242 | | 0.79 |
| TCE → DCE | 0.300 | | 0.74 |
| DCE → VC | 0.100 | | 0.64 |
| VC → ETH | 0.400 | | 0.45 |
| **Zone 2** | λ (1/yr) | half-life (yrs) | |
| PCE → TCE | 0.000 | | |
| TCE → DCE | 0.000 | | |
| DCE → VC | 0.000 | | |
| VC → ETH | 0.000 | | |

λ HELP

## 5. GENERAL

| | | |
|---|---|---|
| Simulation Time* | 1000 | (yr) |
| Modeled Area Width* | 500 | (ft) |
| Modeled Area Length* | 1200 | (ft) |
| Zone 1 Length* | 1200 | (ft) |
| Zone 2 Length* | 0 | (ft) |




Zone 2= L - Zone 1

## 6. SOURCE DATA

TYPE: Continuous Spatially-Varying

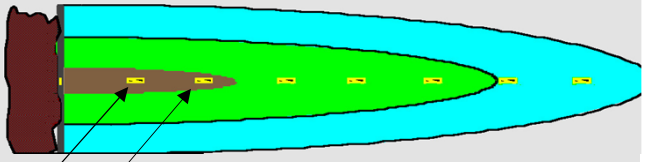
Source Options

Source Thickness in Sat. Zone* 45 (ft)

| | Y1 | Y2 | Y3 |
|---|---|---|---|
| Width* (ft) | 25 | 75 | 130 |

| Conc. (mg/L)* | C1 | C2 | C3 | $k_s$* (1/yr) |
|---|---|---|---|---|
| PCE | 1.2 | .2 | .15 | 0 |
| TCE | .34 | .021 | .047 | 0 |
| DCE | .15 | .007 | .019 | 0 |
| VC | | | | 0 |
| ETH | | | | 0 |

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PCE Conc. (mg/L) | 1.2 | .2 | .15 | .071 | | | | | | | |
| TCE Conc. (mg/L) | .34 | .021 | .047 | .04 | | | | | | | |
| DCE Conc. (mg/L) | .15 | .007 | .019 | .002 | | | | | | | |
| VC Conc. (mg/L) | | | | | | | | | | | |
| ETH Conc. (mg/L) | | | | | | | | | | | |
| Distance from Source (ft) | 0 | 30 | 380 | 640 | | | | | | | |
| Date Data Collected | 2008 | | | | | | | | | | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE | Paste

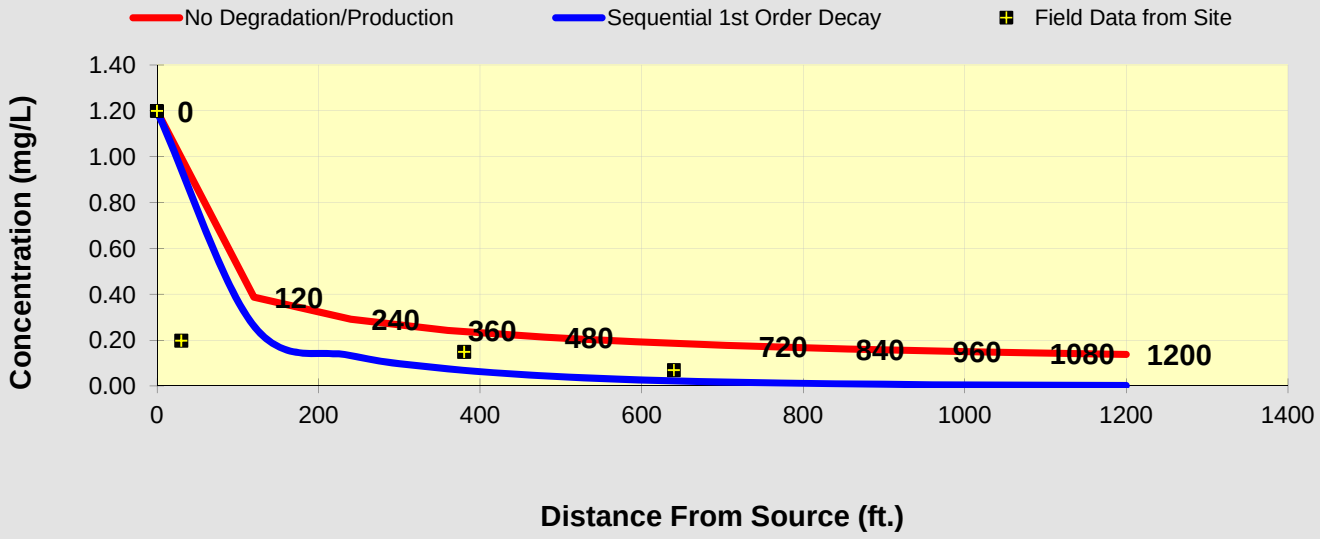
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| PCE | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.200 | 0.388 | 0.292 | 0.244 | 0.214 | 0.193 | 0.177 | 0.164 | 0.154 | 0.146 | 0.138 |
| Biotransformation | 1.2000 | 0.263 | 0.134 | 0.076 | 0.045 | 0.027 | 0.017 | 0.011 | 0.007 | 0.004 | 0.003 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 1.200 | 0.200 | 0.150 | 0.071 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

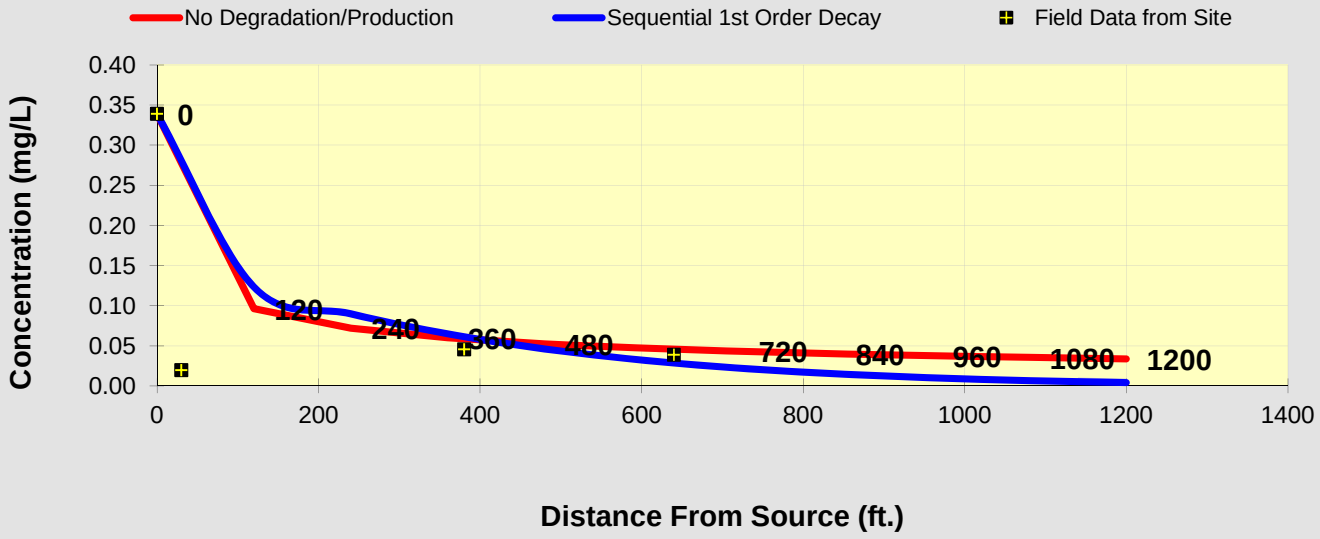
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| TCE | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.340 | 0.097 | 0.073 | 0.061 | 0.054 | 0.048 | 0.044 | 0.041 | 0.039 | 0.037 | 0.035 |
| Biotransformation | 0.3400 | 0.124 | 0.091 | 0.066 | 0.047 | 0.033 | 0.023 | 0.016 | 0.011 | 0.008 | 0.005 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.340 | 0.021 | 0.047 | 0.040 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

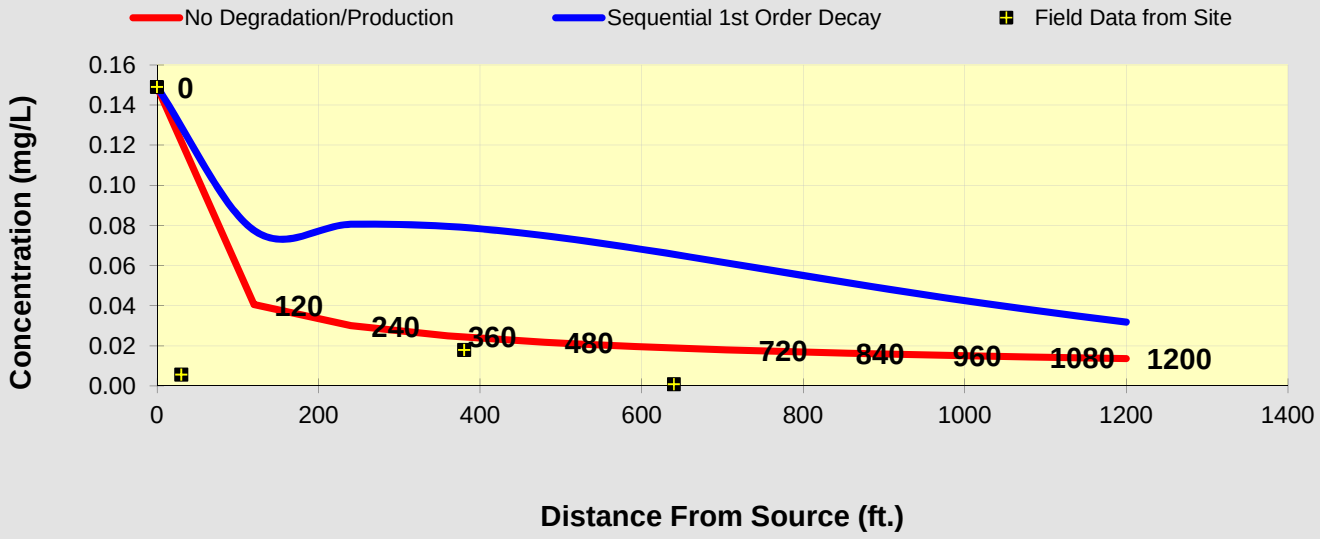
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| DCE | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.150 | 0.042 | 0.031 | 0.026 | 0.023 | 0.021 | 0.019 | 0.017 | 0.016 | 0.015 | 0.015 |
| Biotransformation | 0.1500 | 0.079 | 0.082 | 0.081 | 0.076 | 0.069 | 0.061 | 0.053 | 0.046 | 0.039 | 0.033 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.150 | 0.007 | 0.019 | 0.002 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

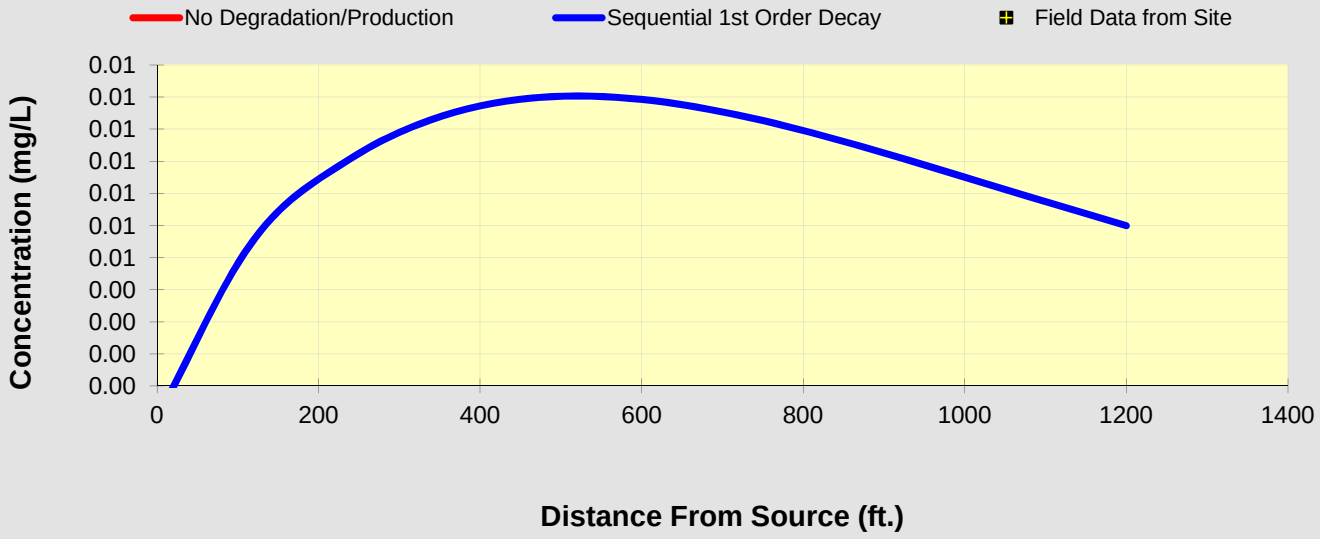
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| VC | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.006 | 0.008 | 0.009 | 0.010 | 0.010 | 0.009 | 0.009 | 0.008 | 0.007 | 0.006 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

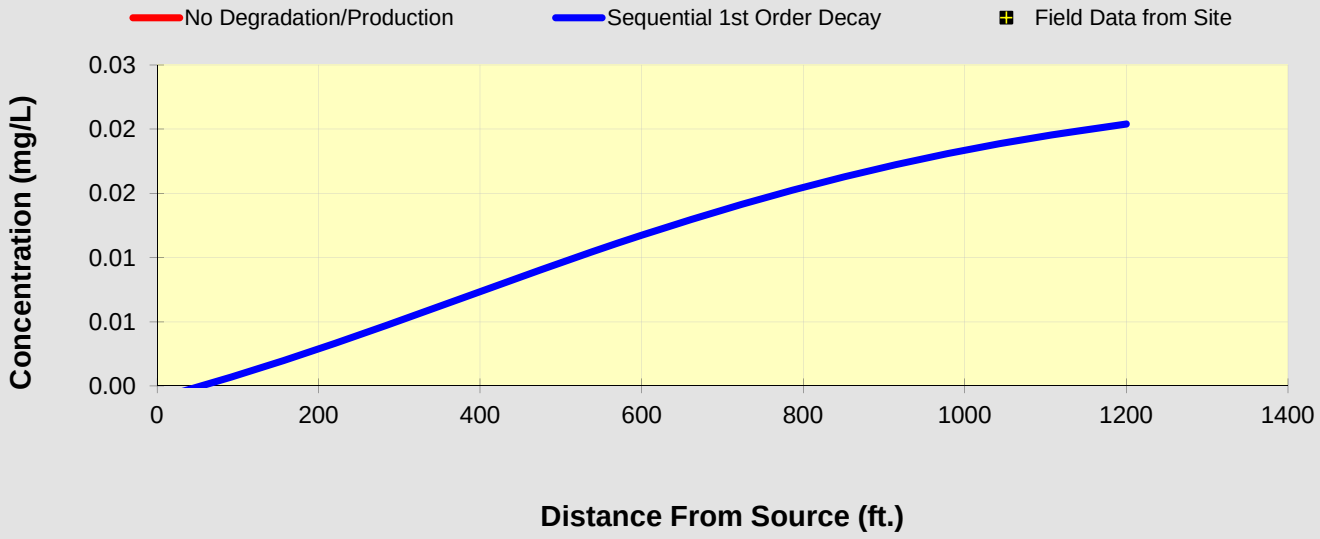
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| ETH | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.002 | 0.005 | 0.007 | 0.010 | 0.013 | 0.015 | 0.017 | 0.019 | 0.020 | 0.021 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

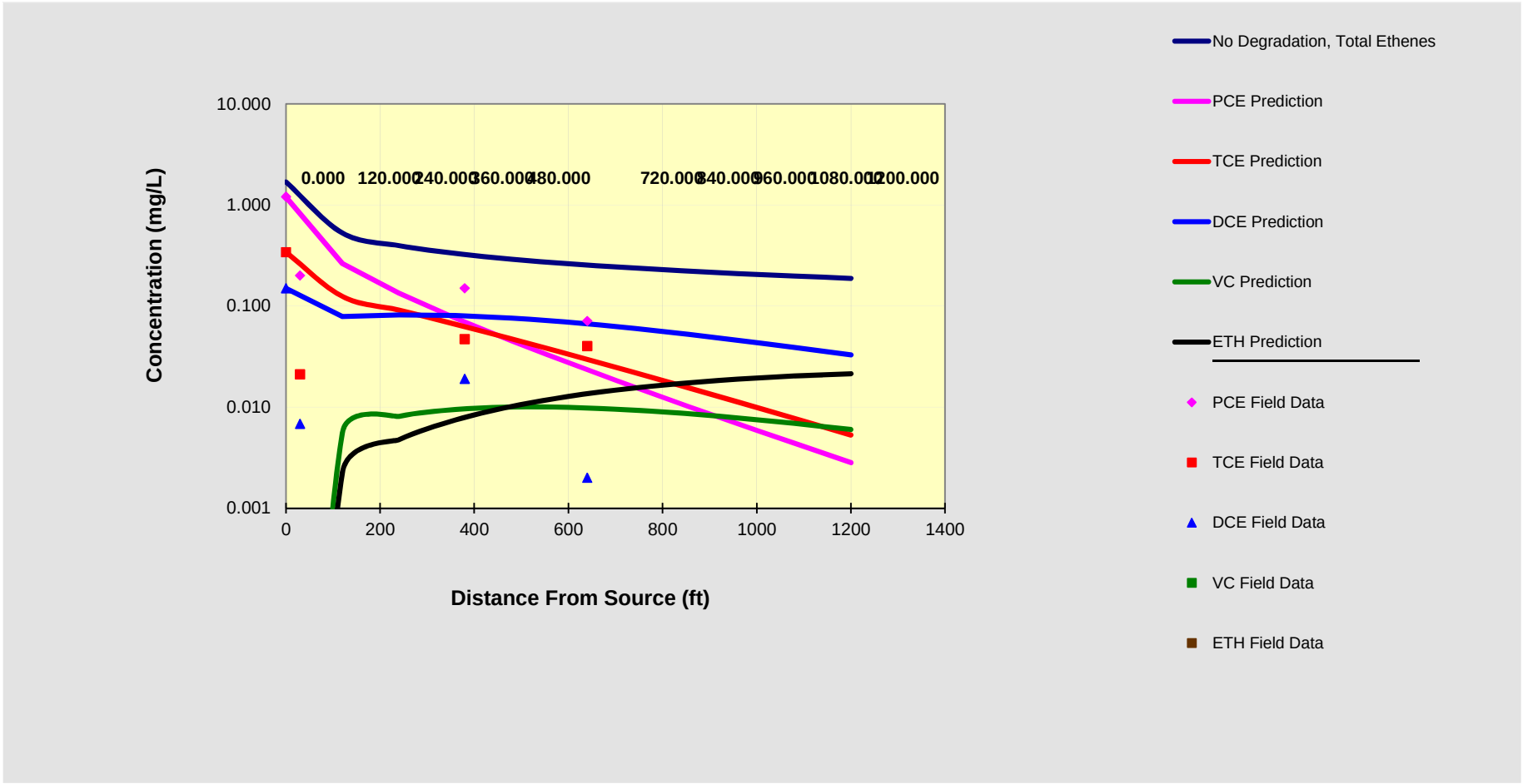
Log ⟺ Linear

Return to Input

To All

To Array

Centerline Output



Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

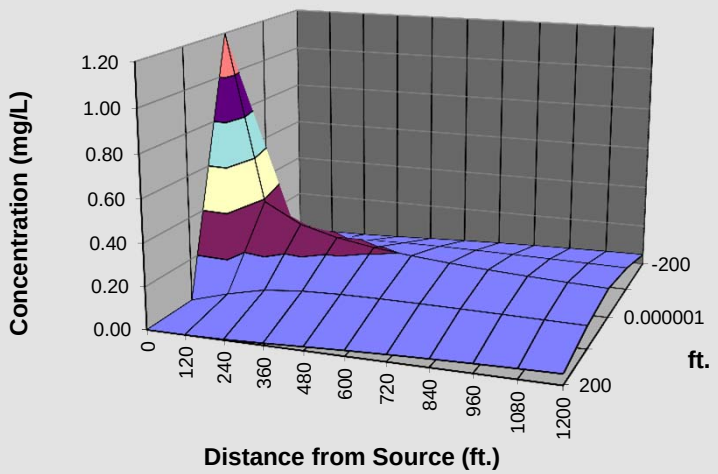
## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

| Transverse Distance (ft) ↓ / Distance from Source (ft) → | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.000 | 0.003 | 0.010 | 0.018 | 0.026 | 0.033 | 0.038 | 0.043 | 0.046 | 0.049 |
| 100 | 0.000 | 0.052 | 0.092 | 0.109 | 0.115 | 0.117 | 0.116 | 0.114 | 0.112 | 0.109 | 0.107 |
| 0 | 1.200 | 0.388 | 0.292 | 0.244 | 0.214 | 0.193 | 0.177 | 0.164 | 0.154 | 0.146 | 0.138 |
| -100 | 0.000 | 0.052 | 0.092 | 0.109 | 0.115 | 0.117 | 0.116 | 0.114 | 0.112 | 0.109 | 0.107 |
| -200 | 0.000 | 0.000 | 0.003 | 0.010 | 0.018 | 0.026 | 0.033 | 0.038 | 0.043 | 0.046 | 0.049 |
| **MASS RATE** (mg/day) | 6.2E+3 | 2.6E+3 | 2.5E+3 | 2.5E+3 | 2.5E+3 | 2.5E+3 | 2.5E+3 | 2.4E+3 | 2.4E+3 | 2.4E+3 | 2.3E+3 |

Show No

Show

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **No Degradation**  Displayed Compound: **PCE**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

| | | |
|---|---|---|
| Plume Mass If No Degradation | 38.4 | (Kg) |
| - Plume Mass If Biotransformation/Production | 11.5 | (Kg) |
| Mass Removed | 26.9 | (Kg) |

If "Can't Calc.", make model area longer

**% Biotransformed =** +70.1%

**% Change in Mass Rate =** 62.5 % (source to edge)

See acre-ft

| | | |
|---|---|---|
| Current Volume of Ground Water in Plume | Can't Calc. | MGal |
| Flow Rate of Water Through Source Area | 0.002 | MGD |

Compare to Pump and Treat

| | | |
|---|---|---|
| Pumping Rate | | (gpm) |
| # Pore Volumes Removed Per Yr. | | |
| # Pore Volumes to Clean-Up | | |
| Clean-Up Time | | (yr) |

Plot All Data  Plot Data > Target

Mass HELP  To Centerline  Return to Input

Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

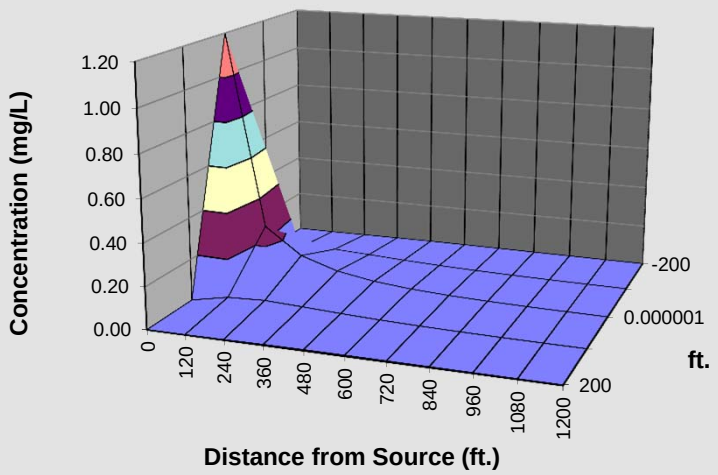
| Transverse Distance (ft) ↓ / Distance from Source (ft) → | 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.000 | 0.001 | 0.003 | 0.004 | 0.004 | 0.003 | 0.003 | 0.002 | 0.001 | 0.001 |
| 100 | 0.000 | 0.035 | 0.042 | 0.034 | 0.024 | 0.017 | 0.011 | 0.007 | 0.005 | 0.003 | 0.002 |
| 0 | 1.200 | 0.263 | 0.134 | 0.076 | 0.045 | 0.027 | 0.017 | 0.011 | 0.007 | 0.004 | 0.003 |
| -100 | 0.000 | 0.035 | 0.042 | 0.034 | 0.024 | 0.017 | 0.011 | 0.007 | 0.005 | 0.003 | 0.002 |
| -200 | 0.000 | 0.000 | 0.001 | 0.003 | 0.004 | 0.004 | 0.003 | 0.003 | 0.002 | 0.001 | 0.001 |
| ***MASS RATE*** (mg/day) | 6.2E+3 | 1.7E+3 | 1.2E+3 | 7.8E+2 | 5.3E+2 | 3.5E+2 | 2.4E+2 | 1.6E+2 | 1.1E+2 | 7.1E+1 | 4.8E+1 |

Show No

Show

Displayed Compound

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **Biotransformation**  **PCE**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

| | | |
|---|---|---|
| Plume Mass If No Degradation | 38.4 | *(Kg)* |
| - Plume Mass If Biotransformation/Production | 11.5 | *(Kg)* |
| Mass Removed | 26.9 | *(Kg)* |

If "Can't Calc.", make model area longer

**% Biotransformed =** **+70.1%**

**% Change in Mass Rate =** **99.2 %** (source to edge)

See acre-ft

| | | |
|---|---|---|
| Current Volume of Ground Water in Plume | 23.23 | *MGal* |
| Flow Rate of Water Through Source Area | 0.002 | *MGD* |

Compare to Pump and Treat

| | | |
|---|---|---|
| Pumping Rate | | *(gpm)* |
| # Pore Volumes Removed Per Yr. | 0.00 | |
| # Pore Volumes to Clean-Up | | |
| Clean-Up Time | | *(yr)* |

Plot All Data  Plot Data > Target

Mass HELP  To Centerline  Return to Input

# BIOCHLOR Natural Attenuation Decision Support System

*Version 2.2*
Excel 2000

Mercer Triangle
January 2008 Run 2
Run Name

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

## 1. ADVECTION

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 59.6 | (ft/yr) |
| ***or*** | | | |
| Hydraulic Conductivity | K | 1.6E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.009 | (ft/ft) |
| Effective Porosity | n | 0.25 | (-) |

## 2. DISPERSION

| | | |
|---|---|---|
| Alpha x* | 78 | (ft) |
| (Alpha y) / (Alpha x)* | 0.1 | (-) |
| (Alpha z) / (Alpha x)* | 1.E-99 | (-) |

Calc.

## 3. ADSORPTION

Retardation Factor* → R

***or***

| | Koc | | R | |
|---|---|---|---|---|
| Soil Bulk Density, rho | 1.7 | (kg/L) | | |
| FractionOrganicCarbon, foc | 1.0E-3 | (-) | | |
| Partition Coefficient | | | | |
| PCE | 426 | (L/kg) | 3.90 | (-) |
| TCE | 130 | (L/kg) | 1.88 | (-) |
| DCE | 125 | (L/kg) | 1.85 | (-) |
| VC | 30 | (L/kg) | 1.20 | (-) |
| ETH | 302 | (L/kg) | 3.05 | (-) |
| **Common R (used in model)* =** | | | **1.88** | |

## 4. BIOTRANSFORMATION

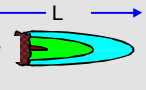
**-1st Order Decay Coefficient***

| **Zone 1** | λ (1/yr) | half-life (yrs) | Yield |
|---|---|---|---|
| PCE → TCE | 0.242 | | 0.79 |
| TCE → DCE | 0.300 | | 0.74 |
| DCE → VC | 0.100 | | 0.64 |
| VC → ETH | 0.400 | | 0.45 |
| **Zone 2** | λ (1/yr) | half-life (yrs) | |
| PCE → TCE | 0.000 | | |
| TCE → DCE | 0.000 | | |
| DCE → VC | 0.000 | | |
| VC → ETH | 0.000 | | |

λ HELP

## 5. GENERAL

| | | |
|---|---|---|
| Simulation Time* | 1000 | (yr) |
| Modeled Area Width* | 500 | (ft) |
| Modeled Area Length* | 3000 | (ft) |
| Zone 1 Length* | 3000 | (ft) |
| Zone 2 Length* | 0 | (ft) |




Zone 2= L - Zone 1

## 6. SOURCE DATA

TYPE: Continuous Spatially-Varying

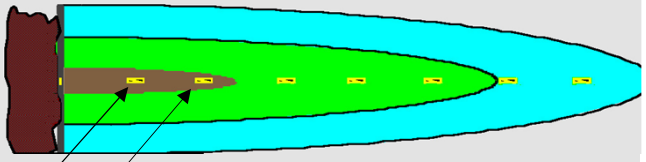
Source Options

Source Thickness in Sat. Zone* 45 (ft)

| | Y1 | Y2 | Y3 |
|---|---|---|---|
| Width* (ft) | 25 | 75 | 130 |

| Conc. (mg/L)* | C1 | C2 | C3 | $k_s$* (1/yr) |
|---|---|---|---|---|
| PCE | 1.2 | .2 | .15 | 0 |
| TCE | .34 | .021 | .047 | 0 |
| DCE | .15 | .007 | .019 | 0 |
| VC | | | | 0 |
| ETH | | | | 0 |

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PCE Conc. (mg/L) | 1.2 | .2 | .15 | .071 | | | | | | | |
| TCE Conc. (mg/L) | .34 | .021 | .047 | .04 | | | | | | | |
| DCE Conc. (mg/L) | .15 | .007 | .019 | .002 | | | | | | | |
| VC Conc. (mg/L) | | | | | | | | | | | |
| ETH Conc. (mg/L) | | | | | | | | | | | |
| Distance from Source (ft) | 0 | 30 | 380 | 640 | | | | | | | |
| Date Data Collected | 2008 | | | | | | | | | | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

**RUN CENTERLINE** | **RUN ARRAY**

**Help** | Restore | RESET

***SEE*** | Paste

## Data Input Instructions:

115 → 1. Enter value directly....or

↑ *or*

0.02 → 2. Calculate by filling in gray cells. Press Enter, then C

(To restore formulas, hit "Restore Formulas" button )

Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

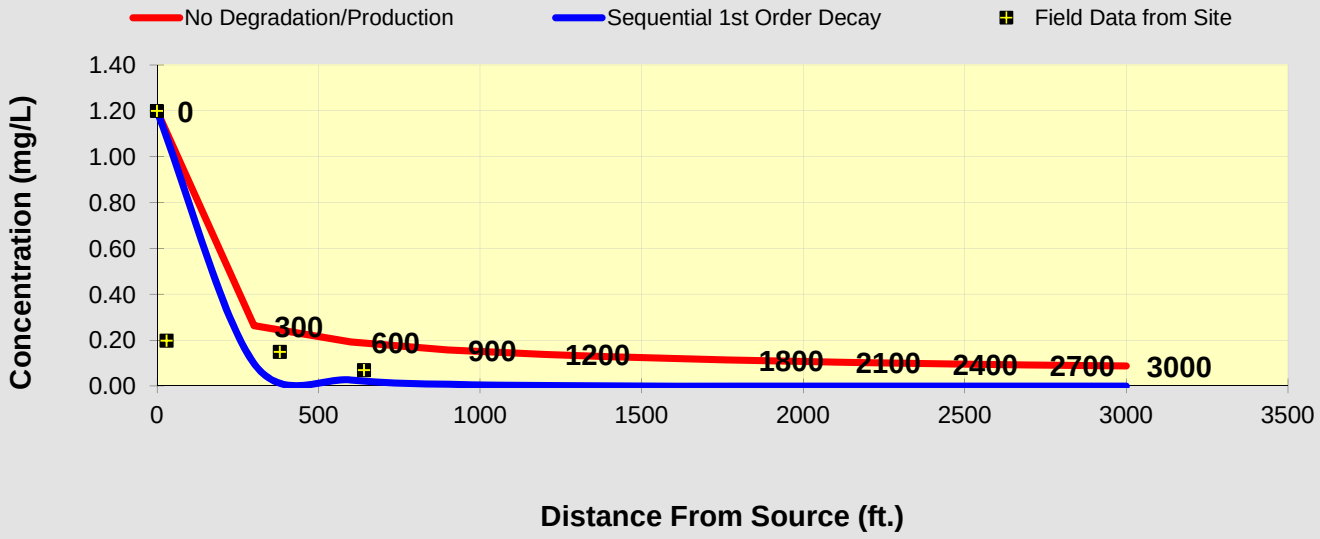
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| PCE | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.200 | 0.264 | 0.193 | 0.159 | 0.138 | 0.124 | 0.114 | 0.105 | 0.099 | 0.093 | 0.088 |
| Biotransformation | 1.2000 | 0.100 | 0.027 | 0.009 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 1.200 | 0.200 | 0.150 | 0.071 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

*1,000.0 Years*

Log ⟺ Linear

Return to Input

To All

To Array

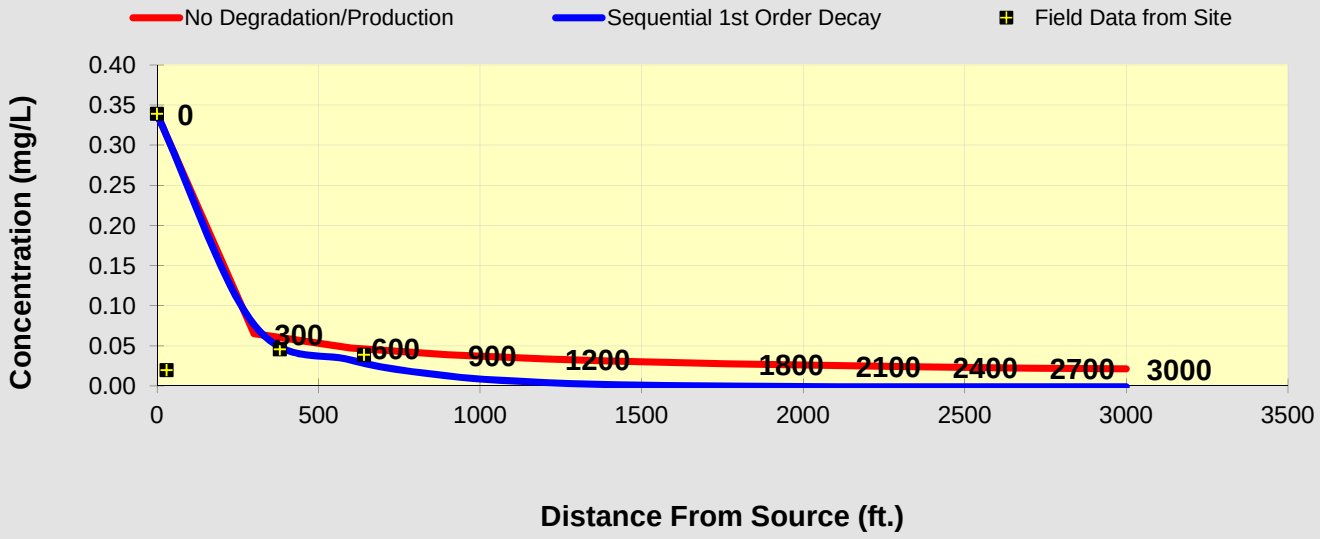
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| TCE | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.340 | 0.066 | 0.048 | 0.040 | 0.035 | 0.031 | 0.029 | 0.026 | 0.025 | 0.023 | 0.022 |
| Biotransformation | 0.3400 | 0.078 | 0.033 | 0.014 | 0.005 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.340 | 0.021 | 0.047 | 0.040 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

*1,000.0 Years*

Log ⟺ Linear

Return to Input

To All

To Array

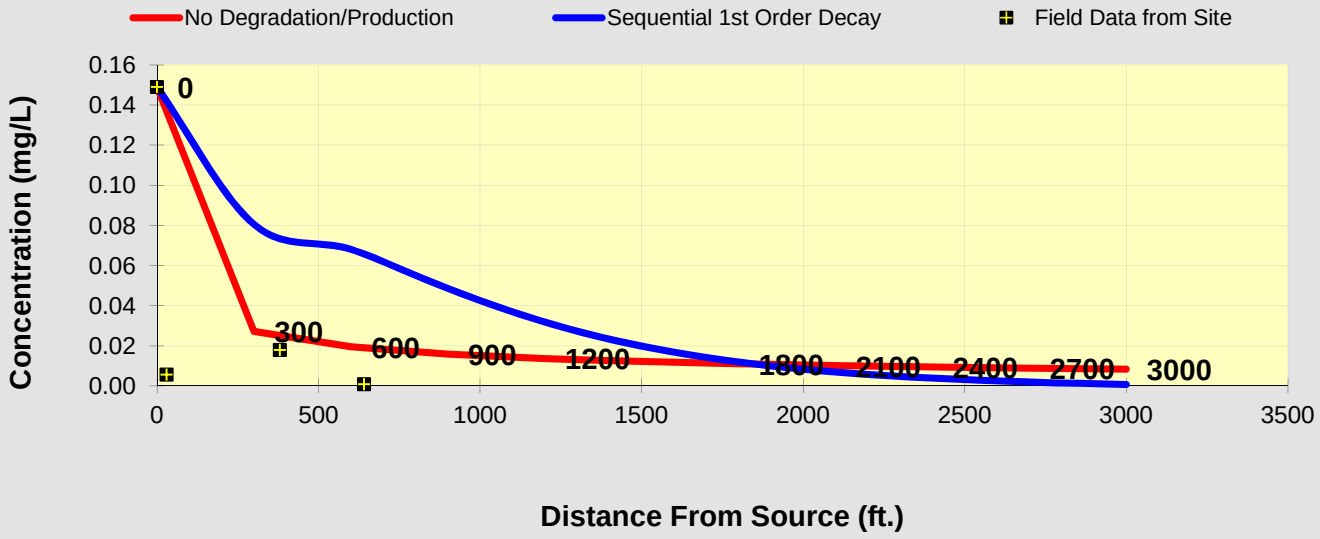
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| DCE | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.150 | 0.028 | 0.021 | 0.017 | 0.015 | 0.013 | 0.012 | 0.011 | 0.010 | 0.010 | 0.009 |
| Biotransformation | 0.1500 | 0.082 | 0.069 | 0.050 | 0.033 | 0.021 | 0.013 | 0.008 | 0.005 | 0.003 | 0.002 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | 0.150 | 0.007 | 0.019 | 0.002 | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

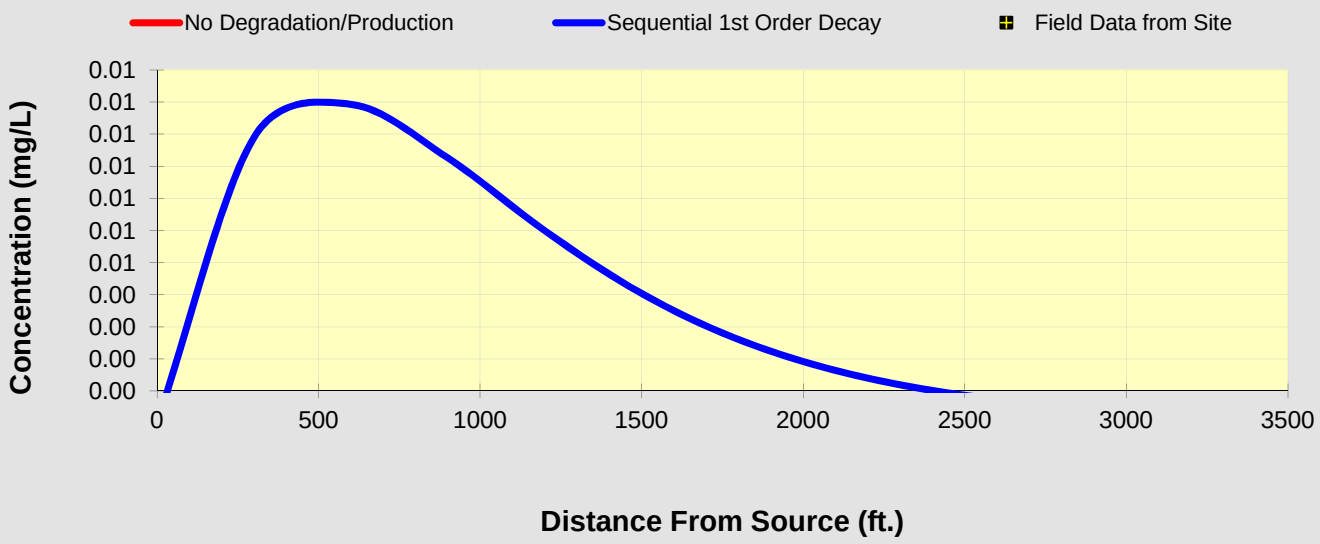
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| VC | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.009 | 0.010 | 0.008 | 0.006 | 0.004 | 0.003 | 0.002 | 0.001 | 0.001 | 0.000 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

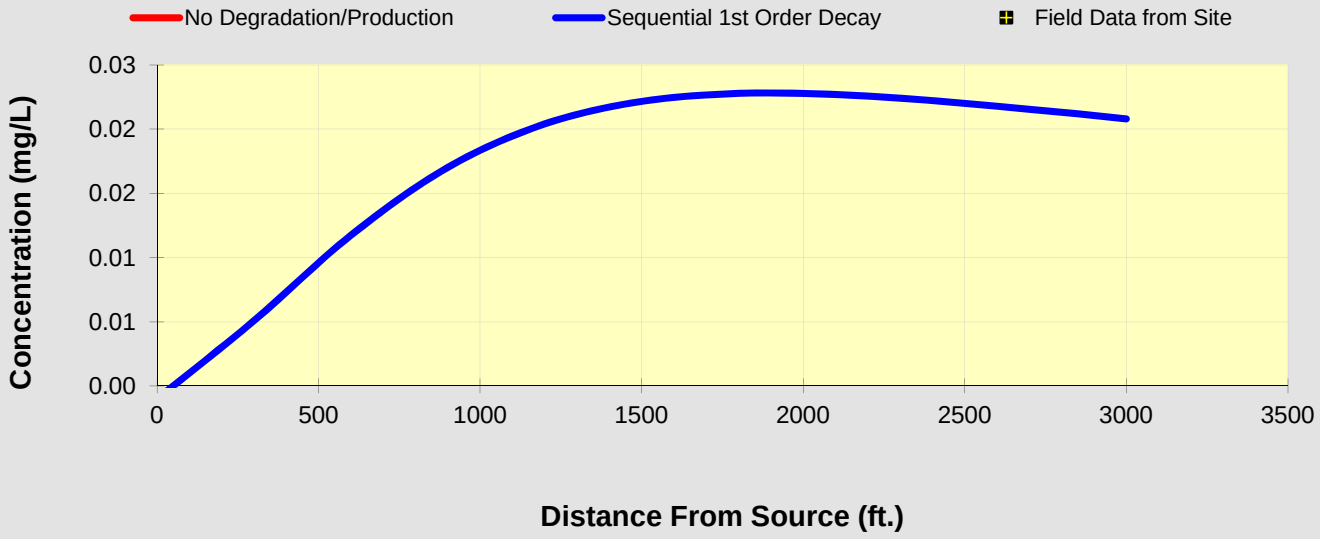
## DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

**Distance from Source (ft)**

| ETH | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Biotransformation | 0.0000 | 0.006 | 0.013 | 0.018 | 0.021 | 0.023 | 0.024 | 0.024 | 0.023 | 0.023 | 0.022 |

**Monitoring Well Locations (ft)**

| | 0 | 30 | 380 | 640 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Data from Site | | | | | | | | | | | |




See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

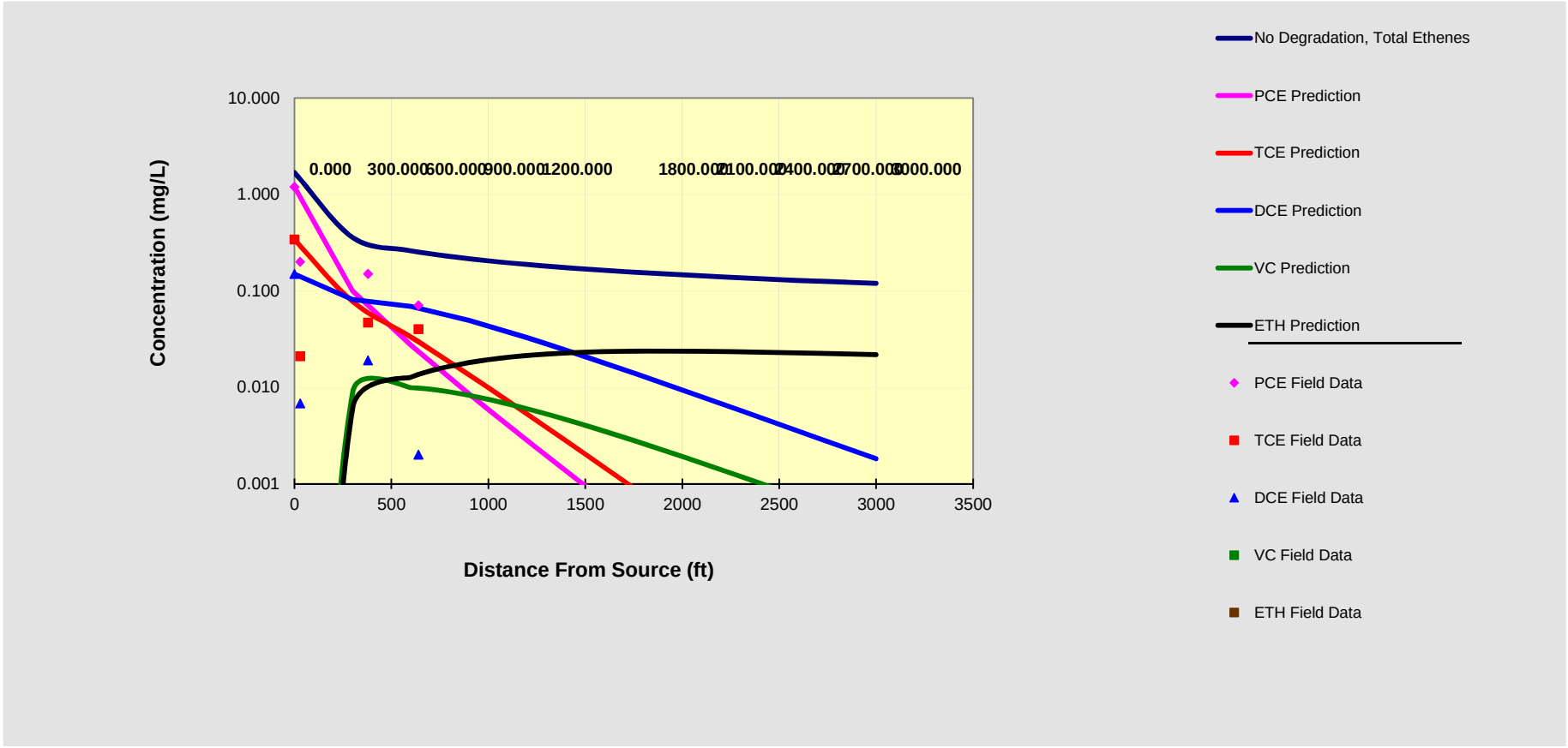
1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array


10.000
1.000
0.100
0.010
0.001
Concentration (mg/L)
0.000
300.000
600.000
900.000
1200.000
1800.000
2100.000
2400.000
2700.000
3000.000
0
500
1000
1500
2000
2500
3000
3500
Distance From Source (ft)
No Degradation, Total Ethenes
PCE Prediction
TCE Prediction
DCE Prediction
VC Prediction
ETH Prediction
PCE Field Data
TCE Field Data
DCE Field Data
VC Field Data
ETH Field Data

Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

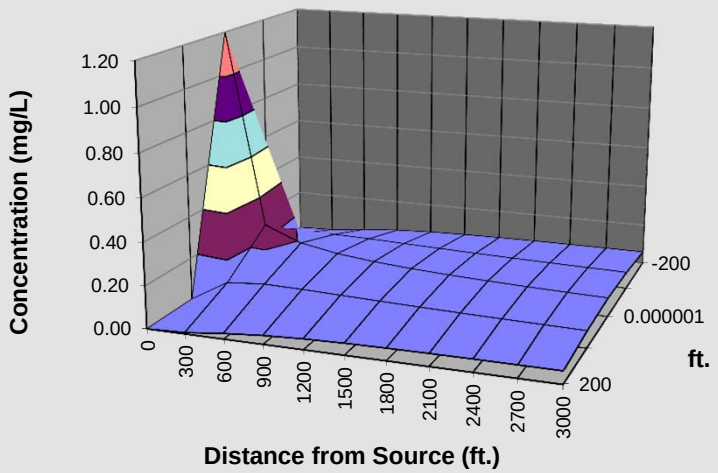
| Transverse Distance (ft) ↓ / Distance from Source (ft) → | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.006 | 0.026 | 0.041 | 0.049 | 0.054 | 0.057 | 0.058 | 0.058 | 0.058 | 0.058 |
| 100 | 0.000 | 0.103 | 0.117 | 0.113 | 0.107 | 0.101 | 0.095 | 0.091 | 0.087 | 0.083 | 0.080 |
| 0 | 1.200 | 0.264 | 0.193 | 0.159 | 0.138 | 0.124 | 0.114 | 0.105 | 0.099 | 0.093 | 0.088 |
| -100 | 0.000 | 0.103 | 0.117 | 0.113 | 0.107 | 0.101 | 0.095 | 0.091 | 0.087 | 0.083 | 0.080 |
| -200 | 0.000 | 0.006 | 0.026 | 0.041 | 0.049 | 0.054 | 0.057 | 0.058 | 0.058 | 0.058 | 0.058 |
| ***MASS RATE*** (mg/day) | 6.2E+3 | 2.5E+3 | 2.5E+3 | 2.4E+3 | 2.3E+3 | 2.3E+3 | 2.2E+3 | 2.1E+3 | 2.0E+3 | 2.0E+3 | 1.9E+3 |

Show No

Show

Displayed Compound: **PCE**

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **No Degradation**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

| | | |
|---|---|---|
| Plume Mass If No Degradation | 87.4 | *(Kg)* |
| - Plume Mass If Biotransformation/Production | 16.0 | *(Kg)* |
| Mass Removed | 71.4 | *(Kg)* |

If "Can't Calc.", make model area longer

**% Biotransformed =** **+81.7%**

**% Change in Mass Rate =** 69.7 % (source to edge)

See acre-ft

| | | |
|---|---|---|
| Current Volume of Ground Water in Plume | Can't Calc. | *MGal* |
| Flow Rate of Water Through Source Area | 0.002 | *MGD* |

Compare to Pump and Treat

| | | |
|---|---|---|
| Pumping Rate | | *(gpm)* |
| # Pore Volumes Removed Per Yr. | | |
| # Pore Volumes to Clean-Up | | |
| Clean-Up Time | | *(yr)* |

Plot All Data | Plot Data > Target

Mass HELP | To Centerline | Return to Input

Start Here → ◉ PCE ○ TCE ○ DCE ○ VC ○ ETH

## DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

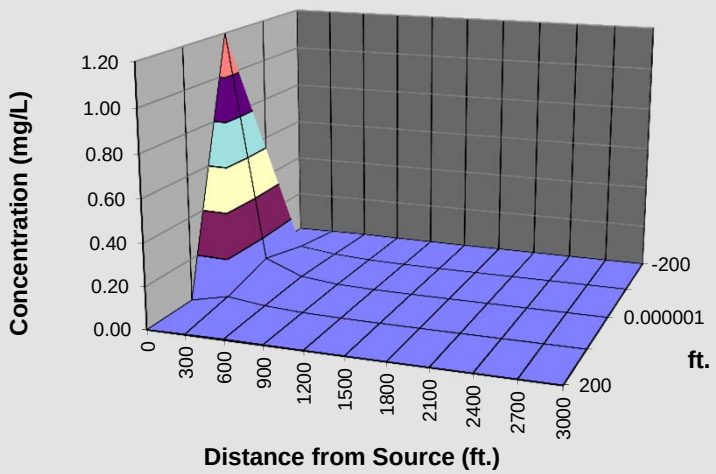
| *Transverse Distance (ft)* ↓ / *Distance from Source (ft)* → | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 0.000 | 0.002 | 0.004 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 100 | 0.000 | 0.039 | 0.017 | 0.006 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0 | 1.200 | 0.100 | 0.027 | 0.009 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| -100 | 0.000 | 0.039 | 0.017 | 0.006 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| -200 | 0.000 | 0.002 | 0.004 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| ***MASS RATE*** (mg/day) | 6.2E+3 | 9.5E+2 | 3.5E+2 | 1.3E+2 | 4.8E+1 | 1.7E+1 | 6.3E+0 | 2.3E+0 | 8.3E-1 | 3.0E-1 | 1.1E-1 |

Show No

Show

Displayed Compound

Time: 1000 yr  Target Level: **0.005** mg/L  Displayed Model: **Biotransformation**  **PCE**




Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

| | | |
|---|---|---|
| Plume Mass If No Degradation | 87.4 | *(Kg)* |
| - Plume Mass If Biotransformation/Production | 16.0 | *(Kg)* |
| Mass Removed | 71.4 | *(Kg)* |
| **% Biotransformed =** | **+81.7%** | |
| **% Change in Mass Rate =** | **100.0 %** | (source to edge) |

If "Can't Calc.", make model area longer

See acre-ft

| | | |
|---|---|---|
| Current Volume of Ground Water in Plume | 25.25 | *MGal* |
| Flow Rate of Water Through Source Area | 0.002 | *MGD* |

Compare to Pump and Treat

| | | |
|---|---|---|
| Pumping Rate | | *(gpm)* |
| # Pore Volumes Removed Per Yr. | 0.00 | |
| # Pore Volumes to Clean-Up | | |
| Clean-Up Time | | *(yr)* |

Plot All Data  Plot Data > Target

Mass HELP  To Centerline  Return to Input

# APPENDIX F

VAPOR INTRUSION SCREENING LEVEL (VISL) CALCULATOR

GEC

# COMMERCIAL GROUNDWATER SCENARIO

# MWA-1, MWA-2, MWD-6 DATA

GEC

# MWA-1

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | No HLC | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | No HLC | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | No HLC | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | No HLC | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 1.5E+02 | 4.13E+01 | 8.8E-07 | 2.4E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | No HLC | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 4.5E+01 | 7.10E+00 | 2.4E-06 | 8.1E-01 | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_GW | 70 | ATc_C_GW | 70 | ATc_GW | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_GW | 26 | ATnc_C_GW | 25 | Atnc_GW | 25 |
| Exposure duration | (yrs) | ED_R_GW | 26 | ED_C_GW | 25 | ED_GW | 25 |
| Exposure frequency | (days/yr) | EF_R_GW | 350 | EF_C_GW | 250 | EF_GW | 250 |
| Exposure time | (hr/day) | ET_R_GW | 24 | ET_C_GW | 8 | ET_GW | 8 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_GW | 0.0005 | AFgw_C_GW | 0.0005 | AFgw_GW | 0.0005 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_GW | 0.03 | AFss_C_GW | 0.03 | AFss_GW | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_GW | 1.00E-06 | mIURTCE_C_GW | 0.00E+00 | mIURTCE_GW | 0.00E+00 |
| | IURTCE_R_GW | 3.10E-06 | IURTCE_C_GW | 4.10E-06 | IURTCE_GW | 4.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 25 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# MWA-2

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | No HLC | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | No HLC | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | No HLC | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | No HLC | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 1.9E+02 | 5.23E+01 | 1.1E-06 | 3.0E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | No HLC | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 6.5E+01 | 1.03E+01 | 3.4E-06 | **1.2E+00** | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_GW | 70 | ATc_C_GW | 70 | ATc_GW | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_GW | 26 | ATnc_C_GW | 25 | Atnc_GW | 25 |
| Exposure duration | (yrs) | ED_R_GW | 26 | ED_C_GW | 25 | ED_GW | 25 |
| Exposure frequency | (days/yr) | EF_R_GW | 350 | EF_C_GW | 250 | EF_GW | 250 |
| Exposure time | (hr/day) | ET_R_GW | 24 | ET_C_GW | 8 | ET_GW | 8 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_GW | 0.0005 | AFgw_C_GW | 0.0005 | AFgw_GW | 0.0005 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_GW | 0.03 | AFss_C_GW | 0.03 | AFss_GW | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_GW | 1.00E-06 | mIURTCE_C_GW | 0.00E+00 | mIURTCE_GW | 0.00E+00 |
| | IURTCE_R_GW | 3.10E-06 | IURTCE_C_GW | 4.10E-06 | IURTCE_GW | 4.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 25 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# MWD-6

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | No HLC | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | No HLC | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | No HLC | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | No HLC | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 2.8E+02 | 7.71E+01 | 1.6E-06 | 4.4E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | No HLC | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 9.1E+01 | 1.44E+01 | 4.8E-06 | **1.6E+00** | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_GW | 70 | ATc_C_GW | 70 | ATc_GW | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_GW | 26 | ATnc_C_GW | 25 | Atnc_GW | 25 |
| Exposure duration | (yrs) | ED_R_GW | 26 | ED_C_GW | 25 | ED_GW | 25 |
| Exposure frequency | (days/yr) | EF_R_GW | 350 | EF_C_GW | 250 | EF_GW | 250 |
| Exposure time | (hr/day) | ET_R_GW | 24 | ET_C_GW | 8 | ET_GW | 8 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_GW | 0.0005 | AFgw_C_GW | 0.0005 | AFgw_GW | 0.0005 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_GW | 0.03 | AFss_C_GW | 0.03 | AFss_GW | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_GW | 1.00E-06 | mIURTCE_C_GW | 0.00E+00 | mIURTCE_GW | 0.00E+00 |
| | IURTCE_R_GW | 3.10E-06 | IURTCE_C_GW | 4.10E-06 | IURTCE_GW | 4.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 25 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# RESIDENTIAL GROUNDWATER SCENARIO

# MW-10, MW-13 & MW-14 DATA

GEC

# MW-10

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | No HLC | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | No HLC | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | No HLC | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | No HLC | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 2.2E+01 | 6.06E+00 | 5.6E-07 | 1.5E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | No HLC | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | | -- | -- | -- | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_GW | 70 | ATc_C_GW | 70 | ATc_GW | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_GW | 26 | ATnc_C_GW | 25 | Atnc_GW | 26 |
| Exposure duration | (yrs) | ED_R_GW | 26 | ED_C_GW | 25 | ED_GW | 26 |
| Exposure frequency | (days/yr) | EF_R_GW | 350 | EF_C_GW | 250 | EF_GW | 350 |
| Exposure time | (hr/day) | ET_R_GW | 24 | ET_C_GW | 8 | ET_GW | 24 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_GW | 0.0005 | AFgw_C_GW | 0.0005 | AFgw_GW | 0.0005 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_GW | 0.03 | AFss_C_GW | 0.03 | AFss_GW | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_GW | 1.00E-06 | mIURTCE_C_GW | 0.00E+00 | mIURTCE_GW | 1.00E-06 |
| | IURTCE_R_GW | 3.10E-06 | IURTCE_C_GW | 4.10E-06 | IURTCE_GW | 3.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 72 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# MW-13

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | No HLC | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | No HLC | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | No HLC | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | No HLC | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 7.2E+01 | 1.98E+01 | 1.8E-06 | 4.8E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | No HLC | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 2.5E+01 | 3.95E+00 | **1.6E-05** | **1.9E+00** | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_GW | 70 | ATc_C_GW | 70 | ATc_GW | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_GW | 26 | ATnc_C_GW | 25 | Atnc_GW | 26 |
| Exposure duration | (yrs) | ED_R_GW | 26 | ED_C_GW | 25 | ED_GW | 26 |
| Exposure frequency | (days/yr) | EF_R_GW | 350 | EF_C_GW | 250 | EF_GW | 350 |
| Exposure time | (hr/day) | ET_R_GW | 24 | ET_C_GW | 8 | ET_GW | 24 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater | AFgw_R_GW | 0.0005 | AFgw_C_GW | 0.0005 | AFgw_GW | 0.0005 |
| Sub-Slab and Exterior Soil Gas | AFss_R_GW | 0.03 | AFss_C_GW | 0.03 | AFss_GW | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_GW | 1.00E-06 | mIURTCE_C_GW | 0.00E+00 | mIURTCE_GW | 1.00E-06 |
| | IURTCE_R_GW | 3.10E-06 | IURTCE_C_GW | 4.10E-06 | IURTCE_GW | 3.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 72 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# MW-14

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | No HLC | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| | CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia (ug/m$^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR (ug/m$^3$)$^{-1}$ | IUR Source* | Reference Concentration RfC (mg/m$^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | No HLC | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | No HLC | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | No HLC | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 4.9E+01 | 1.35E+01 | 1.3E-06 | 3.2E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | No HLC | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 9.1E+00 | 1.44E+00 | 5.8E-06 | 6.9E-01 | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |

**OSWER VAPOR INTRUSION ASSESSMENT**
**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_GW | 70 | ATc_C_GW | 70 | ATc_GW | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_GW | 26 | ATnc_C_GW | 25 | Atnc_GW | 26 |
| Exposure duration | (yrs) | ED_R_GW | 26 | ED_C_GW | 25 | ED_GW | 26 |
| Exposure frequency | (days/yr) | EF_R_GW | 350 | EF_C_GW | 250 | EF_GW | 350 |
| Exposure time | (hr/day) | ET_R_GW | 24 | ET_C_GW | 8 | ET_GW | 24 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_GW | 0.0005 | AFgw_C_GW | 0.0005 | AFgw_GW | 0.0005 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_GW | 0.03 | AFss_C_GW | 0.03 | AFss_GW | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_GW | 1.00E-06 | mIURTCE_C_GW | 0.00E+00 | mIURTCE_GW | 1.00E-06 |
| | IURTCE_R_GW | 3.10E-06 | IURTCE_C_GW | 4.10E-06 | IURTCE_GW | 3.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 72 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

**OSWER VAPOR INTRUSION ASSESSMENT**

**Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |
| Average Groundwater Temperature ($^{o}$C) | Tgw | 20 | Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations |

| CAS | Chemical Name | Site Groundwater Concentration Cgw (ug/L) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# COMMERCIAL SOIL GAS SCENARIO

# VS-1 & VS-2 DATA

GEC

# VS-1 5'

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 2.1E+04 | 6.30E+02 | **1.3E-05** | **3.6E+00** | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 5.6E+02 | 1.68E+01 | 5.6E-06 | **1.9E+00** | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 25 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 25 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 250 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 8 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 0.00E+00 |
| | IURTCE_R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 4.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 25 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration | Calculated Indoor Air Concentration | VI Carcinogenic Risk | VI Hazard | Inhalation Unit Risk | IUR Source* | Reference Concentration | RFC Source* | Mutagenic Indicator |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Csg | Cia | CR | HQ | IUR | | RfC | | |
| | | ($ug/m^3$) | ($ug/m^3$) | | | ($ug/m^3$)$^{-1}$ | | ($mg/m^3$) | | i |

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# VS-1 GW

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($ug/m^3)^{-1}$ | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |
| | 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| | 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| | 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| | 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| | 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| | 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| | 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 5.8E+01 | 1.74E+00 | 3.7E-08 | 9.9E-03 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 9.9E+00 | 2.97E-01 | 9.9E-08 | 3.4E-02 | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ |
|---|---|---|---|---|---|
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- |

| Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|
| | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 25 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 25 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 250 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 8 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 0.00E+00 |
| | IURTCE_R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 4.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 25 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# VS-2 5'

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($ug/m^3)^{-1}$ | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |
| | 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| | 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| | 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| | 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| | 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| | 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| | 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 3.4E+02 | 1.02E+01 | 2.2E-07 | 5.8E-02 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | 1.1E+01 | 3.30E-01 | 1.1E-07 | 3.8E-02 | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ |
|---|---|---|---|---|---|
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- |

| Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|
| | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 25 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 25 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 250 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 8 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 0.00E+00 |
| | IURTCE_R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 4.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 25 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# VS-2 GW

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($ug/m^3)^{-1}$ | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |
| | 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| | 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| | 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| | 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| | 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| | 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| | 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 2.5E+01 | 7.50E-01 | 1.6E-08 | 4.3E-03 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | | -- | -- | -- | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Commercial | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ |
|---|---|---|---|---|---|
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- |

| Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|
| | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 25 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 25 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 250 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 8 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 0.00E+00 |
| | IURTCE_R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 4.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 25 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# RESIDENTIAL SOIL GAS SCENARIO

# VS-3 & VS-4 DATA

GEC

# VS-3 5'

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($ug/m^3)^{-1}$ | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |
| | 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| | 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| | 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| | 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| | 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| | 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| | 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 1.6E+02 | 4.80E+00 | 4.4E-07 | 1.2E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | | -- | -- | -- | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 26 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 26 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 350 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 24 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Groundwater | ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas | ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 1.00E-06 |
| | IURTCE_R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 3.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# VS-3 GW

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($ug/m^3)^{-1}$ | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |
| | 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| | 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| | 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| | 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| | 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| | 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| | 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 2.8E+02 | 8.40E+00 | 7.8E-07 | 2.0E-01 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | | -- | -- | -- | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 26 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 26 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 350 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 24 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Groundwater | ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas | ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 1.00E-06 |
| | IURTCE_R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 3.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# VS-4 5'

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($ug/m^3)^{-1}$ | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |
| | 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| | 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| | 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| | 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| | 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| | 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| | 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 2.8E+01 | 8.40E-01 | 7.8E-08 | 2.0E-02 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | | -- | -- | -- | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ |
|---|---|---|---|---|---|
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- |

| Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|
| | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 26 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 26 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 350 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 24 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| Groundwater ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

Trichloroethylene

| | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| mIURTCE | R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 1.00E-06 |
| IURTCE | R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 3.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# VS-4 GW

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 75-07-0 | Acetaldehyde | | -- | -- | -- | 2.20E-06 | I | 9.00E-03 | I | |
| | 67-64-1 | Acetone | | -- | -- | -- | | | 3.10E+01 | A | |
| | 75-86-5 | Acetone Cyanohydrin | | -- | -- | -- | | | 2.00E-03 | X | |
| | 75-05-8 | Acetonitrile | | -- | -- | -- | | | 6.00E-02 | I | |
| | 107-02-8 | Acrolein | | -- | -- | -- | | | 2.00E-05 | I | |
| | 79-10-7 | Acrylic Acid | | -- | -- | -- | | | 1.00E-03 | I | |
| | 107-13-1 | Acrylonitrile | | -- | -- | -- | 6.80E-05 | I | 2.00E-03 | I | |
| | 309-00-2 | Aldrin | | -- | -- | -- | 4.90E-03 | I | | | |
| | 107-18-6 | Allyl Alcohol | | -- | -- | -- | | | 1.00E-04 | X | |
| | 107-05-1 | Allyl Chloride | | -- | -- | -- | 6.00E-06 | CA | 1.00E-03 | I | |
| | 7664-41-7 | Ammonia | | -- | -- | -- | | | 1.00E-01 | I | |
| | 75-85-4 | Amyl Alcohol, tert- | | -- | -- | -- | | | 3.00E-03 | X | |
| | 12674-11-2 | Aroclor 1016 | | -- | -- | -- | 2.00E-05 | S | | | |
| | 11104-28-2 | Aroclor 1221 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11141-16-5 | Aroclor 1232 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 53469-21-9 | Aroclor 1242 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 12672-29-6 | Aroclor 1248 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11097-69-1 | Aroclor 1254 | | -- | -- | -- | 5.70E-04 | S | | | |
| | 11096-82-5 | Aroclor 1260 | | -- | -- | -- | 5.70E-04 | S | | | |
| x | 103-33-3 | Azobenzene | | -- | -- | -- | 3.10E-05 | I | | | |
| | 56-55-3 | Benz[a]anthracene | | -- | -- | -- | 1.10E-04 | CA | | | Mut |
| | 71-43-2 | Benzene | | -- | -- | -- | 7.80E-06 | I | 3.00E-02 | I | |
| | 100-44-7 | Benzyl Chloride | | -- | -- | -- | 4.90E-05 | CA | 1.00E-03 | P | |
| | 92-52-4 | Biphenyl, 1,1'- | | -- | -- | -- | | | 4.00E-04 | X | |
| | 108-60-1 | Bis(2-chloro-1-methylethyl) ether | | -- | -- | -- | 1.00E-05 | H | | | |
| | 111-44-4 | Bis(2-chloroethyl)ether | | -- | -- | -- | 3.30E-04 | I | | | |
| | 542-88-1 | Bis(chloromethyl)ether | | -- | -- | -- | 6.20E-02 | I | | | |
| | 10294-34-5 | Boron Trichloride | | -- | -- | -- | | | 2.00E-02 | P | |
| | 7637-07-2 | Boron Trifluoride | | -- | -- | -- | | | 1.30E-02 | CA | |
| | 107-04-0 | Bromo-2-chloroethane, 1- | | -- | -- | -- | 6.00E-04 | X | | | |
| | 108-86-1 | Bromobenzene | | -- | -- | -- | | | 6.00E-02 | I | |
| | 74-97-5 | Bromochloromethane | | -- | -- | -- | | | 4.00E-02 | X | |
| | 75-27-4 | Bromodichloromethane | | -- | -- | -- | 3.70E-05 | CA | | | |
| | 75-25-2 | Bromoform | | -- | -- | -- | 1.10E-06 | I | | | |
| | 74-83-9 | Bromomethane | | -- | -- | -- | | | 5.00E-03 | I | |
| | 106-99-0 | Butadiene, 1,3- | | -- | -- | -- | 3.00E-05 | I | 2.00E-03 | I | |
| | 78-92-2 | Butyl alcohol, sec- | | -- | -- | -- | | | 3.00E+01 | P | |
| | 75-15-0 | Carbon Disulfide | | -- | -- | -- | | | 7.00E-01 | I | |
| | 56-23-5 | Carbon Tetrachloride | | -- | -- | -- | 6.00E-06 | I | 1.00E-01 | I | |
| | 12789-03-6 | Chlordane | | -- | -- | -- | 1.00E-04 | I | 7.00E-04 | I | |
| | 7782-50-5 | Chlorine | | -- | -- | -- | | | 1.50E-04 | A | |
| | 10049-04-4 | Chlorine Dioxide | | -- | -- | -- | | | 2.00E-04 | I | |
| | 75-68-3 | Chloro-1,1-difluoroethane, 1- | | -- | -- | -- | | | 5.00E+01 | I | |
| | 126-99-8 | Chloro-1,3-butadiene, 2- | | -- | -- | -- | 3.00E-04 | I | 2.00E-02 | I | |
| | 108-90-7 | Chlorobenzene | | -- | -- | -- | | | 5.00E-02 | P | |
| | 98-56-6 | Chlorobenzotrifluoride, 4- | | -- | -- | -- | | | 3.00E-01 | P | |
| | 75-45-6 | Chlorodifluoromethane | | -- | -- | -- | | | 5.00E+01 | I | |
| | 67-66-3 | Chloroform | | -- | -- | -- | 2.30E-05 | I | 9.80E-02 | A | |
| | 74-87-3 | Chloromethane | | -- | -- | -- | | | 9.00E-02 | I | |
| | 107-30-2 | Chloromethyl Methyl Ether | | -- | -- | -- | 6.90E-04 | CA | | | |
| | 76-06-2 | Chloropicrin | | -- | -- | -- | | | 4.00E-04 | CA | |
| | 8007-45-2 | Coke Oven Emissions | | -- | -- | -- | 6.20E-04 | I | | | Mut |
| | 98-82-8 | Cumene | | -- | -- | -- | | | 4.00E-01 | I | |
| x | 57-12-5 | Cyanide (CN-) | | -- | -- | -- | | | 8.00E-04 | S | |
| | 110-82-7 | Cyclohexane | | -- | -- | -- | | | 6.00E+00 | I | |
| | 108-94-1 | Cyclohexanone | | -- | -- | -- | | | 7.00E-01 | P | |
| | 110-83-8 | Cyclohexene | | -- | -- | -- | | | 1.00E+00 | X | |
| | 72-55-9 | DDE, p,p'- | | -- | -- | -- | 9.70E-05 | CA | | | |
| | 96-12-8 | Dibromo-3-chloropropane, 1,2- | | -- | -- | -- | 6.00E-03 | P | 2.00E-04 | I | Mut |
| | 124-48-1 | Dibromochloromethane | | -- | -- | -- | 2.70E-05 | CA | | | |
| | 106-93-4 | Dibromoethane, 1,2- | | -- | -- | -- | 6.00E-04 | I | 9.00E-03 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| | CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($ug/m^3)^{-1}$ | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 74-95-3 | Dibromomethane (Methylene Bromide) | | -- | -- | -- | | | 4.00E-03 | X | |
| | 764-41-0 | Dichloro-2-butene, 1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 1476-11-5 | Dichloro-2-butene, cis-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 110-57-6 | Dichloro-2-butene, trans-1,4- | | -- | -- | -- | 4.20E-03 | P | | | |
| | 95-50-1 | Dichlorobenzene, 1,2- | | -- | -- | -- | | | 2.00E-01 | H | |
| | 106-46-7 | Dichlorobenzene, 1,4- | | -- | -- | -- | 1.10E-05 | CA | 8.00E-01 | I | |
| | 75-71-8 | Dichlorodifluoromethane | | -- | -- | -- | | | 1.00E-01 | X | |
| | 75-34-3 | Dichloroethane, 1,1- | | -- | -- | -- | 1.60E-06 | CA | | | |
| | 107-06-2 | Dichloroethane, 1,2- | | -- | -- | -- | 2.60E-05 | I | 7.00E-03 | P | |
| | 75-35-4 | Dichloroethylene, 1,1- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 78-87-5 | Dichloropropane, 1,2- | | -- | -- | -- | 1.00E-05 | CA | 4.00E-03 | I | |
| | 542-75-6 | Dichloropropene, 1,3- | | -- | -- | -- | 4.00E-06 | I | 2.00E-02 | I | |
| | 77-73-6 | Dicyclopentadiene | | -- | -- | -- | | | 3.00E-04 | X | |
| | 75-37-6 | Difluoroethane, 1,1- | | -- | -- | -- | | | 4.00E+01 | I | |
| | 94-58-6 | Dihydrosafrole | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 108-20-3 | Diisopropyl Ether | | -- | -- | -- | | | 7.00E-01 | P | |
| | 68-12-2 | Dimethylformamide | | -- | -- | -- | | | 3.00E-02 | I | |
| | 57-14-7 | Dimethylhydrazine, 1,1- | | -- | -- | -- | | | 2.00E-06 | X | |
| | 540-73-8 | Dimethylhydrazine, 1,2- | | -- | -- | -- | 1.60E-01 | CA | | | |
| | 513-37-1 | Dimethylvinylchloride | | -- | -- | -- | 1.30E-05 | CA | | | |
| | 123-91-1 | Dioxane, 1,4- | | -- | -- | -- | 5.00E-06 | I | 3.00E-02 | I | |
| | 106-89-8 | Epichlorohydrin | | -- | -- | -- | 1.20E-06 | I | 1.00E-03 | I | |
| | 106-88-7 | Epoxybutane, 1,2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 111-15-9 | Ethoxyethanol Acetate, 2- | | -- | -- | -- | | | 6.00E-02 | P | |
| | 110-80-5 | Ethoxyethanol, 2- | | -- | -- | -- | | | 2.00E-01 | I | |
| | 141-78-6 | Ethyl Acetate | | -- | -- | -- | | | 7.00E-02 | P | |
| | 75-00-3 | Ethyl Chloride (Chloroethane) | | -- | -- | -- | | | 1.00E+01 | I | |
| | 97-63-2 | Ethyl Methacrylate | | -- | -- | -- | | | 3.00E-01 | P | |
| | 100-41-4 | Ethylbenzene | | -- | -- | -- | 2.50E-06 | CA | 1.00E+00 | I | |
| | 75-21-8 | Ethylene Oxide | | -- | -- | -- | 8.80E-05 | CA | 3.00E-02 | CA | |
| | 151-56-4 | Ethyleneimine | | -- | -- | -- | 1.90E-02 | CA | | | |
| | 50-00-0 | Formaldehyde | | -- | -- | -- | 1.30E-05 | I | 9.80E-03 | A | |
| | 64-18-6 | Formic Acid | | -- | -- | -- | | | 3.00E-04 | X | |
| | 98-01-1 | Furfural | | -- | -- | -- | | | 5.00E-02 | H | |
| | 765-34-4 | Glycidyl | | -- | -- | -- | | | 1.00E-03 | H | |
| | 76-44-8 | Heptachlor | | -- | -- | -- | 1.30E-03 | I | | | |
| | 1024-57-3 | Heptachlor Epoxide | | -- | -- | -- | 2.60E-03 | I | | | |
| | 39635-31-9 | Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 118-74-1 | Hexachlorobenzene | | -- | -- | -- | 4.60E-04 | I | | | |
| | 38380-08-4 | Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 69782-90-7 | Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 52663-72-6 | Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| | 32774-16-6 | Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169) | | -- | -- | -- | 1.10E+00 | E | 1.30E-06 | E | |
| | 87-68-3 | Hexachlorobutadiene | | -- | -- | -- | 2.20E-05 | I | | | |
| | 77-47-4 | Hexachlorocyclopentadiene | | -- | -- | -- | | | 2.00E-04 | I | |
| x | 67-72-1 | Hexachloroethane | | -- | -- | -- | 1.10E-05 | CA | 3.00E-02 | I | |
| | 822-06-0 | Hexamethylene Diisocyanate, 1,6- | | -- | -- | -- | | | 1.00E-05 | I | |
| | 110-54-3 | Hexane, N- | | -- | -- | -- | | | 7.00E-01 | I | |
| | 591-78-6 | Hexanone, 2- | | -- | -- | -- | | | 3.00E-02 | I | |
| | 302-01-2 | Hydrazine | | -- | -- | -- | 4.90E-03 | I | 3.00E-05 | P | |
| | 7647-01-0 | Hydrogen Chloride | | -- | -- | -- | | | 2.00E-02 | I | |
| | 74-90-8 | Hydrogen Cyanide | | -- | -- | -- | | | 8.00E-04 | I | |
| | 7664-39-3 | Hydrogen Fluoride | | -- | -- | -- | | | 1.40E-02 | CA | |
| | 7783-06-4 | Hydrogen Sulfide | | -- | -- | -- | | | 2.00E-03 | I | |
| | 67-63-0 | Isopropanol | | -- | -- | -- | | | 2.00E-01 | P | |
| | 7439-97-6 | Mercury (elemental) | | -- | -- | -- | | | 3.00E-04 | I | |
| | 126-98-7 | Methacrylonitrile | | -- | -- | -- | | | 3.00E-02 | P | |
| | 67-56-1 | Methanol | | -- | -- | -- | | | 2.00E+01 | I | |
| | 110-49-6 | Methoxyethanol Acetate, 2- | | -- | -- | -- | | | 1.00E-03 | P | |
| | 109-86-4 | Methoxyethanol, 2- | | -- | -- | -- | | | 2.00E-02 | I | |
| | 96-33-3 | Methyl Acrylate | | -- | -- | -- | | | 2.00E-02 | P | |

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| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 78-93-3 | Methyl Ethyl Ketone (2-Butanone) | | -- | -- | -- | | | 5.00E+00 | I | |
| 60-34-4 | Methyl Hydrazine | | -- | -- | -- | 1.00E-03 | X | 2.00E-05 | X | |
| 108-10-1 | Methyl Isobutyl Ketone (4-methyl-2-pentanone) | | -- | -- | -- | | | 3.00E+00 | I | |
| 624-83-9 | Methyl Isocyanate | | -- | -- | -- | | | 1.00E-03 | CA | |
| 80-62-6 | Methyl Methacrylate | | -- | -- | -- | | | 7.00E-01 | I | |
| 25013-15-4 | Methyl Styrene (Mixed Isomers) | | -- | -- | -- | | | 4.00E-02 | H | |
| 1634-04-4 | Methyl tert-Butyl Ether (MTBE) | | -- | -- | -- | 2.60E-07 | CA | 3.00E+00 | I | |
| 75-09-2 | Methylene Chloride | | -- | -- | -- | 1.00E-08 | I | 6.00E-01 | I | Mut |
| 2385-85-5 | Mirex | | -- | -- | -- | 5.10E-03 | CA | | | |
| 64742-95-6 | Naphtha, High Flash Aromatic (HFAN) | | -- | -- | -- | | | 1.00E-01 | P | |
| 91-20-3 | Naphthalene | | -- | -- | -- | 3.40E-05 | CA | 3.00E-03 | I | |
| 13463-39-3 | Nickel Carbonyl | | -- | -- | -- | 2.60E-04 | CA | 1.40E-05 | CA | |
| 98-95-3 | Nitrobenzene | | -- | -- | -- | 4.00E-05 | I | 9.00E-03 | I | |
| 75-52-5 | Nitromethane | | -- | -- | -- | 8.80E-06 | P | 5.00E-03 | P | |
| 79-46-9 | Nitropropane, 2- | | -- | -- | -- | 2.70E-03 | H | 2.00E-02 | I | |
| 62-75-9 | Nitrosodimethylamine, N- | | -- | -- | -- | 1.40E-02 | I | 4.00E-05 | X | Mut |
| 924-16-3 | Nitroso-di-N-butylamine, N- | | -- | -- | -- | 1.60E-03 | I | | | |
| 10595-95-6 | Nitrosomethylethylamine, N- | | -- | -- | -- | 6.30E-03 | CA | | | |
| 111-84-2 | Nonane, n- | | -- | -- | -- | | | 2.00E-02 | P | |
| 32598-14-4 | Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 74472-37-0 | Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 31508-00-6 | Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 65510-44-3 | Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123) | | -- | -- | -- | 1.10E-03 | E | 1.30E-03 | E | |
| 57465-28-8 | Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126) | | -- | -- | -- | 3.80E+00 | E | 4.00E-07 | E | |
| 109-66-0 | Pentane, n- | | -- | -- | -- | | | 1.00E+00 | P | |
| 75-44-5 | Phosgene | | -- | -- | -- | | | 3.00E-04 | I | |
| 7803-51-2 | Phosphine | | -- | -- | -- | | | 3.00E-04 | I | |
| 123-38-6 | Propionaldehyde | | -- | -- | -- | | | 8.00E-03 | I | |
| 103-65-1 | Propyl benzene | | -- | -- | -- | | | 1.00E+00 | X | |
| 115-07-1 | Propylene | | -- | -- | -- | | | 3.00E+00 | CA | |
| 107-98-2 | Propylene Glycol Monomethyl Ether | | -- | -- | -- | | | 2.00E+00 | I | |
| 75-56-9 | Propylene Oxide | | -- | -- | -- | 3.70E-06 | I | 3.00E-02 | I | |
| 100-42-5 | Styrene | | -- | -- | -- | | | 1.00E+00 | I | |
| 7446-11-9 | Sulfur Trioxide | | -- | -- | -- | | | 1.00E-03 | CA | |
| 1746-01-6 | TCDD, 2,3,7,8- | | -- | -- | -- | 3.80E+01 | CA | 4.00E-08 | CA | |
| 70362-50-4 | Tetrachlorobiphenyl, 3,4,4',5- (PCB 81) | | -- | -- | -- | 1.10E-02 | E | 1.30E-04 | E | |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | | -- | -- | -- | 7.40E-06 | I | | | |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | | -- | -- | -- | 5.80E-05 | CA | | | |
| 127-18-4 | Tetrachloroethylene | 7.5E+01 | 2.25E+00 | 2.1E-07 | 5.4E-02 | 2.60E-07 | I | 4.00E-02 | I | |
| 811-97-2 | Tetrafluoroethane, 1,1,1,2- | | -- | -- | -- | | | 8.00E+01 | I | |
| 109-99-9 | Tetrahydrofuran | | -- | -- | -- | | | 2.00E+00 | I | |
| 7550-45-0 | Titanium Tetrachloride | | -- | -- | -- | | | 1.00E-04 | A | |
| 108-88-3 | Toluene | | -- | -- | -- | | | 5.00E+00 | I | |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | | -- | -- | -- | | | 3.00E+01 | H | |
| 120-82-1 | Trichlorobenzene, 1,2,4- | | -- | -- | -- | | | 2.00E-03 | P | |
| 71-55-6 | Trichloroethane, 1,1,1- | | -- | -- | -- | | | 5.00E+00 | I | |
| 79-00-5 | Trichloroethane, 1,1,2- | | -- | -- | -- | 1.60E-05 | I | 2.00E-04 | X | |
| 79-01-6 | Trichloroethylene | | -- | -- | -- | 4.10E-06 | I | 2.00E-03 | I | Mut |
| 75-69-4 | Trichlorofluoromethane | | -- | -- | -- | | | 7.00E-01 | H | |
| 96-18-4 | Trichloropropane, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | I | Mut |
| 96-19-5 | Trichloropropene, 1,2,3- | | -- | -- | -- | | | 3.00E-04 | P | |
| 121-44-8 | Triethylamine | | -- | -- | -- | | | 7.00E-03 | I | |
| 526-73-8 | Trimethylbenzene, 1,2,3- | | -- | -- | -- | | | 5.00E-03 | P | |
| 95-63-6 | Trimethylbenzene, 1,2,4- | | -- | -- | -- | | | 7.00E-03 | P | TCE |
| 108-05-4 | Vinyl Acetate | | -- | -- | -- | | | 2.00E-01 | I | |
| 593-60-2 | Vinyl Bromide | | -- | -- | -- | 3.20E-05 | H | 3.00E-03 | I | |
| 75-01-4 | Vinyl Chloride | | -- | -- | -- | 4.40E-06 | I | 1.00E-01 | I | Mut |
| 108-38-3 | Xylene, m- | | -- | -- | -- | | | 1.00E-01 | S | |
| 95-47-6 | Xylene, o- | | -- | -- | -- | | | 1.00E-01 | S | |
| 106-42-3 | Xylene, P- | | -- | -- | -- | | | 1.00E-01 | S | |
| 1330-20-7 | Xylenes | | -- | -- | -- | | | 1.00E-01 | I | |

**OSWER VAPOR INTRUSION ASSESSMENT**

**Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.4, June 2015 RSLs**

| Parameter | Symbol | Value | Instructions |
|---|---|---|---|
| Exposure Scenario | Scenario | Residential | Select residential or commercial scenario from pull down list |
| Target Risk for Carcinogens | TCR_SG | 1.00E-05 | Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F) |
| Target Hazard Quotient for Non-Carcinogens | THQ_SG | 1 | Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G) |

| CAS | Chemical Name | Site Sub-slab or Exterior Soil Gas Concentration Csg ($ug/m^3$) | Calculated Indoor Air Concentration Cia ($ug/m^3$) | VI Carcinogenic Risk CR | VI Hazard HQ | Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$) | IUR Source* | Reference Concentration RfC ($mg/m^3$) | RFC Source* | Mutagenic Indicator i |
|---|---|---|---|---|---|---|---|---|---|---|
| 140-88-5 | Ethyl Acrylate | | -- | -- | -- | | | 8.00E-03 | P | |

**Notes:**

(1) **Inhalation Pathway Exposure Parameters (RME):**

| Exposure Scenario | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Averaging time for carcinogens | (yrs) | ATc_R_SG | 70 | ATc_C_SG | 70 | ATc_SG | 70 |
| Averaging time for non-carcinogens | (yrs) | ATnc_R_SG | 26 | ATnc_C_SG | 25 | ATnc_SG | 26 |
| Exposure duration | (yrs) | ED_R_SG | 26 | ED_C_SG | 25 | ED_SG | 26 |
| Exposure frequency | (days/yr) | EF_R_SG | 350 | EF_C_SG | 250 | EF_SG | 350 |
| Exposure time | (hr/day) | ET_R_SG | 24 | ET_C_SG | 8 | ET_SG | 24 |

(2) **Generic Attenuation Factors:**

| Source Medium of Vapors | Units | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|---|
| Groundwater | ( - ) | AFgw_R_SG | 0.001 | AFgw_C_SG | 0.001 | AFgw_SG | 0.001 |
| Sub-Slab and Exterior Soil Gas | ( - ) | AFss_R_SG | 0.03 | AFss_C_SG | 0.03 | AFss_SG | 0.03 |

(3) **Formulas**

Cia, target = MIN( Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

| Trichloroethylene | Residential Symbol | Residential Value | Commercial Symbol | Commercial Value | Selected (based on scenario) Symbol | Selected (based on scenario) Value |
|---|---|---|---|---|---|---|
| | mIURTCE_R_SG | 1.00E-06 | mIURTCE_C_SG | 0.00E+00 | mIURTCE_SG | 1.00E-06 |
| | IURTCE_R_SG | 3.10E-06 | IURTCE_C_SG | 4.10E-06 | IURTCE_SG | 3.10E-06 |

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

| Age Cohort | Exposure Duration | Age-dependent adjustment factor |
|---|---|---|
| 0 - 2 years | 2 | 10 |
| 2 - 6 years | 4 | 3 |
| 6 - 16 years | 10 | 3 |
| 16 - 26 years | 10 | 1 |

**Mutagenic-mode-of-action (MMOA) adjustment factor** 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

**Notation:**

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

# APPENDIX G

LABORATORY ANALYTICAL RESULTS

GEC

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

February 04, 2016

Paige Sforzo
GeoTechnical & Env. Consultants, Inc.
514 Hillcrest Industrial Blvd.
Macon GA 31204

TEL: (478) 757-1606
FAX: (478) 757-1608

RE: Mercer HSRA

Dear Paige Sforzo: Order No: 1601N86

Analytical Environmental Services, Inc. received 13 samples on 1/30/2016 11:40:00 AM for the analyses presented in following report.

No problems were encountered during the analyses. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits. Any discrepancies associated with the analyses contained herein will be noted and submitted in the form of a project Case Narrative.
AES' certifications are as follows:
-NELAC/Florida Certification number E87582 for analysis of Environmental Water, soil/hazardous waste, and Drinking Water Microbiology, effective 07/01/15-06/30/16.
-AIHA-LAP, LLC Laboratory ID: 100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) Direct Examination, effective until 09/01/17.

These results relate only to the items tested. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

CRKanhai

Chantelle Kanhai
Project Manager

ANALYTICAL ENVIRONMENTAL SERVICES, INC
3080 Presidential Drive, Atlanta GA 30340-3704
AES TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

# CHAIN OF CUSTODY

Work Order: 1601N86

Date: _____ Page _____ of _____

COMPANY: GBC
ADDRESS: 514 Hillcrest Industrial Blvd Macon GA 31204
PHONE: 478 757-1606
FAX: 478 757-1608
SAMPLED BY: Anthony Whipple
SIGNATURE: Anthony Whipple

| # | SAMPLE ID | SAMPLED DATE | SAMPLED TIME | Grab | Composite | Matrix (See codes) | VOCs | No # of Containers |
|---|---|---|---|---|---|---|---|---|
| 1 | ~~GWA-1~~ MWA-1 | 1/27/16 | 11:55 | X | | GW | X | |
| 2 | MWA-5 | 1/27/16 | 4:15 | | | | | |
| 3 | MW-13 | 1/28/16 | 10:10 | | | | | |
| 4 | MW D-6 | | 8:50 | | | | | |
| 5 | MW 15 | | 2:05 | | | | | |
| 6 | MW-14 | | 2:50 | | | | | |
| 7 | MWA-8 | | 3:55 | | | | | |
| 8 | MW 12 | | 4:45 | | | | | |
| 9 | MWA-2 | 1/27/16 | 2:35 | | | | | |
| 10 | MW-16 | 1/29/16 | 1:30 | | | | | |
| 11 | MW-10 | | 2:05 | | | | | |
| 12 | MW-9 | | 2:30 | | | | | |
| 13 | MWB-4R 2/1/16 | | 3:37 | | | | | |
| 14 | | | | | | | | |

ANALYSIS REQUESTED

PRESERVATION (See codes)

Visit our website www.aesatlanta.com to check on the status of your results, place bottle orders, etc.

REMARKS

RELINQUISHED BY: 1: Anthony Whipple DATE/TIME: 1/29/16 5:30
2:
3:

RECEIVED BY: 1: [illegible] (FEDEX) DATE/TIME: 1/30/16 11:40
2: Revised COC Received via email on 2/1/16. (EK)
3:

SHIPMENT METHOD
OUT / / VIA:
IN / / VIA:
CLIENT (FedEx) UPS MAIL COURIER
GREYHOUND OTHER

SPECIAL INSTRUCTIONS/COMMENTS:

PROJECT INFORMATION
PROJECT NAME: Mercer MSRA
PROJECT #: 090698.340
SITE ADDRESS:
SEND REPORT TO: Parse Sprong
INVOICE TO: (IF DIFFERENT FROM ABOVE)
QUOTE #: PO#:

RECEIPT
Total # of Containers

Turnaround Time Request
- ○ Standard 5 Business Days
- ○ 2 Business Day Rush
- ○ Next Business Day Rush
- ○ Same Day Rush (auth req.)
- ○ Other

STATE PROGRAM (if any):
E-mail? Y / N: Fax? Y / N
DATA PACKAGE: I II III IV

SAMPLES RECEIVED AFTER 3PM OR ON SATURDAY ARE CONSIDERED RECEIVED THE NEXT BUSINESS DAY. IF TURNAROUND TIME IS NOT INDICATED, AES WILL PROCEED WITH STANDARD TAT OF SAMPLES.
SAMPLES ARE DISPOSED 30 DAYS AFTER REPORT COMPLETION UNLESS OTHER ARRANGEMENTS ARE MADE.

MATRIX CODES: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) DW = Drinking Water (Blanks) O = Other (specify) WW = Waste Water
PRESERVATIVE CODES: H+I = Hydrochloric acid + ice I = Ice only N = Nitric acid S+I = Sulfuric acid + ice S/M+I = Sodium Bisulfate/Methanol + ice O = Other (specify) NA = None

White Copy - Original; Yellow Copy - Client

## Analytical Environmental Services, Inc

**Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-1 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/27/2016 11:55:00 AM |
| **Lab ID:** | 1601N86-001 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| cis-1,2-Dichloroethene | 25 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-1 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/27/2016 11:55:00 AM |
| **Lab ID:** | 1601N86-001 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Tetrachloroethene | 200 | 50 | | ug/L | 219349 | 10 | 02/04/2016 01:14 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Trichloroethene | 81 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 00:50 | NP |
| Surr: 4-Bromofluorobenzene | 108 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 00:50 | NP |
| Surr: 4-Bromofluorobenzene | 108 | 70.7-125 | | %REC | 219349 | 10 | 02/04/2016 01:14 | NP |
| Surr: Dibromofluoromethane | 99.6 | 82.2-120 | | %REC | 219349 | 10 | 02/04/2016 01:14 | NP |
| Surr: Dibromofluoromethane | 101 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 00:50 | NP |
| Surr: Toluene-d8 | 102 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 00:50 | NP |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 219349 | 10 | 02/04/2016 01:14 | NP |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-5 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/27/2016 4:15:00 PM |
| **Lab ID:** | 1601N86-002 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Methylene chloride | 36 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-5 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/27/2016 4:15:00 PM |
| **Lab ID:** | 1601N86-002 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Tetrachloroethene | 27 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 01:37 | NP |
| Surr: 4-Bromofluorobenzene | 107 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 01:37 | NP |
| Surr: Dibromofluoromethane | 102 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 01:37 | NP |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 01:37 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-13 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 10:10:00 AM |
| **Lab ID:** | 1601N86-003 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| cis-1,2-Dichloroethene | 20 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-13 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 10:10:00 AM |
| **Lab ID:** | 1601N86-003 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Tetrachloroethene | 150 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Trichloroethene | 50 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 02:01 | NP |
| Surr: 4-Bromofluorobenzene | 108 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 02:01 | NP |
| Surr: Dibromofluoromethane | 99.9 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 02:01 | NP |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 02:01 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWD-6 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 8:50:00 AM |
| **Lab ID:** | 1601N86-004 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| cis-1,2-Dichloroethene | 38 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWD-6 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 8:50:00 AM |
| **Lab ID:** | 1601N86-004 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Tetrachloroethene | 240 | 50 | | ug/L | 219349 | 10 | 02/04/2016 10:00 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Trichloroethene | 80 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 02:25 | NP |
| Surr: 4-Bromofluorobenzene | 105 | 70.7-125 | | %REC | 219349 | 10 | 02/04/2016 10:00 | NP |
| Surr: 4-Bromofluorobenzene | 108 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 02:25 | NP |
| Surr: Dibromofluoromethane | 94.2 | 82.2-120 | | %REC | 219349 | 10 | 02/04/2016 10:00 | NP |
| Surr: Dibromofluoromethane | 101 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 02:25 | NP |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 02:25 | NP |
| Surr: Toluene-d8 | 102 | 81.8-120 | | %REC | 219349 | 10 | 02/04/2016 10:00 | NP |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-15 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 2:05:00 PM |
| **Lab ID:** | 1601N86-005 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-15 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 2:05:00 PM |
| **Lab ID:** | 1601N86-005 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 02:49 | NP |
| Surr: 4-Bromofluorobenzene | 105 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 02:49 | NP |
| Surr: Dibromofluoromethane | 102 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 02:49 | NP |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 02:49 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-14 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 2:50:00 PM |
| **Lab ID:** | 1601N86-006 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-14 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 2:50:00 PM |
| **Lab ID:** | 1601N86-006 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Tetrachloroethene | 27 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 03:13 | NP |
| Surr: 4-Bromofluorobenzene | 107 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 03:13 | NP |
| Surr: Dibromofluoromethane | 99.8 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 03:13 | NP |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 03:13 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-8 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 3:55:00 PM |
| **Lab ID:** | 1601N86-007 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-8 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 3:55:00 PM |
| **Lab ID:** | 1601N86-007 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 03:37 | NP |
| Surr: 4-Bromofluorobenzene | 108 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 03:37 | NP |
| Surr: Dibromofluoromethane | 101 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 03:37 | NP |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 03:37 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-12 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 4:45:00 PM |
| **Lab ID:** | 1601N86-008 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-12 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/28/2016 4:45:00 PM |
| **Lab ID:** | 1601N86-008 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Tetrachloroethene | 12 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 04:01 | NP |
| Surr: 4-Bromofluorobenzene | 107 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 04:01 | NP |
| Surr: Dibromofluoromethane | 99.9 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 04:01 | NP |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 04:01 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-2 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/27/2016 2:35:00 PM |
| **Lab ID:** | 1601N86-009 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| cis-1,2-Dichloroethene | 49 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-2 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/27/2016 2:35:00 PM |
| **Lab ID:** | 1601N86-009 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Tetrachloroethene | 360 | 50 | | ug/L | 219349 | 10 | 02/04/2016 04:48 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Trichloroethene | 120 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 04:24 | NP |
| Surr: 4-Bromofluorobenzene | 106 | 70.7-125 | | %REC | 219349 | 10 | 02/04/2016 04:48 | NP |
| Surr: 4-Bromofluorobenzene | 111 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 04:24 | NP |
| Surr: Dibromofluoromethane | 97.6 | 82.2-120 | | %REC | 219349 | 10 | 02/04/2016 04:48 | NP |
| Surr: Dibromofluoromethane | 98.3 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 04:24 | NP |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 04:24 | NP |
| Surr: Toluene-d8 | 105 | 81.8-120 | | %REC | 219349 | 10 | 02/04/2016 04:48 | NP |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-16 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 1:30:00 PM |
| **Lab ID:** | 1601N86-010 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-16 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 1:30:00 PM |
| **Lab ID:** | 1601N86-010 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 05:12 | NP |
| Surr: 4-Bromofluorobenzene | 106 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 05:12 | NP |
| Surr: Dibromofluoromethane | 97.8 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 05:12 | NP |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 05:12 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-10 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 2:05:00 PM |
| **Lab ID:** | 1601N86-011 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-10 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 2:05:00 PM |
| **Lab ID:** | 1601N86-011 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Tetrachloroethene | 29 | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 05:36 | NP |
| Surr: 4-Bromofluorobenzene | 107 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 05:36 | NP |
| Surr: Dibromofluoromethane | 95 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 05:36 | NP |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 05:36 | NP |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-9 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 2:30:00 PM |
| **Lab ID:** | 1601N86-012 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-9 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 2:30:00 PM |
| **Lab ID:** | 1601N86-012 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 06:00 | NP |
| Surr: 4-Bromofluorobenzene | 105 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 06:00 | NP |
| Surr: Dibromofluoromethane | 95.1 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 06:00 | NP |
| Surr: Toluene-d8 | 102 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 06:00 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWB-4 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 3:37:00 PM |
| **Lab ID:** | 1601N86-013 | **Matrix:** | Aqueous |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 2-Butanone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 2-Hexanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Acetone | BRL | 50 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Benzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Bromoform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Bromomethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Carbon disulfide | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Chlorobenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Chloroethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Chloroform | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Chloromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Cyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Ethylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Freon-113 | BRL | 10 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| m,p-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Methyl acetate | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Methylene chloride | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| o-Xylene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 4-Feb-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWB-4 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 1/29/2016 3:37:00 PM |
| **Lab ID:** | 1601N86-013 | **Matrix:** | Aqueous |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Toluene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Trichloroethene | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Vinyl chloride | BRL | 2.0 | | ug/L | 219349 | 1 | 02/04/2016 06:24 | NP |
| Surr: 4-Bromofluorobenzene | 104 | 70.7-125 | | %REC | 219349 | 1 | 02/04/2016 06:24 | NP |
| Surr: Dibromofluoromethane | 97.9 | 82.2-120 | | %REC | 219349 | 1 | 02/04/2016 06:24 | NP |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 219349 | 1 | 02/04/2016 06:24 | NP |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc.**

Sample/Cooler Receipt Checklist

Client GEC Work Order Number 1601186

Checklist completed by _____ 1/30/16
Signature Date

Carrier name: FedEx ✓ UPS __ Courier __ Client __ US Mail __ Other _____

Shipping container/cooler in good condition? Yes ✓ No __ Not Present __

Custody seals intact on shipping container/cooler? Yes __ No __ Not Present ✓

Custody seals intact on sample bottles? Yes __ No __ Not Present ✓

Container/Temp Blank temperature in compliance? (0°≤6°C)* Yes ✓ No __

Cooler #1 1.2 Cooler #2 _____ Cooler #3 _____ Cooler #4 _____ Cooler#5 _____ Cooler #6 _____

Chain of custody present? Yes ✓ No __

Chain of custody signed when relinquished and received? Yes ✓ No __

Chain of custody agrees with sample labels? Yes ✓ No __

Samples in proper container/bottle? Yes ✓ No __

Sample containers intact? Yes ✓ No __

Sufficient sample volume for indicated test? Yes ✓ No __

All samples received within holding time? Yes ✓ No __

Was TAT marked on the COC? Yes __ No ✓

Proceed with Standard TAT as per project history? Yes ✓ No __ Not Applicable __

Water - VOA vials have zero headspace? No VOA vials submitted ✓ TK 1/30/16 Yes ✓ No __

Water - pH acceptable upon receipt? Yes ✓ No __ Not Applicable __

Adjusted? _____ Checked by _____

Sample Condition: Good ✓ Other(Explain) _____

(For diffusive samples or AIHA lead) Is a known blank included? Yes __ No ✓

**See Case Narrative for resolution of the Non-Conformance.**

* Samples do not have to comply with the given range for certain parameters.

\\Aes_server\I\Sample Receipt\My Documents\COCs and pH Adjustment Sheet\Sample_Cooler_Recipt_Checklist_Rev1.rtf

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

AES

June 17, 2016

Paige Sforzo
GeoTechnical & Env. Consultants, Inc.
514 Hillcrest Industrial Blvd.
Macon GA 31204

TEL: (478) 757-1606
FAX: (478) 757-1608

RE: Mercer HSRA

Dear Paige Sforzo: Order No: 1606D75

Analytical Environmental Services, Inc. received 13 samples on 6/14/2016 10:40:00 AM for the analyses presented in following report.

No problems were encountered during the analyses. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits. Any discrepancies associated with the analyses contained herein will be noted and submitted in the form of a project Case Narrative.
AES's accreditations are as follows:
-NELAC/Florida State Laboratory ID E87582 for analysis of Non-Potable Water, Solid & Chemical Materials, and Drinking Water Microbiology, effective 07/01/15-06/30/16.
-NELAC/Louisiana Agency Interest No. 100818 for or analysis of Non-Potable Water and Solid & Chemical Materials, effective 07/01/15-06/30/16.
-NELAC/Texas Certificate No. T104704509-16-6 for or analysis of Non-Potable Water and Solid & Chemical Materials, effective 03/01/16-02/28/17.
-AIHA-LAP, LLC Laboratory ID: 100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) Direct Examination, effective until 09/01/17.

CRKanhai

Chantelle Kanhai
Project Manager

ANALYTICAL ENVIRONMENTAL SERVICES, INC
3785 Presidential Parkway, Atlanta GA 30340-3704
AES TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

# CHAIN OF CUSTODY

Work Order: 1606075

Date: _____ Page _____ of _____

COMPANY: GEC
ADDRESS: 514 Hillcrest Industrial Blvd Macon, GA 31204
PHONE: 478 757-1606
FAX: 478 757-1608
SAMPLED BY: Anthony Whipple
SIGNATURE: Anthony Whipple

| # | SAMPLE ID | SAMPLED DATE | SAMPLED TIME | Grab | Composite | Matrix (See codes) | VOC's | No # of Containers |
|---|---|---|---|---|---|---|---|---|
| 1 | MWA-1 | 6/9/16 | 10:41 | X | | GW | X | 2 |
| 2 | MWA-2 | | 11:55 | | | | | |
| 3 | MW-13 | | 2:09pm | | | | | |
| 4 | MW-9 | | 3:06 | | | | | |
| 5 | MW-14 | ↓ | 4:53 | | | | | |
| 6 | MWD-6 | 6/10/16 | 9:20 | | | | | |
| 7 | MWA-5 | | 11:20 | | | | | |
| 8 | MWB-4 | | 2:00pm | | | | | |
| 9 | MWA-8 | | 3:17 | | | | | |
| 10 | MW-16 | | 3:40 | | | | | |
| 11 | MW-12 | | 4:30 | | | | | |
| 12 | MW-10 | | 5:03 | | | | | |
| 13 | MW-15 | ↓ | 6:12 | ↓ | | ↓ | ↓ | ↓ |
| 14 | | | | | | | | |

ANALYSIS REQUESTED
PRESERVATION (See codes)

Visit our website www.aesatlanta.com to check on the status of your results, place bottle orders, etc.

REMARKS

| RELINQUISHED BY | DATE/TIME | RECEIVED BY | DATE/TIME |
|---|---|---|---|
| 1: Anthony Whipple | 6/13/16 10:30 | 1: Mary Lee | 6/14/16 0940 |
| 2: | | 2: | |
| 3: | | 3: | |

SPECIAL INSTRUCTIONS/COMMENTS:

SHIPMENT METHOD
OUT / / VIA:
IN / / VIA:
CLIENT FedEx UPS MAIL COURIER
GREYHOUND OTHER_____

PROJECT INFORMATION
PROJECT NAME: Mercer HSRA
PROJECT #: 090698.340
SITE ADDRESS:
SEND REPORT TO: Paige
INVOICE TO:
(IF DIFFERENT FROM ABOVE)
QUOTE #:_____ PO#:_____

RECEIPT
Total # of Containers: 26

Turnaround Time Request
- (●) Standard 5 Business Days
- ( ) 2 Business Day Rush
- ( ) Next Business Day Rush
- ( ) Same Day Rush (auth req.)
- ( ) Other _____

STATE PROGRAM (if any): _____
E-mail? Y / N; Fax? Y / N
DATA PACKAGE: I II III IV

SAMPLES RECEIVED AFTER 3PM OR ON SATURDAY ARE CONSIDERED RECEIVED THE NEXT BUSINESS DAY. IF TURNAROUND TIME IS NOT INDICATED, AES WILL PROCEED WITH STANDARD TAT OF 5 DAYS.
SAMPLES ARE DISPOSED 30 DAYS AFTER REPORT COMPLETION UNLESS OTHER ARRANGEMENTS ARE MADE.

MATRIX CODES: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) DW = Drinking Water (Blanks) O = Other (specify) WW = Waste Water
PRESERVATIVE CODES: H+I = Hydrochloric acid + ice I = Ice only N = Nitric acid S+I = Sulfuric acid + ice S/M+I = Sodium Bisulfate/Methanol + ice O = Other (specify) NA = None



White Copy - Original; Yellow Copy - Client

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-1 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 10:41:00 AM |
| **Lab ID:** | 1606D75-001 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| cis-1,2-Dichloroethene | 15 | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-1 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 10:41:00 AM |
| **Lab ID:** | 1606D75-001 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Tetrachloroethene | 150 | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Trichloroethene | 45 | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/15/2016 23:40 | CH |
| Surr: 4-Bromofluorobenzene | 82.6 | 70.7-125 | | %REC | 225520 | 1 | 06/15/2016 23:40 | CH |
| Surr: Dibromofluoromethane | 95.1 | 82.2-120 | | %REC | 225520 | 1 | 06/15/2016 23:40 | CH |
| Surr: Toluene-d8 | 99.4 | 81.8-120 | | %REC | 225520 | 1 | 06/15/2016 23:40 | CH |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-2 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 11:55:00 AM |
| **Lab ID:** | 1606D75-002 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| cis-1,2-Dichloroethene | 24 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-2 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 11:55:00 AM |
| **Lab ID:** | 1606D75-002 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Tetrachloroethene | 190 | 50 | | ug/L | 225520 | 10 | 06/16/2016 01:49 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Trichloroethene | 65 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 01:23 | CH |
| Surr: 4-Bromofluorobenzene | 78.5 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 01:23 | CH |
| Surr: 4-Bromofluorobenzene | 82.7 | 70.7-125 | | %REC | 225520 | 10 | 06/16/2016 01:49 | CH |
| Surr: Dibromofluoromethane | 96.4 | 82.2-120 | | %REC | 225520 | 10 | 06/16/2016 01:49 | CH |
| Surr: Dibromofluoromethane | 98.2 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 01:23 | CH |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 225520 | 10 | 06/16/2016 01:49 | CH |
| Surr: Toluene-d8 | 106 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 01:23 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-13 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 2:09:00 PM |
| **Lab ID:** | 1606D75-003 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| cis-1,2-Dichloroethene | 9.2 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-13 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 2:09:00 PM |
| **Lab ID:** | 1606D75-003 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Tetrachloroethene | 72 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Trichloroethene | 25 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 03:33 | CH |
| Surr: 4-Bromofluorobenzene | 80.6 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 03:33 | CH |
| Surr: Dibromofluoromethane | 104 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 03:33 | CH |
| Surr: Toluene-d8 | 111 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 03:33 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-9 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 3:06:00 PM |
| **Lab ID:** | 1606D75-004 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-9 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 3:06:00 PM |
| **Lab ID:** | 1606D75-004 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Trichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 03:07 | CH |
| Surr: 4-Bromofluorobenzene | 80.3 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 03:07 | CH |
| Surr: Dibromofluoromethane | 102 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 03:07 | CH |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 03:07 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-14 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 4:53:00 PM |
| **Lab ID:** | 1606D75-005 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-14 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/9/2016 4:53:00 PM |
| **Lab ID:** | 1606D75-005 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Tetrachloroethene | 49 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Trichloroethene | 9.1 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 10:48 | CH |
| Surr: 4-Bromofluorobenzene | 81.8 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 10:48 | CH |
| Surr: Dibromofluoromethane | 93.3 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 10:48 | CH |
| Surr: Toluene-d8 | 98.8 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 10:48 | CH |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWD-6 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 9:20:00 AM |
| **Lab ID:** | 1606D75-006 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| cis-1,2-Dichloroethene | 42 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWD-6 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 9:20:00 AM |
| **Lab ID:** | 1606D75-006 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Tetrachloroethene | 280 | 50 | | ug/L | 225520 | 10 | 06/16/2016 02:41 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Trichloroethene | 91 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 02:15 | CH |
| Surr: 4-Bromofluorobenzene | 80.4 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 02:15 | CH |
| Surr: 4-Bromofluorobenzene | 82.9 | 70.7-125 | | %REC | 225520 | 10 | 06/16/2016 02:41 | CH |
| Surr: Dibromofluoromethane | 95.2 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 02:15 | CH |
| Surr: Dibromofluoromethane | 96.9 | 82.2-120 | | %REC | 225520 | 10 | 06/16/2016 02:41 | CH |
| Surr: Toluene-d8 | 102 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 02:15 | CH |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 225520 | 10 | 06/16/2016 02:41 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-5 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 11:20:00 AM |
| **Lab ID:** | 1606D75-007 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Methylene chloride | 19 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-5 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 11:20:00 AM |
| **Lab ID:** | 1606D75-007 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Tetrachloroethene | 28 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Trichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 11:13 | CH |
| Surr: 4-Bromofluorobenzene | 80.5 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 11:13 | CH |
| Surr: Dibromofluoromethane | 98.8 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 11:13 | CH |
| Surr: Toluene-d8 | 102 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 11:13 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWB-4 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 2:00:00 PM |
| **Lab ID:** | 1606D75-008 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWB-4 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 2:00:00 PM |
| **Lab ID:** | 1606D75-008 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Trichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 11:39 | CH |
| Surr: 4-Bromofluorobenzene | 77.8 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 11:39 | CH |
| Surr: Dibromofluoromethane | 98.5 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 11:39 | CH |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 11:39 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-8 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 3:17:00 PM |
| **Lab ID:** | 1606D75-009 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MWA-8 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 3:17:00 PM |
| **Lab ID:** | 1606D75-009 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Trichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 12:05 | CH |
| Surr: 4-Bromofluorobenzene | 82.4 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 12:05 | CH |
| Surr: Dibromofluoromethane | 94.4 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 12:05 | CH |
| Surr: Toluene-d8 | 103 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 12:05 | CH |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-16 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 3:40:00 PM |
| **Lab ID:** | 1606D75-010 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-16 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 3:40:00 PM |
| **Lab ID:** | 1606D75-010 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Trichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 12:31 | CH |
| Surr: 4-Bromofluorobenzene | 79.4 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 12:31 | CH |
| Surr: Dibromofluoromethane | 99 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 12:31 | CH |
| Surr: Toluene-d8 | 99.7 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 12:31 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-12 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 4:30:00 PM |
| **Lab ID:** | 1606D75-011 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-12 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 4:30:00 PM |
| **Lab ID:** | 1606D75-011 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Tetrachloroethene | 23 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Trichloroethene | 7.1 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 12:57 | CH |
| Surr: 4-Bromofluorobenzene | 81.5 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 12:57 | CH |
| Surr: Dibromofluoromethane | 97.9 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 12:57 | CH |
| Surr: Toluene-d8 | 104 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 12:57 | CH |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-10 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 5:03:00 PM |
| **Lab ID:** | 1606D75-012 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-10 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 5:03:00 PM |
| **Lab ID:** | 1606D75-012 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Tetrachloroethene | 22 | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Trichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 13:22 | CH |
| Surr: 4-Bromofluorobenzene | 78.5 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 13:22 | CH |
| Surr: Dibromofluoromethane | 96.8 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 13:22 | CH |
| Surr: Toluene-d8 | 98.4 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 13:22 | CH |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-15 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 6:12:00 PM |
| **Lab ID:** | 1606D75-013 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| 1,1,1-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,1,2,2-Tetrachloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,1,2-Trichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,1-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,1-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,2,4-Trichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,2-Dibromo-3-chloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,2-Dibromoethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,2-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,2-Dichloroethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,2-Dichloropropane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,3-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 1,4-Dichlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 2-Butanone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 2-Hexanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| 4-Methyl-2-pentanone | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Acetone | BRL | 50 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Benzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Bromodichloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Bromoform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Bromomethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Carbon disulfide | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Carbon tetrachloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Chlorobenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Chloroethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Chloroform | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Chloromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| cis-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| cis-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Cyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Dibromochloromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Dichlorodifluoromethane | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Ethylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Freon-113 | BRL | 10 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Isopropylbenzene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| m,p-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Methyl acetate | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Methyl tert-butyl ether | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Methylcyclohexane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Methylene chloride | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| o-Xylene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **Date:** 17-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | MW-15 |
| **Project Name:** | Mercer HSRA | **Collection Date:** | 6/10/2016 6:12:00 PM |
| **Lab ID:** | 1606D75-013 | **Matrix:** | Groundwater |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **TCL VOLATILE ORGANICS SW8260B** | | | | **(SW5030B)** | | | | |
| Styrene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Tetrachloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Toluene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| trans-1,2-Dichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| trans-1,3-Dichloropropene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Trichloroethene | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Trichlorofluoromethane | BRL | 5.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Vinyl chloride | BRL | 2.0 | | ug/L | 225520 | 1 | 06/16/2016 13:48 | CH |
| Surr: 4-Bromofluorobenzene | 79.4 | 70.7-125 | | %REC | 225520 | 1 | 06/16/2016 13:48 | CH |
| Surr: Dibromofluoromethane | 95.4 | 82.2-120 | | %REC | 225520 | 1 | 06/16/2016 13:48 | CH |
| Surr: Toluene-d8 | 98 | 81.8-120 | | %REC | 225520 | 1 | 06/16/2016 13:48 | CH |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

Analytical Environmental Services, Inc.

## Sample/Cooler Receipt Checklist

Client GEC Work Order Number 1606D75

Checklist completed by Sara Masoudi 6/14/2016
Signature Date

Carrier name: FedEx ✓ UPS __ Courier __ Client __ US Mail __ Other _____

Shipping container/cooler in good condition? Yes ✓ No __ Not Present __

Custody seals intact on shipping container/cooler? Yes ✓ No __ Not Present __

Custody seals intact on sample bottles? Yes __ No __ Not Present ✓

Container/Temp Blank temperature in compliance? (0°≤6°C)* Yes ✓ No __

Cooler #1 2.5°C Cooler #2 _____ Cooler #3 _____ Cooler #4 _____ Cooler#5 _____ Cooler #6 _____

Chain of custody present? Yes ✓ No __

Chain of custody signed when relinquished and received? Yes ✓ No __

Chain of custody agrees with sample labels? Yes ✓ No __

Samples in proper container/bottle? Yes ✓ No __

Sample containers intact? Yes ✓ No __

Sufficient sample volume for indicated test? Yes ✓ No __

All samples received within holding time? Yes ✓ No __

Was TAT marked on the COC? Yes ✓ No __

Proceed with Standard TAT as per project history? Yes __ No __ Not Applicable ✓

Water - VOA vials have zero headspace? No VOA vials submitted __ Yes ✓ No __

Water - pH acceptable upon receipt? Yes ✓ No __ Not Applicable __

Adjusted? _____ Checked by _____

Sample Condition: Good ✓ Other(Explain) _____

(For diffusive samples or AIHA lead) Is a known blank included? Yes __ No ✓

**See Case Narrative for resolution of the Non-Conformance.**

* Samples do not have to comply with the given range for certain parameters.

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

June 22, 2016

Paige Sforzo
GeoTechnical & Env. Consultants, Inc.
514 Hillcrest Industrial Blvd
Macon GA 31204

TEL: (478) 757-1606
FAX: (478) 757-1608

RE: Mercer Triangle

Dear Paige Sforzo: Order No: 1606F52

Analytical Environmental Services, Inc. received 10 samples on 6/15/2016 3:40:00 PM for the analyses presented in following report.

No problems were encountered during the analyses. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits. Any discrepancies associated with the analyses contained herein will be noted and submitted in the form of a project Case Narrative.
AES' certifications are as follows:
-NELAC/Florida Certification number E87582 for analysis of Air & Emissions for Volatile Organics effective 07/01/15-06/30/16.

These results relate only to the items tested. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

CKKanhai

Chantelle Kanhai
Project Manager

## APPENDIX

| Compound | CAS # | Alternate Name | TO-14A | TO-15 | SOP |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | | | | X |
| Allyl chloride | 107-05-1 | 3-Chloropropene | | X | |
| Benzene | 71-43-2 | | X | X | |
| Benzyl chloride | 100-44-7 | | X | X | |
| Bromodichloromethane | 75-27-4 | Dichlorobromomethane | | | X |
| Bromoform | 75-25-2 | Tribromomethane | | X | |
| Bromomethane | 74-83-9 | Methyl bromide | X | X | |
| 1,3-Butadiene | 106-99-0 | | | X | |
| Carbon disulfide | 75-15-0 | | | X | |
| Carbon tetrachloride | 56-23-5 | | X | X | |
| Chlorobenzene | 108-90-7 | | X | X | |
| Chloroethane | 75-00-3 | Ethyl chloride | X | X | |
| Chloroform | 67-66-3 | | X | X | |
| Chloromethane | 74-87-3 | Methyl chloride | X | X | |
| Cyclohexane | 110-82-7 | | | | X |
| Dibromochloromethane | 124-48-1 | Chlorodibromomethane | | | X |
| 1,2-Dibromoethane | 106-93-4 | EDB/Ethylene dibromide | X | X | |
| 1,2-Dichlorobenzene | 95-50-1 | *o*-Dichlorobenzene | X | X | |
| 1,3-Dichlorobenzene | 541-73-1 | *m*-Dichlorobenzene | X | X | |
| 1,4-Dichlorobenzene | 106-46-7 | p-Dichlorobenzene | X | X | |
| Dichlorodifluoromethane | 75-71-8 | Freon-12 | X | | |
| 1,1-Dichloroethane | 75-34-3 | | X | X | |
| 1,2-Dichloroethane | 107-06-2 | | X | X | |
| 1,1-Dichloroethene | 75-35-4 | 1,1-Dichloroethylene | X | X | |
| *cis*-1,2-Dichloroethene | 156-59-2 | *cis*-1,2-Dichloroethylene | X | X | |
| *trans*-1,2-Dichloroethene | 156-60-5 | *trans*-1,2-Dichloroethylene | | X | |
| 1,2-Dichloropropane | 78-87-5 | | X | X | |
| *cis*-1,3-Dichloropropene | 10061-01-5 | | X | X | |
| *trans*-1,3-Dichloropropene | 10061-02-6 | | X | X | |
| 1,2-Dichloro-1,1,2,2-tetrafluoroethane | 76-14-2 | Freon-114 | X | | |
| 1,4-Dioxane | 123-91-1 | 1,4-Diethylene oxide | | X | |
| Ethyl acetate | 141-78-6 | Acetic acid, ethyl ester | | | X |
| Ethylbenzene | 100-41-4 | | X | X | |
| 4-Ethyltoluene | 622-96-8 | | | | X |
| n-Heptane | 142-82-5 | Heptane | | | X |
| Hexachlorobutadiene | 87-68-3 | Hexachloro-1,3-butadiene | X | X | |

| | | | | | |
|---|---|---|---|---|---|
| n-Hexane | 110-54-3 | Hexane | | X | |
| **Compound** | **CAS #** | **Alternate Name** | **TO-14A** | **TO-15** | **SOP** |
| 2-Hexanone | 591-78-6 | Methyl butyl ketone | | | X |
| Methylene chloride | 75-09-2 | Dichloromethane | X | X | |
| Methyl tert-butyl ether | 1634-04-4 | MTBE | | X | |
| Methyl ethyl ketone | 78-93-3 | MEK/2-Butanone | | X | |
| Methyl isobutyl ketone | 108-10-1 | 4-Methyl-2-pentanone | | X | |
| 2-Propanol | 67-63-0 | Isopropanol/Isopropyl alcohol | | | X |
| Propene | 115-07-1 | Propylene | | | X |
| Styrene | 100-42-5 | | | X | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | | X | X | |
| Tetrachloroethene | 127-18-4 | Tetrachloroethylene | X | X | |
| Tetrahydrofuran | 109-99-9 | | | | X |
| Toluene | 108-88-3 | | | X | |
| 1,2,4-Trichlorobenzene | 120-82-1 | | | X | |
| 1,1,1-Trichloroethane | 74-55-6 | | | X | |
| 1,1,2-Trichloroethane | 79-00-5 | | | X | |
| Trichloroethene | 79-01-6 | Trichloroethylene | | X | |
| Trichlorofluoromethane | 75-69-4 | Freon-11 | X | | |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | 76-13-1 | Freon-113 | X | | |
| 1,2,4-Trimethylbenzene | 95-63-6 | | X | X | |
| 1,3,5-Trimethylbenzene | 108-67-8 | | X | X | |
| 2,2,4-Trimethylpentane | 540-84-1 | Isooctane | | X | |
| Vinyl acetate | 108-05-04 | | | X | |
| Vinyl bromide | 593-60-2 | Bromoethene | | X | |
| Vinyl chloride | 75-01-4 | Chloroethene | X | X | |
| Xylenes, Total | 1330-20-7 | | X | X | |
| m/p-Xylene | 179601-23-1 | | X | X | |
| o-Xylene | 95-47-6 | | X | X | |

ANALYTICAL ENVIRONMENTAL SERVICES, INC
3080 Presidential Drive, Atlanta GA 30340-3704
TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

# VAPOR/AIR CHAIN OF CUSTODY

Work Order #: 1606FS2

Page 1 of 1

Company: GEC

Address: 514 Hillcrest Industrial Blvd Macon, GA 31204

Bottle Order #: 74534

Turnaround Time (Circle One): (Standard) 3 Day Rush 2 Day Rush Other

Phone: 478-757-1606

Fax: 478-757-1608

Sampled by: Paige Stofko

Signature:

| # | Sample ID | Sample Start Date | Sample Start Time (24hr) | Sample Finish Date | Sample Finish Time (24 hr) | Sample Matrix* | Canister Serial # | Flow Controller ID | Canister Pressure In Field ("Hg) Start | Canister Pressure In Field ("Hg) Stop | ANALYSIS REQUESTED TO-15 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ambient 1 | 6/13/16 | 1115 | 6/13/16 | 1915 | AA | 18781 | 3312 | 30 | 3.5 | ✓ | *only analyze for: cis-1,2-dichloro ethene tetrachloroethene trichloroethene methylene Chloride, * |
| 2 | Ambient 2 | | 932 | | 1755 | AA | 18901 | 4995 | 30 | 2 | ✓ | |
| 3 | VS-1 5' | | 1134 | | 1142 | SV | 4000 | 1125 | 26 | 0 | ✓ | |
| 4 | VS-1 GW | | 1125 | | | SV | 3995 | 1103 | 27 | 3.5 | ✓ | |
| 5 | VS-2 5' | | 922 | | 930 | SV | 3989 | 1105 | 26 | 0 | ✓ | |
| 6 | VS-2 GW | | 925 | | | SV | 3898 | 1135 | 29 | 20 | ✓ | |
| 7 | VS-3 5' | | 1035 | | 1044 | SV | 3980 | 1148 | 27 | 0 | ✓ | |
| 8 | VS-3 GW | | 1024 | | 1034 | SV | 3957 | 0126 | 27 | 0 | ✓ | |
| 9 | VS-4 5' | | 955 | | 1002 | SV | 3965 | 1142 | 27 | 0 | ✓ | |
| 10 | VS-4 GW | | 956 | | 1214 | SV | 3990 | 9094 | 27 | 0 | ✓ | |

SPECIAL INSTRUCTIONS/COMMENTS:

If specialized list is required, list analytes here:

*cis-1,2-dichloroethene
tetrachloroethene
trichloroethene
methylene chloride
Only analyze for these constituents *

RELINQUISHED BY: DATE/TIME:

1: 6/14/16 1000

2:

3:

RECEIVED BY: DATE/TIME:

1: Paris Masondi 3:40

2: 6-15-16

3:

SHIPMENT METHOD

OUT / / VIA:

IN / / VIA:

CLIENT (FedEx) UPS MAIL COURIER

GREYHOUND OTHER

PROJECT INFORMATION

PROJECT NAME: Mercer Triangle

PROJECT #: 090698.340

SITE ADDRESS: Macon, GA

SEND REPORT TO: P. Stofko

INVOICE TO:
(IF DIFFERENT FROM ABOVE)

PO#:

STATE PROGRAM (if any): VRP

E-mail? Y / N Fax? Y / N

QUOTE #:

DATA PACKAGE: I II III IV

SAMPLES RECEIVED AFTER 3PM OR SATURDAY ARE CONSIDERED AS RECEIVED ON THE NEXT BUSINESS DAY; IF NO TAT IS MARKED ON COC, AES WILL PROCEED AS STANDARD TAT.

Visit our website www.aesatlanta.com to check on the status of your results, place bottle orders, etc.

*SAMPLE MATRIX: IA = Indoor Air AA = Ambient Air SS = Subslab SV = Soil Vapor O = Other (specify)

**AES, Inc., assumes no liability with respect to the collection and shipment of these samples.**



White Copy - Original; Blue Copy - Client

ANALYTICAL ENVIRONMENTAL SERVICES, INC
3080 Presidential Drive, Atlanta GA 30340-3704
TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

# VAPOR/AIR FIELD TEST DATA SHEET

6-13-16 PM
Work Order #: ~~1606FS2~~ 1606FS2

Page 1 of 1

| Company: | Address: | Project Name: | Project Number: |
|---|---|---|---|
| GEC | 514 Hillcrest Industrial Blvd. Macon, GA | Mercer Triangle | 0160698.340 |
| Phone: 478-757-1600 | Fax: 478-757-1605 | Site Address: 1400 Coleman Ave Macon, GA 31204 | |
| Sampled by: Paige Sforzo | Signature: Paige Sforzo | | |

**SAMPLING INFORMATION**

| # | Sample ID | Canister Serial # | Flow Controller ID# | Canister Cert. ID# | Sample Start Date | Sample Start Time (24hr) | Sample Start Canister Pressure in Field ("Hg) | Sample Start Flow Control Readout (mL/min) | Sample Start Temperature Interior (°F) | Sample Start Temperature Ambient (°F) | Sample Stop Date | Sample Stop Time (24hr) | Sample Stop Canister Pressure in Field ("Hg) | Sample Stop Flow Control Readout (mL/min) | Sample Stop Temperature Interior (°F) | Sample Stop Temperature Ambient (°F) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ambient 1 | 18781 | 3312 | 224115 | 6/13/16 | 9:15 | 30 | | | 88 | | 1915 | 3.5 | | | |
| 2 | Ambient 2 | 18901 | 4995 | 223104 | 6/13/16 | 9:32 | 30 | | | | | 1956 | 2 | | | |
| 3 | VS-2 5' | 3989 | 1105 | 222240 | 6/13/16 | 9:28 | 26 | | | | | 9:30 | 0 | | | |
| 4 | VS-2 GW | 3898 | 1135 | 222240 | 6/13/16 | 9:25 | 28 | | | | | 1900 | 20 | | | |
| 5 | VS-1 5' | 4000 | 01125 | 222239 | 6/13/16 | 11:34 | 26 | | | | | 1142 | 0 | | | |
| 6 | VS-1 GW | 3995 | 01103 | 222240 | 6/13/16 | 1125 | 27 | | | | | 1916 | 3.5 | | | |
| 7 | VS-4 5' | 3965 | 01142 | 222488 | 6/13/16 | 9:55 | 27 | | | | | 10:02 | 0 | | | |
| 8 | VS-4 GW | 3990 | 9094 | 222488 | 6/13/16 | 9:56 | 27 | | | | | 1214 | 0 | | | |
| 9 | VS-~~3~~ 5 5' | 3980 | 01148 | 222988 | 6/13/16 | 10:35 | 27 | | | | | 10:44 | 0 | | | |
| 10 | VS-3 GW | 3957 | 01126 | 222988 | 6/13/16 | 10:24 | 27 | | | | | 10:34 | 0 | | | |

**Date Shipped Out From Lab:** 6/8/16

**Date Received Back To Lab:** 6/14/16

**Weather Conditions**
Ambient Temp Avg:
Ambient Temp High/Low:
Indoor Air Temp Avg:
Barometric Pressure:
Wind Speed/Direction:
Other:

**Field Notes:**
- for sample VS-2 GW flow controller 1135 was replaced w/ 1148
- for sample VS-1 GW flow controller 1103 was replaced w/ 1126 - over 8 hrs limited sample was collected; could be a result of clogged restrictor or damaged implant



White Copy - Original; Blue Copy - Client

**Client:** GeoTechnical & Env. Consultants, Inc.
**Project:** Mercer Triangle
**Lab ID:** 1606F52

## Case Narrative

Sample Receiving Nonconformance:

The sample ID for 1606F52-004 was labeled as "VS-2 GW" on the canister. The sample was differentiated from the other "VS-2 GW" (1606F52-006) by matching the Canister Cert. ID# from the Field Test Data Sheet.

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | AMBIENT 1 |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 7:15:00 PM |
| **Lab ID:** | 1606F52-001 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 0.79 | | ug/m3 | 225789 | 2 | 06/20/2016 13:30 | MD |
| Methylene chloride | BRL | 0.69 | | ug/m3 | 225789 | 2 | 06/20/2016 13:30 | MD |
| Tetrachloroethene | BRL | 1.4 | | ug/m3 | 225789 | 2 | 06/20/2016 13:30 | MD |
| Trichloroethene | BRL | 1.1 | | ug/m3 | 225789 | 2 | 06/20/2016 13:30 | MD |
| Surr: 4-Bromofluorobenzene | 96.2 | 70-130 | | %REC | 225789 | 2 | 06/20/2016 13:30 | MD |

**Qualifiers:**

- * Value exceeds maximum contaminant level
- BRL Below reporting limit
- H Holding times for preparation or analysis exceeded
- N Analyte not NELAC certified
- B Analyte detected in the associated method blank
- > Greater than Result value
- E Estimated (value above quantitation range)
- S Spike Recovery outside limits due to matrix
- Narr See case narrative
- NC Not confirmed
- < Less than Result value
- J Estimated value detected below Reporting Limit

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | AMBIENT 2 |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 5:55:00 PM |
| **Lab ID:** | 1606F52-002 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 0.79 | | ug/m3 | 225789 | 2 | 06/20/2016 14:25 | MD |
| Methylene chloride | BRL | 0.69 | | ug/m3 | 225789 | 2 | 06/20/2016 14:25 | MD |
| Tetrachloroethene | BRL | 1.4 | | ug/m3 | 225789 | 2 | 06/20/2016 14:25 | MD |
| Trichloroethene | BRL | 1.1 | | ug/m3 | 225789 | 2 | 06/20/2016 14:25 | MD |
| Surr: 4-Bromofluorobenzene | 95.8 | 70-130 | | %REC | 225789 | 2 | 06/20/2016 14:25 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-1 5' |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 11:42:00 AM |
| **Lab ID:** | 1606F52-003 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 400 | | ug/m3 | 225789 | 2 | 06/21/2016 16:48 | MD |
| Methylene chloride | BRL | 350 | | ug/m3 | 225789 | 2 | 06/21/2016 16:48 | MD |
| Tetrachloroethene | 21000 | 680 | | ug/m3 | 225789 | 2 | 06/21/2016 16:48 | MD |
| Trichloroethene | 560 | 540 | | ug/m3 | 225789 | 2 | 06/21/2016 16:48 | MD |
| Surr: 4-Bromofluorobenzene | 102 | 70-130 | | %REC | 225789 | 2 | 06/21/2016 16:48 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-1 GW |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 11:25:00 AM |
| **Lab ID:** | 1606F52-004 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | 5.4 | 4.0 | | ug/m3 | 225789 | 8 | 06/21/2016 12:24 | MD |
| Methylene chloride | BRL | 3.5 | | ug/m3 | 225789 | 8 | 06/21/2016 12:24 | MD |
| Tetrachloroethene | 58 | 6.8 | | ug/m3 | 225789 | 8 | 06/21/2016 12:24 | MD |
| Trichloroethene | 9.9 | 5.4 | | ug/m3 | 225789 | 8 | 06/21/2016 12:24 | MD |
| Surr: 4-Bromofluorobenzene | 99.5 | 70-130 | | %REC | 225789 | 8 | 06/21/2016 12:24 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-2 5' |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 9:30:00 AM |
| **Lab ID:** | 1606F52-005 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 4.0 | | ug/m3 | 225789 | 2 | 06/21/2016 13:14 | MD |
| Methylene chloride | BRL | 3.5 | | ug/m3 | 225789 | 2 | 06/21/2016 13:14 | MD |
| Tetrachloroethene | 340 | 6.8 | | ug/m3 | 225789 | 2 | 06/21/2016 13:14 | MD |
| Trichloroethene | 11 | 5.4 | | ug/m3 | 225789 | 2 | 06/21/2016 13:14 | MD |
| Surr: 4-Bromofluorobenzene | 103 | 70-130 | | %REC | 225789 | 2 | 06/21/2016 13:14 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-2 GW |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 9:25:00 AM |
| **Lab ID:** | 1606F52-006 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 4.0 | | ug/m3 | 225789 | 2 | 06/21/2016 17:37 | MD |
| Methylene chloride | BRL | 3.5 | | ug/m3 | 225789 | 2 | 06/21/2016 17:37 | MD |
| Tetrachloroethene | 25 | 6.8 | | ug/m3 | 225789 | 2 | 06/21/2016 17:37 | MD |
| Trichloroethene | BRL | 5.4 | | ug/m3 | 225789 | 2 | 06/21/2016 17:37 | MD |
| Surr: 4-Bromofluorobenzene | 104 | 70-130 | | %REC | 225789 | 2 | 06/21/2016 17:37 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-3 5' |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 10:44:00 AM |
| **Lab ID:** | 1606F52-007 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 4.0 | | ug/m3 | 225789 | 2 | 06/21/2016 18:26 | MD |
| Methylene chloride | BRL | 3.5 | | ug/m3 | 225789 | 2 | 06/21/2016 18:26 | MD |
| Tetrachloroethene | 160 | 6.8 | | ug/m3 | 225789 | 2 | 06/21/2016 18:26 | MD |
| Trichloroethene | BRL | 5.4 | | ug/m3 | 225789 | 2 | 06/21/2016 18:26 | MD |
| Surr: 4-Bromofluorobenzene | 100 | 70-130 | | %REC | 225789 | 2 | 06/21/2016 18:26 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-3 GW |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 10:34:00 AM |
| **Lab ID:** | 1606F52-008 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 4.0 | | ug/m3 | 225789 | 2 | 06/21/2016 19:15 | MD |
| Methylene chloride | BRL | 3.5 | | ug/m3 | 225789 | 2 | 06/21/2016 19:15 | MD |
| Tetrachloroethene | 280 | 6.8 | | ug/m3 | 225789 | 2 | 06/21/2016 19:15 | MD |
| Trichloroethene | BRL | 5.4 | | ug/m3 | 225789 | 2 | 06/21/2016 19:15 | MD |
| Surr: 4-Bromofluorobenzene | 102 | 70-130 | | %REC | 225789 | 2 | 06/21/2016 19:15 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-4 5' |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 10:02:00 AM |
| **Lab ID:** | 1606F52-009 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS** | **TO-15** | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 4.0 | | ug/m3 | 225789 | 2 | 06/21/2016 20:05 | MD |
| Methylene chloride | BRL | 3.5 | | ug/m3 | 225789 | 2 | 06/21/2016 20:05 | MD |
| Tetrachloroethene | 28 | 6.8 | | ug/m3 | 225789 | 2 | 06/21/2016 20:05 | MD |
| Trichloroethene | BRL | 5.4 | | ug/m3 | 225789 | 2 | 06/21/2016 20:05 | MD |
| Surr: 4-Bromofluorobenzene | 104 | 70-130 | | %REC | 225789 | 2 | 06/21/2016 20:05 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

**Analytical Environmental Services, Inc** **TO-15 Report** **Date:** 22-Jun-16

| | | | |
|---|---|---|---|
| **Client:** | GeoTechnical & Env. Consultants, Inc. | **Client Sample ID:** | VS-4 GW |
| **Project Name:** | Mercer Triangle | **Collection Date:** | 6/13/2016 12:14:00 PM |
| **Lab ID:** | 1606F52-010 | **Matrix:** | Air |

| Analyses | Result | Reporting Limit | Qual | Units | BatchID | Dilution Factor | Date Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Toxic Organic Compounds in Air by GCMS TO-15** | | | | **(TO-15)** | | | | |
| cis-1,2-Dichloroethene | BRL | 4.0 | | ug/m3 | 225789 | 2 | 06/21/2016 20:54 | MD |
| Methylene chloride | BRL | 3.5 | | ug/m3 | 225789 | 2 | 06/21/2016 20:54 | MD |
| Tetrachloroethene | 75 | 6.8 | | ug/m3 | 225789 | 2 | 06/21/2016 20:54 | MD |
| Trichloroethene | BRL | 5.4 | | ug/m3 | 225789 | 2 | 06/21/2016 20:54 | MD |
| Surr: 4-Bromofluorobenzene | 101 | 70-130 | | %REC | 225789 | 2 | 06/21/2016 20:54 | MD |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds maximum contaminant level | E | Estimated (value above quantitation range) |
| BRL | Below reporting limit | S | Spike Recovery outside limits due to matrix |
| H | Holding times for preparation or analysis exceeded | Narr | See case narrative |
| N | Analyte not NELAC certified | NC | Not confirmed |
| B | Analyte detected in the associated method blank | < | Less than Result value |
| > | Greater than Result value | J | Estimated value detected below Reporting Limit |

# Analytical Environmental Services, Inc.

## Sample Receipt Checklist for Air Canisters

Client: Geotechnical  Work Order Number: 1606FS2

Checklist completed by: Parb Masoudi  6/15/16
Signature  Date

Carrier name: FedEx ✓ UPS ___ Courier ___ Client ___ US Mail ___ Other ___

| | | | |
|---|---|---|---|
| Shipping container in good condition? | Yes ✓ | No ___ | Not Present ___ |
| Custody seals intact on shipping container? | Yes ✓ | No ___ | Not Present ___ |
| Chain of custody present? | Yes ✓ | No ___ | |
| Chain of custody signed when relinquished and received? | Yes ✓ | No ___ | |
| Chain of custody agrees with sample labels? | Yes ___ | No ✓ | |
| Field data sheets present? | Yes ✓ | No ___ | |
| Sample containers intact? | Yes ✓ | No ___ | |

If no, explain: ___

| | | | |
|---|---|---|---|
| All samples received within holding time? | Yes ✓ | No ___ | |
| Was TAT marked on the COC? | Yes ✓ | No ___ | |
| Proceed with Standard TAT as per project history? | Yes ___ | No ___ | Not Applicable ✓ |
| All canisters received per Bottle Order issued? | Yes ✓ | No ___ | |

**See Case Narrative for resolution of the Non-Conformance.**