Human Health Exposure Evaluation Report

West Virginia State University Property

5000 Fairlawn Avenue
Institute, Kanawha County, West Virginia 25112

Prepared for:

West Virginia Department of Environmental Protection

Office of Environmental Remediation
601 57th Street SE, Charleston, WV 25304

Prepared by:

The Mahfood Group LLC®

1061 Waterdam Plaza Drive
Suite 201
McMurray, Pennsylvania 15317

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1 Introduction

This report was prepared by The Mahfood Group LLC® (TMG) under the West Virginia Department of Environmental Protection (WVDEP), Work Directive No. DEP17*07A-1. This report presents the site-specific human health exposure evaluation (HHEE) for the West Virginia State University (WVSU) property in Institute, West Virginia (site). As directed by the WVDEP, the HHEE was completed in general accordance with USEPA and WVDEP risk assessment procedures (see reference section). Specifically, following discussions with the WVDEP, because this site is not within the Voluntary Remediation Program (VRP) under the West Virginia Voluntary Remediation and Redevelopment Act (VRRA), available data were screened using USEPA criteria with target carcinogenic risks set at 1×10^{-6} and noncarcinogenic target risks at a hazard quotient (HQ) of 0.1 for identifying constituents of concern. This approach results in a conservative analysis. This HHEE was completed with the goal of evaluating potential human health exposure issues associated with findings reported to date for the WVSU property.

The WVDEP work order directive DEP17*07A-1 included a full review of the project-related documents:

- East Property Boundary Investigation (Phase I), (CH2M Hill - August 5, 2013);
- 2015 Groundwater Performance Monitoring Report, (CH2M Hill - April 2016);
- Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V, (CH2M Hill - April 15, 2016) (hereafter "GW Report");
- Vapor Intrusion Investigation, (CH2M Hill - April 18, 2016) (hereafter "Vapor Intrusion Report");
- Soil Vapor Sample Map West Virginia State University Property and Adjoining Parcels, (EnviroProbe Integrated Solutions [EnviroProbe] - September 12, 2016);
- Soil Gas COPC Summary Campus Assessment data table with soil gas sampling results, (EnviroProbe);
- WVSU Vapor Point Boring Logs (15-0137), (EnviroProbe);

- Well Logs (15-0137), (EnviroProbe);
- Soil Gas Implant Installation and Sampling Protocol, (EnviroProbe);
- WVSU Soil Gas Analytical (15-0137), (ESC on behalf of EnviroProbe); and,
- WVSU EnviroProbe Groundwater Analytical, (PACE Labs on behalf of EnviroProbe).

Additional work order directive tasks included:

- Development of data tables screened against appropriate USEPA human health benchmarks. In addition, figures will be modified from existing reports to show exceedances of applicable criteria by area of concern, as practical, to convey HHEE findings and results previously unpublished. TMG prepared a groundwater data summary table containing the previously unpublished September 2016 EnviroProbe monitoring well sample groundwater data. These results were combined with the previously published CH2M Hill permanent monitoring well data for comparative purposes. The EnviroProbe exterior soil gas data were previously tabulated, but not published. That table in its original form and a re-screened version are included in Attachment 1. TMG modified 5 figures from the Vapor Intrusion Report and the previously unpublished EnviroProbe exterior soil gas concentration figure to reflect the combining of CH2M Hill and EnviroProbe data and also to show changes in exceedances as a result of the data re-screening.
- Identification of data gaps and information gaps and associated additional data/information needed to further evaluate potential human health exposure issues on the WVSU property. Data gaps are identified as they are relevant and are summarized in Section 4.
- Prepare a report summarizing the tasks performed and the potential human health exposure risks associated with the WVSU property based on the data provided, if applicable. If exposure risks cannot be properly evaluated, prepare a summary of additional data/information needed to conduct a proper evaluation. This report includes a summary of the CH2M Hill reports and data reviews, the re-screening of

analytical data available, and the subsequent evaluation on the relevance of a human health exposure risk assessment for the site.

This report is organized into five sections including this section (the Introduction – Section 1). The subsequent sections include:

- Section 2 (Analytical Results and Constituents of Concern): This section presents the analytical results and selection of constituents of concern (COCs).
- Section 3 (Conceptual Site Model): This section presents the conceptual site model (CSM) for the site. The site CSM consists of a hydrogeologic CSM, a preliminary exposure pathway evaluation where select pathways will be qualitatively eliminated from consideration, and a human health CSM.
- Section 4 (Data Gap Analysis): This section presents a data gap analysis and data needs to satisfy those gaps to complete the HHEE.
- Section 5 (References): This section contains the references cited in this document.

Various tables and attachments are also presented as part of this document and are referenced, where appropriate, in the text.

1.1 Site History and Current Conditions

The WVSU property is located at 5000 Fairlawn Avenue in Institute, Kanawha County, West Virginia. There is limited information provided in the CH2M Hill reports regarding the manufacturing processes and specific chemicals used at the UCC property. This limits the ability to determine that exact source areas on the UCC property and exactly what constituents are expected to be able to migrate to the WVSU property.

According to the WVSU website, WVSU was chartered in 1891. By 1955, the footprint of the university layout was established and many structures were complete that remain to this day. Two historic aerial photographs (1955 and 1971) from the CH2M Hill GW Report are included in Attachment 2. The 1955 aerial photograph appears to show two water impoundments approximately 5 to 7 acres in surface area. The 1971 aerial photograph appears to show these two impoundments filled in with apparent access roads running west towards the Union Carbide Corporation (UCC) property.

The WVSU property is comprised of an approximately 140-acre roughly rectangular shaped parcel with northeast frontage on Fairlawn Avenue. The ground surface of the site is generally flat floodplain with a mix of grassy lawns, asphalt parking and more than 40 buildings of various sizes. The floodplain slopes slowly to the southwest from Fairlawn to the New York Central Railroad and Kanawha River, which constitute the downgradient property boundary. The former UCC property borders the WVSU property to the northwest. Residential neighborhoods and a golf course abut the site to the southeast. North of Fairlawn Ave. is mixed residential and light commercial properties with no signs of heavy industry or manufacturing. The primary historical use of the site has been college or university-level higher education and the anticipated future use of the site is to remain the same. However, the historic aerial photographs from the CH2M Hill GW Report (included in Attachment 2) show evidence of some industrial use (e.g., filling of impoundments with fly ash) and imply the potential for there to have been additional undocumented industrial use on the WVSU property.

WVSU students reside on-site in dormitories located in the northern portion of the site in Judge Keith Scholars (JKS) Hall and Dawson Hall, and faculty resident housing is located in the southern portion of the site just south of the former impoundments filled in between 1955 and 1971. Other on-site potential receptors include non-resident faculty and staff, non-resident students, and visitors.

There is no reported data on utility lines (e.g. subsurface location and depth). Other than locations of indoor air sampling, no descriptions of below grade basements or crawl spaces were provided.

Groundwater at the site predominantly flows toward the south-southeast in the southern portion of the site. There is no specific hydrogeological data reported for the more northern and eastern portions of the site. The nearest surface water feature to the site is the Kanawha River, which is located at the southwest boundary of the site and is a local discharge feature relative to the site. The 1955 aerial photograph and a 1958 Saint Albans USGS 7.5 min quadrangle map from the GW Report (included in Attachment 2) revealed there were shallow streams running diagonally across the southern portion of the site from approximately north to south flowing into the former impoundments that eventually discharged to the Kanawha River. The 1971 aerial photograph (included in Attachment 2) shows these impoundments appear to have been filled in. A Google Earth

aerial from 1990 (included in Attachment 2) shows no signs of the former impoundment with grassy areas and other development covering those areas. Surface run-off control on the site is uncertain, but is expected to overland flow to storm drain catch basins in the parking lots, roads and other impermeable surfaces, presumably discharging to the river.

1.2 Previous Investigation Summary

A series of phases of environmental investigations of groundwater and air media were completed by CH2M Hill and EnviroProbe reported in the documents listed in Section 1. These investigations stemmed from the premise that dissolved-phase groundwater constituents of potential concern (COPCs) were migrating from the UCC property to the WVSU property, with each phase expanding on prior findings. A summary of the investigations included in those reports and EnviroProbe data, table, and figure provided is below. A brief description of the extent of the investigation, excerpted conclusions from the associated reports or document, and any TMG commentary to the findings are presented below, organized by media with groundwater first, followed by the various components of the vapor intrusion investigation, which was reported separately. TMG assumes that the "grab" (as identified in the CH2M Hill reports) groundwater samples were acceptable for analysis within this report. The discussions below are related to COPCs (and not COCs) in the context of constituent distribution, migration, and prevalence of detections. Further analysis on a comparison of the COPCs to applicable screening criteria to select COCs is discussed below in Section 2.2.

1.2.1 Groundwater

CH2M Hill Phase I – August 2013 – Sixteen grab groundwater samples (which includes 2 duplicate samples) were collected from five temporary well locations in the southwestern portion of the site. (Note that the total number of samples for Phase I was counted based on the data tables presented in the CH2M Hill reports.) These wells were analyzed for the 12 volatile organic compounds (VOCs) and 3 semi-volatile organic compounds (SVOCs) that were detected in the 4 eastern property boundary wells (TW-65A/B and VW-3A/B) on the UCC property.

Conclusions from the CH2M Hill Phase I: COPCs detected on the UCC property may have migrated beneath the WVSU property. Groundwater flow is to the southeast. COPCs were above USEPA Regional Screening Levels/Maximum Contaminant Levels

(RSLs/MCLs) on the WVSU property but no potable water use was identified and therefore, there is no risk associated with ingestion of drinking water. There were some exceedances of the residential vapor intrusion screening levels (VISLs), but no VOCs were above commercial/industrial vapor intrusion screening levels (VISLs). There are no occupied buildings in the area investigated and no known plans for residential reuse. An environmental covenant should be placed on the WVSU property to prohibit the use of groundwater, require a vapor barrier for newly constructed buildings, and to prohibit residential reuse of the property.

TMG Conclusion: TMG concurs with the Phase I conclusions as they are defined which are limited to the Phase I area (southwestern portion of the WVSU property) investigated.

CH2M Hill Phase II through V – April 2016 – Twenty grab groundwater samples (including 3 duplicate samples) were collected from seven temporary well locations spread across the southern portion of the site and were analyzed for VOCs and SVOCs in Phase II and III. The Phase II groundwater samples were analyzed for the same of list of VOCs and SVOCs as the Phase I groundwater samples. Note however that Phase III samples were only collected for purposes of delineating 1,4-dioxane in groundwater and, therefore, were only analyzed for 1,4-dioxane. In Phase IV, twenty-three groundwater samples were collected (including one duplicate sample) from twelve monitoring wells ("TW" wells) and one existing monitoring well on the UCC property (MW-104). These wells were analyzed for the investigation-specific COPC list of VOCs and SVOCs (i.e. same list as Phase I and II). In Phase V, fourteen groundwater samples were collected from eleven temporary well locations and were analyzed for the investigation-specific COPC list of VOCs and SVOCs, plus target compound list (TCL) SVOCs, polynuclear aromatic hydrocarbons (PAHs), and Resource Conservation and Recovery Act (RCRA) metals at WVSU's request. Many of the Phase V samples were collected within or in the vicinity of the projected former impoundment areas. (Note that the total number of samples for Phases II through V was counted based on the data tables presented in the CH2M Hill reports.)

Conclusions from the CH2M Hill Phase II through V: Hydrogeological data from the monitoring wells installed during the Phase IV investigation confirmed the southeasterly groundwater flow direction across the site that becomes more southerly towards the Kanawha River and are influenced by subsurface hydrogeologic conditions

Groundwater impacts on the WVSU property appear to have resulted from more than one source for 1,4-dioxane and chloroform specifically (in the southeastern portion of the WVSU property) including the migration of COPCs in groundwater from the UCC property. COPC plumes originating from the UCC property have been delineated. Groundwater data indicate the vapor intrusion pathway is incomplete with the exception of potential future residential-type use (e.g., homes, dormitories, daycare, or other) in the Phase I investigation area. Based on detections of a mixture of naphthalene and 1,2-dichloroethane (1,2-DCA) in the shallow monitoring well TW-107, which is not found elsewhere in shallow groundwater on-site, there is a potential residential exposure to groundwater flowing from the eastern WVSU property boundary to adjacent off-site receptors reportedly unrelated to activities at the UCC property.

TMG Conclusions: Based on visual observations of borings completed in the projected impoundment area reported in the Phase II through V GW Report, it appears the impoundments were filled with fly ash. This conclusion was not specifically stated in the Phase II through V GW Report, although the data and the subsequent Vapor Intrusion Report strongly suggest it. No speculation was made as to the origin of the fly ash, but it is likely from a coal-burning source. TMG generally concurs with the other conclusions drawn as they were defined, except the issue related to the potential residential exposure to groundwater from the eastern WVSU property boundary. This supposition is speculative in that no water-level data are known to have been collected on the adjacent property to support groundwater flow direction toward the property to the east of TW-107, which is also a golf course and not residential.

EnviroProbe Groundwater Sampling Event – September 2016 – Nine monitoring wells (TW-105 through TW-113) on the WVSU property were sampled by EnviroProbe in September 2016. No written explanation of the sampling effort or results was provided with the associated analytical laboratory results. The samples were analyzed for TCL VOCs, SVOCs including PAHs, and RCRA metals. These previously unpublished groundwater results were tabulated and compiled by TMG for detected COPCs only to permit a side-by-side comparison to the CH2M Hill monitoring well groundwater results (see Table 1-1). The TMG comparison is further discussed in Section 2.

TMG Conclusion: The detected VOCs appeared to be generally comparable and consistent between the CH2M Hill and EnviroProbe sampling events. A few VOCs

(chloromethane, bromodichloromethane, and 1,1,1-trichloroethane) that were not on the CH2M Hill's investigation-specific list were detected in one sample each from EnviroProbe. The chloromethane and 1,1,1-trichloroethane concentrations were less than their respective RSLs and VISLs. The single bromodichloromethane detection exceeded both the re-screened tap water RSL and residential VISL. Seven non-carcinogenic PAHs were detected in one sample at concentrations less than their respective tap water RSLs (if available). In general, the EnviroProbe groundwater results showed consistent findings with previous reported results by CH2M Hill. Groundwater data are discussed in more detail in Section 2.1.

1.2.2 Vapor Intrusion/Indoor Air

CH2M Hill Vapor Intrusion – June 2015 and January to February 2016 – The Vapor Intrusion investigation activities occurred in two phases concurrent with Phase IV and V of the groundwater investigation. The Vapor Intrusion investigation, requested by WVSU, focused on four distinct areas (Athletic Facility, Convocation Center, Eastern Area, and Faculty Housing) because each area has different geographic features and a distinct set of data available to evaluate vapor intrusion potential.

The initial phase of Vapor Intrusion investigation in June 2015 included collection of indoor and outdoor (ambient) air samples from the Athletic Facility, Convocation Center, and Faculty Housing Areas. Between two and six samples were collected from each story of each singular building tested. (Note however that because the Convocation Center was built in two stages separated by many years, six indoor air samples were collected from the older part of the building and the newer part of the building for a total of twelve indoor air samples on the ground floor.) The samples were analyzed for a specific subset list of VOCs consisting of 1,1-dichloroethane, 1,1-dichloroethene, 1,4-dioxane, benzene, chlorobenzene, chloroform, and trichlorofluoromethane (TCFM).

A second phase Vapor Intrusion investigation was completed in January and February 2016 in the Faculty Housing area and at the Eastern Area to investigate impacts related to the former impoundments and to address temporal variability. Sixteen exterior soil gas samples were collected (including one duplicate sample and two split samples) at seven locations 5 ft-bgs and just above the water table (approximately 15-20 ft-bgs). A second round of indoor and outdoor air samples were collected at the same locations in the

unoccupied residence in the Faculty Housing Area previously tested. Also, subslab and crawl space air samples were collected from the same unoccupied faculty residence to evaluate entry points for vapor intrusion. The second phase Vapor Intrusion samples were analyzed for a TCL-like list of VOCs to evaluate the potential contribution from the former impoundments.

Conclusions from the CH2M Hill Vapor Intrusion Report: CH2M Hill generally concluded based on multiple lines of evidence examined that there was not a significant Vapor Intrusion source on the WVSU property related to the COPCs in groundwater originating from the UCC property. Specifically, the current Vapor Intrusion potential at the Athletic Facility and Convocation Center was deemed insignificant based on a lack of VISL exceedances in indoor air (highest hierarchy of media for Vapor Intrusion evaluation) and at the Eastern Area based on limited exterior soil gas exceedances. Vapor Intrusion potential was concluded to be insignificant in the unoccupied residence tested in the Faculty Housing Area based on a lack of VISL exceedances in the subslab soil vapor samples indicating there is not a significant source for the Vapor Intrusion pathway. CH2M Hill stated that there were several VOCs in one exterior soil gas sample location (INS-0562) above VISLs, indicating that potential VI risk cannot be ruled out without additional data in occupied structures located within a 100-foot radius of this sample location.

TMG Conclusion: TMG generally concurs with CH2M Hill's conclusions for the Vapor Intrusion Report at the target risk and HQ evaluated. TMG recognizes the exterior soil gas sample exceedances in INS-0562. EnviroProbe performed additional exterior soil gas sampling in August 2016, which assisted to further evaluate vapor intrusion within the area of soil gas point INS-0562. TMG has evaluated the vapor intrusion pathway for the Faculty Housing Area including both CH2M Hill's and EnviroProbe's sample results, which is discussed in Section 3.3.2.

EnviroProbe Exterior Soil Gas Sampling – August 2016 – EnviroProbe installed thirteen shallow (8-10 ft-bgs) vapor points spread across the site including areas in the northern portion of the property not previously evaluated for groundwater or Vapor Intrusion issues and a few in close proximity to CH2M Hill exterior soil gas sampling locations. The northern portion of the property that will be assessed is identified as the Northern Area in subsequent discussions in this report. Ten of the vapor points were

sampled (VP-2, VP-8, and VP-12 were not sampled). The vapor point samples were analyzed for the same TCL-like list of VOCs as CH2M Hill's second Vapor Intrusion phase samples. The only text provided by the WVDEP associated with this sampling event described the vapor point sampling techniques and procedures.

TMG Conclusion: The EnviroProbe exterior soil gas results are somewhat distinctive in comparison to the CH2M Hill exterior soil gas results in that the EnviroProbe results show the same constituents with similar concentrations across a wide aerial extent. VOCs in EnviroProbe exterior soil gas results were detected above VISLs (benzene, naphthalene, and vinyl chloride). Note that these COCs do not exceed applicable VISLs in any CH2M Hill exterior soil gas in any area except for one benzene detection in CH2M Hill exterior soil gas point INS-0572 (5-6') (located within the Convocation Center). Also, these COCs do not exceed applicable VISLs in any CH2M Hill groundwater samples in any area except one detection of benzene in the Athletic Facility area and one detection of naphthalene in the Eastern Area (discussed further in Section 3.3.2).

1.2.3 Summary of WVDEP Provided Reports to Review

Following WVDEP's direction, the reports provided and data collected within those reports were reviewed and considered. TMG generally agrees with the primary conclusions presented by CH2M Hill as they are described in the reports; however, in accordance with the WVDEP Work Directive No. DEP17*07A-1, TMG will perform a separate evaluation using all provided information from CH2M Hill and EnviroProbe. In addition, the analytical data will be re-screened against current applicable standards in order to identify any remaining data gaps.

For instance, TMG agrees that it appears COPCs have migrated in groundwater from the UCC property following a predominant south-southeasterly flow direction that is likely influenced by subsurface conditions, including the fly ash-filled impoundments in the southern portion of the site. However, what is not clear is the source of the fly ash and also what the specific sources are on the UCC property that would indicate what specific constituents have migrated to the WVSU property. However, review of the groundwater analytical data from monitoring wells located in the UCC property (Table A-1 in the 2015 Groundwater Monitoring Report) clearly indicates detectable levels of COPCs

present in monitoring wells in close proximity to the WVSU property boundary. In addition, anecdotal data suggests that the fly ash may have originated from the UCC property. One type of fill placement implies the potential for other historic fill placement, permitted or otherwise.

It is unclear based on the review of the available documentation whether fate and transport modeling has been conducted or proposed in order to support constituent migration from the UCC property to WVSU property and to assist in validating the analytical data collected on the WVSU property. Furthermore, it is also not confirmed that fate and transport modeling has been proposed or completed in order to support diffuse groundwater discharge to the surface water of the Kanawha River. However, evaluation of the Kanawha River and any associated ecological receptors were not part of the WVDEP Work Directive No. DEP17*07A-1 and, therefore, these issues were not considered further in this report.

Based on the criteria CH2M Hill used for assessing the analytical data collected (commercial receptor at 1 $x10^{-5}$ target risk and HQ of 1), TMG also concurs with the overall conclusion that for the multiple lines of evidence approach taken for the vapor intrusion evaluation that vapor intrusion may not be significant at the WVSU property. However, as part of this report, TMG will re-screen the available data and perform a further qualitative assessment of the vapor intrusion exposure pathway.

No EnviroProbe reports were provided, so no conclusive statements can be commented upon.

Discussions of the development and assessment of a conceptual site model and data gaps analysis will be presented in Sections 3 and 4 that will allow for completion of a comprehensive HHEE.

2 Analytical Results and Constituents of Concern

All constituents considered related to the UCC property were identified as COPCs. The analytical data in CH2M Hill's reports and the soil gas data table from EnviroProbe were screened using a target carcinogenic risk of 1 x 10^{-5} for commercial/industrial and 1 x 10^{-6} for residential. Following direction from the WVDEP and because the site is not in the VRP, available data were screened for potable water use and vapor intrusion using USEPA criteria with target carcinogenic risks set at 1 x 10^{-6} and noncarcinogenic target risks at a HQ of 0.1 (for both residential and commercial/industrial screening values) to identify constituents of concern (COCs) for potential quantitative analysis. This approach results in a conservative analysis. Any detected COPC that exceeds any of the relevant screening criteria was identified as a COC.

Analytical data tables extracted from the GW and Vapor Intrusion Reports and the EnviroProbe soil gas summary table are presented in Attachment 1. These data tables are presented in their original form and then with a duplicate version containing hand annotated updates to reflect the re-screening requested by the WVDEP. A CH2M Hill modified figure to show all combined site wide groundwater and exterior soil gas sample locations is presented as Figure 2-1.

2.1 Analytical Data and Constituents of Concern

Soil

Review of available reports revealed that no analytical soil quality data were collected. Lithologic soil data were presented in the CH2M Hill GW Report, but no analytical soil sample data were reported. Therefore, no conclusions were able to be made regarding soil quality and vadose zone soil acting as a potential vapor source.

Groundwater

As directed by the WVDEP, groundwater analytical data were re-screened against USEPA tap water RSLs [USEPA 2016a] only (i.e., not MCLs) based on a target carcinogenic risk of 1 x 10^{-6} and an HQ of 0.1. In addition, groundwater analytical data were also screened against USEPA OSWER residential and commercial VISL target groundwater concentrations based on a target risk of 1×10^{-6} and target HQ of 0.1. These

target groundwater concentrations were calculated using the USEPA VISL Calculator, Version 3.5.1, (based on May 2016 RSLs) [USEPA 2016b].

The cumulative groundwater data for the groundwater investigation activities are presented in two forms. First, the EnviroProbe and CH2M Hill monitoring well groundwater data ("MW" and "TW" groundwater samples) were tabulated and screened as described in the above paragraph. This was completed for two purposes, 1) to make a comparison between the two data sets (CH2M Hill versus EnvrioProbe), and, 2) to select COCs. This monitoring well groundwater data are presented in Table 1-1. Second, groundwater analytical data tables ("INS" groundwater samples) in their original form were extracted from the GW report and re-screened as described in the above paragraph. In addition, these groundwater data tables were reviewed for completeness and accuracy. If any inaccuracies were found, these were hand annotated on the second set of pdf files in Attachment 1 for completeness.

As shown on Table 1-1, with some minor disparities between samples, the two sets of sample results (CH2M Hill versus EnviroProbe) from the monitoring wells are relatively comparable over time. There was one exception related to 1,4-dioxane. The quantitation limit reported for this constituent in the EnviroProbe groundwater samples was 100 ug/L, which was higher than the maximum detected concentration in the CH2M Hill groundwater sample set.

Based on the screening, Table 2-1 presents summary statistics and the selection of direct contact groundwater COC and Table 2-2 presents summary statistics and the selection of vapor intrusion groundwater COC. All groundwater samples from all monitoring wells (site-wide) were included to create Tables 2-1 and 2-2. These tables are also segregated into shallow and deep interval samples. Vapor intrusion was only evaluated in the shallow interval samples, except when only a deep interval groundwater sample was collected from an individual well or grab groundwater sample location. As shown in Table 2-1, there were 12 COC in shallow groundwater and 7 COC in deep groundwater samples that exceeded a tap water RSL. As shown in Table 2-2, there were 10 COC in groundwater that exceeded a residential VISL and 3 COC that exceeded a commercial VISL. Specific monitoring wells located within the areas of concern (e.g. Athletic Facility, Faculty Housing, etc.) will be used in Section 3 to evaluate the vapor intrusion pathway.

With the re-screening for direct contact of groundwater, the same COCs that exceeded criteria in CH2M Hill's groundwater evaluation (1,4-dioxane, naphthalene, 1,1-dichloroethane, and dichlorofluoromethane) remained as COCs, and a few other constituents (1,2-dichloroethane, bromodichloromethane, chlorobenzene, and chloroform) now had one or more individual exceedances in this re-screened data set.

Exterior Soil Gas/Indoor Air/Crawl Space Air/Subslab Air/Ambient Air

The exterior soil gas and subslab analytical data were re-screened against USEPA OSWER residential and commercial VISLs for exterior soil vapor [USEPA 2016b] based on a target carcinogenic risk of 1×10^{-6} and an HQ of 0.1. The indoor air and crawl space analytical data were re-screened against USEPA OSWER residential and commercial VISLs for indoor air [USEPA 2016b] based on a target carcinogenic risk of 1×10^{-6} and/or a HQ of 0.1. Exterior soil gas, indoor air, crawl space air, subslab air and ambient air analytical data were used as part of the multiple lines of evidence analysis in conjunction with groundwater for the vapor intrusion pathway analysis. Ambient air analytical results were used to assess the potential for confounding influence on indoor air. Therefore, ambient air samples were not compared to screening criteria.

Maximum detected concentrations of each COPC in the various air media were compared to residential and commercial VISLs to identify vapor intrusion COC. Tables 2-3 through 2-7 present the re-screening statistical summaries for the Athletic Facility Area, Convocation Center Area, Eastern Area, Faculty Housing Area, and Northern Area, respectively. Note that the Athletic Facility and Convocation Center are recreational facilities on the campus and it is noted that some regulatory bodies require this type of building be assessed as a residential scenario. This is a secondary reason why the re-screening of available groundwater and air data was initially done to residential standards to address this potential issue.

Many of the same COCs detected in groundwater samples were also detected in the various air samples. A few new additional COCs were identified and new exceedances of previously identified COCs were observed based on the more conservative screening. Evaluations of the various cumulative air (ambient, indoor, crawl space) and soil gas (sub-slab and exterior) COCs relative to each other are discussed by area in Section 3 including the EnviroProbe exterior soil gas results. The previously unpublished

EnviroProbe soil gas figure presenting sample locations and soil gas COCs with VISL exceedances is presented as Figure 2-2.

3 Conceptual Site Model

This section presents the conceptual site model developed for the site and includes a hydrogeologic CSM, a preliminary exposure pathway evaluation, and a human health CSM.

3.1 Hydrogeologic Conceptual Site Model

The hydrogeological conceptual model in this section was excerpted from the CH2M Hill GW Report with no intent to change the technical hydrogeological interpretation. Components of the hydrogeological interpretation are important to the overall conceptual model as it pertains to migration routes and potential exposure pathways. The unmodified figures from the CH2M Hill GW Report referenced in this section are included in Attachment 2 for completeness and reference.

Groundwater across the investigation area is found at approximately 20 ft-bgs and the bedrock surface is 50 or more ft-bgs. Along the property line between the UCC property and WVSU, groundwater flow is to the south-southeast toward the WVSU property (Attachment 2 - Figure 7). On the WVSU property, groundwater flow becomes southerly, with flow heading toward the Kanawha River.

The direction of groundwater flow along the property line appears to be influenced by the following factors:

- The presence of thicker, more permeable sands, creating a preferential flow path in the deeper aquifer toward the Kanawha River (Attachment 2 - Figures 4 and 5); and,
- A historical surface water drainage identified on the southern half of the WVSU property that discharged to the Kanawha River (Attachment 2 - Figure 6).

Groundwater flow appears to generally follow the alignment of the historical drainage and the underlying thicker, more permeable aquifer at depth. Historically, there were two surface water drainages within the investigation area that were filled in over the years, as indicated on historical aerial photographs and topographic maps. These features are important because they appear to influence subsurface groundwater flow patterns and may influence the presence of COPCs detected in groundwater. In the late 1950s, the northwestern drainage was impounded and two surface water bodies are noted in a

historical photograph from 1955. The extent of these former features is shown on Attachment 2 Figure 6. The artificial impoundments and local drainage were filled in by 1971 based on a historical aerial photograph.

Fill material was reported in the boring logs for eight of the borings installed in the southern portion of the WVSU property. Accumulations of fly ash up to 27 feet were reported in TW-107 and 26 feet in INS-0470.

The shallow and deep 1,4-dioxane and the shallow 1,1-dichloroethene concentration plume figures in the CH2M Hill GW Report (Figures 8, 9 and 11 in Attachment 2) have been used as a "marker" by TMG to depict the apparent extent of COPCs migrating from the UCC property onto the WVSU property.

3.2 Preliminary Exposure Pathway Evaluation

A preliminary evaluation of potential exposure pathways is included in this section to qualitatively eliminate those pathways that are known to be incomplete or determined to result in a negligible or de minimis risk. The following preliminary exposure pathways were considered for evaluation:

- Potable groundwater use;
- Volatilization to trench air and outdoor air exposures;
- Direct contact soil exposures; and,
- Vapor intrusion indoor air exposures.

3.2.1 Potable Groundwater Use

As reported in the CH2M Hill Phase I Eastern Property Boundary Investigation Report, there are no drinking water wells on-site and no known groundwater potable use on-site. In addition, CH2M Hill recommended that an environmental covenant be placed on the property to prohibit groundwater use on the property. Although there are a number of tap water RSL exceedances in the overburden water-bearing zone on-site, this exposure pathway can be eliminated. ***Therefore, no groundwater COCs will be carried through for quantitative risk analysis based on groundwater potable use.*** Note, even though groundwater potable use exposure pathways have been deemed incomplete on-site and a covenant has been proposed by CH2M Hill, the potential for groundwater impacts to affect the Kanawha River and downgradient surface water intakes has not been evaluated.

3.2.2 Volatilization to Trench Air and Outdoor Air Exposures

The water table is approximately 20 ft-bgs. Typical trench depths for construction or utility worker scenarios would be 8 to 10 ft-bgs at a maximum. Without knowledge of the soil quality in the shallow subsurface, the difference between the maximum trench depth and the water table depth is expected to result in a negligible potential for volatilization to trench air given the minimum separation distance of 10 feet between the bottom of the trench and water table. The minimum separation distance of 10 feet would allow for significant attenuation capacity. In addition, the maximum concentrations were compared to tap water RSLs based on a target risk of 1×10^{-6} and HQ of 0.1. However, in actuality, the applicable exposure pathway would be limited to inhalation of volatiles in trench air only (i.e. not potable use exposure pathways).

Furthermore, because of the distance between the water table and the ground surface, volatilization to outdoor air during non-intrusive activities and exposure to ambient air based on the Vapor Intrusion investigation represents a de minimis potential risk. ***Therefore, these exposure pathways were also eliminated and no quantitative risk analysis will be completed for these exposure pathways.***

3.2.3 Direct Contact Soil Exposures

Based on the depth to groundwater, the only potential direct contact exposures would be to soil. ***However, since soil quality is unknown, these exposures pathways also cannot be evaluated.***

3.2.4 Vapor Intrusion Indoor Air Exposures

Vapor intrusion exposures to indoor air are considered a complete exposure pathway. The vapor intrusion to indoor air exposure pathway will be evaluated by area in more detail following presentation of the human health CSM and evaluation of migration routes below.

3.3 Human Health Conceptual Site Model

The CSM is a comprehensive view of the site that integrates the various components of the overall environmental setting, including: site geology, hydrogeology, and hydrology; the current distribution and migration of site-related COCs; and potential receptors (both current and future) that may contact site-related COCs through potential exposure

pathways associated with various on-site activities. This HHEE focuses specifically on on-site exposures.

The CSM process was completed in accordance with WVDEP guidance (VRRA 2001). The overall CSM can be broken down into a geologic and hydrogeologic component (e.g. evaluation of transport pathways) and a human health exposure component (e.g. evaluation of exposure pathways). The CSM identifies those potentially complete transport and exposure pathways which may need to be quantitatively evaluated in a site-specific risk assessment to determine whether risk-based benchmarks are met.

Potential constituent migration routes and potential receptors are assessed in this section to determine whether potentially complete exposure pathways exist at the site. An exposure pathway is considered complete if all four of the following elements exist: 1) a potential source of COC; 2) a potential transport mechanism to an exposure medium (this is not needed if the source medium is the exposure medium); 3) contact between a potential receptor and the exposure medium; and, 4) an uptake mechanism associated with the potential receptor.

3.3.1 Potential Constituent Migration Routes

The evaluation of migration routes are based on the detection of constituents and is independent of whether those constituents exceed applicable screening criteria or not.

Following the preliminary evaluation and elimination of certain exposure pathways in Section 3.2, the most likely remaining constituent migration routes are:

- Groundwater migration from UCC Property to WVSU Property – This migration route is retained based on the detections of constituents in groundwater samples from monitoring wells located along the western WVSU property boundary and their potential to continue to migrate further onto the WVSU property.
- Soil vapor migration to indoor air – This migration route is retained based on the detection of constituents in groundwater samples from wells located within close proximity to existing buildings on-site and exterior soil gas and subslab samples collected within or adjacent to existing on-site buildings.
- Outdoor air to indoor air – There is the potential for outdoor air to influence indoor air quality. This was evaluated using ambient air samples.

Note because there are no vadose zone analytical data to identify the potential for VOC impacts, the contribution of VOCs migrating from soil to soil vapor cannot be assessed.

3.3.2 Vapor Intrusion Exposure Pathway

COCs for the vapor intrusion analysis were evaluated by area in a similar fashion as completed in the CH2M Hill report. Areas include: Athletic Facility Area, Convocation Center Area, Eastern Area, Faculty Housing Area, and Northern Area. As explained in Section 1, the Northern Area was a previously undefined area only sampled by EnviroProbe in the northern portion of the WVSU property. The groundwater and exterior soil gas sampling locations are shown on Figure 2-1. The ambient air, indoor air, crawl space, and subslab soil gas sampling locations are presented in various figures in Attachment 2.

Following USEPA guidance (OSWER Vapor Intrusion Guidance 2015), a multiple lines of evidence approach was followed. COCs were evaluated by using the following hierarchy: indoor air, crawl space, subslab soil gas, exterior soil gas, and groundwater. Additionally, ambient air data were evaluated as a comparative analysis to assist in validating the indoor air data.

Other indoor sources such as chemicals and cleaners used or stored in the building, or construction materials including carpeting, may affect indoor air quality data. These alternate sources of COCs could present confounding variables in the analysis of indoor air. In many cases, it is difficult to discern the difference between these "background" influences and vapor intrusion sources.

COCs are presented in Tables 2-3 through 2-7 for the Athletic Facility Area, Convocation Center Area, Eastern Area, Faculty Housing Area, and Northern Area, respectively. Results of each of these areas is presented in the following sections. Note that COCs qualified due to blank contamination during CH2M Hill's comprehensive data validation process were treated as nondetected results for risk screening. Additionally, split sample results were considered separate but relevant additional sampling results for a sampled location. Field duplicates were not included in the dataset for evaluating vapor intrusion. Finally, samples collected from shallow groundwater depths were considered relevant for vapor intrusion when a sampling location had both a shallow and deep groundwater

sample collected, except in the case when only a deep water sample was collected from a well or grab sample location. In that case, the deep groundwater sample was used to evaluate vapor intrusion.

Athletic Facility Area

Ten indoor air samples (INST-AF-IA01 through INST-AF-IA10), 1 ambient air sample (INST-AF-AA01), 1 exterior soil gas sample (VP-1), and 5 groundwater samples (TW-110 with 2 events, INS-0388, INS-0390, and INS-0467) were collected as part of the vapor intrusion assessment for the Athletic Facility Area. Table 2-3 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Athletic Facility Area re-screened against current applicable screening criteria. Figure 3-1 is a modified version of Figure 7 from the Vapor Intrusion Report to reflect updates via re-screening.

The following constituents were identified as COCs:

- Chloroform (indoor air, groundwater)
- Benzene (exterior soil gas, groundwater)
- 1,1-Dichloroethane (groundwater)
- Chlorobenzene (groundwater)

Chloroform

Chloroform was detected in 1 of 10 indoor air samples above the residential VISL in sample location INST-AF-IA04. No other COCs were detected in indoor air above residential screening criteria. Note that chloroform was not detected in the EnviroProbe soil gas sample VP-1 collected near the Athletic Facility. However, VP-1 is located north and sidegradient of the Athletic Facility (i.e. not near groundwater sampling locations INS-0390 and TW-110, located west of the building).

Chloroform was also detected above the residential VISL in groundwater sample INS-0390 and both deep groundwater samples from TW-110. Chloroform also exceeded the commercial VISL in groundwater sample INS-0390. This may suggest a potential vapor

intrusion connection between groundwater in INS-0390 and TW-110 and indoor air. However, groundwater samples from INS-0387 and INS-0389 (located upgradient of the Athletic Facility and closer to the WVSU western property boundary) had no detections of chloroform. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and the chloroform detection in indoor air was not above the commercial VISL even at the more restrictive target risk (1×10^{-6}) and HQ (0.1) used for screening purposes.

Benzene

Benzene was not detected in any indoor air samples collected from the Athletic Facility. Benzene was identified as a COC in exterior soil gas sample VP-1 located in the Athletic Facility Area. Benzene also exceeded a residential VISL in groundwater at INS-0390. However, benzene was not detected in groundwater samples from INS-0387 and INS-0389 (located upgradient of the Athletic Facility and closer to the WVSU western property boundary). Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and benzene was not detected in indoor air.

1,1-Dichloroethane (1,1-DCA)

1,1-DCA was not detected in any indoor air samples collected from the Athletic Facility. In addition, 1,1-DCA was not detected in exterior soil gas sample VP-1. This constituent exceeded the residential VISL in one groundwater sample from TW-110. 1,1-DCA was not detected in INS-0387 and a detection below the residential VISL in groundwater sample INS-0389 (located upgradient of the Athletic Facility and closer to the WVSU western property boundary). Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and 1,1-DCA was not detected in indoor air.

Chlorobenzene

Chlorobenzene was detected in indoor air, but did not exceed the residential VISL. Chlorobenzene was not detected in exterior soil gas sample VP-1. Chlorobenzene exceeded the residential VISL in groundwater samples from INS-0388 and INS-0390, but was not detected in upgradient groundwater sampling locations INS-0387 and INS-0389. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and

chlorobenzene did not have any exceedances in indoor air.

Trichlorofluoromethane (TCFM)

There are no USEPA screening criteria available for TCFM. TCFM was detected in every indoor air sample collected from the Athletic Facility and was the only detection reported in the ambient air sample (INST-AF-AA01) collected in the vicinity of the Athletic Facility Area. Because TCFM does not have USEPA screening criteria, there will be no further discussion of TCFM; however, this constituent will remain a COPC (i.e. not a COC).

Note that the Athletic Facility is a recreational facility on the campus and it was noted that some regulatory bodies require this type of building be assessed as a residential scenario, which is one reason why the re-screening of available groundwater and air data was initially done to residential standards to address this potential issue. However, based on the fact that no one resides at the Athletic Facility, commercial screening criteria for assessing whether COCs should be quantitatively evaluated would be considered appropriate. ***Therefore, no COCs will be carried through for quantitative evaluation for the Athletic Facility Area (see Table 2-3).***

Convocation Center Area

Fifteen indoor air samples (INST-CC-IA01 through INST-CC-IA15), 1 crawl space sample location under the steps (INST-CC-CS01), 1 ambient air sample (INST-CC-AA01), 4 exterior soil gas samples (INS-0572 [5-6', 12-13', and 12-13' split sample] and VP-5), and 1 shallow groundwater sample (CH2M Hill sample from TW-106) were collected as part of the vapor intrusion assessment for the Convocation Center Area. Table 2-4 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Convocation Center Area re-screened against current applicable screening criteria. Figure 3-2 is a modified version of Figure 8 from the Vapor Intrusion Report to reflect updates via re-screening.

The following constituents were identified as COCs:

- Chloroform (indoor air);

- Benzene (exterior soil gas);
- Dichlorodifluoromethane (exterior soil gas, groundwater); and,
- Naphthalene (exterior soil gas).

Chloroform

Chloroform was detected in 1 of 15 indoor air samples (INST-CC-IA01 through INST-CC-IA15) above the residential VISL in indoor air sample INST-CC-IA05. Chloroform did not exceed the commercial VISL even at the more restrictive target risk and HQ used for screening purposes. No other COCs were detected in indoor air above residential screening criteria. Chloroform was not detected in the crawl space sample (INST-CC-CS01), any exterior soil gas samples (VP-5 and INS-0572 [5-6' and 12-13']), or the shallow groundwater sample (TW-106, located adjacent to and west of the Convocation Center) relevant to the Convocation Center Area. In addition, chloroform was not detected in any upgradient wells from the Convocation Center Area (i.e. MW-104, TW-104, and TW-108, located west and northwest of the Convocation Center).

Benzene

Benzene was not detected in any indoor air samples or the crawl space sample from the Convocation Center. Benzene exceeded the residential VISL in 2 out of 4 exterior soil gas samples (i.e. VP-5 and INS-0572 [5-6']). This constituent was not detected in the shallow groundwater sample from TW-106 or upgradient wells MW-104, TW-104, and TW-108. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and benzene did not have any detections in indoor air.

Dichlorodifluoromethane (DCDFM)

DCDFM was not detected in any indoor air samples or the crawl space sample from the Convocation Center. This constituent exceeded the residential VISL in one exterior soil gas sample (INS-0572 [5-6']). DCDFM was not detected in the shallow groundwater sample from TW-106 or upgradient wells MW-104, TW-104, and TW-108. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and DCDFM did not have any detections in indoor air.

Naphthalene

Naphthalene was not analyzed in any indoor air samples or the crawl space sample from the Convocation Center. Naphthalene exceeded the residential VISL in one exterior soil gas sample (VP-5). Naphthalene was not detected in the exterior soil gas samples from INS-0572. This constituent was not detected in the shallow groundwater sample from TW-106 or upgradient wells MW-104, TW-104, and TW-108. The naphthalene detection in the exterior soil gas sample VP-5 was not above the commercial VISL even at the more restrictive target risk (1×10^{-6}) and HQ (0.1) used for screening purposes.

Trichlorofluoromethane (TCFM)

There are no USEPA screening criteria available for TCFM. TCFM was detected in every indoor air sample collected from the Convocation Center and was the only detection reported in the ambient air sample (INST-CC-AA01) collected in the vicinity of the Convocation Center Area. Because TCFM does not have USEPA screening criteria, there will be no further discussion of TCFM; however, this constituent will remain a COPC (i.e. not a COC).

Note that the Convocation Center is a recreational facility on the campus and it was noted that some regulatory bodies require this type of building be assessed as a residential scenario, which is one reason why the re-screening of available groundwater and air data was initially done to residential standards to address this potential issue. However, based on the fact that no one resides at the Convocation Center, commercial screening criteria for assessing whether COCs should be quantitatively evaluated would be considered appropriate. ***Therefore, no COCs will be carried through for quantitative evaluation for the Convocation Center Area (see Table 2-4).***

Eastern Area

The Eastern Area differs from the other vapor intrusion investigative areas as there are no current enclosed structures that could be regularly occupied by humans. So, this vapor intrusion evaluation is based solely on exterior soil gas and groundwater data on a future structure. Five exterior soil gas samples (INS-0569 [5-6' and 13-14'] and INS-0571 [5-6', 5-6' split sample, and 11-12']), and 2 groundwater samples (CH2M Hill shallow

groundwater sample from TW-107 and shallow grab from INS-0570) were collected as part of the vapor intrusion assessment for the Eastern Area. Table 2-5 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Eastern Area re-screened against current applicable screening criteria. Figure 3-3 is a modified version of Figure 9 from the Vapor Intrusion Report to reflect updates via re-screening.

The following constituents were identified as COCs:

- Naphthalene (groundwater); and,
- 1,2-Dichloroethane (groundwater).

Naphthalene

Naphthalene was not detected in any exterior soil gas samples located within the Eastern Area. Naphthalene was not detected in shallow groundwater sample INS-0570, but was detected and exceeded the residential VISL in TW-107. Note that naphthalene did not exceed the commercial VISL in groundwater.

1,2-Dichloroethane (1,2-DCA)

1,2-DCA was not detected in any exterior soil gas samples located within the Eastern Area. 1,2-DCA was not detected in shallow groundwater sample INS-0570, but was detected and exceeded the residential VISL in TW-107. Note that 1,2-DCA did not exceed the commercial VISL in groundwater.

Based on USEPA's vapor intrusion hierarchy, exterior soil gas would have highest precedence in this case. ***Therefore, no COCs will be carried through for quantitative evaluation for the Eastern Area (see Table 2-5).***

Faculty Housing Area

Thirteen indoor air samples (INST-FR-IA01 through INST-FR-IA06 with 2 events each plus a split sample collected in the 2nd event), 2 crawl space samples (INST-FR-CS01 including a split sample), 3 ambient air samples (INST-FR-AA01 with 2 events plus a split sample collected in the 2nd event), 4 subslab soil gas samples (INST-FR-SS01 with 2

events and a split sample on the 2nd event, and INST-FR-SS02), 10 exterior soil gas samples (INS-0560 [5-6' and 16-17'], INS-0562 [5-6' and 11-12'], INS-0564 [5-6' and 17.5-18.5'], INS-0565 [16-17'], VP-1, VP-3, and VP-4), and 5 groundwater samples (TW-111 with 2 events, INS-0465, INS-0559, and INS-0563) were collected as part of the vapor intrusion assessment for the Faculty Housing Area. Table 2-6 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Faculty Housing Area re-screened against current applicable screening criteria. Figure 3-4 is a modified version of Figure 10 from the Vapor Intrusion Report to reflect updates via re-screening.

The following constituents were identified as COCs:

- 1,2-Dichloroethane (indoor air, exterior soil gas);
- Acrylonitrile (indoor air);
- Benzene (indoor air, exterior soil gas, crawl space);
- Carbon tetrachloride (indoor air, crawl space);
- Chloroform (indoor air, exterior soil gas);
- Naphthalene (indoor air, exterior soil gas);
- 1,2,4-Trimethylbenzene (exterior soil gas);
- 1,2-Dichloropropane (exterior soil gas);
- Trichloroethylene (exterior soil gas);
- Vinyl Chloride (exterior soil gas); and,
- Benzyl Chloride (crawl space).

Given the complexity of the vapor intrusion analysis for the Faculty Housing Area, a different evaluation was completed for this section. Table 3-1 presents a summary of applicable VISLs exceedances for each media and indicates each location that has an

exceedance.

As discussed previously in this report, the premise for potential vapor intrusion impacts and/or indoor air impacts was the migration of constituents via groundwater flow from the UCC property to the WVSU property. Because no vadose zone soil samples were collected, it is difficult to determine alternative subsurface sources separate from the groundwater acting as a potential subsurface source. In addition, ambient air data were also considered as a potential source for indoor air impacts. Therefore, Table 3-1 shows the following:

- The COCs that were detected in air/soil gas samples either had no detections in groundwater or the COCs were not analyzed in groundwater because they were not considered to be related to the UCC property.
- Two COCs had detections in ambient air samples at equivalent concentrations as found in the indoor air samples.
- There were either no detections or no exceedances in subslab soil gas samples.
- With no likely groundwater subsurface source beneath the house and apparent similarities between indoor, crawl space, and ambient air samples, this suggests that the COPC (ambient air only) and COC detections in indoor air may be attributed to sources other than vapor intrusion. This could mean other interior background sources. This could also be from an unidentified exterior source other than the dissolved-phase plume that migrated onto the WVSU property. This potential for an unidentified interior or exterior sources could bias the vapor intrusion assessment.

Therefore, no COCs will be carried through for quantitative evaluation for the Faculty Housing Area (see Table 2-6).

Northern Area

Part of the EnviroProbe exterior soil gas sampling program included installation and sampling of 6 vapor point locations in the northern area of the campus away from the groundwater plume and other previous vapor intrusion investigations. These additional

locations appeared to target specific on-site buildings including dormitories (Dawson Hall and Judge Keith Scholars [JKS] Hall) and student gathering locations (Quad and Student Union). VP-6 was used to evaluate the Quad, VP-7 was used to evaluate Dawson Hall, VP-9 and VP-10 were used to evaluate JKS Hall, and VP-11 and VP-13 were used to evaluate the Student Union.

The maximum detected soil gas concentrations from these locations were re-screened against applicable screening criteria and are presented on Table 2-7.

Benzene and naphthalene were the only COCs retained in the Northern Area soil gas points. The following summarizes the exceedances for each building/area in the Northern Area:

- **Quad**: benzene and naphthalene exceed the residential VISL based on a target risk of 1 x 10^{-6} and target HQ of 0.1. However, these COC do not exceed the commercial VISLs based on a target risk of 1 x 10^{-6} and target HQ of 0.1.

- **Dawnson Hall**: benzene and naphthalene exceed the residential VISL based on a target risk of 1 x 10^{-6} and target HQ of 0.1. However, these COC would not exceed the residential VISLs based on a target risk of 1 x 10^{-5} and target HQ of 1.

- **JKS Hall**: benzene and naphthalene exceed the residential and commercial VISL based on a target risk of 1 x 10^{-6} and target HQ of 0.1. However, these COC would not exceed the residential VISLs based on a target risk of 1 x 10^{-5} and target HQ of 1.

- **Student Union**: benzene and naphthalene exceed the residential VISL based on a target risk of 1 x 10^{-6} and target HQ of 0.1. However, these COC do not exceed the commercial VISLs based on a target risk of 1 x 10^{-6} and target HQ of 0.1.

Finally, there are 4 groundwater sampling locations located close to and south of the Northern Area. These wells are INS-0553, INS-0554, INS-0573, and INS-0574. Only deep groundwater samples were collected from these sampling locations. However, only 1,4-Dioxane was detected in 3 of the 4 deep groundwater samples, but below the residential VISL. Note acetone was detected in INS-0554, but this constituent is believed to be a common lab contaminant. Also, groundwater flow direction from these sampling

locations is south/southeast, flowing away from the Northern Area.

Therefore, no COCs will be carried through for quantitative evaluation for the Northern Area (see Table 2-7).

4 Data Gaps Analysis

In accordance with the Work Directive No. DEP17*07A-1, a data gap analysis has been completed in order to identify critical factors that could potentially affect the conclusions of this HHEE. In some cases, data gaps were identified by CH2M Hill and were considered as part of the evaluation in this report. The following sections specifically identify various data gaps by media.

4.1 Soil

The primary objective of this analysis is to have a comprehensive understanding of potential human health exposures. Therefore, an important data gap was identified to satisfy this objective. The lack of shallow subsurface soil quality data on-site was identified as a data gap. This is based on the premise that alternate sources of COCs may be present in various media (e.g. groundwater and indoor, air). These could have originated from the placement of fill, waste disposal activities, or incidental/accidental spills or releases on-site. Without direct knowledge or evidence to indicate impacts to the vadose zone, it is difficult to assess the potential for these alternate sources to either leach to groundwater to or volatilize to indoor air. In addition, without soil quality data, evaluation of potential direct contact exposures (e.g. ingestion, dermal contact, etc.) with soil is not possible.

CH2M Hill suggested the fly ash-filled in impoundments could be a source of vapor intrusion COCs. It is highly unlikely the VOCs were contained within the fly ash, unless the deposited fly ash had other materials included within its matrix. The primary concern with fly ash would be metals. Anecdotal information suggests the fly ash could have originated from the UCC property from the coal-fired residue burner historically operated on that facility.

4.2 Groundwater

Because there is a lack of soil quality data, there remains a data gap relative to the potential for vadose zone to impact the groundwater and act as an alternative source of COCs in groundwater, soil gas, and indoor air as compared to the COCs that have potentially migrated in groundwater from the UCC property to the WVSU property.

The cumulative groundwater dataset from all CH2M Hill and EnviroProbe investigations resulted in only 1 or 2 events

4.3 Air

The following data gaps were identified for the various air (indoor air, crawl space, and ambient air) and soil gas (exterior soil gas and subslab soil gas) media:

- Some COCs were detected above their respective residential VISLs in groundwater and in exterior soil gas samples but were not analyzed in corresponding indoor air samples. Having different sets of analytical parameters lists among the various media makes it difficult to evaluate the potential migration of COCs from one media to another.

- Only 3 buildings out of 40 plus on-site were evaluated for vapor intrusion. Building on the fact that there is the potential for unidentified deposited material within the vadose zone, there could be potential vapor intrusion issues from vadose zones sources with other buildings on-site that have not been investigated. However, the unoccupied residence in the Faculty Housing area is likely to represent the worst-case on-site residential exposure being closest to the groundwater plume.

4.4 Robustness of the Datasets

Even though no quantitative evaluation for indoor air exposure is recommended, the following elements are a few things that may suggest the potential need for further evaluation:

- The site has a complex conceptual site model in regards to constituent migration and potential sources of vapor intrusion COCs. The main premise for the various investigations for the presence of COCs on the WVSU property was based on the potential migration of impacted groundwater from the UCC property. However, other than the vapor intrusion sources identified by CH2M Hill, there is the potential for alternate sources of COCs from deposited material in the vadose zone, which may lead to a lack of samples in other potential sources areas.

- There is some disparity in the samples collected from various consultants. For example, the EnviroProbe exterior soil gas samples had unusually consistent results for benzene across all VP samples. Theses VP samples cover a wide area across the WVSU property with unidentifiable potential vapor intrusion sources. Another example is that the EnviroProbe groundwater samples had a high detection limit for 1,4-Dioxane (i.e. <100 ug/L) while the groundwater samples from CH2M Hill had this constituent detected essentially across all groundwater sampling locations. Note that these are only examples and there may be other disparities not mentioned here.

- The analytical datasets from the various consultants present some noted confounding variables. For example, there were detections of constituents in ambient air, where this media has been reported by various regulatory agencies to potentially affect indoor air quality. Note that these are only examples and there may be other confounding variables not mentioned here.

- There is a limited dataset across all media with generally 1 round of data (2 rounds in some groundwater).

Based on this information, there could be a data gap in regards to the robustness of the analytical dataset. This could potentially affect the overall quality of the datasets and subsequently affect the quality of the CSM and human health exposure analysis. Because of this data gap, only limited conclusions can be drawn for the exposure pathway analysis.

Statement of Limitations

This document is prepared for the West Virginia Department of Environmental Protection (WVDEP) in accordance with Work Directive No. DEP17*07A-1. This report was prepared based on the information supplied by and under direction of the WVDEP. The results of the HHEE presented in this report apply to the existing and reasonably foreseeable site conditions at the time of this assessment. This HHEE is based only on the current site conditions defined by the analytical data and does not assess potential future releases. Changes in the conditions of the property may occur with time due to natural processes or works of man at the site or on adjacent properties. Changes in applicable standards and toxicity criteria may also occur as a result of legislation or the broadening of knowledge. As a result, if any of the exposure assumptions and/or assessment change in the future for this site, the results of this analysis may not apply. The Mahfood Group LLC® is not responsible for the misinterpretation or misuse of this HHEE analysis.

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Tables

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Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	MW-104 MW104-GW-071115 7/11/2015 23-33 Investigation Shallow CH2M	TW-102 TW102-GW01-070915 7/9/2015 8.5-12.5 Investigation Shallow CH2M	TW-102 TW102-GW02-070915 7/9/2015 38-42 Investigation Deep CH2M	TW-103 TW103-GW01-070815 7/8/2015 18-22 Investigation Shallow CH2M
Semivolatile Organic Compounds (ug/L)								
1,4-Dioxane	123-91-1	0.46	2900	13000	**0.85** /Gw	**0.59** L/Gw	< 0.2	< 0.21
Isophorone	78-59-1	78	Nav	Nav	< 1	< 1	< 1	< 1
Naphthalene	91-20-3	0.17	4.6	20	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Organic Compounds (ug/L)								
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	75-35-4	28	20	82	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	< 0.5	< 0.5	< 0.5
Acetone	67-64-1	1400	2300000	9500000	< 5	< 5	9.2	6
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	108-90-7	7.8	41	170	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	67-66-3	0.22	0.81	3.6	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	127-18-4	4.1	5.8	24	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	108-88-3	110	1900	8100	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 0.5	< 0.5	< 0.5	< 0.5
Additional Detected Constituents from Env Probe Investigation								
Chloromethane	74-87-3	19	26	110	NA	NA	NA	NA
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA	NA	NA	NA
Acenaphthene	83-32-9	53	Nav	Nav	NA	NA	NA	NA
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	NA	NA	NA
Anthracene	120-12-7	180	Nav	Nav	NA	NA	NA	NA
Fluoranthene	206-44-0	80	Nav	Nav	NA	NA	NA	NA
Fluorene	86-73-7	29	Nav	Nav	NA	NA	NA	NA
Phenanthrene	85-01-8	Nav	Nav	Nav	NA	NA	NA	NA
Pyrene	129-00-0	12	Nav	Nav	NA	NA	NA	NA
Criteria Exceeded in Sample					/Gw	/Gw		

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-103 TW103-GW02-070815 7/8/2015 48-52 [1] Investigation Deep CH2M	TW-103 TW103-GW-080115 8/1/2015 47-57 Investigation Deep CH2M	TW-104 TW104-GW01-062515 6/25/2015 16-20 Investigation Shallow CH2M	TW-104 TW104-GW02-062515 6/25/2015 46-56 [2] Investigation Deep CH2M
Semivolatile Organic Compounds (ug/L)								
1,4-Dioxane	123-91-1	0.46	2900	13000	< 0.2	< 0.2	< 0.22	**8.5** /Gw
Isophorone	78-59-1	78	Nav	Nav	< 1	< 1	< 1	< 1
Naphthalene	91-20-3	0.17	4.6	20	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Organic Compounds (ug/L)								
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	75-35-4	28	20	82	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	< 0.5	< 0.5	< 0.5
Acetone	67-64-1	1400	2300000	9500000	< 5	< 5	< 5	< 5
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	108-90-7	7.8	41	170	< 0.5	< 0.5	**12** /Gw	< 0.5
Chloroform	67-66-3	0.22	0.81	3.6	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 0.5	< 0.5	< 0.5	**22** /Gw/Vr/Vc
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	127-18-4	4.1	5.8	24	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	108-88-3	110	1900	8100	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 0.5	< 0.5	< 0.5	< 0.5
Additional Detected Constituents from Env Probe Investigation								
Chloromethane	74-87-3	19	26	110	NA	NA	NA	NA
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA	NA	NA	NA
Acenaphthene	83-32-9	53	Nav	Nav	NA	NA	NA	NA
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	NA	NA	NA
Anthracene	120-12-7	180	Nav	Nav	NA	NA	NA	NA
Fluoranthene	206-44-0	80	Nav	Nav	NA	NA	NA	NA
Fluorene	86-73-7	29	Nav	Nav	NA	NA	NA	NA
Phenanthrene	85-01-8	Nav	Nav	Nav	NA	NA	NA	NA
Pyrene	129-00-0	12	Nav	Nav	NA	NA	NA	NA
Criteria Exceeded in Sample							/Gw	/Gw/Vr/Vc

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-104 TW104-GW-080115 8/1/2015 45-55 Investigation Deep CH2M	TW-105 TW105-GW01-062515 6/25/2015 17-21 Investigation Shallow CH2M	TW-105 TW105-GW-073115 7/31/2015 48-58 Investigation Deep CH2M	TW-105 TW105-GW-011416 1/14/2016 48-58 Investigation Deep CH2M	TW-105 TW-105-GW-011416D 1/14/2016 48-58 Duplicate Deep CH2M
Semivolatile Organic Compounds (ug/L)									
1,4-Dioxane	123-91-1	0.46	2900	13000	**3.7** /Gw	< 0.21	< 0.2	< 0.21	< 0.2
Isophorone	78-59-1	78	Nav	Nav	< 1	< 1	< 1	< 1	< 1
Naphthalene	91-20-3	0.17	4.6	20	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Organic Compounds (ug/L)									
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	75-35-4	28	20	82	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acetone	67-64-1	1400	2300000	9500000	< 5	< 5	< 5	< 5	< 5
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	108-90-7	7.8	41	170	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	67-66-3	0.22	0.81	3.6	< 0.5	< 0.5	**3.1** /Gw/Vr	< 0.5	< 0.5
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	**1** /Vr	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	127-18-4	4.1	5.8	24	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	108-88-3	110	1900	8100	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Additional Detected Constituents from Env Probe Investigation									
Chloromethane	74-87-3	19	26	110	NA	NA	NA	NA	NA
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	53	Nav	Nav	NA	NA	NA	NA	NA
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	NA	NA	NA	NA
Anthracene	120-12-7	180	Nav	Nav	NA	NA	NA	NA	NA
Fluoranthene	206-44-0	80	Nav	Nav	NA	NA	NA	NA	NA
Fluorene	86-73-7	29	Nav	Nav	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	Nav	Nav	Nav	NA	NA	NA	NA	NA
Pyrene	129-00-0	12	Nav	Nav	NA	NA	NA	NA	NA
Criteria Exceeded in Sample					/Gw/Vr		/Gw/Vr		

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-105 TW-105 9/20/2016 48-58 Investigation Deep Env Probe	TW-106 TW106-GW01-062515 6/25/2015 17-21 Investigation Shallow CH2M	TW-106 TW106-GW-080115 8/1/2015 48-58 Investigation Deep CH2M	TW-106 TW106-GW-011416 1/14/2016 48-58 Investigation Deep CH2M	TW-106 TW-106 9/21/2016 48-58 Investigation Deep Env Probe
Semivolatile Organic Compounds (ug/L)									
1,4-Dioxane	123-91-1	0.46	2900	13000	< 100	< 0.23	**2** /Gw	**1.7** /GW	< 100
Isophorone	78-59-1	78	Nav	Nav	NA	< 1	< 1	< 1	NA
Naphthalene	91-20-3	0.17	4.6	20	< 0.11	< 0.6	< 0.5	< 0.5	< 0.11
Volatile Organic Compounds (ug/L)									
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
1,1-Dichloroethene	75-35-4	28	20	82	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Acetone	67-64-1	1400	2300000	9500000	< 10.0	< 5	< 5	< 5	< 10.0
Benzene	71-43-2	0.46	1.6	6.9	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Chlorobenzene	108-90-7	7.8	41	170	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Chloroform	67-66-3	0.22	0.81	3.6	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 1.0	< 0.5	**17** /Vr/Vc	**17** J/Vr/Vc	**1.2** /Vr
Ethylbenzene	100-41-4	1.5	3.5	15	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Tetrachloroethene	127-18-4	4.1	5.8	24	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Toluene	108-88-3	110	1900	8100	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 1.0	< 0.5	< 0.5	< 0.5	< 1.0
Additional Detected Constituents from Env Probe Investigation									
Chloromethane	74-87-3	19	26	110	5.2	NA	NA	NA	< 1.0
Bromodichloromethane	75-27-4	0.13	0.88	3.8	< 1.0	NA	NA	NA	< 1.0
1,1,1-Trichloroethane	71-55-6	800	740	3100	< 1.0	NA	NA	NA	< 1.0
Acenaphthene	83-32-9	53	Nav	Nav	< 0.11	NA	NA	NA	< 0.11
Acenaphthylene	208-96-8	Nav	Nav	Nav	< 0.11	NA	NA	NA	< 0.11
Anthracene	120-12-7	180	Nav	Nav	< 0.11	NA	NA	NA	< 0.11
Fluoranthene	206-44-0	80	Nav	Nav	< 0.11	NA	NA	NA	< 0.11
Fluorene	86-73-7	29	Nav	Nav	< 0.11	NA	NA	NA	< 0.11
Phenanthrene	85-01-8	Nav	Nav	Nav	< 0.11	NA	NA	NA	< 0.11
Pyrene	129-00-0	12	Nav	Nav	< 0.11	NA	NA	NA	< 0.11
Criteria Exceeded in Sample							/Gw/Vr/Vc	/Gw/Vr/Vc	/Vr

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-107 TW107-GW01-070715 7/7/2015 17-21 Investigation Shallow CH2M	TW-107 TW107-GW-073015 7/30/2015 42-52 Investigation Deep CH2M	TW-107 TW-107 9/21/2016 42-52 Investigation Deep Env Probe	TW-108 TW108-GW01-070815 7/8/2015 17-21 Investigation Shallow CH2M	TW-108 TW108-GW01-070815D 7/8/2015 17-21 Duplicate Shallow CH2M
Semivolatile Organic Compounds (ug/L)									
1,4-Dioxane	123-91-1	0.46	2900	13000	**2.2** L/Gw	0.3	< 100	**3.5** /Gw	**4.1** /Gw
Isophorone	78-59-1	78	Nav	Nav	< 1	< 1	NA	< 1 UL	< 1
Naphthalene	91-20-3	0.17	4.6	20	**7** /Gw/Vr	**13** /Gw/Vr	< 0.10	< 0.5 UL	< 0.5
Volatile Organic Compounds (ug/L)									
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
1,1-Dichloroethene	75-35-4	28	20	82	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	**4.7** /Gw/Vr	< 0.5	< 1.0	< 0.5	< 0.5
Acetone	67-64-1	1400	2300000	9500000	< 25	< 5	< 10.0	< 5	< 5
Benzene	71-43-2	0.46	1.6	6.9	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
Chlorobenzene	108-90-7	7.8	41	170	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
Chloroform	67-66-3	0.22	0.81	3.6	< 2.5	**0.7** /Gw	< 1.0	< 0.5	< 0.5
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
Ethylbenzene	100-41-4	1.5	3.5	15	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
Tetrachloroethene	127-18-4	4.1	5.8	24	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
Toluene	108-88-3	110	1900	8100	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 2.5	< 0.5	< 1.0	< 0.5	< 0.5
Additional Detected Constituents from Env Probe Investigation									
Chloromethane	74-87-3	19	26	110	NA	NA	< 1.0	NA	NA
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	NA	< 1.0	NA	NA
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA	NA	< 1.0	NA	NA
Acenaphthene	83-32-9	53	Nav	Nav	NA	NA	0.36	NA	NA
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	NA	0.86	NA	NA
Anthracene	120-12-7	180	Nav	Nav	NA	NA	0.21	NA	NA
Fluoranthene	206-44-0	80	Nav	Nav	NA	NA	0.13	NA	NA
Fluorene	86-73-7	29	Nav	Nav	NA	NA	0.89	NA	NA
Phenanthrene	85-01-8	Nav	Nav	Nav	NA	NA	1.5	NA	NA
Pyrene	129-00-0	12	Nav	Nav	NA	NA	0.26	NA	NA
Criteria Exceeded in Sample					/Gw/Vr	/Gw/Vr		/Gw	/Gw

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-108 TW108-GW-073115 7/31/2015 45-55 Investigation Deep CH2M	TW-108 TW-108 9/20/2016 45-55 Investigation Deep Env Probe	TW-109 TW109-GW-073115 7/31/2015 48-58 Investigation Deep CH2M	TW-109 TW-109 9/20/2016 48-58 Investigation Deep Env Probe
Semivolatile Organic Compounds (ug/L)								
1,4-Dioxane	123-91-1	0.46	2900	13000	**19** /Gw	< 100	**8** /Gw	< 100
Isophorone	78-59-1	78	Nav	Nav	< 1	NA	< 1	NA
Naphthalene	91-20-3	0.17	4.6	20	< 0.5	< 0.10	< 0.5	< 0.11
Volatile Organic Compounds (ug/L)								
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 0.5	< 1.0	0.6	< 1.0
1,1-Dichloroethene	75-35-4	28	20	82	< 0.5	< 1.0	< 0.5	< 1.0
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	< 1.0	< 0.5	< 1.0
Acetone	67-64-1	1400	2300000	9500000	44	< 10.0	39	21.8
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	< 1.0	< 0.5	< 1.0
Chlorobenzene	108-90-7	7.8	41	170	< 0.5	< 1.0	< 0.5	< 1.0
Chloroform	67-66-3	0.22	0.81	3.6	< 0.5	< 1.0	**2.6** /Gw/Vr	**41.9** /Gw/Vr/Vc
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 0.5	< 1.0	**1.4** /Vr	NA
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5	< 1.0	< 0.5	< 1.0
Tetrachloroethene	127-18-4	4.1	5.8	24	< 0.5	< 1.0	< 0.5	< 1.0
Toluene	108-88-3	110	1900	8100	< 0.5	< 1.0	< 0.5	< 1.0
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 0.5	< 1.0	< 0.5	NA
Additional Detected Constituents from Env Probe Investigation								
Chloromethane	74-87-3	19	26	110	NA	< 1.0	NA	5.4
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	< 1.0	NA	**3.2** /Gw/Vr
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA	< 1.0	NA	< 1.0
Acenaphthene	83-32-9	53	Nav	Nav	NA	< 0.10	NA	< 0.11
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	< 0.10	NA	< 0.11
Anthracene	120-12-7	180	Nav	Nav	NA	< 0.10	NA	< 0.11
Fluoranthene	206-44-0	80	Nav	Nav	NA	< 0.10	NA	< 0.11
Fluorene	86-73-7	29	Nav	Nav	NA	< 0.10	NA	< 0.11
Phenanthrene	85-01-8	Nav	Nav	Nav	NA	< 0.10	NA	< 0.11
Pyrene	129-00-0	12	Nav	Nav	NA	< 0.10	NA	< 0.11
Criteria Exceeded in Sample					/Gw		/Gw/Vr	/Gw/Vr/Vc

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-110 TW110-GW-073115 7/31/2015 44-54 Investigation Deep CH2M		TW-110 TW-110 9/20/2016 44-54 Investigation Deep Env Probe		TW-111 TW111-GW-080115 8/1/2015 41.5-51.5 Investigation Deep CH2M		TW-111 TW-111 9/20/2016 41.5-51.5 Investigation Deep Env Probe	
Semivolatile Organic Compounds (ug/L)												
1,4-Dioxane	123-91-1	0.46	2900	13000	**19**	/Gw	< 100		**32**	/Gw	< 100	
Isophorone	78-59-1	78	Nav	Nav	< 1		NA		< 1		NA	
Naphthalene	91-20-3	0.17	4.6	20	< 0.5		< 0.10		< 0.5		< 0.10	
Volatile Organic Compounds (ug/L)												
1,1-Dichloroethane	75-34-3	2.8	7.6	33	**6.9**	/Gw	**9.1**	/Gw/Vr	< 0.5		< 1.0	
1,1-Dichloroethene	75-35-4	28	20	82	5	L	7.3		< 0.5		< 1.0	
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	UL	< 1.0		< 0.5		< 1.0	
Acetone	67-64-1	1400	2300000	9500000	< 5		< 10.0		< 5		< 10.0	
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	UL	< 1.0		< 0.5		< 1.0	
Chlorobenzene	108-90-7	7.8	41	170	< 0.5		< 1.0		< 0.5		< 1.0	
Chloroform	67-66-3	0.22	0.81	3.6	**1.1**	L/Gw/Vr	**1.8**	/Gw/Vr	< 0.5		< 1.0	
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	0.6		< 1.0		< 0.5		< 1.0	
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5		< 1.0		< 0.5		< 1.0	
Tetrachloroethene	127-18-4	4.1	5.8	24	< 0.5		< 1.0		< 0.5		< 1.0	
Toluene	108-88-3	110	1900	8100	< 0.5		< 1.0		< 0.5		< 1.0	
Trichlorofluoromethane	75-69-4	520	Nav	Nav	2		3.6		< 0.5		< 1.0	
Additional Detected Constituents from Env Probe Investigation												
Chloromethane	74-87-3	19	26	110	NA		< 1.0		NA		< 1.0	
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA		< 1.0		NA		< 1.0	
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA		8.1		NA		< 1.0	
Acenaphthene	83-32-9	53	Nav	Nav	NA		< 0.10		NA		< 0.10	
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA		< 0.10		NA		< 0.10	
Anthracene	120-12-7	180	Nav	Nav	NA		< 0.10		NA		< 0.10	
Fluoranthene	206-44-0	80	Nav	Nav	NA		< 0.10		NA		< 0.10	
Fluorene	86-73-7	29	Nav	Nav	NA		< 0.10		NA		< 0.10	
Phenanthrene	85-01-8	Nav	Nav	Nav	NA		< 0.10		NA		< 0.10	
Pyrene	129-00-0	12	Nav	Nav	NA		< 0.10		NA		< 0.10	
Criteria Exceeded in Sample					/Gw/Vr		/Gw/Vr		/Gw			

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-112 TW112-GW-073115 7/31/2015 35-45 Investigation Deep CH2M	TW-112 TW-112 9/21/2016 35-45 Investigation Deep Env Probe	TW-113 TW113-GW-073015 7/30/2015 41-51 Investigation Deep CH2M	TW-113 TW-113 9/21/2016 41-51 Investigation Deep Env Probe
Semivolatile Organic Compounds (ug/L)								
1,4-Dioxane	123-91-1	0.46	2900	13000	**3** /Gw	< 100	**3** /Gw	< 100
Isophorone	78-59-1	78	Nav	Nav	< 1	NA	< 1	NA
Naphthalene	91-20-3	0.17	4.6	20	< 0.5	< 0.11	< 0.5	< 0.10
Volatile Organic Compounds (ug/L)								
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 0.5	< 1.0	< 0.5	< 1.0
1,1-Dichloroethene	75-35-4	28	20	82	< 0.5	< 1.0	< 0.5	< 1.0
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	< 1.0	< 0.5	< 1.0
Acetone	67-64-1	1400	2300000	9500000	< 5	< 10.0	< 5	< 10.0
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	< 1.0	< 0.5	< 1.0
Chlorobenzene	108-90-7	7.8	41	170	< 0.5	< 1.0	< 0.5	< 1.0
Chloroform	67-66-3	0.22	0.81	3.6	**0.5** /Gw	< 1.0	< 0.5	< 1.0
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 0.5	< 1.0	< 0.5	< 1.0
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5	< 1.0	< 0.5	< 1.0
Tetrachloroethene	127-18-4	4.1	5.8	24	< 0.5	< 1.0	< 0.5	< 1.0
Toluene	108-88-3	110	1900	8100	< 0.5	< 1.0	< 0.5	< 1.0
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 0.5	< 1.0	< 0.5	< 1.0
Additional Detected Constituents from Env Probe Investigation								
Chloromethane	74-87-3	19	26	110	NA	< 1.0	NA	< 1.00
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	< 1.0	NA	< 1.00
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA	< 1.0	NA	< 1.00
Acenaphthene	83-32-9	53	Nav	Nav	NA	< 0.11	NA	< 0.10
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	< 0.11	NA	< 0.10
Anthracene	120-12-7	180	Nav	Nav	NA	< 0.11	NA	< 0.10
Fluoranthene	206-44-0	80	Nav	Nav	NA	< 0.11	NA	< 0.10
Fluorene	86-73-7	29	Nav	Nav	NA	< 0.11	NA	< 0.10
Phenanthrene	85-01-8	Nav	Nav	Nav	NA	< 0.11	NA	< 0.10
Pyrene	129-00-0	12	Nav	Nav	NA	< 0.11	NA	< 0.10
Criteria Exceeded in Sample					/Gw		/Gw	

Table 1-1
Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Notes:
L - indicates the reported concentration is biased low
U - indicates the constituent was not detected above the reporting detection limit
UL - indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.
NA - not analyzed
Groundwater sample TW-109 was not analyzed for dichlorodifluoromethane and trichlorofluoromethane, which was confirmed by the Pace lab report.
Env Probe groundwater data which was analyzed by Pace Laboratory had a quantitation limit for 1,4-Dioxane of 100 ug/L
It was assumed that the EnviroProbe groundwater samples were collected at the screened interval presented in the assoicated log (i.e. the deep groundwater samples collected by CH2M Hill).
[1] This interval is located within the screen interval (i.e. 47-57') which is based on the log for TW-103
[2] This interval is located within the screen interval (i.e. 45-55') which is based on the log for TW-104
Abbreviations used in comparisons:
/Gw - Indicates exceedance of the USEPA tapwater regional screening level (RSL) with a target risk = 1.0E-06 and HQ = 0.1, based on May 2016 RSLs
/Vr - Indicates exceedance of the USEPA residential vapor intrusion screening level (VISL) target groundwater concentration with a target risk 1.0E-06 and HQ = 0.1, based on May 2016 RSLs
/Vc - Indicates exceedance of the USEPA commercial vapor intrusion screening level (VISL) target groundwater concentrations with a target risk of 1.0E-06 and HQ = 0.1, based on May 2016 RSLs

Table 2-1
Groundwater Direct Contact Constituents of Concern
Human Health Exposure Evaluation
West Virginia University
Institute, WV

COPC	Shallow Groundwater Maximum Concentration	Shallow Groundwater Maximum Concentration Location	Shallow Groundwater Frequency of Detections	Deep Groundwater Maximum Concentration	Deep Groundwater Maximum Concentration Location	Deep Groundwater Frequency of Detections	Tapwater RSL	Shallow Groundwater Exceed Tapwater (Yes or No)	Deep Groundwater Exceeds Tapwater (Yes or No)	COC carried through to quantitative risk assessment (Yes or No?) - Rationale
Groundwater (ug/L)										
1,4-Dioxane	19.9	INS-0385	20/28	36.7	INS-0390 (42-47')	26/44	0.46	**Yes**	**Yes**	No complete exposure pathways
1,1-Dichloroethane	6.44	INS-0467	4/22	12.3	INS-0389 (42-47')	10/46	2.8	**Yes**	**Yes**	No complete exposure pathways
1,1-Dichloroethene	2.73	INS-0467	2/22	7.3	TW-110	5/46	28	No	No	No
1,2-Dichloroethane	4.7	TW-107	1/22	---	---	---	0.17	**Yes**	No	No complete exposure pathways
1,1,1-Trichloroethane	---	---	---	8.1	TW-110	1/9	800	No	No	No
2-Butanone	---	---	---	5.5	INS-0554 (51-55')	1/8	560	No	No	No
Acetone	6	TW-103	1/22	44	TW-108	6/46	1400	No	No	No
Benzene	1.76	INS-0390	1/22	5.3	INS-0388 (42-47')	2/46	0.46	**Yes**	**Yes**	No complete exposure pathways
Bromodichloromethane	---	---	---	3.2	TW-109	1/16	0.13	No	**Yes**	No complete exposure pathways
Chlorobenzene	165	INS-0388	3/22	205	INS-0388 (33.5-43.5')	2/46	7.8	**Yes**	**Yes**	No complete exposure pathways
Chloroform	12.2	INS-0390	3/22	41.9	TW-109	14/46	0.22	**Yes**	**Yes**	No complete exposure pathways
Chloromethane	---	---	---	5.4	TW-109	2/16	19	No	No	No
Dichlorodifluoromethane	---	---	---	57.2 L	INS-0389 (42-47')	12/46	20	No	**Yes**	No complete exposure pathways
Ethyl ether	3 K	INS-0559	1/5	---	---	---	390	No	No	No
Naphthalene	7	TW-107	1/22	13	TW-107	1/41	0.17	**Yes**	**Yes**	No complete exposure pathways
Tetrachloroethene	30	INS-0555	1/22	---	---	---	4.1	**Yes**	No	No complete exposure pathways
Trichloroethylene	2.3	INS-0555	1/5	---	---	---	0.28	**Yes**	No	No complete exposure pathways
Trichlorofluoromethane	26.5	INS-0390	3/22	141	INS-0389 (35-45')	9/24	520	No	No	No
Acenaphthene	---	---	---	0.36	TW-107	1/10	53	No	No	No
Acenaphthylene	---	---	---	0.86	TW-107	1/10	Nav	No	No	No
Anthracene	---	---	---	0.21	TW-107	1/10	180	No	No	No
Fluoranthene	---	---	---	0.13	TW-107	1/10	80	No	No	No
Fluorene	---	---	---	0.89	TW-107	1/10	29	No	No	No
Phenanthrene	---	---	---	1.5	TW-107	1/10	Nav	No	No	No
Pyrene	---	---	---	0.26	TW-107	1/10	12	No	No	No
Arsenic	131	INS-0563	2/4	---	---	---	0.052	**Yes**	No	No complete exposure pathways
Barium	1580	INS-0566	4/4	---	---	---	380	**Yes**	No	No complete exposure pathways

Notes:
COPC - constituent of potential concern
COC - constituent of concern
Nav - not available
K - indicates the analyte was positively identified, but the associated numerical value may be biased high.
L - the analyte was positively identified, but the associated numerical value may be biased low.
Only constituents with at least one detection are presented in this table.
USEPA Tapwater Regional Screening Level (RSLs) (TR = 1x10-6 and THQ = 0.1), May 2016.

Table 2-2
Groundwater Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia University
Institute, WV

COPC	Shallow Groundwater Maximum Concentration	Shallow Groundwater Maximum Concentration Location	Shallow Groundwater Frequency of Detections	Deep Groundwater Maximum Concentration	Deep Groundwater Maximum Concentration Location	Deep Groundwater Frequency of Detections	Commercial VISL	Residential VISL	Groundwater Exceeds VISL [1]	COC carried through to quantitative risk assessment (Yes or No?) - Rationale
Groundwater (ug/L)										
1,4-Dioxane	19.9	INS-0385	20/28	36.7	INS-0390 (42-47')	26/44	13000	2900	No	No
1,1-Dichloroethane	6.44	INS-0467	4/22	12.3	INS-0389 (42-47')	10/46	33	7.6	No	No
1,1-Dichloroethene	2.73	INS-0467	2/22	7.3	TW-110	5/46	82	20	No	No
1,2-Dichloroethane	4.7	TW-107	1/22	---	---	---	9.8	2.2	**Yes (Res)**	No, indoor air media takes precedence
1,1,1-Trichloroethane	---	---	---	8.1	TW-110	1/9	3100	740	No	No
2-Butanone	---	---	---	5.5	INS-0554 (51-55')	1/8	940000	220000	No	No
Acetone	6	TW-103	1/22	44	TW-108	6/46	9500000	2300000	No	No
Benzene	1.76	INS-0390	1/22	5.3	INS-0388 (42-47')	2/46	6.9	1.6	**Yes (Res)**	No, indoor air media takes precedence
Bromodichloromethane	---	---	---	3.2	TW-109	1/16	3.8	0.88	**Yes (Res)**	No, indoor air media takes precedence
Chlorobenzene	165	INS-0388	3/22	205	INS-0388 (33.5-43.5')	2/46	170	41	**Yes (Res)**	No, indoor air media takes precedence
Chloroform	12.2	INS-0390	3/22	41.9	TW-109	14/46	3.6	0.81	**Yes (Res and Com)**	No, indoor air media takes precedence
Chloromethane	---	---	---	5.4	TW-109	2/16	110	26	No	No
Dichlorodifluoromethane	---	---	---	57.2 L	INS-0389 (42-47')	12/46	3.1	0.74	**Yes (Res and Com)**	No, indoor air media takes precedence
Ethyl ether	3 K	INS-0559	1/5	---	---	---	Nav	Nav	No	No
Naphthalene	7	TW-107	1/22	13	TW-107	1/41	20	4.6	**Yes (Res)**	No, indoor air media takes precedence
Tetrachloroethene	30	INS-0555	1/22	---	---	---	24	5.8	**Yes (Res and Com)**	No, indoor air media takes precedence
Trichloroethylene	2.3	INS-0555	1/5	---	---	---	2.2	0.52	**Yes (Res and Com)**	No, indoor air media takes precedence
Trichlorofluoromethane	26.5	INS-0390	3/22	141	INS-0389 (35-45')	9/24	Nav	Nav	No	No
Acenaphthene	---	---	---	0.36	TW-107	1/10	Nav	Nav	No	No
Acenaphthylene	---	---	---	0.86	TW-107	1/10	Nav	Nav	No	No
Anthracene	---	---	---	0.21	TW-107	1/10	Nav	Nav	No	No
Fluoranthene	---	---	---	0.13	TW-107	1/10	Nav	Nav	No	No
Fluorene	---	---	---	0.89	TW-107	1/10	Nav	Nav	No	No
Phenanthrene	---	---	---	1.5	TW-107	1/10	Nav	Nav	No	No
Pyrene	---	---	---	0.26	TW-107	1/10	Nav	Nav	No	No

Notes:
COPC - constituent of potential concern
COC - constituent of concern
Nav - not available
K - indicates the analyte was positively identified, but the associated numerical value may be biased high.
L - the analyte was positively identified, but the associated numerical value may be biased low.
Only constituents with at least one detection are presented in this table. (Note that metals are not shown because they are not volatile.)
USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).
[1] Maximum concentrations were determined for shallow and deep overburden groundwater samples. If a shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

Table 2-3
Athletic Facility Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Athletic Facility:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Ambient Air (ug/m^3)							
Trichlorofluromethane	1.18	INST-AF-AA01	1/1	---	---	---	---
Indoor Air (ug/m^3)							
Chlorobenzene	0.501	INST-AF-IA02	2/10	22	5.2	No	No
Chloroform	0.184	INST-AF-IA04	1/10	0.53	0.12	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Trichlorofluoromethane	1.5	INST-AF-IA06	10/10	Nav	Nav	No	No, no inhalation toxicity available
Exterior Soil Gas (ug/m^3) [1]							
Acetone	167	VP-1	1/1	450000	110000	No	No
Benzene	19.4	VP-1	1/1	52	12	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Carbon Disulfide	3.96	VP-1	1/1	10000	2400	No	No
Ethanol	549	VP-1	1/1	Nav	Nav	No	No, no inhalation toxicity available
Trichlorofluoromethane	1.34	VP-1	1/1	Nav	Nav	No	No, no inhalation toxicity available
Dichlorodifluoromethane	1.75	VP-1	1/1	1500	350	No	No
Heptane	1.89	VP-1	1/1	Nav	Nav	No	No, no inhalation toxicity available
N-hexane	2.03	VP-1	1/1	10000	2400	No	No
2-Butanone	3.78	VP-1	1/1	73000	17000	No	No
Propene	126	VP-1	1/1	44000	10000	No	No
Toluene	2.32	VP-1	1/1	73000	17000	No	No
Groundwater (ug/L) [2]							
1,1-Dichloroethane	9.1	TW-110	4/5	33	7.6	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
1,1-Dichloroethene	7.3	TW-110	4/5	82	20	No	No
Benzene	1.76	INS-0390	1/5	6.9	1.6	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Chlorobenzene	165	INS-0388	2/5	170	41	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Chloroform	12.2	INS-0390	4/5	3.6	0.81	**Yes (Res and Com)**	No, indoor air COCs take precedence
Dichlorodifluoromethane	0.6	TW-110	1/5	3.1	0.74	No	No
Trichlorofluoromethane	26.5	INS-0390	3/5	Nav	Nav	No	No, no inhalation toxicity available
1,1,1-Trichloroethane	8.1	TW-110	1/1	3100	740	No	No
1,4-Dioxane	19	TW-110	4/5	13000	2900	No	No

Notes:
COPC - constituent of potential concern
COC - constituent of concern
J - indicates the reported concentration is estimated.
Nav - not available
Only constituents with at least one detection in the area being evaluated are presented in this table.
Ambient air samples were not compared to screening criteria. These samples were included for qualitative comparison purposes only.
USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).
[1] VP-1 was included as an exterior soil gas point to evaluate vapor intrusion for the athletic facility.
[2] Monitoring wells TW-110, INS-0388, INS-0390, and INS-0467 were used to select COC for groundwater within the area of the athletic facility. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

Table 2-4
Convocation Center Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Convocation Center:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Ambient Air (ug/m^3)							
Trichlorofluoromethane	0.886	INST-CC-AA01	1/1	---	---	---	---
Crawl Space (ug/m^3)							
Trichlorofluoromethane	5.49	INST-CC-CS01	1/1	Nav	Nav	No	No, no inhalation toxicity available
Indoor Air (ug/m^3)							
Chloroform	0.256	INST-CC-IA05	1/15	0.53	0.12	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Trichlorofluoromethane	10.7	INST-CC-IA14	15/15	Nav	Nav	No	No, no inhalation toxicity available
Exterior Soil Gas (ug/m^3) [1]							
2-Butanone	30.9	INS-0572-01-012016	2/4	73000	17000	No	No
Acetone	169	VP-5	4/4	450000	110000	No	No
Benzene	38	INS-0572-01-012016	2/4	52	12	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Carbon Disulfide	30.3	VP-5	2/4	10000	2400	No	No
Cyclohexane	1.18	VP-5	1/1	88000	21000	No	No
1,3-Dichlorobenzene	3.46	VP-5	1/4	Nav	Nav	No	No, no inhalation toxicity available
Dichlorodifluoromethane	418	INS-0572-01-012016	4/4	1500	350	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Ethanol	489	VP-5	1/1	Nav	Nav	No	No, no inhalation toxicity available
Ethylbenzene	6.67	INS-0572-01-012016	1/4	160	37	No	No
4-Ethyltoluene	1.5	VP-5	1/1	Nav	Nav	No	No, no inhalation toxicity available
Heptane	4.12	VP-5	1/1	Nav	Nav	No	No, no inhalation toxicity available
Methylene Chloride	1.72	VP-5	1/4	8800	2100	No	No
m,p-Xylenes	14.9	INS-0572-01-012016	3/4	1500	350	No	No
n-Hexane	55.6	INS-0572-01-012016	2/4	10000	2400	No	No
Naphthalene	8.09	VP-5	1/4	12	2.8	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
o-Xylenes	5.12	INS-0572-01-012016	3/4	1500	350	No	No
2-Propanol	3.69	VP-5	1/1	2900	700	No	No
Propene	184	VP-5	1/1	44000	10000	No	No
Toluene	27.6	INS-0572-01-012016	2/4	73000	17000	No	No
Trichlorofluoromethane	20.8	INS-0572-01-012016	4/4	Nav	Nav	No	No, no inhalation toxicity available
1,2,4-Trimethylbenzene	1.64	VP-5	1/4	100	240	No	No
Groundwater (ug/L) [2]							
No detections	---	---	---	---	---	---	---

Notes:
COPC - constituent of potential concern
COC - constituent of concern
Nav - not available
Only constituents with at least one detection in the area being evaluated are presented in this table.
Ambient air samples were not compared to screening criteria. These samples were included for qualitative comparison purposes only.
USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).
[1] VP-5 was included as an exterior soil gas point to evaluate vapor intrusion for the convocation center.
[2] Monitoring well TW-106 was used to select COC for groundwater within the area of the convocation center. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

Table 2-5
Eastern Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Exterior Soil Gas (ug/m^3)							
1,2,4-Trimethylbenzene	21.4 J	0571-02-012016	3/5	100	24	No	No
1,3,5-Trimethylbenzene	17 J	0571-01-020516S	3/5	Nav	Nav	No	No
2-Butanone	24.4	0569-02-011416	3/5	73000	17000	No	No
Acetone	108 NJ	0569-02-011416	4/5	450000	110000	No	No
Benzene	4.88 NJ	0569-02-011416	1/5	52	12	No	No
Carbon Disulfide	3.7 J	0571-01-020516S	1/5	10000	2400	No	No
Ethylbenzene	5.5 J	0571-01-020516S	2/5	160	37	No	No
m,p-xylene	25.1	0569-01-011516	2/5	1500	350	No	No
n-Hexane	13.7 NJ	0569-02-011416	1/5	10000	2400	No	No
o-xylene	9.5 J	0571-01-020516S	2/5	1500	350	No	No
Tetrachloroethene	27	0569-02-011416	1/5	580	140	No	No
Toluene	53.7	0569-02-011416	3/5	73000	17000	No	No
Trichlorofluoromethane	10.6	0569-02-011416	2/5	Nav	Nav	No	No
Groundwater (ug/L) [1]							
1,4-Dioxane	2.2	TW-107	1/2	13000	2900	No	No
Naphthalene	7	TW-107	1/2	20	4.6	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
1,2-Dichloroethane	4.7	TW-107	1/2	9.8	2.2	**Yes (Res)**	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)

Notes:
COPC - constituent of potential concern
COC - constituent of concern
Nav - not available
J - The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
NJ - The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
Only constituents with at least one detection in the area being evaluated are presented in this table.

Note there were no soil gas samples (i.e. VP locations) collected within the eastern area during the Envrioprobe investigation.
USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).
[1] Monitoring wells TW-107 and INS-0570 were used to select groundwater COC within the eastern area. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

Table 2-6
Faculty Housing Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia University
Institute, WV

Faculty Housing:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Ambient Air (µg/m^3)							
1,1,2-Trichloro-1,2,2-trifluoroethane	0.787 J	FR-AA01-012716S	2/2	---	---	---	No
2-Butanone	0.663 J	FR-AA1-012616	1/2	---	---	---	No
4-Methyl-2-pentanone	3.3 J	FR-AA1-012616	1/2	---	---	---	No
Acetone	21 J	FR-AA01-012716S	2/2	---	---	---	No
Benzene	0.855 J	FR-AA01-012716S	2/3	---	---	---	No
Carbon tetrachloride	0.752 J	FR-AA01-012716S	1/2	---	---	---	No
Dichlorodifluoromethane	3.75 J	FR-AA01-012716S	2/2	---	---	---	No
Ethylbenzene	0.281 J	FR-AA01-012716S	1/2	---	---	---	No
m,p-xylene	0.755 J	FR-AA01-012716S	2/2	---	---	---	No
Methylene chloride	0.866 J	FR-AA01-012716S	1/2	---	---	---	No
n-hexane	0.649 J	FR-AA1-012616	1/2	---	---	---	No
o-xylene	0.423 J	FR-AA01-012716S	1/2	---	---	---	No
Toluene	0.983 J	FR-AA01-012716S	2/2	---	---	---	No
Trichlorofluoromethane	1.17 J	FR-AA1-012616	2/3	---	---	---	No
Indoor Air (µg/m^3)							
1,1,2-Trichloro-1,2,2-trifluoroethane	1	FR-IA03-012716S	7/7	13000	3100	No	No
1,1-Dichloroethene	0.213	FR-IA3-06192015	5/13	88	21	No	No
1,2,4-Trimethylbenzene	0.274 J	FR-IA4-012616	4/7	3.1	0.73	No	No
1,2-Dichloroethane	0.25	FR-IA03-012716S	1/7	0.47	0.11	**Yes (Res)**	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
2-Butanone	1.84	FR-IA2-012716	6/7	2200	520	No	No
4-Methyl-2-pentanone	4.04	FR-IA3-012616	6/7	1300	310	No	No
Acetone	19	FR-IA03-012716S	7/7	14000	3200	No	No
Acrylonitrile	0.236 J	FR-IA03-012716S	1/7	0.18	0.041	**Yes (Res and Com)**	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
Benzene	0.942	FR-IA2-012716	8/13	1.6	0.36	**Yes (Res)**	No, maximum concentration not significantly different than AA
Carbon tetrachloride	0.922	FR-IA03-012716S	1/7	2.0	0.47	**Yes (Res)**	No, maximum concentration not significantly different than AA
Chloroethane	0.223	FR-IA03-012716S	1/7	4400	1000	No	No
Chloroform	0.39	FR-IA03-012716S	1/13	0.53	0.12	**Yes (Res)**	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
Dichlorodifluoromethane	3.95	FR-IA03-012716S	6/7	44	10	No	No
Ethylbenzene	0.859	FR-IA03-012716S	4/7	4.9	1.1	No	No
m,p-xylene	1.95	FR-IA03-012716S	7/7	44	10	No	No
Methylene chloride	0.731	FR-IA03-012716S	1/7	260	63	No	No
n-hexane	1.69	FR-IA2-012716	6/7	310	73	No	No
Naphthalene	0.736	FR-IA1-012616	1/7	0.36	0.083	**Yes (Res and Com)**	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
o-xylene	1.31	FR-IA03-012716S	7/7	44	10	No	No
tert-Butyl Methyl ether	0.687 J	FR-IA03-012716S	1/7	47	11	No	No
Tetrachloroethene	0.353	FR-IA03-012716S	1/7	18	4.2	No	No
Toluene	2.35 J	FR-IA03-012716S	7/7	2200	520	No	No
Trichlorofluoromethane	1.3	FR-IA2-012716	12/13	Nav	Nav	No	No

Table 2-6
Faculty Housing Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia University
Institute, WV

Faculty Housing:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Exterior Soil Gas (µg/m^3) [1]							
1,1-Dichloroethane	5.23	0562-01-011416	1/7	260	58	No	No
1,1-Dichloroethene	0.959	VP-3	1/10	2900	700	No	No
Trans-1,2-Dichloroethene	3	VP-3	2/10	Nav	Nav	No	No
1,2,4-Trimethylbenzene	49.4	0564-01-011416	4/10	100	24	**Yes (Res)**	No, indoor air COCs take precedence
1,2-Dichloroethane	41.6	0562-02-011416	2/7	16	3.6	**Yes (Res and Com)**	No, indoor air COCs take precedence
1,2-Dichloropropane	747	0562-02-011416	2/7	41	9.4	**Yes (Res and Com)**	No, indoor air COCs take precedence
1,3-Dichlorobenzene	4.51	VP-4	2/10	Nav	Nav	No	No
1,3,5-Trimethylbenzene	18.1	0564-01-011416	2/10	Nav	Nav	No	No
2-Butanone	9.99	0565-02-011916	5/10	73000	17000	No	No
Acetone	328	VP-4	9/10	450000	110000	No	No
Benzene	78.4	VP-4	6/10	52	12	**Yes (Res and Com)**	No, indoor air COCs take precedence
Carbon Disulfide	140	VP-3	4/10	10000	2400	No	No
Carbon tetrachloride	15	0562-01-011416	1/7	68	16	No	No
Chloroform	96.8	0562-01-011416	1/7	18	4.1	**Yes (Res and Com)**	No, indoor air COCs take precedence
Chloromethane	1.03	VP-3	1/10	1300	310	No	No
Cyclohexane	26.8	VP-3	2/3	88000	21000	No	No
Dichlorodifluoromethane	4.03	VP-4	3/10	1500	350	No	No
Ethanol	549	VP-1	3/3	Nav	Nav	No	No
Ethylbenzene	18.8	0564-01-011416	5/10	160	37	No	No
4-Ethyltoluene	2.44	VP-3	2/3	Nav	Nav	No	No
m,p-xylene	99.8	0564-01-011416	5/10	1500	350	No	No
Heptane	33.3	VP-4	3/3	Nav	Nav	No	No
n-hexane	35.1	0564-01-011416	7/10	10000	2400	No	No
Methylene Chloride	4.15	VP-4	2/10	8800	2100	No	No
n-Propylbenzene	7.15	0564-01-011416	1/7	15000	3500	No	No
Naphthalene	20	VP-4	2/10	12	2.8	**Yes (Res and Com)**	No, indoor air COCs take precedence
2-Propanol	8.33	VP-4	2/3	2900	700	No	No
o-xylene	30.4	0564-01-011416	5/10	1500	350	No	No
Propene	296	VP-3	3/3	44000	10000	No	No
Styrene	2.29	VP-4	2/10	15000	3500	No	No
Toluene	1060	0565-02-011916	8/10	73000	17000	No	No
Tetrachloroethene	1.52	VP-4	2/10	580	140	No	No
2,2,4-Trimethylpentane	9.68	VP-3	2/3	Nav	Nav	No	No
Trichloroethylene	17.8 J	0560-02-011316	3/7	29	7.0	**Yes (Res)**	No, indoor air COCs take precedence
Trichlorofluoromethane	307	0565-02-011916	4/10	Nav	Nav	No	No
Vinyl Chloride	11.8	VP-3	2/10	93	5.6	**Yes (Res)**	No, indoor air COCs take precedence

Table 2-6
Faculty Housing Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia University
Institute, WV

Faculty Housing:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Sub-Slab Soil Gas (µg/m^3)							
1,1,2-Trichloro-1,2,2-trifluoroethane	0.805 J	FR-SS01-012916S	1/4	440000	100000	No	No
1,2,4-Trimethylbenzene	1.11 J	FR-SS01-012916S	1/4	100	24	No	No
1,4-Dichlorobenzene	0.786 J	FR-SS01-012916S	1/4	37	8.5	No	No
Acetone	26 J	FR-SS01-012916S	2/4	450000	110000	No	No
Benzene	0.674 J	FR-SS01-012916S	1/4	52	12	No	No
Carbon Disulfide	8.8 J	FR-SS01-012916S	1/4	10000	2400	No	No
Carbon tetrachloride	0.763 J	FR-SS01-012916S	1/4	68	16	No	No
Chloroform	0.542 J	FR-SS01-012916S	1/4	18	4.1	No	No
Dichlorodifluoromethane	3.64 J	FR-SS01-012916S	1/4	1500	350	No	No
Ethylbenzene	2.23 J	FR-SS01-012916S	1/4	160	37	No	No
m,p-xylene	7.03 J	FR-SS01-012916S	1/4	1500	350	No	No
Methylene chloride	320 J	FR-SS01-012916S	1/4	8800	2100	No	No
n-hexane	8.8 J	FR-SS01-012916S	1/4	10000	2400	No	No
Naphthalene	0.368 J	FR-SS01-012916S	1/4	12	2.8	No	No
o-xylene	4.03 J	FR-SS01-012916S	1/4	1500	350	No	No
tert-Butyl Methyl ether	0.192 J	FR-SS01-012916S	1/4	1600	360	No	No
Tetrachloroethene	7.45 J	FR-SS01-012916S	1/4	580	140	No	No
Toluene	3.91 J	FR-SS01-012916S	1/4	73000	17000	No	No
Trichlorofluoromethane	19	FR-SS01-020416S	3/4	Nav	Nav	No	No
Crawl Space (µg/m^3)							
1,1,2-Trichloro-1,2,2-trifluoroethane	0.775	FR-CS01-012716S	2/2	13000	3100	No	No
2-Butanone	1.25 J	FR-CS1-012616	1/2	2200	520	No	No
4-Methyl-2-pentanone	2.33	FR-CS1-012616	1/2	1300	310	No	No
Acetone	18	FR-CS01-012716S	2/2	14000	3200	No	No
Benzene	0.822	FR-CS01-012716S	2/2	1.6	0.36	**Yes (Res)**	No, maximum concentration not significantly different than AA
Benzyl Chloride	0.218	FR-CS1-012616	1/2	0.25	0.057	**Yes (Res)**	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
Carbon tetrachloride	0.754	FR-CS01-012716S	1/2	2.0	0.47	**Yes (Res)**	No, maximum concentration not significantly different than AA
Dichlorodifluoromethane	3.64 J	FR-CS01-012716S	2/2	44	10	No	No
Ethylbenzene	0.504	FR-CS01-012716S	1/2	4.9	1.1	No	No
m,p-xylene	1.32	FR-CS01-012716S	2/2	44	10	No	No
Methylene chloride	4.1	FR-CS01-012716S	1/2	260	63	No	No
n-hexane	0.67	FR-CS1-012616	1/2	310	73	No	No
o-xylene	0.831	FR-CS01-012716S	2/2	44	10	No	No
Toluene	2.12	FR-CS01-012716S	2/2	2200	520	No	No
Trichlorofluoromethane	1.18	FR-CS1-012616	1/2	Nav	Nav	No	No

Table 2-6
Faculty Housing Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia University
Institute, WV

Faculty Housing:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Groundwater (ug/L) [2]							
1,4-Dioxane	32	TW-111	4/5	13000	2900	No	No

Notes
AA - Ambient Air
SS - Sub Slab (Air Sample)
GW - Groundwater
Res - Residential
Com - Commercial
VISL - Vapor Intrusion Screening Level
COPC - constituent of potential concern
COC - constituent of concern
Nav - not available
J - The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
Only constituents with at least one detection are presented in this table.
USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).

[1] Enviroprobe soil gas points VP-1, VP-3, and VP-4 were included to select COC for the faculty housing area.

[2] Monitoring wells TW-111, INS-0465, INS-0559, and INS-0563 were used to select groundwater COC within the Faculty Housing Area. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, than the results from the shallow sample only were used to evaluate the COC for VI. However, if only a deep overburden groundwater sample was collected, than the deep overburden groundwater was used to evaluate the COC.

Table 2-7
Northern Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Soil Gas - EnviroProbe Investigation

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Quad [1]							
2-Butanone	10.2	VP-6	1/1	73000	17000	No	No
Acetone	115	VP-6	1/1	450000	110000	No	No
Benzene	24	VP-6	1/1	52	12	**Yes (Res)**	No, doesn't exceed commercial VISL
Carbon Disulfide	116	VP-6	1/1	10000	2400	No	No
Cyclohexane	4.35	VP-6	1/1	88000	21000	No	No
1,3-Dichlorobenzene	6.98	VP-6	1/1	Nav	Nav	No	No
Ethanol	1440	VP-6	1/1	Nav	Nav	No	No
Ethylbenzene	1.76	VP-6	1/1	160	37	No	No
4-Ethyltoluene	3.12	VP-6	1/1	Nav	Nav	No	No
Dichlorodifluoromethane	2.14	VP-6	1/1	1500	350	No	No
Heptane	21.5	VP-6	1/1	Nav	Nav	No	No
n-Hexane	16.5	VP-6	1/1	10000	2400	No	No
Methylene Chloride	1.67	VP-6	1/1	8800	2100	No	No
Naphthalene	10.2	VP-6	1/1	12	2.8	**Yes (Res)**	No, doesn't exceed commercial VISL
2-Propanol	11.1	VP-6	1/1	2900	700	No	No
Propene	649	VP-6	1/1	44000	10000	No	No
Styrene	2.48	VP-6	1/1	15000	3500	No	No
Tetrachloroethene	2.39	VP-6	1/1	580	140	No	No
Toluene	50.6	VP-6	1/1	73000	17000	No	No
1,2,4-Trimethylbenzene	3.04	VP-6	1/1	100	24	No	No
1,3,5-Triemthylbenzene	1.04	VP-6	1/1	Nav	Nav	No	No
2,2,4-Trimethylpentane	2.66	VP-6	1/1	Nav	Nav	No	No
m,p-Xylene	5.4	VP-6	1/1	1500	350	No	No
o-Xylene	2.32	VP-6	1/1	1500	350	No	No
Trichlorofluoromethane	1.96	VP-6	1/1	Nav	Nav	No	No

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Table 2-7
Northern Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Soil Gas - EnviroProbe Investigation

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Dawnson Hall [2]							
2-Butanone	9.52	VP-7	1/1	73000	17000	No	No
Acetone	199	VP-7	1/1	450000	110000	No	No
Benzene	30.3	VP-7	1/1	52	12	**Yes (Res)**	No, > 1 x 10-6, but < 1 x 10-5 residential VISL
Carbon Disulfide	384	VP-7	1/1	10000	2400	No	No
Cyclohexane	5.6	VP-7	1/1	88000	21000	No	No
1,3-Dichlorobenzene	6.54	VP-7	1/1	Nav	Nav	No	No
Ethanol	1330	VP-7	1/1	Nav	Nav	No	No
4-Ethyltoluene	1.88	VP-7	1/1	Nav	Nav	No	No
Dichlorodifluoromethane	2.31	VP-7	1/1	1500	350	No	No
Heptane	7.47	VP-7	1/1	Nav	Nav	No	No
n-Hexane	30.4	VP-7	1/1	10000	2400	No	No
Methylene Chloride	2.23	VP-7	1/1	8800	2100	No	No
Naphthalene	10.9	VP-7	1/1	12	2.8	**Yes (Res)**	No, > 1 x 10-6, but < 1 x 10-5 residential VISL
2-Propanol	4.66	VP-7	1/1	2900	700	No	No
Propene	1210	VP-7	1/1	44000	10000	No	No
Styrene	0.859	VP-7	1/1	15000	3500	No	No
Toluene	9.52	VP-7	1/1	73000	17000	No	No
1,2,4-Trimethylbenzene	1.99	VP-7	1/1	100	24	No	No
2,2,4-Trimethylpentane	5.37	VP-7	1/1	Nav	Nav	No	No
m,p-Xylene	2.05	VP-7	1/1	1500	350	No	No
Trichlorofluoromethane	1.86	VP-7	1/1	Nav	Nav	No	No

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Table 2-7
Northern Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Soil Gas - EnviroProbe Investigation

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
JKS Hall [3]							
2-Butanone	6.48	VP-9	2/2	73000	17000	No	No
Acetone	295	VP-9	2/2	450000	110000	No	No
Benzene	57.5	VP-9	2/2	52	12	**Yes (Res and Com)**	No, > 1 x 10-6, but < 1 x 10-5 residential VISL
Carbon Disulfide	602	VP-9	2/2	10000	2400	No	No
Chloromethane	1.15	VP-10	1/2	1300	310	No	No
Cyclohexane	7.86	VP-9	2/2	88000	21000	No	No
1,3-Dichlorobenzene	7.48	VP-9	2/2	Nav	Nav	No	No
Ethanol	697	VP-9	2/2	Nav	Nav	No	No
Ethylbenzene	1.1	VP-9	1/2	160	37	No	No
4-Ethyltoluene	2.35	VP-9	2/2	Nav	Nav	No	No
Dichlorodifluoromethane	2.32	VP-9	2/2	1500	350	No	No
Heptane	18.3	VP-9	2/2	Nav	Nav	No	No
n-Hexane	38.6	VP-9	2/2	10000	2400	No	No
Methylene Chloride	4.01	VP-10	2/2	8800	2100	No	No
Naphthalene	15.2	VP-9	2/2	12	2.8	**Yes (Res and Com)**	No, > 1 x 10-6, but < 1 x 10-5 residential VISL
Propene	1040	VP-9	2/2	44000	10000	No	No
Styrene	0.925	VP-9	1/2	15000	3500	No	No
Tetrachloroethene	1.82	VP-9	1/2	580	140	No	No
Toluene	21.3	VP-9	2/2	73000	17000	No	No
1,2,4-Trimethylbenzene	2.43	VP-9	2/2	100	24	No	No
2,2,4-Trimethylpentane	7.08	VP-9	2/2	Nav	Nav	No	No
m,p-Xylenes	3.35	VP-9	2/2	1500	350	No	No
o-Xylenes	1.22	VP-9	1/2	1500	350	No	No
Trichlorofluoromethane	22	VP-10	2/2	Nav	Nav	No	No

Notes on last page

Table 2-7
Northern Area Vapor Intrusion Constituents of Concern
Human Health Exposure Evaluation
West Virginia State University
Institute, WV

Soil Gas - EnviroProbe Investigation

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Student Union [4]							
2-Butanone	10.1	VP-11	1/2	73000	17000	No	No
Acetone	73.7	VP-11	2/2	450000	110000	No	No
Benzene	18.8	VP-11	2/2	52	12	**Yes (Res)**	No, doesn't exceed commercial VISL
Carbon Disulfide	112	VP-11	2/2	10000	2400	No	No
Chlorobenzene	1.5	VP-13	1/2	730	170	No	No
Cyclohexane	8.47	VP-13	2/2	88000	21000	No	No
1,3-Dichlorobenzene	2.95	VP-11	2/2	Nav	Nav	No	No
Ethanol	451	VP-11	2/2	Nav	Nav	No	No
Ethylbenzene	1.17	VP-13	1/2	160	37	No	No
4-Ethyltoluene	1.92	VP-13	2/2	Nav	Nav	No	No
Dichlorodifluoromethane	2.8	VP-13	2/2	1500	350	No	No
Heptane	7.55	VP-13	2/2	Nav	Nav	No	No
n-Hexane	17.2	VP-13	2/2	10000	2400	No	No
Methylene Chloride	4.1	VP-11	2/2	8800	2100	No	No
Naphthalene	10.8	VP-13	1/2	12	2.8	**Yes (Res)**	No, doesn't exceed commercial VISL
Propene	66.7	VP-13	2/2	44000	10000	No	No
Toluene	13.4	VP-13	2/2	73000	17000	No	No
1,2,4-Trimethylbenzene	1.95	VP-13	1/2	100	24	No	No
2,2,4-Trimethylpentane	6.64	VP-13	2/2	Nav	Nav	No	No
Vinyl Chloride	0.917	VP-13	1/2	93	5.6	No	No
m,p-Xylenes	4.88	VP-13	1/2	1500	350	No	No
o-Xylenes	2.54	VP-13	1/2	1500	350	No	No
Trichlorofluoromethane	27.6	VP-11	2/2	Nav	Nav	No	No

Notes:
COPC - constituent of potential concern
COC - constituent of concern
Nav - not available
Only constituents with at least one detection in the area being evaluated are presented in this table.
USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).
[1] To evaluate the quad soil gas point VP-6 was used to select vapor intrusion COCs.
[2] To evaluate Dawnson Hall (i.e. dormitory) soil gas point VP-7 was used to select vapor intrusion COCs.
[3] To evaluate JKS Hall (i.e. dormitory) soil gas points VP-9 and VP-10 were used to select vapor intrusion COCs
[4] To evaluate the Student Union soil gas points VP-11 and VP-13 were used to select vapor intrusion COCs.

Table 3-1
Faculty Housing Area COC Location Summary by Media
Human Health Exposure Evaluation
West Viriginia State University
Institute, WV

Constituent	Ambient Air [1]	Indoor Air	Crawl Space	Subslab Soil Gas	Exterior Soil Gas	Groundwater
1,2-Dichloroethane	ND	FR-IA03-012716S	ND	ND	0562-01-011416 0562-02-011416	ND
Acrylonitrile	ND	FR-IA03-012716S	ND	ND	ND	NA
Benzene	FR-AA1-012616 FR-AA01-012716S	FR-IA1-012616 FR-IA2-012716 FR-IA3-06192015 FR-IA3-012616 FR-IA03-012716S FR-IA4-06192015 FR-IA4-012616 FR-IA5-012616	FR-CS1-012616 FR-CS01-012716S	NE	VP-1 VP-3 VP-4	ND
Carbon tetrachloride	FR-AA01-012716S	FR-IA03-012716S	FR-CS01-012716S	NE	NE	ND
Chloroform	ND	FR-IA03-012716S	ND	NE	0562-01-011416	ND
Naphthalene	ND	FR-IA1-012616	ND	NE	VP-3 VP-4	ND
1,2,4-Trimethylbenzene	ND	NE	ND	NE	0564-01-011416 0560-01-011416	ND
1,2-Dichloropropane	ND	ND	ND	ND	0562-02-011416 0562-01-011416	NA
Trichloroethylene	ND	ND	ND	ND	0560-02-011316 0560-01-011416 0562-02-011416	ND
Vinyl Chloride	ND	ND	ND	ND	VP-3 VP-4	ND
Benzyl Chloride	ND	ND	FR-CS1-012616	ND	ND	NA

Notes:

[1] Ambient air samples were not compared to screening criteria. The locations presented in the ambient air column are locations that have detections of the constituent.

ND - non-detect

NE - no exceedance of applicable screening criteria

NA - not analyzed

Sample IDs are presented exactly as they were presented in the data tables from the CH2M Hill reports.

Figures

ED_002092A_00000310-00064

0 400 800
Feet

Note:
Wells TWs-02, 03, 04, 05, 06, 07, and 08 were sampled in the shallow and deep intervals during installation.

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Figure 2-1
Sampling Locations (Sitewide Combined)
Human Health Exposure Evaluation
West Virginia State University Institute, West Virginia

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\VAPORINTRUSIONINVESTIGATION\MAPFILES\FIG2_SAMPLINGLOCATIONS.MXD AESPEJO 4/11/2016 12:51:43 PM

VP-1
VP-2
VP-8
VP-12
Dawson St
Washington Ave
Kimball Ave
Stadium Drive
Dunbar Dr
Jackson Way
Chelsea Place
Blaine St
Ellis St
Hale St
Lewis St
Lincoln St
Jackson St
Washington St
Kimball St
Dawson St
Jefferson St
Madison St
Monroe St
Jefferson St
Madison St
Monroe St
Washington St
Kimball St
Dawson

Groundwater INS-0388	Result ug/L	Commercial VISL	Residential VISL
Chlorobenzene	165	170	41

Exterior Soil Gas VP-1	Result ug/m3	Commercial VISL	Residential VISL
Benzene	19.4	52	12

Groundwater TW-110	Result ug/L	Commercial VISL	Residential VISL
1,1-Dichloroethane	9.1	33	7.6

Analyte[a]	Units	Commercial / Industrial VISL	Residential VISL	INS-0390
			Sample ID>>	0390-GW01-031213
			Depth (ft)>>	32-37
			Sample Date>>	3/12/2013
Chloroform	µg/L	3.6	0.81	**12.2**
Benzene	ug/L	6.9	1.6	1.76

Indoor Air INST-AF-IA04	Result ug/m3	Commercial VISL	Residential VISL
Chloroform	0.184	0.53	0.12

WEST VIRGINIA STATE UNIVERSITY CAMPUS

Notes:
1. Only the results for the locations with the maximum detected concentrations are shown on this figure.
2. USEPA commercial and residential VISLs are based on a target risk of 1E-6 and target hazard quotient of 0.1.
3. ug/m3 - micrograms per cubic meter
4. ug/L - micrograms per liter

INS-0467 had an exceedance of a VISL, but the maximum concentration came from other monitoring wells.

Legend
- Enviroprobe Exterior Soil Gas Sample Location
- Shallow Groundwater Sample Location
- Athletic Facility Area
- Athletic Facility
- West Virginia State University Campus

N

0 75 150
Feet

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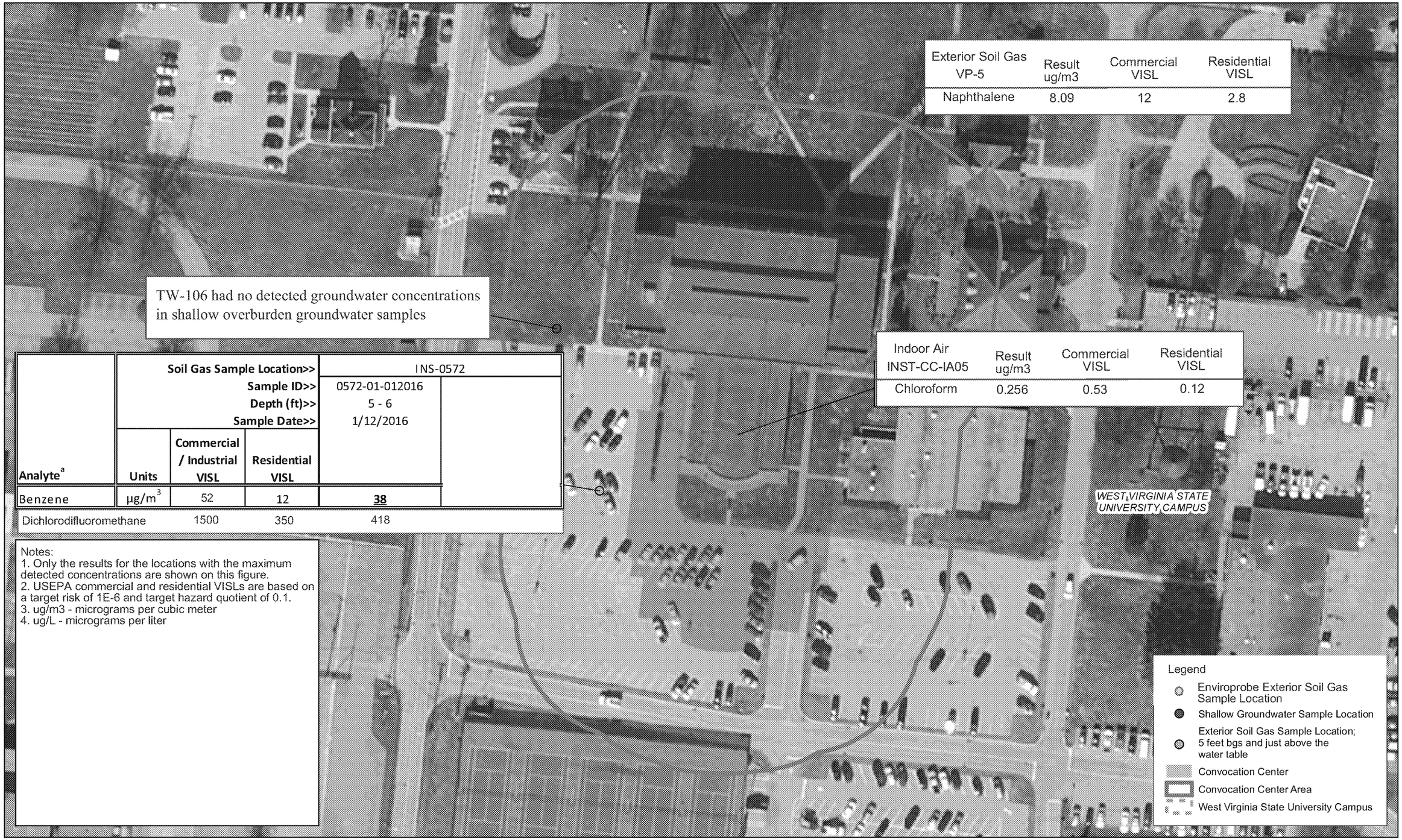
Figure 3-1
Athletic Facility Maximum Concentration Exceedances
Human Health Exposure Evaluation
West Virginia State University
Institute, West Virginia

MAHFOOD group ch2m

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\VAPORINTRUSIONINVESTIGATION\MAPFILES\FIG7_SIMPLE_CSM_ATHLETICFACILITY.MXD AESPEJO 4/11/2016 1:51:53 PM



TW-106 had no detected groundwater concentrations in shallow overburden groundwater samples

Exterior Soil Gas VP-5	Result ug/m3	Commercial VISL	Residential VISL
Naphthalene	8.09	12	2.8

Indoor Air INST-CC-IA05	Result ug/m3	Commercial VISL	Residential VISL
Chloroform	0.256	0.53	0.12

		Soil Gas Sample Location>>		INS-0572
		Sample ID>>		0572-01-012016
		Depth (ft)>>		5 - 6
		Sample Date>>		1/12/2016
Analyte[a]	**Units**	**Commercial / Industrial VISL**	**Residential VISL**	
Benzene	µg/m^3	52	12	**38**
Dichlorodifluoromethane		1500	350	418

Notes:
1. Only the results for the locations with the maximum detected concentrations are shown on this figure.
2. USEPA commercial and residential VISLs are based on a target risk of 1E-6 and target hazard quotient of 0.1.
3. ug/m3 - micrograms per cubic meter
4. ug/L - micrograms per liter

0 75 150
Feet

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Figure 3-2
Convocation Center Maximum Concentration Exceedances
Human Health Exposure Evaluation
West Virginia State University
Institute, West Virginia

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\VAPORINTRUSIONINVESTIGATION\MAPFILES\FIG8_SIMPLE_CSM_CONVOCATIONCTR.MXD AESPEJO 4/11/2016 1:42:33 PM

INS-0569, No soil gas concentrations > VISLs

INS-0570, No detected groundwater concentrations

INS-0571, No soil gas concentrations > VISLs

WEST VIRGINIA STATE UNIVERSITY CAMPUS

Groundwater TW-107	Result ug/L	Commercial VISL	Residential VISL
Naphthalene	7	20	4.6
1,2-Dichloroethane	4.7	9.8	2.2

Notes:
1. Only the results for the locations with the maximum detected concentrations are shown on this figure.
2. USEPA commercial and residential VISLs are based on a target risk of 1E-6 and target hazard quotient of 0.1.
3. ug/L - micrograms per liter

Legend
- Shallow Groundwater Sample Location or Monitoring Well
- Exterior Soil Gas Sample Location; 5 feet bgs and just above the water table
- Eastern Area
- West Virginia State University Campus

N

0 75 150
Feet

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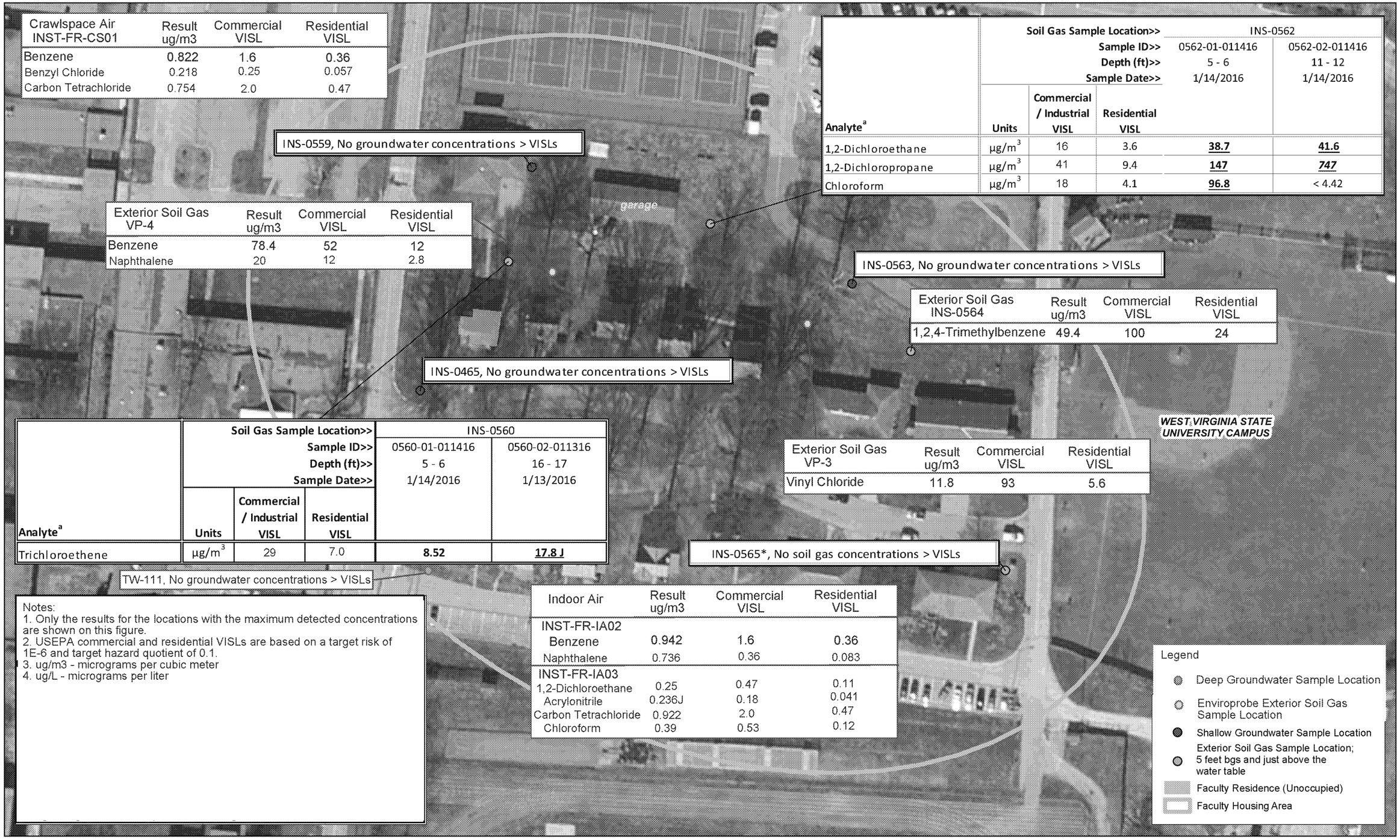
Figure 3-3
Eastern Area Maximum Concentration Exceedances
Human Health Exposure Evaluation

West Virginia State University
Institute, West Virginia

MAHFOOD group ch2m

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\VAPORINTRUSIONINVESTIGATION\MAPFILES\FIG9_SIMPLE_CSM_EASTERNAREA.MXD AESPEJO 4/11/2016 1:08:55 PM



Crawlspace Air INST-FR-CS01	Result ug/m3	Commercial VISL	Residential VISL
Benzene	0.822	1.6	0.36
Benzyl Chloride	0.218	0.25	0.057
Carbon Tetrachloride	0.754	2.0	0.47

Exterior Soil Gas VP-4	Result ug/m3	Commercial VISL	Residential VISL
Benzene	78.4	52	12
Naphthalene	20	12	2.8

				INS-0562	
			Soil Gas Sample Location>>		
			Sample ID>>	0562-01-011416	0562-02-011416
			Depth (ft)>>	5 - 6	11 - 12
			Sample Date>>	1/14/2016	1/14/2016
Analyte[a]	Units	Commercial / Industrial VISL	Residential VISL		
1,2-Dichloroethane	µg/m³	16	3.6	**38.7**	**41.6**
1,2-Dichloropropane	µg/m³	41	9.4	**147**	***747***
Chloroform	µg/m³	18	4.1	**96.8**	< 4.42

Exterior Soil Gas INS-0564	Result ug/m3	Commercial VISL	Residential VISL
1,2,4-Trimethylbenzene	49.4	100	24

				INS-0560	
			Soil Gas Sample Location>>		
			Sample ID>>	0560-01-011416	0560-02-011316
			Depth (ft)>>	5 - 6	16 - 17
			Sample Date>>	1/14/2016	1/13/2016
Analyte[a]	Units	Commercial / Industrial VISL	Residential VISL		
Trichloroethene	µg/m³	29	7.0	**8.52**	**17.8 J**

Exterior Soil Gas VP-3	Result ug/m3	Commercial VISL	Residential VISL
Vinyl Chloride	11.8	93	5.6

Indoor Air	Result ug/m3	Commercial VISL	Residential VISL
INST-FR-IA02			
Benzene	0.942	1.6	0.36
Naphthalene	0.736	0.36	0.083
INST-FR-IA03			
1,2-Dichloroethane	0.25	0.47	0.11
Acrylonitrile	0.236J	0.18	0.041
Carbon Tetrachloride	0.922	2.0	0.47
Chloroform	0.39	0.53	0.12

Notes:
1. Only the results for the locations with the maximum detected concentrations are shown on this figure.
2. USEPA commercial and residential VISLs are based on a target risk of 1E-6 and target hazard quotient of 0.1.
3. ug/m3 - micrograms per cubic meter
4. ug/L - micrograms per liter

Legend
- Deep Groundwater Sample Location
- Enviroprobe Exterior Soil Gas Sample Location
- Shallow Groundwater Sample Location
- Exterior Soil Gas Sample Location; 5 feet bgs and just above the water table
- Faculty Residence (Unoccupied)
- Faculty Housing Area

0 75 150
Feet

Note:
* = indicates that a shallow soil gas sample was not sucessfully collected

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Figure 3-4
Faculty Housing Maximum Concentration Exceedances
Human Health Exposure Evaluation

West Virginia State University
Institute, West Virginia

MAHFOOD group ch2m

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\VAPORINTRUSIONINVESTIGATION\MAPFILES\FIG10_SAMPLING_XSECTIONS_FACULTYAREA.MXD AESPEJO 4/11/2016 1:21:54 PM

Attachment 1

Original and Manually Re-screened Groundwater and Air Sample Data

ED_002092A_00000310-00071

Original Copies of CH2M Hill Groundwater Analytical Data

Phases I through V

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results					
				Location>>	INS-0385		INS-0387		INS-0388	
				Sample ID>>	0385-GW01-031513		0387-GW01-031413		0388-GW01-031413	
				Depth (ft)>>	27 - 32		30 - 35		32 - 37	
				Sample Date>>	3/15/2013		3/14/2013		3/14/2013	
		RBSLs								
Analyte[a]	**Units**	**MCL / RSL**	**Commercial/ Industrial VISL**	**Residential VISL**		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	**19.9**	10.9	1.1 UJ	1.1	**2.87 J**	1.1
Isophorone	µg/L	78	NA	NA	5.43 U	5.43	5.49 U	5.43	5.56 U	5.49
Naphthalene	µg/L	0.17	310	7.2	5.43 U	5.43	5.49 U	5.43	5.56 U	5.49
VOC										
1,1-Dichloroethane	µg/L	2.8	430	9.9	**3.29**	1	1 U	1	1 U	1
1,1-Dichloroethene	µg/L	7	1000	240	1 U	1	1 U	1	1 U	1
1,2-Dichloroethane	µg/L	5	130	30	1 U	1	1 U	1	1 U	1
Acetone	µg/L	1400	120000000	29000000	5 U	5	5 UL	5	5 U	5
Benzene	µg/L	5	92	2.1	1 U	1	1 U	1	1 U	1
Chlorobenzene	µg/L	100	2400	570	1 U	1	1 U	1	**165**	1
Chloroform	µg/L	80	46	1.1	**4.46**	1	1 U	1	1 U	1
Dichlorodifluoromethane	µg/L	20	41	9.9	1 U	1	1 U	1	1 U	1
Ethylbenzene	µg/L	700	220	49	1 U	1	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	340	21	1 U	1	1 U	1	1 U	1
Toluene	µg/L	1000	110000	26000	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	NA	NA	**8.55**	1	1 U	1	1 U	1

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results			
				Location>>	INS-0389		INS-0390	
				Sample ID>>	0389-GW01-031313		0390-GW01-031213	
				Depth (ft)>>	32 - 37		32 - 37	
				Sample Date>>	3/13/2013		3/12/2013	
		RBSLs						
Analyte[a]	**Units**	**MCL / RSL**	**Commercial/ Industrial VISL**	**Residential VISL**		RL		RL
SVOC								
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	**3.71 J**	1.09	**7.08 J**	1.11
Isophorone	µg/L	78	NA	NA	5.43 U	5.43	5.56 U	5.56
Naphthalene	µg/L	0.17	310	7.2	5.43 U	5.43	5.56 U	5.56
VOC								
1,1-Dichloroethane	µg/L	2.8	430	9.9	**1.88**	1	**2.67**	1
1,1-Dichloroethene	µg/L	7	1000	240	1 U	1	**1.45**	1
1,2-Dichloroethane	µg/L	5	130	30	1 U	1	1 U	1
Acetone	µg/L	1400	120000000	29000000	5 U	5	5 U	5
Benzene	µg/L	5	92	2.1	1 U	1	**1.76**	1
Chlorobenzene	µg/L	100	2400	570	1 U	1	**64.8**	1
Chloroform	µg/L	80	46	1.1	1 U	1	**12.2**	1
Dichlorodifluoromethane	µg/L	20	41	9.9	1 U	1	1 U	1
Ethylbenzene	µg/L	700	220	49	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	340	21	1 U	1	1 U	1
Toluene	µg/L	1000	110000	26000	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	NA	NA	**3.64**	1	**26.5**	1

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
			INS-0385		INS-0387		INS-0387		INS-0388	
			0385-GW02-031513		0387-GW-051613		0387-GW-051613D		0388-GW-051713	
			37 - 42		35 - 45		35 - 45		33.5 - 43.5	
Analyte[a]	**Units**	**MCL / RSL**	3/15/2013	RL	5/16/2013	RL	5/16/2013	RL	5/17/2013	RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**11.6**	10.5	- -		- -		- -	
Isophorone	µg/L	78	5.26 U	5.26	- -		- -		- -	
Naphthalene	µg/L	0.17	5.26 U	5.26	- -		- -		- -	
VOC										
1,1-Dichloroethane	µg/L	2.8	**3.98**	1	1 U	1	1 U	1	1 U	1
1,1-Dichloroethene	µg/L	7	1 U	1	1 U	1	1 U	1	1 U	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Acetone	µg/L	1400	5 U	5	5 UL	5	5 UL	5	5 U	5
Benzene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Chlorobenzene	µg/L	100	1 U	1	1 U	1	1 U	1	**205**	1
Chloroform	µg/L	80	**24.6**	1	1 U	1	1 U	1	**2.25**	1
Dichlorodifluoromethane	µg/L	20	**2.09**	1	1 UJ	1	1 UJ	1	1 U	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	**52.1**	1	1 U	1	1 U	1	**3.11**	1

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
			INS-0387 0387-GW02-031413 40 - 45		INS-0387 0387-GW02-031413D 40 - 45		INS-0388 0388-GW02-031413 42 - 47		INS-0389 0389-GW-051613 35-45	
Analyte[a]	**Units**	**MCL / RSL**	3/14/2013	RL	3/14/2013	RL	3/14/2013	RL	5/16/2013	RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	1.1 UJ	1.1	1.12 UJ	1.12	**5.46 J**	1.09	- -	
Isophorone	µg/L	78	5.49 U	5.49	5.62 U	5.62	5.43 U	5.43	- -	
Naphthalene	µg/L	0.17	5.49 U	5.49	5.62 U	5.62	5.43 U	5.43	- -	
VOC										
1,1-Dichloroethane	µg/L	2.8	**1.26**	1	**1.24**	1	**1.76**	1	**6.18**	1
1,1-Dichloroethene	µg/L	7	1 U	1	1 U	1	1 U	1	**1.03**	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Acetone	µg/L	1400	5 UL	5	5 UL	5	5 U	5	5 U	5
Benzene	µg/L	5	1 U	1	1 U	1	**5.3**	1	1 U	1
Chlorobenzene	µg/L	100	1 U	1	1 U	1	1 U	1	1 U	1
Chloroform	µg/L	80	**1.78**	1	**1.56**	1	**29.9**	1	**29.6**	1
Dichlorodifluoromethane	µg/L	20	1 U	1	1 U	1	1 U	1	**43 K**	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	**2.29**	1	**2.05**	1	**49.5**	1	**141**	1

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results					
			INS-0389 0389-GW02-031313 42 - 47		INS-0390 0390-GW-051713 35 - 45		INS-0390 0390-GW02-031213 42 - 47	
Analyte[a]	**Units**	**MCL / RSL**	3/13/2013	RL	5/17/2013	RL	3/12/2013	RL
SVOC								
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**4.83 J**	1.08	- -		**36.7**	10.3
Isophorone	µg/L	78	5.38 U	5.38	- -		5.15 U	5.15
Naphthalene	µg/L	0.17	5.38 U	5.38	- -		5.15 U	5.15
VOC								
1,1-Dichloroethane	µg/L	2.8	**12.3**	1	**2.96**	1	**1.51**	1
1,1-Dichloroethene	µg/L	7	**1.15**	1	**1.4**	1	1 U	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1
Acetone	µg/L	1400	5 U	5	5 U	5	5 U	5
Benzene	µg/L	5	1 U	1	**1.67**	1	1 U	1
Chlorobenzene	µg/L	100	1 U	1	**37.7**	1	1 U	1
Chloroform	µg/L	80	**13.8**	1	**13**	1	1 U	1
Dichlorodifluoromethane	µg/L	20	**57.2 L**	1	1 U	1	1 UJ	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	**25.6 L**	1	**30.5**	1	1 U	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

Underlined results indicate shallow concentrations detected above the Residential VISL (no concentrations are greater than commercial/industrial VISLs).

Grey shaded result indicates concentration detected above the MCL/RSL.

µg/L = micrograms per liter

NA = Not applicable

J flag indicates the reported concentration is estimated.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UJ flag indicates the constituent was not detected above an estimated reporting detection limit.

Table 2. Summary of Phase II Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results							
				Location>>	INS-0465		INS-0466		INS-0467		INS-0468	
				Sample ID>>	0465-GW01-102714		0466-GW01-102814		0467-GW01-102114		0468-GW01-102414	
				Depth (ft)>>	23 - 27		22 - 26		32 - 36		32 - 36	
				Sample Date>>	10/27/2014		10/28/2014		10/21/2014		10/24/2014	
		RBSLs										
Analyte[a]	**Units**	**MCL / RSL**	**Commercial/Industrial VISL**	**Residential VISL**		RL		RL		RL		RL
SVOC												
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	**4.64**	1.15	1.05 U	1.05	**5.05**	1.08	**2.52**	1.11
Isophorone	µg/L	78	NA	NA	5.75 U	5.75	5.26 U	5.26	5.38 UJ	5.38	2.78 U	5.56
Naphthalene	µg/L	0.17	310	7.2	5.75 U	5.75	5.26 U	5.26	5.38 UJ	5.38	2.78 U	5.56
VOC												
1,1-Dichloroethane	µg/L	2.8	430	9.9	1 U	1	1 U	1	**6.44**	1	0.125 U	1
1,1-Dichloroethene	µg/L	7	1000	240	1 U	1	1 U	1	**2.73**	1	0.5 U	1
1,2-Dichloroethane	µg/L	5	130	30	1 U	1	1 U	1	1 U	1	0.25 U	1
Acetone	µg/L	1400	120000000	29000000	5 UJ	5	5 UJ	5	5 U	5	2.5 UJ	5
Benzene	µg/L	5	92	2.1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chlorobenzene	µg/L	100	2400	570	1 U	1	1 U	1	1 U	1	0.125 U	1
Chloroform	µg/L	80	46	1.1	1 U	1	1 U	1	**1.07**	1	0.125 U	1
Dichlorodifluoromethane	µg/L	20	41	9.9	1 UJ	1	1 UJ	1	1 UJ	1	0.25 UJ	1
Ethylbenzene	µg/L	700	220	49	1 U	1	1 U	1	1 U	1	0.25 U	1
Tetrachloroethene	µg/L	5	340	21	1 U	1	1 U	1	1 U	1	0.25 U	1
Toluene	µg/L	1000	110000	26000	1 U	1	1 U	1	1 U	1	0.25 U	1
Trichlorofluoromethane	µg/L	520	NA	NA	1 U	1	1 U	1	1 U	1	0.25 U	1

Table 2. Summary of Phase II Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
		Location>>	INS-0465		INS-0466		INS-0466		INS-0467		INS-0468	
		Sample ID>>	0465-GW02-102714		0466-GW02-102814		0466-GW02-102814D		0467-GW02-102114		0468-GW02-102414	
		Depth (ft)>>	44 - 47		42 - 46		42 - 46		42 - 46		41 - 45	
		Sample Date>>	10/27/2014		10/27/2014		10/28/2014		10/21/2014		10/24/2014	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL		RL
SVOC												
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**14.7**	11.1	**7.02**	1.08	**5.58**	1.12	**22.2 K**	10.8	**3.61**	1.27
Isophorone	µg/L	78	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
Naphthalene	µg/L	0.17	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
VOC												
1,1-Dichloroethane	µg/L	2.8	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
1,1-Dichloroethene	µg/L	7	1 U	1	1 U	1	1 U	1	1 U	1	0.5 U	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Acetone	µg/L	1400	5 UJ	5	5 UJ	5	5 UJ	5	5 U	5	2.5 UJ	5
Benzene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chlorobenzene	µg/L	100	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chloroform	µg/L	80	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Dichlorodifluoromethane	µg/L	20	1 UJ	1	1 UJ	1	1 UJ	1	1 UJ	1	0.25 UJ	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Trichlorofluoromethane	µg/L	520	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentrations are greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

µg/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UJ flag indicates the constituent was not detected above an estimated reporting detection limit.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

Table 3. Summary of Phase III Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results						
					Location>>	INS-0469		INS-0469		INS-0470	
		RBSLs			Sample ID>>	0469-GW01-021015		0469-GW01-021015S		0470-GW01-021115	
			Commercial /Industrial	Residential	Depth (ft)>>	33 - 37		33 - 37		18 - 22	
					Sample Date>>	2/10/2015		2/10/2015		2/11/2015	
Analyte[a]	Units	MCL / RSL	VISL	VISL			RL		RL		RL
SVOC											
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000		**3.46**	1.19	**2.3**	0.11	**5.19**	1.33

					Shallow Interval Results						
					Location>>	INS-0470		INS-0471		INS-0471	
		RBSLs			Sample ID>>	0470-GW01-021115S		0471-GW01-021215		0471-GW01-021215D	
			Commercial /Industrial	Residential	Depth (ft)>>	18 - 22		34 - 38		34 - 38	
					Sample Date>>	2/11/2015		2/12/2015		2/12/2015	
Analyte[a]	Units	MCL / RSL	VISL	VISL			RL		RL		RL
SVOC											
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000		**4.2**	0.5	**5.13**	1.06	**5.41**	1.06

					Shallow Interval Results				
					Location>>	INS-0471		INS-0471	
		RBSLs			Sample ID>>	0471-GW01-021215DS		0471-GW01-021215S	
			Commercial /Industrial	Residential	Depth (ft)>>	34 - 38		34 - 38	
					Sample Date>>	2/12/2015		2/12/2015	
Analyte[a]	Units	MCL / RSL	VISL	VISL			RL		RL
SVOC									
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000		**4.4**	0.11	**4.4**	0.12

Table 3. Summary of Phase III Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

	Deep Interval Results							
Deep Interval Results		**Location>>**	INS-0470		INS-0470		INS-0471	
		Sample ID>>	0470-GW02-021115		0470-GW02-021115S		0471-GW02-021215S	
		Depth (ft)>>	46 - 50		46 - 50		44 - 48	
		Sample Date>>	2/11/2015		2/11/2015		2/12/2015	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL
SVOC								
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**3.48**	1.08	**2.3**	0.11	**3.3**	0.11

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06

for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

µg/L = micrograms per liter

Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results					
				Location>>	MW-104		TW-102		TW-103	
				Sample ID>>	MW104-GW-071115		TW102-GW01-070915		TW103-GW01-070815	
				Depth (ft)>>	23-33		8.5-12.5		18-22	
				Sample Date>>	7/11/2015		7/9/2015		7/8/2015	
		RBSLs								
Analyte[a]	**Units**	**MCL / RSL**	**Commercial /Industrial VISL**	**Residential VISL**		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	**0.85**	0.21	**0.59 L**	0.21	0.21 U	0.21
Isophorone	µg/L	78	NA	NA	1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	310	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC										
1,1-Dichloroethane	µg/L	2.8	430	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	1000	240	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	130	30	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	120000000	29000000	5 U	5	5 U	5	**6**	5
Benzene	µg/L	5	92	2.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	2400	570	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	46	1.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	41	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	220	49	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	340	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	110000	26000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results					
				Location>>	TW-104		TW-105		TW-106	
				Sample ID>>	TW104-GW01-062515		TW105-GW01-062515		TW106-GW01-062515	
				Depth (ft)>>	16-20		17-21		17-21	
				Sample Date>>	6/25/2015		6/25/2015		6/25/2015	
		RBSLs								
Analyte[a]	**Units**	**MCL / RSL**	**Commercial /Industrial VISL**	**Residential VISL**		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	0.22 U	0.22	0.21 U	0.21	0.23 U	0.23
Isophorone	µg/L	78	NA	NA	1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	310	7.2	0.5 U	0.5	0.5 U	0.5	0.6 U	0.6
VOC										
1,1-Dichloroethane	µg/L	2.8	430	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	1000	240	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	130	30	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	120000000	29000000	5 U	5	5 U	5	5 U	5
Benzene	µg/L	5	92	2.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	2400	570	**12**	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	46	1.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	41	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	220	49	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	340	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	110000	26000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results					
				Location>>	TW-107		TW-108		TW-108	
				Sample ID>>	TW107-GW01-070715		TW108-GW01-070815		TW108-GW01-070815D	
				Depth (ft)>>	17-21		17-21		17-21	
				Sample Date>>	7/7/2015		7/8/2015		7/8/2015	
		RBSLs								
Analyte[a]	**Units**	**MCL / RSL**	**Commercial /Industrial VISL**	**Residential VISL**		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	**2.2 L**	0.29	**3.5**	0.2	**4.1**	0.2
Isophorone	µg/L	78	NA	NA	1 U	1	1 UL	1	1 U	1
Naphthalene	µg/L	0.17	310	7.2	**7**	0.7	0.5 UL	0.5	0.5 U	0.5
VOC										
1,1-Dichloroethane	µg/L	2.8	430	9.9	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	1000	240	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	130	30	**4.7**	2.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	120000000	29000000	25 U	5	5 U	5	5 U	5
Benzene	µg/L	5	92	2.1	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	2400	570	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	46	1.1	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	41	9.9	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	220	49	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	340	21	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	110000	26000	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	NA	NA	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5

Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	TW-102		TW-103		TW-103		TW-104	
		Sample ID>>	TW102-GW02-070915		TW103-GW02-070815		TW103-GW-080115		TW104-GW02-062515	
		Depth (ft)>>	38-42		48-52		47-57		46-56	
		Sample Date>>	7/9/2015		7/8/2015		8/1/2015		6/25/2015	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	0.2 U	0.2	0.2 U	0.2	0.2 U	0.2	**8.5**	0.2
Isophorone	µg/L	78	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC										
1,1-Dichloroethane	µg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	**9.2**	5	5 U	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	**22**	0.5
Ethylbenzene	µg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	TW-104		TW-105		TW-106		TW-107	
		Sample ID>>	TW104-GW-080115		TW105-GW-073115		TW106-GW-080115		TW107-GW-073015	
		Depth (ft)>>	45-55		48-58		48-58		42-52	
		Sample Date>>	8/1/2015		7/31/2015		8/1/2015		7/30/2015	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**3.7**	0.2	0.2 U	0.2	**2**	0.2	**0.3**	0.2
Isophorone	µg/L	78	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	**13**	0.5
VOC										
1,1-Dichloroethane	µg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	5 U	5	5 U	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	0.5 U	0.5	**3.1**	0.5	0.5 U	0.5	**0.7**	0.5
Dichlorodifluoromethane	µg/L	20	**1**	0.5	0.5 U	0.5	**17**	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	TW-108		TW-109		TW-110		TW-111	
		Sample ID>>	TW108-GW-073115		TW109-GW-073115		TW110-GW-073115		TW111-GW-080115	
		Depth (ft)>>	45-55		48-58		44-54		41.5-51.5	
		Sample Date>>	7/31/2015		7/31/2015		7/31/2015		8/1/2015	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**19**	1.1	**8**	0.21	**19**	1.1	**32**	2
Isophorone	µg/L	78	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC										
1,1-Dichloroethane	µg/L	2.8	0.5 U	0.5	**0.6**	0.5	**6.9**	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U	0.5	0.5 U	0.5	**5 L**	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 UL	0.5	0.5 U	0.5
Acetone	µg/L	1400	**44**	5	**39**	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 UL	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	0.5 U	0.5	**2.6**	0.5	**1.1 L**	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5 U	0.5	**1.4**	0.5	**0.6**	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U	0.5	0.5 U	0.5	**2**	0.5	0.5 U	0.5

Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results			
		Location>>	TW-112		TW-113	
		Sample ID>>	TW112-GW-073115		TW113-GW-073015	
		Depth (ft)>>	35-45		41-51	
		Sample Date>>	7/31/2015		7/30/2015	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL
SVOC						
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**3**	0.2	**3**	0.2
Isophorone	µg/L	78	1 U	1	1 U	1
Naphthalene	µg/L	0.17	0.5 U	0.5	0.5 U	0.5
VOC						
1,1-Dichloroethane	µg/L	2.8	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	**0.5**	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U	0.5	0.5 U	0.5

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results only.

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

µg/L = micrograms per liter

NA = Not applicable

L flag indicates the reported concentration is biased low.

U flag indicates the constituent was not detected above the reporting detection limit.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

Table 5. Summary of Phase V Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte[a]	**Units**	**MCL / RSL**	**Commercial /Industrial VISL**	**Residential VISL**		RL		RL		RL		RL		RL
SVOC														
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	0.20 U	0.21	**0.49**	0.2	**7.7**	0.2	**3.4**	0.2	0.20 U	0.2
Isophorone	µg/L	78	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	310	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC														
1,1-Dichloroethane	µg/L	2.8	430	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	1000	240	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	130	30	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	120000000	29000000	5 U	5	5 U	5	5 U	5	5 U	5	0.5 U	5
Benzene	µg/L	5	92	2.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	2400	570	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	46	1.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	41	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	220	49	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	340	21	**30**	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	110000	26000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 5. Summary of Phase V Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
		Sample Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**0.24**	0.21	0.22 U	0.21	**0.48**	0.21	**0.47**	0.21
Isophorone	µg/L	78	1 U	1	1 U	1	R	1	R	1
Naphthalene	µg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC										
1,1-Dichloroethane	µg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	5 U	5	**22**	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 5. Summary of Phase V Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
		Location>>	INS-0573		INS-0574		TW-105		TW-105		TW-106	
		Sample ID>>	0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
		Depth (ft)>>	46-50		47-51		48-58		48-58		48-58	
		Sample Date>>	1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL		RL
SVOC												
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**0.57**		**2.5**		0.21 U	0.21	0.2 U	0.2	**1.7**	0.2
Isophorone	µg/L	78	1 U		1 U		1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC												
1,1-Dichloroethane	µg/L	2.8	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	5.0 U		5.0 U		5 U	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	**17 J**	0.5
Ethylbenzene	µg/L	700	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

Underlined results indicate shallow concentrations detected above the Residential VISL.

µg/L = micrograms per liter

NA = Not applicable

R flag indicates the data were not of sufficient quality for reporting.

U flag indicates the constituent was not detected above the reporting detection limit.

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte[a]	**Units**	**MCL / RSL**	**Commercial/ Industrial VISL**	**Residential VISL**		RL		RL		RL		RL		RL
VOC														
1,1,2,2-Tetrachloroethane	µg/L	0.076	200	4.6	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	µg/L	5	36	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	µg/L	15	180	43	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	µg/L	5	140	3.3	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	µg/L	120	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	µg/L	75	170	3.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	13000000	3000000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2-Hexanone	µg/L	38	49000	12000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	µg/L	6300	3300000	780000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	µg/L	80	51	1.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	µg/L	7.5	89	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	µg/L	810	6600	1600	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	µg/L	5	24	0.54	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	µg/L	190	1300	310	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	µg/L	80	18	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	µg/L	5	25000	970	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	µg/L	100	56000	13000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	µg/L	100	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	µg/L	5	29	1.6	***2.3***	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	µg/L	2	29	0.24	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	µg/L	10000	2300	550	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC														
2,4,5-Trichlorophenol	µg/L	1200	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4,6-Trichlorophenol	µg/L	4.1	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dichlorophenol	µg/L	46	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dimethylphenol	µg/L	360	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dinitrophenol	µg/L	39	NA	NA	31 UJ	31	30 U	30	30 U	30	R	30	30 U	30
2,4-Dinitrotoluene	µg/L	0.24	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2,6-Dinitrotoluene	µg/L	0.049	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Chloronaphthalene	µg/L	750	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Chlorophenol	µg/L	91	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2-Methylnaphthalene	µg/L	36	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.051	0.052 U	0.052

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte[a]	**Units**	**MCL / RSL**	**Commercial/ Industrial VISL**	**Residential VISL**		RL		RL		RL		RL		RL
SVOC (continued)														
2-Methylphenol	µg/L	930	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2-Nitroaniline	µg/L	190	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Nitrophenol	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
3,3'-Dichlorobenzidine	µg/L	0.13	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
3-Nitroaniline	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4,6-Dinitro-2-methylphenol	µg/L	1.5	NA	NA	15 UJ	15	15 U	15	15 U	15	R	15	15 U	15
4-Bromophenyl phenyl ether	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Chloro-3-methylphenol	µg/L	1400	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
4-Chloroaniline	µg/L	0.37	NA	NA	4 U	4	4 U	4	4 U	4	4 U	4	4 U	4
4-Chlorophenyl phenyl ether	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Nitroaniline	µg/L	3.8	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Nitrophenol	µg/L	42	0.0000011	NA	31 U	31	30 U	30	30 U	30	R	30	30 U	30
Acenaphthene	µg/L	530	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acenaphthylene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Anthracene	µg/L	1800	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Benzo (a) anthracene	µg/L	0.012	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.052	0.052 U	0.052
Benzo (a) pyrene	µg/L	0.2	NA	NA	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052 U	0.5
Benzo (b) fluoranthene	µg/L	0.034	NA	NA	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052 U	0.5
Benzo (g,h,i) perylene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Benzo(k)fluoranthene	µg/L	0.34	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bis (2-chloroethoxy) methane	µg/L	59	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Bis (2-chloroethyl) ether	µg/L	0.014	850	20	0.052 U	0.052	0.051 U	0.051	0.051 U	0.051	0.05 U	0.051	0.051 UJ	0.051
Bis (2-chloroisopropyl) ether	µg/L	710	610	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Bis (2-ethylhexyl) phthalate	µg/L	6	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Butyl benzylphthalate	µg/L	16	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Chrysene	µg/L	3.4	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Di-n-butylphthalate	µg/L	900	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Di-n-octylphthalate	µg/L	200	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Dibenzo (a,h) anthracene	µg/L	0.0034	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibenzofuran	µg/L	7.9	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Diethyl phthalate	µg/L	15000	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Dimethyl phthalate	µg/L	NA	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Ethyl ether	µg/L	3900	NA	NA	0.5 U	0.5	**3 K**	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	µg/L	800	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte[a]	**Units**	**MCL / RSL**	**Commercial/ Industrial VISL**	**Residential VISL**		RL		RL		RL		RL		RL
SVOC (continued)														
Fluorene	µg/L	290	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Hexachlorobenzene	µg/L	1	0.65	0.15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Hexachlorobutadiene	µg/L	0.14	21	0.47	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Hexachlorocyclopentadiene	µg/L	50	5.2	1.2	15 U	15	15 U	15	15 U	15	15 U	15	15 U	15
Hexachloroethane	µg/L	0.33	110	2.6	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Indeno (1,2,3-c,d) pyrene	µg/L	0.034	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
n-Nitrosodi-n-propylamine	µg/L	0.011	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
n-Nitrosodiphenylamine	µg/L	12	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Nitrobenzene	µg/L	0.14	5000	110	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
p-Cresol	µg/L	1900	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
Pentachlorophenol	µg/L	1	NA	NA	5 U	5	5 U	5	5 U	5	R	5	5 U	5
Phenanthrene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Phenol	µg/L	5800	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
Pyrene	µg/L	120	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.051	0.052 U	0.052
Metal														
Arsenic, dissolved	mg/L	0.01	NA	NA	- -		**0.0643**	0.02	**0.131**	0.02	0.02 U	0.02	0.02 U	0.02
Barium, dissolved	mg/L	2	NA	NA	- -		**0.562**	0.005	**0.668**	0.005	**1.58**	0.005	**0.0901**	0.005
Cadmium, dissolved	mg/L	0.005	NA	NA	- -		0.005 U	0.005	0.005 U	0.005	0.005 U	0.005	0.005 U	0.005
Chromium, dissolved	mg/L	0.1	NA	NA	- -		0.015 U	0.015	0.015 U	0.015	0.015 U	0.015	0.015 U	0.015
Lead, dissolved	mg/L	0.015	NA	NA	- -		0.015 U	0.015	0.015 U	0.015	0.015 U	0.015	0.015 U	0.015
Mercury, dissolved	mg/L	0.002	0.0061	0.0015	- -		0.0002 U	2E-04	0.0002 U	2E-04	0.0002 U	2E-04	0.0002 U	2E-04
Selenium, dissolved	mg/L	0.05	NA	NA	- -		0.02 U	0.02	0.02 U	0.02	0.02 U	0.02	0.02 U	0.02
Silver, dissolved	mg/L	0.094	NA	NA	- -		0.005 U	0.005	0.005 U	0.005	0.005 U	0.005	0.005 U	0.005

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
		Sample Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL
VOC										
1,1,2,2-Tetrachloroethane	µg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	µg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	µg/L	120	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	µg/L	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	µg/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	5 U	5	**5.5**	5	5 U	5	5 U	5
2-Hexanone	µg/L	38	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	µg/L	6300	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	µg/L	7.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	µg/L	810	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	µg/L	190	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	µg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	µg/L	10000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC										
2,4,5-Trichlorophenol	µg/L	1200	- -		- -		1 U	1	1 U	1
2,4,6-Trichlorophenol	µg/L	4.1	- -		- -		1 U	1	1 U	1
2,4-Dichlorophenol	µg/L	46	- -		- -		1 U	1	1 U	1
2,4-Dimethylphenol	µg/L	360	- -		- -		1 U	1	1 U	1
2,4-Dinitrophenol	µg/L	39	- -		- -		31 U	31	31 U	31
2,4-Dinitrotoluene	µg/L	0.24	- -		- -		R	5	R	5
2,6-Dinitrotoluene	µg/L	0.049	- -		- -		R	1	R	1
2-Chloronaphthalene	µg/L	750	- -		- -		R	1	R	1
2-Chlorophenol	µg/L	91	- -		- -		1 U	1	1 U	1
2-Methylnaphthalene	µg/L	36	- -		- -		R	0.5	R	0.5

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
		Sample Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL
SVOC (continued)										
2-Methylphenol	µg/L	930	- -		- -		1 U	1	1 U	1
2-Nitroaniline	µg/L	190	- -		- -		R	1	R	1
2-Nitrophenol	µg/L	NA	- -		- -		1 U	1	1 U	1
3,3'-Dichlorobenzidine	µg/L	0.13	- -		- -		R	5	R	5
3-Nitroaniline	µg/L	NA	- -		- -		R	1	R	1
4,6-Dinitro-2-methylphenol	µg/L	1.5	- -		- -		16 U	16	15 U	15
4-Bromophenyl phenyl ether	µg/L	NA	- -		- -		R	1	R	1
4-Chloro-3-methylphenol	µg/L	1400	- -		- -		1 U	1	1 U	1
4-Chloroaniline	µg/L	0.37	- -		- -		R	4	R	4
4-Chlorophenyl phenyl ether	µg/L	NA	- -		- -		R	1	R	1
4-Nitroaniline	µg/L	3.8	- -		- -		R	1	R	1
4-Nitrophenol	µg/L	42	- -		- -		31 U	31	31 U	31
Acenaphthene	µg/L	530	- -		- -		R	0.5	R	0.5
Acenaphthylene	µg/L	NA	- -		- -		R	0.5	R	0.5
Anthracene	µg/L	1800	- -		- -		R	0.5	R	0.5
Benzo (a) anthracene	µg/L	0.012	- -		- -		R	0.5	R	0.5
Benzo (a) pyrene	µg/L	0.2	- -		- -		R	0.5	R	0.5
Benzo (b) fluoranthene	µg/L	0.034	- -		- -		R	0.5	R	0.5
Benzo (g,h,i) perylene	µg/L	NA	- -		- -		R	0.5	R	0.5
Benzo(k)fluoranthene	µg/L	0.34	- -		- -		R	0.5	R	0.5
Bis (2-chloroethoxy) methane	µg/L	59	- -		- -		R	1	R	1
Bis (2-chloroethyl) ether	µg/L	0.014	- -		- -		0.052 U	0.05	0.051 U	0.05
Bis (2-chloroisopropyl) ether	µg/L	710	- -		- -		R	1	R	1
Bis (2-ethylhexyl) phthalate	µg/L	6	- -		- -		R	5	R	5
Butyl benzylphthalate	µg/L	16	- -		- -		R	5	R	5
Chrysene	µg/L	3.4	- -		- -		R	0.5	R	0.5
Di-n-butylphthalate	µg/L	900	- -		- -		R	5	R	5
Di-n-octylphthalate	µg/L	200	- -		- -		R	5	R	5
Dibenzo (a,h) anthracene	µg/L	0.0034	- -		- -		R	0.5	R	0.5
Dibenzofuran	µg/L	7.9	- -		- -		R	1	R	1
Diethyl phthalate	µg/L	15000	- -		- -		R	5	R	5
Dimethyl phthalate	µg/L	NA	- -		- -		R	5	R	5
Ethyl ether	µg/L	3900	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	µg/L	800	- -		- -		R	0.5	R	0.5

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
		Sample Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL
SVOC (continued)										
Fluorene	µg/L	290	- -		- -		R	0.5	R	0.5
Hexachlorobenzene	µg/L	1	- -		- -		R	0.5	R	0.5
Hexachlorobutadiene	µg/L	0.14	- -		- -		R	1	R	1
Hexachlorocyclopentadiene	µg/L	50	- -		- -		R	16	R	15
Hexachloroethane	µg/L	0.33	- -		- -		R	5	R	5
Indeno (1,2,3-c,d) pyrene	µg/L	0.034	- -		- -		R	0.5	R	0.5
n-Nitrosodi-n-propylamine	µg/L	0.011	- -		- -		R	1	R	1
n-Nitrosodiphenylamine	µg/L	12	- -		- -		R	1	R	1
Nitrobenzene	µg/L	0.14	- -		- -		R	1	R	1
p-Cresol	µg/L	1900	- -		- -		1 U	1	1 U	1
Pentachlorophenol	µg/L	1	- -		- -		5 U	5	5 U	5
Phenanthrene	µg/L	NA	- -		- -		R	0.5	R	0.5
Phenol	µg/L	5800	- -		- -		1 U	1	1 U	1
Pyrene	µg/L	120	- -		- -		R	0.5	R	0.5

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
		Location>>	INS-0573		INS-0574		TW-105		TW-105		TW-106	
		Sample ID>>	0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
		Depth (ft)>>	46-50		47-51		48-58		48-58		48-58	
		Sample Date>>	1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL		RL
VOC												
1,1,2,2-Tetrachloroethane	µg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	µg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	µg/L	120	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	µg/L	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	µg/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2-Hexanone	µg/L	38	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	µg/L	6300	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	µg/L	7.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	µg/L	810	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	µg/L	190	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	µg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	µg/L	10000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC												
2,4,5-Trichlorophenol	µg/L	1200	- -		1 U	1	- -		- -		- -	
2,4,6-Trichlorophenol	µg/L	4.1	- -		1 U	1	- -		- -		- -	
2,4-Dichlorophenol	µg/L	46	- -		1 U	1	- -		- -		- -	
2,4-Dimethylphenol	µg/L	360	- -		1 U	1	- -		- -		- -	
2,4-Dinitrophenol	µg/L	39	- -		30 UJ	30	- -		- -		- -	
2,4-Dinitrotoluene	µg/L	0.24	- -		5 U	5	- -		- -		- -	
2,6-Dinitrotoluene	µg/L	0.049	- -		1 U	1	- -		- -		- -	
2-Chloronaphthalene	µg/L	750	- -		1 U	1	- -		- -		- -	
2-Chlorophenol	µg/L	91	- -		1 U	1	- -		- -		- -	
2-Methylnaphthalene	µg/L	36	- -		0.5 U	0.5	- -		- -		- -	

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
		Location>>	INS-0573		INS-0574		TW-105		TW-105		TW-106	
		Sample ID>>	0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
		Depth (ft)>>	46-50		47-51		48-58		48-58		48-58	
		Sample Date>>	1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL		RL
SVOC (continued)												
2-Methylphenol	µg/L	930	- -		1 U	1	- -		- -		- -	
2-Nitroaniline	µg/L	190	- -		1 U	1	- -		- -		- -	
2-Nitrophenol	µg/L	NA	- -		1 U	1	- -		- -		- -	
3,3'-Dichlorobenzidine	µg/L	0.13	- -		5 U	5	- -		- -		- -	
3-Nitroaniline	µg/L	NA	- -		1 U	1	- -		- -		- -	
4,6-Dinitro-2-methylphenol	µg/L	1.5	- -		15 U	15	- -		- -		- -	
4-Bromophenyl phenyl ether	µg/L	NA	- -		1 U	1	- -		- -		- -	
4-Chloro-3-methylphenol	µg/L	1400	- -		1 U	1	- -		- -		- -	
4-Chloroaniline	µg/L	0.37	- -		4 U	4	- -		- -		- -	
4-Chlorophenyl phenyl ether	µg/L	NA	- -		1 U	1	- -		- -		- -	
4-Nitroaniline	µg/L	3.8	- -		1 U	1	- -		- -		- -	
4-Nitrophenol	µg/L	42	- -		30 U	30	- -		- -		- -	
Acenaphthene	µg/L	530	- -		0.5 U	0.5	- -		- -		- -	
Acenaphthylene	µg/L	NA	- -		0.5 U	0.5	- -		- -		- -	
Anthracene	µg/L	1800	- -		0.5 U	0.5	- -		- -		- -	
Benzo (a) anthracene	µg/L	0.012	- -		0.5 U	0.5	- -		- -		- -	
Benzo (a) pyrene	µg/L	0.2	- -		0.5 U	0.5	- -		- -		- -	
Benzo (b) fluoranthene	µg/L	0.034	- -		0.5 U	0.5	- -		- -		- -	
Benzo (g,h,i) perylene	µg/L	NA	- -		0.5 U	0.5	- -		- -		- -	
Benzo(k)fluoranthene	µg/L	0.34	- -		0.5 U	0.5	- -		- -		- -	
Bis (2-chloroethoxy) methane	µg/L	59	- -		1 U	1	- -		- -		- -	
Bis (2-chloroethyl) ether	µg/L	0.014	- -		0.051 U	0.051	- -		- -		- -	
Bis (2-chloroisopropyl) ether	µg/L	710	- -		1 U	1	- -		- -		- -	
Bis (2-ethylhexyl) phthalate	µg/L	6	- -		5 U	5	- -		- -		- -	
Butyl benzylphthalate	µg/L	16	- -		5 U	5	- -		- -		- -	
Chrysene	µg/L	3.4	- -		0.5 U	0.5	- -		- -		- -	
Di-n-butylphthalate	µg/L	900	- -		5 U	5	- -		- -		- -	
Di-n-octylphthalate	µg/L	200	- -		5 U	5	- -		- -		- -	
Dibenzo (a,h) anthracene	µg/L	0.0034	- -		0.5 U	0.5	- -		- -		- -	
Dibenzofuran	µg/L	7.9	- -		1 U	1	- -		- -		- -	
Diethyl phthalate	µg/L	15000	- -		5 U	5	- -		- -		- -	
Dimethyl phthalate	µg/L	NA	- -		5 U	5	- -		- -		- -	
Ethyl ether	µg/L	3900	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	µg/L	800	- -		0.5 U	0.5	- -		- -		- -	

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
		Location>>	INS-0573		INS-0574		TW-105		TW-105		TW-106	
		Sample ID>>	0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
		Depth (ft)>>	46-50		47-51		48-58		48-58		48-58	
		Sample Date>>	1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL		RL		RL
SVOC (continued)												
Fluorene	µg/L	290	- -		0.5 U	0.5	- -		- -		- -	
Hexachlorobenzene	µg/L	1	- -		0.5 U	0.5	- -		- -		- -	
Hexachlorobutadiene	µg/L	0.14	- -		1 U	1	- -		- -		- -	
Hexachlorocyclopentadiene	µg/L	50	- -		15 U	15	- -		- -		- -	
Hexachloroethane	µg/L	0.33	- -		5 U	5	- -		- -		- -	
Indeno (1,2,3-c,d) pyrene	µg/L	0.034	- -		0.5 U	0.5	- -		- -		- -	
n-Nitrosodi-n-propylamine	µg/L	0.011	- -		1 U	1	- -		- -		- -	
n-Nitrosodiphenylamine	µg/L	12	- -		1 U	1	- -		- -		- -	
Nitrobenzene	µg/L	0.14	- -		1 U	1	- -		- -		- -	
p-Cresol	µg/L	1900	- -		1 U	1	- -		- -		- -	
Pentachlorophenol	µg/L	1	- -		5 U	5	- -		- -		- -	
Phenanthrene	µg/L	NA	- -		0.5 U	0.5	- -		- -		- -	
Phenol	µg/L	5800	- -		1 U	1	- -		- -		- -	
Pyrene	µg/L	120	- -		0.5 U	0.5	- -		- -		- -	

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

Italicized results indicate concentration detected above the Residential VISL.

mg/L = milligrams per liter

µg/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit.

UJ flag indicates the analyte was below the reported sample quantitation limit. However, the reported value is approximate.

K flag indicates the analyte was positively identified, but the associated numerical value may be biased high.

R flag indicates the sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet the quality control criteria. The presence or absence of the analyte cannot be verified.

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Vapor Intrusion Investigation Data

Table 2-1. Athletic Facility Area Sampling Results

Eastern Property Boundary Vapor Intrusion Investigation

UCC Institute Facility, Institute, West Virginia

Analyte	Screening Level[a]	INST-AF-AA01	INST-AF-IA01	INST-AF-IA02	INST-AF-IA03	INST-AF-IA04	INST-AF-IA05	INST-AF-IA06		INST-AF-IA07	INST-AF-IA08	INST-AF-IA09	INST-AF-IA10
Location		INST-AF-AA01	INST-AF-IA01	INST-AF-IA02	INST-AF-IA03	INST-AF-IA04	INST-AF-IA05	INST-AF-IA06		INST-AF-IA07	INST-AF-IA08	INST-AF-IA09	INST-AF-IA10
Sample ID		AF-AA1-062015	AF-IA1-062015	AF-IA2-062015	AF-IA3-062015	AF-IA4-062015	AF-IA5-062015	AF-IA6-06202015	AF-IA6-06202015D	AF-IA7-062015	AF-IA8-062015	AF-IA9-062015	AF-IA10-062015
Sample Date		6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015
VOCs (µg/m^3)													
1,1-Dichloroethane	77	0.148 U	0.148 U	0.146 U	0.151 U	0.146 U	0.152 U	0.155 U	0.148 U	0.143 U	0.139 U	0.149 U	0.143 U
1,1-Dichloroethene	880	0.145 U	0.145 U	0.143 U	0.148 U	0.143 U	0.149 U	0.152 U	0.145 U	0.14 U	0.136 U	0.146 U	0.14 U
1,4-Dioxane (p-Dioxane)	25	3.3 U	3.3 U	3.24 U	3.35 U	3.24 U	3.39 U	3.45 U	3.3 U	3.19 U	3.1 U	3.32 U	3.19 U
Benzene	16	0.585 U	0.585 U	0.575 U	0.595 U	0.575 U	0.601 U	0.611 U	0.585 U	0.566 U	0.549 U	0.588 U	0.566 U
Chlorobenzene	220	0.169 U	**0.496**	**0.501**	0.171 U	0.166 U	0.173 U	0.176 U	0.169 U	0.163 U	0.158 U	0.17 U	0.163 U
Chloroform	5.3	0.179 U	0.179 U	0.176 U	0.182 U	**0.184**	0.22 B	0.195 B	0.191 B	0.173 U	0.168 U	0.18 U	0.173 U
Trichlorofluoromethane	--	**1.18**	**0.852**	**0.863**	**0.903**	**0.909**	**1.09**	**1.5**	**1.39**	**1.33**	**1.22**	**1.23**	**1.2**
VOCs, Total	--	**1.18**	**1.348**	**1.364**	**0.903**	**1.093**	**1.31**	**1.695**	**1.581**	**1.33**	**1.22**	**1.23**	**1.2**

Notes:

a : Screening levels are based on USEPA regional screening levels (RSLs; USEPA 2015b) for indoor air for a commercial/industrial exposure scenario.

The RSLs are based on a 1E-05 (1 x 10^{-5}) target carcinogenic risk for current and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

-- : Not available

NA = Not analyzed

B = The analyte was detected in the associated method and/or calibration blank.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

µg/m$_3$ = Micrograms per Cubic Meter

Bold indicates the analyte was detected

Shading indicates the result exceeded screening criteria (Note there are no representative cases)

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Table 2-2. Convocation Center Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

				Outdoor Air		Crawl Space Air		Indoor Air																Exterior Soil Gas		
			Location>>	INST-CC-AA01		INST-CC-S01		INST-CC-IA01	INST-CC-IA02	INST-CC-IA03	INST-CC-IA04	INST-CC-IA05	INST-CC-IA06	INST-CC-IA07		INST-CC-IA08	INST-CC-IA09	INST-CC-IA10	INST-CC-IA11	INST-CC-IA12	INST-CC-IA13	INST-CC-IA14		INST-CC-IA15	IHS-0572		
			Sample ID>>	CC-AA1-06202015	CC-AA1-06202015D	CC-CS1-06202015	CC-CS1-06202015D	CC-IA1-06202015	CC-IA2-06202015	CC-IA3-06202015	CC-IA4-06202015	CC-IA5-06202015	CC-IA6-06202015	CC-IA7-06202015	CC-IA7-06202015D	CC-IA8-06202015	CC-IA9-06202015	CC-IA10-06202015	CC-IA11-06202015	CC-IA12-06202015	CC-IA13-06202015	CC-IA14-06202015	CC-IA14-06202015D	CC-IA15-06202015	0572-01-012016	0572-02-020516	0572-02-020516S
			Sample Depth (feet)>>	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	5 - 6	12 - 13	12 - 13
			Sample Date>>	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	1/20/2016	2/5/2016	2/5/2016
		Screening Levels[a,b]																									
Analyte	Unit	Commercial/Industrial Indoor Air RSL	Commercial/Industrial Soil Gas VISL	Residential Soil Gas VISL																							
1,1,1-Trichloroethane	µg/m³	22000	730000	*170000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.91 U	4.91 U	5.5 UJ
1,1,2,2-Tetrachloroethane	µg/m³	2.1	70	*1.6*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.18 U	6.18 U	6.9 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/m³	130000	4400000	*1000000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.9 U	6.9 U	15 UJ
1,1,2-Trichloroethane	µg/m³	0.88	29	*5.8*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.91 U	4.91 U	5.5 UJ
1,1-Dichloroethane	µg/m³	77	2600	*58*	0.17 U	0.156 U	0.168 U	0.152 U	0.149 U	0.155 U	0.156 U	0.159 U	0.152 U	0.147 U	0.148 U	0.147 U	0.154 U	0.143 U	0.145 U	0.156 U	0.18 U	0.166 U	0.155 U	0.162 U	0.137 UJ	3.64 U	3.64 U	4 UJ
1,1-Dichloroethene	µg/m³	880	29000	*7000*	0.167 U	0.152 U	0.165 U	0.149 U	0.146 U	0.152 U	0.152 U	0.156 U	0.149 U	0.144 U	0.145 U	0.144 U	0.151 U	0.14 U	0.142 U	0.152 U	0.177 U	0.163 U	0.152 U	0.159 U	0.134 UJ	3.57 U	3.57 U	4 UJ
1,2,4-Trichlorobenzene	µg/m³	8.8	290	*70*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.68 U	6.68 U	15 UJ
1,2,4-Trimethylbenzene	µg/m³	31	1000	*240*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.43 U	4.43 U	4.9 UJ
1,2-Dibromoethane (EDB)	µg/m³	0.2	6.8	*0.16*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.92 U	6.92 U	7.7 UJ
1,2-Dichlorobenzene	µg/m³	880	29000	*7000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.41 U	5.41 U	6 UJ
1,2-Dichloroethane	µg/m³	4.7	160	*3.6*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.64 U	3.64 U	4 UJ
1,2-Dichloropropane	µg/m³	12	410	*9.4*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.16 U	4.16 U	4.6 UJ
1,2-Dichlorotetrafluoroethane	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.29 U	6.29 U	7 UJ
1,3,5-Trimethylbenzene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.43 U	4.43 U	4.9 UJ
1,3-Dichlorobenzene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.41 U	5.41 U	6 UJ
1,4-Dichlorobenzene	µg/m³	11	370	*8.5*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.41 U	5.41 U	6 UJ
1,4-Dioxane (p-Dioxane)	µg/m³	25	820	*19*	3.81 U	3.46 U	3.74 U	3.39 U	3.32 U	3.45 U	3.46 U	3.54 U	3.39 U	3.28 U	3.3 U	**7.44 J**	3.43 U	3.19 U	3.23 U	3.46 U	4.03 U	3.7 U	3.45 U	3.61 U	3.04 UJ	3.24 U	3.24 U	3.6 UJ
2-Butanone	µg/m³	22000	730000	*170000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**30.9**	2.65 U	5.9 UJ
2-Hexanone	µg/m³	130	4400	*1000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.69 U	3.69 U	8.2 UJ
2-Methylnaphthalene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.24 U	5.24 U	--
4-Methyl-2-pentanone	µg/m³	13000	440000	*100000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.69 U	3.69 U	8.2 UJ
Acetone	µg/m³	140000	4500000	*1100000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**130**	**6.98 NJ**	**6.8 J**
Acrylonitrile	µg/m³	1.8	60	*1.4*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.95 U	1.95 U	4.3 UJ
Benzene	µg/m³	16	520	*12*	0.673 U	0.614 U	0.663 U	0.601 U	0.588 U	0.611 U	0.614 U	0.627 U	0.601 U	0.582 U	0.585 U	0.582 U	0.608 U	0.566 U	0.572 U	0.614 U	0.712 U	0.657 U	0.611 U	0.64 U	0.54 UJ	**38**	2.88 U	3.2 UJ
Benzyl chloride	µg/m³	2.5	83	*1.9*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.66 U	4.66 U	5.2 UJ
Bis (2-chloroisopropyl) ether	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.3 U	6.3 U	--
Bromodichloromethane	µg/m³	3.3	110	*2.5*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.03 U	6.03 U	6.7 UJ
Bromoform	µg/m³	110	3700	*85*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.3 U	9.3 U	10 UJ
Bromomethane	µg/m³	22	730	*170*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.5 U	3.5 U	3.9 UJ
Carbon disulfide	µg/m³	3100	100000	*24000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**28.5**	2.8 U	3.1 UJ
Carbon tetrachloride	µg/m³	20	680	*16*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.66 U	5.66 U	6.3 UJ
Chlorobenzene	µg/m³	220	7300	*1700*	0.194 U	0.177 U	0.191 U	0.173 U	0.17 U	0.176 U	0.177 U	0.181 U	0.173 U	0.168 U	0.169 U	**0.312**	0.175 U	0.163 U	0.165 U	0.177 U	0.205 U	0.189 U	0.176 U	0.184 U	0.155 UJ	4.14 U	4.14 U	4.6 UJ
Chloroethane	µg/m³	44000	1500000	*350000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.38 U	2.38 U	2.6 UJ
Chloroform	µg/m³	5.3	180	*4.1*	0.206 U	0.188 U	0.203 U	0.184 U	0.18 U	0.187 U	0.188 U	0.192 U	**0.256**	0.178 U	0.179 U	0.178 U	0.186 U	0.173 U	0.175 U	0.188 U	0.218 U	0.201 U	0.187 U	0.196 U	0.165 UJ	4.4 U	4.4 U	4.9 UJ
Chloromethane	µg/m³	190	6300	*3100*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.86 U	1.86 U	2.1 UJ
cis-1,2-Dichloroethylene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.57 U	3.57 U	4 UJ
cis-1,3-Dichloropropene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.09 U	4.09 U	4.5 UJ
Dibromochloromethane	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.67 U	7.67 U	8.5 UJ
Dichlorodifluoromethane	µg/m³	440	15000	*3500*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**418**	**172**	**210 J**
Ethylbenzene	µg/m³	49	1600	*37*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**6.67**	3.91 U	4.3 UJ
Hexachlorobutadiene	µg/m³	5.6	190	*4.3*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.49 U	9.49 U	21 UJ
m,p-Xylene	µg/m³	440	15000	*3500*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**14.9**	7.82 U	8.1
Methylene chloride	µg/m³	2600	88000	*3400*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.13 U	3.13 U	3.5 UJ
n-Butylbenzene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.94 U	4.94 U	5.5 UJ
n-Hexane	µg/m³	3100	100000	*24000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**55.6**	3.17 U	3.5 UJ
n-Propylbenzene	µg/m³	4400	150000	*35000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.42 U	4.42 U	4.9 UJ
Naphthalene	µg/m³	3.6	120	*2.8*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.72 U	4.72 U	5.2 UJ
o-Xylene	µg/m³	440	15000	*3500*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**5.12**	3.91 U	**5.1 J**
Styrene	µg/m³	4400	150000	*35000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.83 U	3.83 U	4.3 UJ
tert-Butyl Methyl Ether	µg/m³	470	16000	*360*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.25 U	3.25 U	3.6 UJ
Tetrachloroethene	µg/m³	180	5800	*360*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.11 U	6.11 U	6.8 UJ
Toluene	µg/m³	22000	730000	*170000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**27.6**	3.39 U	3.8 UJ
Trans-1,2-Dichloroethylene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.57 U	3.57 U	4 UJ
trans-1,3-Dichloropropene	µg/m³	NA	NA	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.09 U	4.09 U	4.5 UJ
Trichloroethylene	µg/m³	8.8	290	*16*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.83 U	4.83 U	5.4 UJ
Trichlorofluoromethane	µg/m³	NA	NA	*NA*	**0.886**	**1.09**	**5.49**	**5**	**1.4**	**1.19**	**1.54**	**1.54**	**1.16**	**1.14**	**1.85**	**1.65**	**1.27**	**1.19**	**1.23**	**1.22**	**1.17**	**4.74**	**10.7**	**9.77**	**1.94 J**	**20.8**	**8.06**	**11 J**
Vinyl acetate	µg/m³	880	29000	*7000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.17 U	3.17 U	3.5 UJ
Vinyl chloride	µg/m³	28	930	*7.7*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.3 U	2.3 U	2.6 UJ
VOCs, Total	µg/m³	NA	NA	*NA*	**0.886**	**1.09**	**5.49**	**5**	**1.4**	**1.19**	**1.54**	**1.54**	**1.416**	**1.14**	**1.85**	**9.402**	**1.27**	**1.19**	**1.23**	**1.22**	**1.17**	**4.74**	**10.7**	**9.77**	**1.94**	**776.09**	**187.04**	**240.9**

Notes:

a : Screening levels are based on USEPA regional screening levels (RSLs, USEPA 2015b) for indoor air for a commercial/industrial exposure scenario.
The RSLs are based on a 1E-05 (1 x 10^{-5}) target carcinogenic risk for current exposure scenarios and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

b : Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03,
a 1E-06 (1 x 10-6) target carcinogenic risk for hypothetical, future residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

-- = Not analyzed
B = The analyte was detected in the associated method and/or calibration blank.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
NA = Not available
NJ = The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.
µg/m³ = Micrograms per Cubic Meter
Bold indicates the analyte was detected
Shaded indicates the detected concentration exceeded the industrial screening level (RSL). (Note there are no representative cases)
Blue colored results indicate concentration was detected above the Commercial/Industrial Soil Gas VISL (Note there are no representative cases)
Italicized results indicate concentration was detected above the Residential Soil Gas VISL

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Table 2-3. Eastern Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

				Location>>	INS-0569		INS-0571		
				Sample ID>>	0569-01-011516	0569-02-011416	0571-01-020516	0571-01-020516S	0571-02-012016
				Sample Depth (feet)>>	5 - 6	13 - 14	5 - 6	5 - 6	11 - 12
				Sample Date>>	1/15/2016	1/14/2016	2/5/2016	2/5/2016	1/20/2016
		RBSLs[a]							
Analyte	**Unit**	Commercial/Industrial Soil Gas VISL	*Residential Soil Gas VISL*						
1,1,1-Trichloroethane	µg/m^3	730000	*170000*		4.99 U	5.38 U	4.77 U	5.5 UJ	4.55 UJ
1,1,2,2-Tetrachloroethane	µg/m^3	70	*1.6*		6.28 U	6.77 U	6.01 U	6.9 UJ	5.73 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/m^3	4400000	*1000000*		7.02 U	7.56 U	6.7 U	15 UJ	6.39 UJ
1,1,2-Trichloroethane	µg/m^3	29	*5.8*		4.99 U	5.38 U	4.77 U	5.5 UJ	4.55 UJ
1,1-Dichloroethane	µg/m^3	2600	*58*		3.71 U	3.99 U	3.54 U	4 UJ	3.38 UJ
1,1-Dichloroethene	µg/m^3	29000	*7000*		3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
1,2,4-Trichlorobenzene	µg/m^3	290	*70*		6.79 U	7.32 U	6.49 U	15 UJ	6.19 UJ
1,2,4-Trimethylbenzene	µg/m^3	1000	*240*		**13.2**	4.85 U	4.3 U	**6.8 J**	**21.4 J**
1,2-Dibromoethane (EDB)	µg/m^3	6.8	*0.16*		7.03 U	7.58 U	6.72 U	7.7 UJ	6.41 UJ
1,2-Dichlorobenzene	µg/m^3	29000	*7000*		5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,2-Dichloroethane	µg/m^3	150	*3.6*		3.71 U	3.99 U	3.54 U	4 UJ	3.38 UJ
1,2-Dichloropropane	µg/m^3	410	*9.4*		4.23 U	4.56 U	4.04 U	4.6 UJ	3.85 UJ
1,2-Dichlorotetrafluoroethane	µg/m^3	NA	*NA*		6.4 U	6.9 U	6.12 U	7 UJ	5.83 UJ
1,3,5-Trimethylbenzene	µg/m^3	NA	*NA*		**5.35**	4.85 U	4.3 U	**17 J**	**7.3 J**
1,3-Dichlorobenzene	µg/m^3	NA	*NA*		5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,4-Dichlorobenzene	µg/m^3	370	*8.5*		5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,4-Dioxane (p-Dioxane)	µg/m^3	820	*19*		3.3 U	3.56 U	3.15 U	3.6 UJ	3.01 UJ
2-Butanone	µg/m^3	730000	*170000*		**9.45**	**24.4**	2.58 U	5.9 UJ	**3.39 J**
2-Hexanone	µg/m^3	4400	*1000*		3.75 U	4.04 U	3.58 U	8.2 UJ	3.42 UJ
2-Methylnaphthalene	µg/m^3	NA	*NA*		5.32 U	5.74 U	5.09 U	- -	4.85 UJ
4-Methyl-2-pentanone	µg/m^3	440000	*100000*		3.75 U	4.04 U	3.58 U	8.2 UJ	3.42 UJ
Acetone	µg/m^3	4500000	*1100000*		**8.65 NJ**	**108 NJ**	**19.3**	**11 B**	**14.8 J**
Acrylonitrile	µg/m^3	60	*1.4*		1.99 U	2.14 U	1.9 U	4.3 UJ	1.81 UJ
Benzene	µg/m^3	520	*12*		2.92 U	**4.88 NJ**	2.79 U	3.2 UJ	2.66 UJ
Benzyl chloride	µg/m^3	83	*1.9*		4.74 U	5.11 U	4.53 U	5.2 UJ	4.32 UJ
Bis (2-chloroisopropyl) ether	µg/m^3	NA	*NA*		6.4 U	6.9 U	6.12 U	- -	5.84 UJ
Bromodichloromethane	µg/m^3	110	*2.5*		6.13 U	6.61 U	5.86 U	6.7 UJ	5.59 UJ
Bromoform	µg/m^3	3700	*85*		9.46 U	10.2 U	9.04 U	10 UJ	8.62 UJ
Bromomethane	µg/m^3	730	*170*		3.55 U	3.83 U	3.4 U	3.9 UJ	3.24 UJ
Carbon disulfide	µg/m^3	100000	*24000*		2.85 U	3.07 U	2.72 U	**3.7 J**	2.6 UJ
Carbon tetrachloride	µg/m^3	680	*16*		5.76 U	6.21 U	5.5 U	6.3 UJ	5.25 UJ
Chlorobenzene	µg/m^3	7300	*1700*		4.21 U	4.54 U	4.03 U	4.6 UJ	3.84 UJ
Chloroethane	µg/m^3	1500000	*350000*		2.42 U	2.6 U	2.31 U	2.6 UJ	2.2 UJ
Chloroform	µg/m^3	180	*4.1*		4.47 U	4.82 U	4.27 U	4.9 UJ	4.07 UJ
Chloromethane	µg/m^3	13000	*3100*		1.89 U	2.04 U	1.81 U	2.1 UJ	1.72 UJ
cis-1,2-Dichloroethylene	µg/m^3	NA	*NA*		3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
cis-1,3-Dichloropropene	µg/m^3	NA	*NA*		4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 UJ

Table 2-3. Eastern Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

Dibromochloromethane	µg/m^3	NA	*NA*	7.8 U	8.4 U	7.45 U	8.5 UJ	7.1 UJ
Dichlorodifluoromethane	µg/m^3	15000	*3500*	4.53 U	4.88 U	4.33 U	4.9 UJ	4.12 UJ
Ethylbenzene	µg/m^3	1600	*37*	**4.86**	4.28 U	3.8 U	**5.5 J**	3.62 UJ
Hexachlorobutadiene	µg/m^3	190	*4.3*	9.65 U	10.4 U	9.22 U	21 UJ	8.79 UJ
m,p-Xylene	µg/m^3	15000	*3500*	**25.1**	8.57 U	7.6 U	**9.4 J**	7.24 UJ
Methylene chloride	µg/m^3	88000	*3400*	3.18 U	3.43 U	3.04 U	3.5 UJ	2.9 UJ
n-Butylbenzene	µg/m^3	NA	*NA*	5.03 U	5.42 U	4.8 U	5.5 UJ	4.58 UJ
n-Hexane	µg/m^3	100000	*24000*	3.23 U	**13.7 NJ**	3.08 U	3.5 UJ	2.94 UJ
n-Propylbenzene	µg/m^3	150000	*35000*	4.5 U	4.85 U	4.3 U	4.9 UJ	4.1 UJ
Naphthalene	µg/m^3	120	*2.8*	4.8 U	5.17 U	4.59 U	5.2 UJ	4.37 UJ
o-Xylene	µg/m^3	15000	*3500*	**7.55**	4.28 U	3.8 U	**9.5 J**	3.62 UJ
Styrene	µg/m^3	150000	*35000*	3.9 U	4.2 U	3.73 U	4.3 UJ	3.55 UJ
tert-Butyl Methyl Ether	µg/m^3	16000	*360*	3.3 U	3.56 U	3.15 U	3.6 UJ	3.01 UJ
Tetrachloroethene	µg/m^3	5800	*360*	6.21 U	**27**	5.93 U	6.8 UJ	5.66 UJ
Toluene	µg/m^3	730000	*170000*	**18.9**	**53.7**	3.3 U	**5.5 J**	3.14 UJ
Trans-1,2-Dichloroethylene	µg/m^3	NA	*NA*	3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
trans-1,3-Dichloropropene	µg/m^3	NA	*NA*	4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 UJ
Trichloroethylene	µg/m^3	290	*16*	4.92 U	5.3 U	4.7 U	5.4 UJ	4.48 UJ
Trichlorofluoromethane	µg/m^3	NA	*NA*	**5.89**	**10.6**	4.91 U	5.6 UJ	4.69 UJ
Vinyl acetate	µg/m^3	29000	*7000*	3.22 U	3.47 U	3.08 U	3.5 UJ	2.94 UJ
Vinyl chloride	µg/m^3	930	*7.7*	2.34 U	2.52 U	2.24 U	2.6 UJ	2.13 UJ
VOCs, Total	µg/m^3	NA	*NA*	**98.95**	**242.28**	**19.3**	**68.4**	**46.89**

Notes:

a : Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03,
a 1E-06 (1 x 10-6) target carcinogenic risk for hypothetical, future residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 200

- - = Not analyzed

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

NA = Not available

NJ = The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.

µg/m^3 = Micrograms per Cubic Meter

Bold indicates the analyte was detected

Blue colored results indicate concentration was detected above the Commercial/Industrial Soil Gas VISL (Note there are no representative cases)

Italicized results indicate concentration was detected above the Residential Soil Gas VISL (Note there are no representative cases)

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Table 2-4. Faculty Housing Area Sampling Results

Vapor Intrusion Investigation

West Virginia State University, Institute, West Virginia

					Outdoor Air			Subslab Soil Vapor				Crawl Space Air							
				Location>>	INST-FR-AA01			INST-FR-SS01			INST-FR-SS02	INST-FR-CS01			INST-FR-IA01		INST-FR-IA02		
				Sample ID>>	FR-AA1-06192015	FR-AA1-012616	FR-AA01-012716S	FR-SS01-012916S	FR-SS01-020316	FR-SS01-020416S	FR-SS02-020316	FR-CS1-012616	FR-CS1-012616D	FR-CS01-012716S	FR-IA1-06192015	FR-IA1-012616	FR-IA2-06192015	FR-IA2-012716	FR-IA3-06192015
				Sample Depth (feet)>>	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0
				Sample Date>>	6/20/2015	1/26/2016	1/26/2016	1/28/2016	2/3/2016	2/3/2016	2/3/2016	1/26/2016	1/26/2016	1/26/2016	6/20/2015	1/26/2016	6/20/2015	1/27/2016	6/20/2015
		Screening Levels[a,b]																	
		Residential	Commercial/Industrial	Residential															
Analyte	Unit	Indoor Air RSL	Soil Gas VISL	Soil Gas VISL															
1,1,1-Trichloroethane	µg/m³	5200	730000	*170000*	- -	0.188 UJ	0.273 UJ	0.273 UJ	4.8 U	5.5 U	5.44 U	0.19 U	0.19 U	0.273 U	- -	0.222 U	- -	0.206 U	- -
1,1,2,2-Tetrachloroethane	µg/m³	0.048	70	*1.6*	- -	0.236 UJ	6.9 UJ	6.9 UJ	6.04 U	6.9 U	6.84 U	0.239 U	0.239 U	6.9 U	- -	0.279 U	- -	0.26 U	- -
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/m³	31000	4400000	*1000000*	- -	**0.51 J**	**0.787 J**	**0.805 J**	6.74 U	15 U	7.64 U	**0.506**	**0.531**	**0.775**	- -	**0.552**	- -	**0.512**	- -
1,1,2-Trichloroethane	µg/m³	0.18	29	*5.8*	- -	0.188 UJ	0.273 UJ	0.273 UJ	4.8 U	5.5 U	5.44 U	0.19 U	0.19 U	0.273 U	- -	0.222 U	- -	0.206 U	- -
1,1-Dichloroethane	µg/m³	1.8	2600	*58*	0.152 U	0.139 UJ	0.202 UJ	0.202 UJ	3.56 U	4 U	4.03 U	0.141 U	0.141 U	0.202 U	0.152 U	0.165 U	0.164 U	0.153 U	0.146 U
1,1-Dichloroethene	µg/m³	210	290000	*7000*	0.149 U	0.136 UJ	0.198 UJ	0.198 UJ	3.49 U	4 U	3.95 U	0.138 U	0.138 U	0.198 U	**0.205**	0.161 U	**0.201**	0.15 U	**0.213**
1,2,4-Trichlorobenzene	µg/m³	2.1	290	*70*	- -	0.255 UJ	15 UJ	15 UJ	6.53 U	15 U	7.4 U	0.258 U	**0.366**	15 U	- -	0.302 U	- -	0.281 U	- -
1,2,4-Trimethylbenzene	µg/m³	7.3	1000	*240*	- -	0.169 UJ	0.246 UJ	**1.11 J**	4.33 U	4.9 U	4.9 U	0.171 U	**0.241**	0.246 U	- -	**0.246**	- -	0.186 U	- -
1,2-Dibromoethane (EDB)	µg/m³	0.0047	5.8	*0.16*	- -	0.264 UJ	0.384 UJ	0.384 UJ	6.76 U	7.7 U	7.66 U	0.267 U	0.267 U	0.384 U	- -	0.313 U	- -	0.291 U	- -
1,2-Dichlorobenzene	µg/m³	210	29000	*7000*	- -	0.207 UJ	0.301 UJ	0.301 UJ	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U	- -	0.245 U	- -	0.228 U	- -
1,2-Dichloroethane	µg/m³	0.11	160	*3.6*	- -	0.139 UJ	0.202 UJ	0.202 UJ	3.56 U	4 U	4.03 U	0.141 U	0.141 U	0.202 U	- -	0.165 U	- -	0.153 U	- -
1,2-Dichloropropane	µg/m³	0.28	410	*9.4*	- -	0.159 UJ	0.231 UJ	0.231 UJ	4.07 U	4.6 U	4.61 U	0.161 U	0.161 U	0.231 U	- -	0.188 U	- -	0.175 U	- -
1,2-Dichlorotetrafluoroethane	µg/m³	NA	NA	*NA*	- -	0.24 UJ	7 UJ	7 UJ	6.15 U	7 U	6.97 U	0.243 U	0.243 U	7 U	- -	0.284 U	- -	0.265 U	- -
1,3,5-Trimethylbenzene	µg/m³	NA	NA	*NA*	- -	0.169 UJ	4.9 UJ	4.9 UJ	4.33 U	4.9 U	4.9 U	0.171 U	0.171 U	4.9 U	- -	0.2 U	- -	0.186 U	- -
1,3-Dichlorobenzene	µg/m³	NA	NA	*NA*	- -	0.207 UJ	0.301 UJ	0.301 UJ	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U	- -	0.245 U	- -	0.228 U	- -
1,4-Dichlorobenzene	µg/m³	0.26	370	*8.5*	- -	0.207 UJ	0.301 UJ	**0.786 J**	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U	- -	0.245 U	- -	0.228 U	- -
1,4-Dioxane (p-Dioxane)	µg/m³	0.56	820	*19*	3.39 U	3.1 UJ	3.6 UJ	3.6 UJ	3.17 U	3.6 U	3.59 U	3.13 U	3.13 U	3.6 U	3.39 U	3.7 U	3.65 U	3.41 U	3.24 U
2-Butanone	µg/m³	5200	730000	*170000*	- -	**0.663 J**	5.9 UJ	5.9 UJ	2.59 U	5.9 U	2.94 U	**1.25 J**	**0.696 J**	5.9 U	- -	**0.861**	- -	**1.84**	- -
2-Hexanone	µg/m³	31	4400	*1000*	- -	3.52 UJ	8.2 UJ	8.2 UJ	3.6 U	8.2 U	4.08 U	3.56 U	3.56 U	8.2 U	- -	4.2 U	- -	3.88 U	- -
2-Methylnaphthalene	µg/m³	NA	NA	*NA*	- -	10 UJ	- -	- -	5.12 U	- -	5.8 U	10.1 U	10.1 U	- -	- -	11.8 U	- -	11 U	- -
4-Methyl-2-pentanone	µg/m³	3100	440000	*100000*	- -	**3.3 J**	8.2 UJ	8.2 UJ	3.6 U	8.2 U	4.08 U	**2.33**	**2.2**	8.2 U	- -	**2.79**	- -	**3.04**	- -
Acetone	µg/m³	32000	4500000	*1100000*	- -	**11.2 J**	**21 J**	**26 J**	2.09 U	**7.2**	2.37 U	**12.5 J**	**9.76 J**	**18**	- -	**13.1 J**	- -	**8.12 J**	- -
Acrylonitrile	µg/m³	0.041	60	*1.4*	- -	1.87 UJ	0.109 UJ	0.109 UJ	1.91 U	4.3 U	2.16 U	1.89 UJ	1.89 UJ	0.109 U	- -	2.2 UJ	- -	2.05 UJ	- -
Benzene	µg/m³	0.36	520	*12*	0.601 U	**0.601 J**	**0.855 J**	**0.674 J**	2.81 U	3.2 U	3.18 U	0.585	0.627	0.822	0.601 U	0.709	0.647 U	0.942	0.585
Benzyl chloride	µg/m³	0.057	83	*1.9*	- -	0.178 UJ	5.2 UJ	5.2 UJ	4.56 U	5.2 U	5.16 U	0.218	0.18 U	5.2 U	- -	0.211 U	- -	0.196 U	- -
Bis (2-chloroisopropyl) ether	µg/m³	NA	NA	*NA*	- -	6.01 UJ	- -	- -	6.16 U	- -	6.97 U	6.08 U	6.08 U	- -	- -	7.1 U	- -	6.62 U	- -
Bromodichloromethane	µg/m³	0.076	110	*2.5*	- -	0.23 UJ	0.335 UJ	0.335 UJ	5.9 U	6.7 U	6.68 U	0.233 U	0.233 U	0.335 U	- -	0.273 U	- -	0.254 U	- -
Bromoform	µg/m³	7.6	3700	*85*	- -	1.78 UJ	10 UJ	10 UJ	9.09 U	10 U	10.3 U	1.8 U	1.8 U	10 U	- -	2.1 U	- -	1.96 U	- -
Bromomethane	µg/m³	5.2	730	*170*	- -	0.668 UJ	3.9 UJ	3.9 UJ	3.42 U	3.9 U	3.87 U	0.675 U	0.675 U	3.9 U	- -	0.79 U	- -	0.735 U	- -
Carbon disulfide	µg/m³	730	100000	*24000*	- -	0.107 UJ	3.1 UJ	**8.8 J**	2.74 U	3.1 U	3.1 U	0.108 U	0.108 U	3.1 U	- -	0.127 U	- -	0.118 U	- -
Carbon tetrachloride	µg/m³	0.47	680	*16*	- -	2.16 UJ	**0.752 J**	**0.763 J**	5.54 U	6.3 U	6.27 U	2.19 U	2.19 U	0.754	- -	2.56 U	- -	2.38 U	- -
Chlorobenzene	µg/m³	52	7300	*1700*	0.173 U	0.158 UJ	4.6 UJ	4.6 UJ	4.05 U	4.6 U	4.59 U	0.16 U	0.16 U	4.6 U	0.173 U	0.187 U	0.186 U	0.174 U	0.166 U
Chloroethane	µg/m³	10000	1500000	*350000*	- -	0.0907 UJ	0.132 UJ	0.132 UJ	2.32 U	2.6 U	2.63 U	0.0918 U	0.0918 U	0.132 U	- -	0.107 U	- -	0.0999 U	- -
Chloroform	µg/m³	0.12	180	*4.1*	0.184 U	0.168 UJ	0.244 UJ	**0.542 J**	4.3 U	4.9 U	4.87 U	0.17 U	0.17 U	0.244 U	0.184 U	0.199 U	0.198 U	0.185 U	0.176 U
Chloromethane	µg/m³	94	13000	*3100*	- -	1.77 UJ	2.1 UJ	2.1 UJ	1.82 U	2.1 U	2.06 U	1.8 U	1.8 U	2.1 U	- -	2.1 U	- -	1.95 U	- -
cis-1,2-Dichloroethylene	µg/m³	NA	NA	*NA*	- -	0.136 UJ	0.198 UJ	0.198 UJ	3.49 U	4 U	3.95 U	0.138 U	0.138 U	0.198 U	- -	0.161 U	- -	0.15 U	- -
cis-1,3-Dichloropropene	µg/m³	NA	NA	*NA*	- -	0.156 UJ	4.5 UJ	4.5 UJ	3.99 U	4.5 U	4.52 U	0.158 U	0.158 U	4.5 U	- -	0.185 U	- -	0.172 U	- -
Dibromochloromethane	µg/m³	NA	NA	*NA*	- -	0.293 UJ	8.5 UJ	8.5 UJ	7.49 U	8.5 U	8.49 U	0.296 U	0.296 U	8.5 U	- -	0.347 U	- -	0.322 U	- -
Dichlorodifluoromethane	µg/m³	100	15000	*3500*	- -	**2.39 J**	**3.75 J**	**3.64 J**	4.35 U	4.9 U	4.93 U	**2.38 J**	**2.5 J**	**3.64 J**	- -	**2.54**	- -	0.468 U	- -
Ethylbenzene	µg/m³	1.1	1600	*37*	- -	0.149 UJ	**0.281 J**	**2.23 J**	3.82 U	4.3 U	4.33 U	0.151 U	**0.163**	**0.504**	- -	0.177 U	- -	**0.408**	- -
Hexachlorobutadiene	µg/m³	0.13	190	*4.3*	- -	0.363 UJ	21 UJ	21 UJ	9.28 U	21 U	10.5 U	0.367 U	0.367 U	21 U	- -	0.429 U	- -	0.399 U	- -
m,p-Xylene	µg/m³	100	15000	*3500*	- -	**0.39 J**	**0.755 J**	**7.03 J**	7.64 U	4.3 U	8.66 U	**0.455**	**0.49**	**1.32**	- -	**0.481**	- -	**1.51**	- -
Methylene chloride	µg/m³	100	88000	*3400*	- -	5.97 UJ	**0.866 J**	**320 J**	3.06 U	3.5 U	3.46 U	6.04 U	6.04 U	**4.1**	- -	7.1 U	- -	6.57 U	- -
n-Butylbenzene	µg/m³	NA	NA	*NA*	- -	0.189 UJ	5.5 UJ	5.5 UJ	4.83 U	5.5 U	5.47 U	0.191 U	0.191 U	5.5 U	- -	0.223 U	- -	0.208 U	- -
n-Hexane	µg/m³	730	100000	*24000*	- -	**0.649 J**	3.5 UJ	**8.8 J**	3.1 U	3.5 U	3.51 U	**0.67**	**0.771**	3.5 U	- -	**1.15**	- -	**1.69**	- -
n-Propylbenzene	µg/m³	1000	150000	*35000*	- -	0.169 UJ	4.9 UJ	4.9 UJ	4.32 U	4.9 U	4.9 U	0.171 U	0.171 U	4.9 U	- -	0.2 U	- -	0.186 U	- -
Naphthalene	µg/m³	0.083	120	*2.8*	- -	0.18 UJ	0.262 UJ	**0.368 J**	4.61 U	5.2 U	5.23 U	0.182 U	0.591 J	0.262 U	- -	0.736	- -	0.198 U	- -
o-Xylene	µg/m³	100	15000	*3500*	- -	0.149 UJ	**0.423 J**	**4.03 J**	3.82 U	4.3 U	4.33 U	**0.197**	**0.193**	**0.831**	- -	**0.201**	- -	**0.574**	- -
Styrene	µg/m³	1000	150000	*35000*	- -	0.146 UJ	0.213 UJ	0.213 UJ	3.75 U	4.3 U	4.25 U	0.148 U	0.148 U	0.213 U	- -	0.173 U	- -	0.161 U	- -
tert-Butyl Methyl Ether	µg/m³	11	16000	*360*	- -	0.124 UJ	0.18 UJ	**0.192 J**	3.17 U	3.6 U	3.59 U	0.125 U	0.125 U	0.18 U	- -	0.147 U	- -	0.136 U	- -
Tetrachloroethene	µg/m³	11	5800	*360*	- -	0.233 UJ	0.339 UJ	**7.45 J**	5.97 U	6.8 U	6.76 U	0.236 U	0.236 U	0.339 U	- -	0.276 U	- -	0.257 U	- -
Toluene	µg/m³	5200	730000	*170000*	- -	**0.617 J**	**0.983 J**	**3.91 J**	3.32 U	3.8 U	3.76 U	**1.43**	**1.51**	**2.12**	- -	**1.46**	- -	**1.98**	- -
Trans-1,2-Dichloroethylene	µg/m³	NA	NA	*NA*	- -	0.136 UJ	0.198 UJ	0.198 UJ	3.49 U	4 U	3.95 U	0.138 U	0.138 U	0.198 U	- -	0.161 U	- -	0.15 U	- -
trans-1,3-Dichloropropene	µg/m³	NA	NA	*NA*	- -	0.156 UJ	4.5 UJ	4.5 UJ	3.99 U	4.5 U	4.52 U	0.158 U	0.158 U	4.5 U	- -	0.185 U	- -	0.172 U	- -
Trichloroethylene	µg/m³	0.48	290	*16*	- -	0.185 U	0.269 UJ	0.269 UJ	4.72 U	5.4 U	5.35 U	0.187 U	0.187 U	0.269 U	- -	0.218 U	- -	0.203 U	- -
Trichlorofluoromethane	µg/m³	NA	NA	*NA*	**0.972**	**1.17 J**	5.6 UJ	5.6 UJ	**6**	**19**	**7.6**	**1.18**	**1.26**	5.6 U	**1.17**	**1.27**	**1.1**	**1.3**	**1.17**
Vinyl acetate	µg/m³	210	29000	*7000*	- -	0.303 UJ	3.5 UJ	3.5 UJ	3.1 U	3.5 U	3.51 U	0.306 U	0.306 U	3.5 U	- -	0.358 U	- -	0.333 U	- -
Vinyl chloride	µg/m³	0.17	530	*7.7*	- -	0.0879 UJ	0.128 UJ	0.128 UJ	2.25 U	2.6 U	2.55 U	0.0889 U	0.0889 U	0.128 U	- -	0.104 U	- -	0.0967 U	- -
VOCs, Total	µg/m³	NA	NA	*NA*	**0.972**	**21.49**	**30.452**	**396.762**	**6**	**26.2**	**7.6**	**23.701**	**21.308**	**32.866**	**1.375**	**25.36**	**1.301**	**21.916**	**1.968**

Table 2-4. Faculty Housing Area Sampling Results

Vapor Intrusion Investigation

West Virginia State University, Institute, West Virginia

					Indoor Air										Exterior Soil Gas							
				Location>>	INST-FR-IA03			INST-FR-IA04		INST-FR-IA05		INST-FR-IA06			INS-0560		INS-0562		INS-0564		INS-0565	
				Sample ID>>	FR-IA3-012616	FR-IA03-012716S	FR-IA03-012716DS	FR-IA4-06192015	FR-IA4-012616	FR-IA5-06222015	FR-IA5-012616	FR-IA6-06192015	FR-IA6-06192015D	FR-IA6-012616	0560-01-011416	0560-02-011316	0562-01-011416	0562-02-011416	0564-01-011416	0564-02-020516S	0565-02-011916	0565-02-011916/D
				Sample Depth (feet)>>	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	5 - 6	16 - 17	5 - 6	11 - 12	5 - 6	17.5 - 18.5	16 - 17	16 - 17
				Sample Date>>	1/26/2016	1/26/2016	1/26/2016	6/20/2015	1/26/2016	6/23/2015	1/26/2016	6/20/2015	6/20/2015	1/26/2016	1/14/2016	1/13/2016	1/14/2016	1/14/2016	1/14/2016	2/5/2016	1/19/2016	1/19/2016
		Screening Levels[a,b]																				
Analyte	Unit	Residential Indoor Air RSL	Commercial/Industrial Soil Gas VISL	Residential Soil Gas VISL																		
1,1,1-Trichloroethane	µg/m³	5200	730310	*170000*	0.214 U	0.273 U	0.273 U	- -	0.185 UJ	- -	0.181 UJ	- -	- -	0.216 U	5.11 U	4.72 UJ	5.77 U	4.94 U	5.05 U	5.5 U	9.77 U	9.71 U
1,1,2,2-Tetrachloroethane	µg/m³	0.048	70	*1.6*	0.27 U	6.9 U	6.9 U	- -	0.233 UJ	- -	0.228 UJ	- -	- -	0.272 U	6.42 U	5.94 UJ	7.26 U	6.21 U	6.35 U	6.9 U	12.3 U	12.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/m³	31000	4400000	*1000000*	**0.518**	**1**	**0.783**	- -	**0.511 J**	- -	**0.533 J**	- -	- -	**0.507**	7.17 U	6.63 UJ	8.11 U	6.94 U	7.09 U	15 U	13.7 U	13.6 U
1,1,2-Trichloroethane	µg/m³	0.18	29	*5.8*	0.214 U	0.273 U	0.273 U	- -	0.185 UJ	- -	0.181 UJ	- -	- -	0.216 U	5.11 U	4.72 UJ	5.77 U	4.94 U	5.05 U	5.5 U	9.77 U	9.71 U
1,1-Dichloroethane	µg/m³	1.8	2600	*58*	0.159 U	0.202 U	0.202 U	0.147 U	0.138 UJ	0.145 U	0.134 UJ	0.156 U	0.142 UJ	0.161 U	3.79 U	3.5 UJ	**5.23**	3.66 U	3.75 U	4 U	7.25 U	7.2 U
1,1-Dichloroethene	µg/m³	210	29000	*7000*	0.156 U	0.198 U	0.198 U	**0.186**	0.135 UJ	0.142 U	0.131 UJ	**0.156**	**0.198 J**	0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
1,2,4-Trichlorobenzene	µg/m³	2.1	290	*70*	0.291 U	15 U	15 U	- -	0.252 UJ	- -	0.246 UJ	- -	- -	0.294 U	6.94 U	6.42 UJ	7.85 U	6.72 U	6.87 U	15 U	13.3 U	13.2 U
1,2,4-Trimethylbenzene	µg/m³	7.3	1000	*240*	**0.22**	**0.26**	0.246 U	- -	**0.274 J**	- -	0.163 UJ	- -	- -	0.195 U	**25.2**	4.25 UJ	5.2 U	4.45 U	**49.4**	4.9 U	8.8 U	8.75 U
1,2-Dibromoethane (EDB)	µg/m³	0.0047	6.8	*0.16*	0.302 U	0.384 U	0.384 U	- -	0.261 UJ	- -	0.255 UJ	- -	- -	0.305 U	7.19 U	6.64 UJ	8.13 U	6.96 U	7.11 U	7.7 U	13.8 U	13.7 U
1,2-Dichlorobenzene	µg/m³	210	28000	*7000*	0.236 U	0.301 U	0.301 U	- -	0.204 UJ	- -	0.199 UJ	- -	- -	0.239 U	5.63 U	5.2 UJ	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,2-Dichloroethane	µg/m³	0.11	160	*3.6*	0.159 U	0.25	0.202 U	- -	0.138 UJ	- -	0.134 UJ	- -	- -	0.161 U	3.79 U	3.5 UJ	***38.7***	***41.6***	3.75 U	4 U	7.25 U	7.2 U
1,2-Dichloropropane	µg/m³	0.28	410	*9.4*	0.181 U	0.231 U	0.231 U	- -	0.157 UJ	- -	0.153 UJ	- -	- -	0.183 U	4.32 U	4 UJ	***147***	*747*	4.28 U	4.6 U	8.27 U	8.23 U
1,2-Dichlorotetrafluoroethane	µg/m³	NA	NA	*NA*	0.274 U	7 U	7 U	- -	0.238 UJ	- -	0.232 UJ	- -	- -	0.277 U	6.54 U	6.04 UJ	7.4 U	6.33 U	6.47 U	7 U	12.5 U	12.4 U
1,3,5-Trimethylbenzene	µg/m³	NA	NA	*NA*	0.193 U	4.9 U	4.9 U	- -	0.167 UJ	- -	0.163 UJ	- -	- -	0.195 U	**8.3**	4.25 UJ	5.2 U	4.45 U	**18.1**	4.9 U	8.8 U	8.75 U
1,3-Dichlorobenzene	µg/m³	NA	NA	*NA*	0.236 U	0.301 U	0.301 U	- -	0.204 UJ	- -	0.199 UJ	- -	- -	0.239 U	5.63 U	5.2 UJ	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,4-Dichlorobenzene	µg/m³	0.26	370	*8.5*	0.236 U	0.301 U	0.301 U	- -	0.204 UJ	- -	0.199 UJ	- -	- -	0.239 U	5.63 U	5.2 UJ	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,4-Dioxane (p-Dioxane)	µg/m³	0.56	820	*19*	3.54 U	3.6 U	3.6 U	3.26 U	3.06 UJ	3.23 U	2.99 UJ	3.48 U	3.17 UJ	3.57 U	3.37 U	3.12 UJ	3.81 U	3.26 U	3.34 U	3.6 U	6.45 U	6.41 U
2-Butanone	µg/m³	5200	730000	*170000*	**0.828**	5.9 U	5.9 U	- -	**0.549 J**	- -	**1.39 J**	- -	- -	**1.21**	2.76 U	**9.12 J**	3.12 U	2.67 U	2.73 U	5.9 U	**9.99**	**11.2**
2-Hexanone	µg/m³	31	4400	*1000*	4.02 U	8.2 U	8.2 U	- -	3.48 UJ	- -	3.4 UJ	- -	- -	4.06 U	3.83 U	3.54 UJ	4.33 U	3.71 U	3.79 U	8.2 U	7.33 U	7.29 U
2-Methylnaphthalene	µg/m³	NA	NA	*NA*	11.4 U	- -	- -	- -	9.88 UJ	- -	9.64 UJ	- -	- -	11.5 U	5.44 U	5.03 UJ	6.15 U	5.26 U	5.38 U	- -	10.4 U	10.4 U
4-Methyl-2-pentanone	µg/m³	3100	440000	*100000*	**4.04**	8.2 U	8.2 U	- -	**2.68 J**	- -	**2.86 J**	- -	- -	**2.48**	3.83 U	3.54 UJ	4.33 U	3.71 U	3.79 U	8.2 U	7.33 U	7.29 U
Acetone	µg/m³	32000	4500000	*1100000*	**14.4 J**	**19**	**20**	- -	**10.3 J**	- -	**15.7 J**	- -	- -	**13 J**	**23.4 NJ**	**38.9 NJ**	**6.38 NJ**	**9.16 NJ**	**7.2 NJ**	6.7 B	**52.4 NJ**	**52.7 NJ**
Acrylonitrile	µg/m³	0.041	60	*1.4*	2.13 UJ	0.236 J	0.109 UJ	- -	1.84 UJ	- -	1.8 UJ	- -	- -	2.15 UJ	2.03 U	1.88 UJ	2.3 U	1.96 U	2.01 U	4.3 U	3.89 U	3.86 U
Benzene	µg/m³	0.36	520	*12*	0.637	0.927	0.949	0.601	0.621 J	0.572 U	0.66 J	0.618 U	0.562 UJ	0.634 U	**5.62**	**2.86 NJ**	3.38 U	2.89 U	**9.94**	3.2 U	5.72 U	5.69 U
Benzyl chloride	µg/m³	0.057	83	*1.9*	0.203 U	5.2 U	5.2 U	- -	0.176 UJ	- -	0.172 UJ	- -	- -	0.205 U	4.84 U	4.48 UJ	5.48 U	4.69 U	4.79 U	5.2 U	9.27 U	9.22 U
Bis (2-chloroisopropyl) ether	µg/m³	NA	NA	*NA*	6.87 U	- -	- -	- -	5.94 UJ	- -	5.8 UJ	- -	- -	6.94 U	6.55 U	6.05 UJ	7.4 U	6.33 U	6.48 U	- -	12.5 U	12.5 U
Bromodichloromethane	µg/m³	0.076	110	*2.5*	0.263 U	0.335 U	0.335 U	- -	0.228 UJ	- -	0.222 UJ	- -	- -	0.266 U	6.27 U	5.79 UJ	7.09 U	6.07 U	6.2 U	6.7 U	12 U	11.9 U
Bromoform	µg/m³	7.6	3700	*85*	2.03 U	10 U	10 U	- -	1.76 UJ	- -	1.71 UJ	- -	- -	2.05 U	9.67 U	8.94 UJ	10.9 U	9.36 U	9.57 U	10 U	18.5 U	18.4 U
Bromomethane	µg/m³	5.2	730	*170*	0.762 U	3.9 U	3.9 U	- -	0.66 UJ	- -	0.644 UJ	- -	- -	0.77 U	3.63 U	3.36 UJ	4.11 U	3.52 U	3.59 U	3.9 U	6.95 U	6.91 U
Carbon disulfide	µg/m³	730	100000	*24000*	0.122 U	3.1 U	3.1 U	- -	0.106 UJ	- -	0.103 UJ	- -	- -	0.124 U	2.91 U	2.69 UJ	3.29 U	2.82 U	2.88 U	**3.2**	5.57 U	5.54 U
Carbon tetrachloride	µg/m³	0.47	68B	*16*	2.47 U	0.922	0.726	- -	2.14 UJ	- -	2.09 UJ	- -	- -	2.5 U	5.89 U	5.44 UJ	**15**	5.7 U	5.82 U	6.3 U	11.3 U	11.2 U
Chlorobenzene	µg/m³	82	7300	*1700*	0.181 U	4.6 U	4.6 U	0.167 U	0.156 UJ	0.165 U	0.153 UJ	0.178 U	0.162 UJ	0.183 U	4.31 U	3.98 UJ	4.87 U	4.17 U	4.26 U	4.6 U	8.24 U	8.19 U
Chloroethane	µg/m³	10000	1500000	*350000*	0.104 U	**0.223**	0.132 U	- -	0.0897 UJ	- -	0.0875 UJ	- -	- -	0.105 U	2.47 U	2.28 UJ	2.79 U	2.39 U	2.44 U	2.6 U	4.72 U	4.7 U
Chloroform	µg/m³	0.12	180	*4.1*	0.192 U	0.39	0.244 U	0.212 B	0.166 UJ	0.175 U	0.162 UJ	0.189 U	0.172 UJ	0.194 U	4.57 U	4.22 UJ	***96.8***	4.42 U	4.52 U	4.9 U	8.74 U	8.69 U
Chloromethane	µg/m³	94	13000	*3100*	2.03 U	2.1 U	2.1 U	- -	1.75 UJ	- -	1.71 UJ	- -	- -	2.05 U	1.93 U	1.79 UJ	2.18 U	1.87 U	1.91 U	2.1 U	3.7 U	**4.83 NJ**
cis-1,2-Dichloroethylene	µg/m³	NA	NA	*NA*	0.156 U	0.198 U	0.198 U	- -	0.135 UJ	- -	0.131 UJ	- -	- -	0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
cis-1,3-Dichloropropene	µg/m³	NA	NA	*NA*	0.178 U	4.5 U	4.5 U	- -	0.154 UJ	- -	0.15 UJ	- -	- -	0.18 U	4.25 U	3.92 UJ	4.8 U	4.11 U	4.2 U	4.5 U	8.13 U	8.08 U
Dibromochloromethane	µg/m³	NA	NA	*NA*	0.334 U	8.5 U	8.5 U	- -	0.289 UJ	- -	0.282 UJ	- -	- -	0.338 U	7.97 U	7.36 UJ	9.01 U	7.71 U	7.88 U	8.5 U	15.2 U	15.2 U
Dichlorodifluoromethane	µg/m³	100	15000	*3500*	**2.42**	**3.95**	**3.52**	- -	**2.4 J**	- -	**2.47 J**	- -	- -	**2.41**	4.63 U	4.28 UJ	5.23 U	4.48 U	4.58 U	4.9 U	8.85 U	8.8 U
Ethylbenzene	µg/m³	1.1	1600	*37*	**0.177**	**0.859**	**0.763**	- -	**0.171 J**	- -	0.144 UJ	- -	- -	0.172 U	**9.85**	3.75 UJ	4.59 U	3.93 U	**18.8**	**4.6**	7.77 U	7.73 U
Hexachlorobutadiene	µg/m³	0.13	190	*4.3*	0.414 U	21 U	21 U	- -	0.358 UJ	- -	0.35 UJ	- -	- -	0.418 U	9.87 U	9.12 UJ	11.2 U	9.55 U	9.76 U	21 U	18.9 U	18.8 U
m,p-Xylene	µg/m³	100	15000	*3500*	**0.579**	**1.95**	**1.8**	- -	**0.552 J**	- -	**0.434 J**	- -	- -	**0.446**	**49**	7.51 UJ	9.14 U	7.86 U	**99.8**	**12**	15.5 U	15.5 U
Methylene chloride	µg/m³	100	88000	*3400*	6.82 U	**0.731**	0.695 U	- -	5.9 UJ	- -	5.76 UJ	- -	- -	6.89 U	3.25 U	3 UJ	3.68 U	3.14 U	3.22 U	3.5 U	6.22 U	6.18 U
n-Butylbenzene	µg/m³	NA	NA	*NA*	0.216 U	5.5 U	5.5 U	- -	0.186 UJ	- -	0.182 UJ	- -	- -	0.218 U	5.14 U	4.75 UJ	5.81 U	4.97 U	5.08 U	5.5 U	9.83 U	9.77 U
n-Hexane	µg/m³	730	100000	*24000*	**0.882**	3.5 U	3.5 U	- -	**1.01 J**	- -	**0.993 J**	- -	- -	**0.871**	**12.8**	**7.85 NJ**	3.73 U	3.19 U	**35.1**	3.5 U	**9.29 NJ**	**9.57 NJ**
n-Propylbenzene	µg/m³	1000	150000	*35000*	0.193 U	4.9 U	4.9 U	- -	0.167 UJ	- -	0.163 UJ	- -	- -	0.195 U	4.6 U	4.25 UJ	5.2 U	4.45 U	**7.15**	4.9 U	8.8 U	8.75 U
Naphthalene	µg/m³	0.083	120	*2.8*	0.206 U	0.262 U	0.262 U	- -	0.178 UJ	- -	0.174 UJ	- -	- -	0.208 U	4.91 U	4.53 UJ	5.55 U	4.75 U	4.85 U	5.2 U	9.38 U	9.33 U
o-Xylene	µg/m³	100	15000	*3500*	**0.206**	**1.31**	**1.11**	- -	**0.227 J**	- -	**0.183 J**	- -	- -	**0.203**	**14.9**	3.75 UJ	4.59 U	3.93 U	**30.4**	**6**	7.77 U	7.73 U
Styrene	µg/m³	1000	150000	*35000*	0.167 U	0.213 U	0.213 U	- -	0.145 UJ	- -	0.141 UJ	- -	- -	0.169 U	3.99 U	3.68 UJ	4.51 U	3.86 U	3.94 U	4.3 U	7.63 U	7.58 U
tert-Butyl Methyl Ether	µg/m³	11	16000	*360*	0.142 U	**0.687 J**	0.18 UJ	- -	0.122 UJ	- -	0.12 UJ	- -	- -	0.143 U	3.37 U	3.12 UJ	3.81 U	3.26 U	3.34 U	3.6 U	6.45 U	6.42 U
Tetrachloroethene	µg/m³	11	5800	*360*	0.266 U	**0.353**	0.339 U	- -	0.23 UJ	- -	0.225 UJ	- -	- -	0.269 U	6.35 U	5.86 UJ	7.17 U	6.14 U	6.28 U	6.8 U	12.1 U	12.1 U
Toluene	µg/m³	5200	730000	*170000*	**1.92 J**	**2.35 J**	**2.37**	- -	**1.47 J**	- -	**1.38 J**	- -	- -	**1.45**	**47.5**	**5.14 J**	3.99 U	3.41 U	**82.8**	**160**	**1,060**	**1,040**
Trans-1,2-Dichloroethylene	µg/m³	NA	NA	*NA*	0.156 U	0.198 U	0.198 U	- -	0.135 UJ	- -	0.131 UJ	- -	- -	0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
trans-1,3-Dichloropropene	µg/m³	NA	NA	*NA*	0.178 U	4.5 U	4.5 U	- -	0.154 UJ	- -	0.15 UJ	- -	- -	0.18 U	4.25 U	3.92 UJ	4.8 U	4.11 U	4.2 U	4.5 U	8.13 U	8.08 U
Trichloroethylene	µg/m³	0.48	290	*16*	0.211 U	0.269 U	0.269 U	- -	0.182 UJ	- -	0.178 UJ	- -	- -	0.213 U	**8.52**	***17.8 J***	5.68 U	**8.3**	4.97 U	5.4 U	9.61 U	9.56 U
Trichlorofluoromethane	µg/m³	NA	NA	*NA*	**1.18**	5.6 U	5.6 U	**1.11**	**1.17 J**	**0.909**	**1.23 J**	**0.943**	**1.18 J**	**1.18**	5.26 U	4.86 UJ	5.94 U	5.09 U	5.2 U	5.6 U	**307**	**309**
Vinyl acetate	µg/m³	210	29000	*7000*	0.346 U	3.5 U	3.5 U	- -	0.299 UJ	- -	0.292 UJ	- -	- -	0.349 U	3.29 U	3.04 UJ	3.73 U	3.19 U	3.26 U	3.5 U	6.3 U	6.27 U
Vinyl chloride	µg/m³	0.17	530	*7.7*	0.1 U	0.128 U	0.128 U	- -	0.0868 UJ	- -	0.0848 UJ	- -	- -	0.101 U	2.39 U	2.21 UJ	2.7 U	2.31 U	2.37 U	2.6 U	4.58 U	4.55 U
VOCs, Total	µg/m³	NA	NA	*NA*	**28.007**	**35.398**	**32.021**	**2.109**	**21.935**	**0.909**	**27.833**	**1.099**	**1.378**	**23.757**	**205.09**	**81.67**	**309.11**	**806.06**	**358.69**	**192.5**	**1,438.68**	**1,427.30**

Table 2-4. Faculty Housing Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

Notes:
a : Screening levels are based on USEPA regional screening levels (RSLs; USEPA 2015b) for indoor air for a residential exposure scenario.
The RSLs are based on a 1E-06 (1 x 10^{-6}) target carcinogenic risk for current exposure scenarios and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).
b : Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03,
a 1E-06 (1 x 10-6) target carcinogenic risk for residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).
-- = Not analyzed
B = The analyte was detected in the associated method and/or calibration blank.
J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
NA = Not available
NJ = The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
µg/m^3 = Micrograms per Cubic Meter
Bold indicates the analyte was detected
Shading indicates the result exceeded Residential Indoor Air RSL
Blue colored results indicate concentration was detected above the Commercial/Industrial Soil Gas VISL
Italicized results indicate concentration was detected above the Residential Soil Gas VISL

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Soil Gas COPC Summary
Campus Assessment

Campus Location				Faculty Housing				Fleming Hall	Quad	Dawnson Hall	JKS Hall	Student Union		
Client Sample ID	Units	VISL Residential Limit	VISL Commercial Limit	FR-AA1-012616*	VP-1	VP-3	VP-4	VP-5	VP-6	VP-7	VP-9	VP-10	VP-11	VP-13
Depth				0-0	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'
Date Collected				1/26/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016
Analyte				Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
ACETONE	µg/m³	1.00E+06	4.50E+06	21 J	167	196	328	169	115	199	295	236	73.7	49.9
BENZENE	µg/m³	12	520	0.601 J	19.4	54.7	78.4	33.1	24	30.3	57.5	55.3	18.8	13.1
CARBON DISULFIDE	µg/m³	2.40E+04	1.00E+05	0.107 UJ	3.96	140	110	30.3	116	384	602	318	112	85.9
CHLOROBENZENE	µg/m³	1700	7300	0.158 UJ	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	1.5
CHLOROMETHANE	µg/m³	3100	1.30E+04	1.77 UJ	<0.413	1.03	<0.413	<0.413	<0.413	<0.413	<0.413	1.15	<0.413	<0.413
CYCLOHEXANE	µg/m³	2.10E+05	8.80E+05	NS	<0.689	26.8	13.4	1.18	4.35	5.6	7.86	5.06	4.58	8.47
1,3-DICHLOROBENZENE	µg/m³	NE	NE	0.207 UJ	<1.2	2.26	4.51	3.46	6.98	6.54	7.48	3.1	2.95	2.43
1,1-DICHLOROETHENE	µg/m³	7000	2.90E+04	0.136 UJ	<0.793	0.959	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793
TRANS-1,2-DICHLOROETHENE	µg/m³	NE	NE	0.136 UJ	<0.793	3	1.9	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793
ETHANOL	µg/m³	NE	NE	NS	549	435	547	489	1440	1330	697	359	451	257
ETHYLBENZENE	µg/m³	37	1600	0.149 UJ	<0.867	4.48	3.24	<0.867	1.76	<0.867	1.1	<0.867	<0.867	1.17
4-ETHYLTOLUENE	µg/m³	NE	NE	NS	<0.982	2.44	2.04	1.5	3.12	1.88	2.35	1.59	1.02	1.92
TRICHLOROFLUOROMETHANE	µg/m³	NE	NE	1.17 J	1.34	1.58	1.53	2.58	1.96	1.86	2.18	22	27.6	2.16
DICHLORODIFLUOROMETHANE	µg/m³	3500	1.50E+04	2.39 J	1.75	2.03	4.03	2.49	2.14	2.31	2.32	2.17	2.23	2.8
HEPTANE	µg/m³	NE	NE	NS	1.89	13.9	33.3	4.12	21.5	7.47	18.3	17.8	3.53	7.55
N-HEXANE	µg/m³	2.40E+04	1.00E+05	NS	2.03	29.7	24.2	8.36	16.5	30.4	38.6	23.7	15.2	17.2
METHYLENE CHLORIDE	µg/m³	3400	8.80E+04	5.97 UJ	<0.694	4.12	4.15	1.72	1.67	2.23	2.12	4.01	4.1	3
2-BUTANONE (MEK)	µg/m³	1.70E+05	7.30E+05	0.663 J	3.78	5.79	4.99	5.47	10.2	9.52	6.48	4.15	10.1	<3.69
NAPHTHALENE	µg/m³	2.8	120	0.18 UJ	<3.3	12.4	20	8.09	10.2	10.9	15.2	10.6	<3.3	10.8
2-PROPANOL	µg/m³	7000	2.90E+04	NS	<3.07	8.16	8.33	3.69	11.1	4.66	<3.07	<3.07	<3.07	<3.07
PROPENE	µg/m³	1.00E+05	4.40E+05	NS	126	296	132	184	649	1210	1040	258	49.3	66.7
STYRENE	µg/m³	3.50E+04	1.50E+05	0.146 UJ	<0.851	1.67	2.29	<0.851	2.48	0.859	0.925	<0.851	<0.851	<0.851
TETRACHLOROETHENE	µg/m³	360	5800	0.233 UJ	<1.36	1.49	1.52	<1.36	2.39	<1.36	1.82	<1.36	<1.36	<1.36
TOLUENE	µg/m³	1.70E+05	7.30E+05	0.617 J	2.32	46.5	53.7	4.87	50.6	9.52	21.3	18.1	11.4	13.4
1,2,4-TRIMETHYLBENZENE	µg/m³	240	1000	0.169 UJ	<0.982	2.46	2.25	1.64	3.04	1.99	2.43	1.67	<0.982	1.95
1,3,5-TRIMETHYLBENZENE	µg/m³	NE	NE	NS	<0.982	<0.982	<0.982	<0.982	1.04	<0.982	<0.982	<0.982	<0.982	<0.982
2,2,4-TRIMETHYLPENTANE	µg/m³	NE	NE	NS	<0.934	9.68	8.65	<0.934	2.86	5.37	7.08	6.87	4.18	6.64
VINYL CHLORIDE	µg/m³	5.6	930	0.0879 UJ	<0.511	11.8	6.27	<0.511	<0.511	<0.511	<0.511	<0.511	<0.511	0.917
M&P-XYLENE	µg/m³	3500	1.50E+04	0.39 J	<1.73	15.3	10.2	2.05	5.4	2.05	3.35	2.18	<1.73	4.88
O-XYLENE	µg/m³	3500	1.50E+04	0.149 UJ	<0.867	5.97	4.75	0.925	2.32	<0.867	1.22	<0.867	<0.867	2.54

Indicates analyte included on DOW's RCRA analyte list

Indicates analyte exceeds Residential VISL screening limit

µg/m³ = micrograms per cubic meter

* Ambient air sample collected by DOW outside vacant faculty residence on 1/26/16

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Rescreened Copies of CH2M Hill Groundwater Analytical Data

Phases I through V

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results			
				Location>>	INS-0389		INS-0390	
				Sample ID>>	0389-GW01-031313		0390-GW01-031213	
				Depth (ft)>>	32 - 37		32 - 37	
				Sample Date>>	3/13/2013		3/12/2013	
		RBSLs						
Analyte*	Units	MCL / RSL	Commercial/ Industrial VISL	Residential VISL		RL		RL
SVOC								
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	**3.71 J** TAP	1.09	**7.08 J** TAP	1.11
Isophorone	µg/L	78	NA	NA	5.43 U	5.43	5.56 U	5.56
Naphthalene	µg/L	0.17	310	7.2	5.43 U	5.43	5.56 U	5.56
VOC								
1,1-Dichloroethane	µg/L	2.8	430	9.9	**1.88**	1	**2.67**	1
1,1-Dichloroethene	µg/L	7	1000	240	1 U	1	**1.45**	1
1,2-Dichloroethane	µg/L	5	130	30	1 U	1	1 U	1
Acetone	µg/L	1400	120000000	29000000	5 U	5	5 U	5
Benzene	µg/L	5	92	2.1	1 U	1	**1.76**	1
Chlorobenzene	µg/L	100	2400	570	1 U	1	**64.8**	1
Chloroform	µg/L	80	46	1.1	1 U	1	**12.2**	1
Dichlorodifluoromethane	µg/L	20	41	9.9	1 U	1	1 U	1
Ethylbenzene	µg/L	700	220	49	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	340	21	1 U	1	1 U	1
Toluene	µg/L	1000	110000	26000	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	NA	NA	**3.64**	1	**26.5**	1

TAP Res VISL

TAP Res VISL

TAP, C, R VISL

23

20

Duplicate

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
			INS-0385 0385-GW02-031513 37 - 42		INS-0387 0387-GW-051613 35 - 45		INS-0387 0387-GW-0516130 35 - 45		INS-0388 0388-GW-051713 33.5 - 43.5	
Analyte[a]	Units	MCL / RSL	3/15/2013	RL	5/16/2013	RL	5/16/2013	RL	5/17/2013	RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	TAP **11.6**	10.5	--		--		--	
Isophorone	µg/L	78	5.26 U	5.26	--		--		--	
Naphthalene	µg/L	0.17	5.26 U	5.26	--		--		--	
VOC										
1,1-Dichloroethane	µg/L	2.8	TAP **3.98**	1	1 U	1	1 U	1	1 U	1
1,1-Dichloroethene	µg/L	7	1 U	1	1 U	1	1 U	1	1 U	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Acetone	µg/L	1400	5 U	5	5 UL	5	5 UL	5	5 U	5
Benzene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Chlorobenzene	µg/L	100	1 U	1	1 U	1	1 U	1	TAP **205** VFC	1
Chloroform	µg/L	80	TAP **24.6** VFC	1	1 U	1	1 U	1	TAP **2.25** ✓ VC	1
Dichlorodifluoromethane	µg/L	20	**2.09** VC	1	1 UJ	1	1 UJ	1	1 U	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	**52.1**	1	1 U	1	1 U	1	**3.11**	1

✓ EXCEED VISL IF COMPAILED

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Duplicate

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
			INS-0387		INS-0387		INS-0388		INS-0389	
			0387-GW02-031413		0387-GW02-031413D		0388-GW02-031413		0389-GW-051613	
			40 - 45		40 - 45		42 - 47		35-45	
Analyte[a]	Units	MCL / RSL	3/14/2013	RL	3/14/2013	RL	3/14/2013	RL	5/16/2013	RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	1.1 UJ	1.1	1.12 UJ	1.12	TAP **5.46 J**	1.09	--	
Isophorone	µg/L	78	5.49 U	5.49	5.62 U	5.62	5.43 U	5.43	--	
Naphthalene	µg/L	0.17	5.49 U	5.49	5.62 U	5.62	5.43 U	5.43	--	
VOC										
1,1-Dichloroethane	µg/L	2.8	**1.26**	1	**1.24**	1	**1.76**	1	TAP **6.18**	1
1,1-Dichloroethene	µg/L	7	1 U	1	1 U	1	1 U	1	**1.03**	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Acetone	µg/L	1400	5 UL	5	5 UL	5	5 U	5	5 U	5
Benzene	µg/L	5	1 U	1	1 U	1	TAP **5.3**	1	1 U	1
Chlorobenzene	µg/L	100	1 U	1	1 U	1	1 U	1	1 U	1
Chloroform	µg/L	80	TAP **1.78**	1	TAP **1.56**	1	TAP **29.9**	1	TAP **29.6**	1
Dichlorodifluoromethane	µg/L	20	1 U	1	1 U	1	1 U	1	TAP **43 K**	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	**2.29**	1	**2.05**	1	**49.5**	1	**141**	1

Table 1. Summary of Phase I Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results					
			INS-0389		INS-0390		INS-0390	
			0389-GW02-031313		0390-GW-051713		0390-GW02-031213	
			42 - 47		35 - 45		42 - 47	
Analyte[a]	Units	MCL / RSL	3/13/2013	RL	5/17/2013	RL	3/12/2013	RL
SVOC								
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**4.83 J**	1.08	--		**36.7**	10.3
Isophorone	µg/L	78	5.38 U	5.38	--		5.15 U	5.15
Naphthalene	µg/L	0.17	5.38 U	5.38	--		5.15 U	5.15
VOC								
1,1-Dichloroethane	µg/L	2.8	**12.3**	1	**2.96**	1	**1.51**	1
1,1-Dichloroethene	µg/L	7	**1.15**	1	**1.4**	1	1 U	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1
Acetone	µg/L	1400	5 U	5	5 U	5	5 U	5
Benzene	µg/L	5	1 U	1	**1.67**	1	1 U	1
Chlorobenzene	µg/L	100	1 U	1	**37.7**	1	1 U	1
Chloroform	µg/L	80	**13.8**	1	**13**	1	1 U	1
Dichlorodifluoromethane	µg/L	20	**57.2 L**	1	1 U	1	1 UJ	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	µg/L	520	**25.6 L**	1	**30.5**	1	1 U	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

Underlined results indicate shallow concentrations detected above the Residential VISL (no concentrations are greater than commercial/industrial VISLs).

Grey shaded result indicates concentration detected above the MCL/RSL.

µg/L = micrograms per liter

NA = Not applicable

J flag indicates the reported concentration is estimated.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UJ flag indicates the constituent was not detected above an estimated reporting detection limit.

Table 2. Summary of Phase II Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results							
				Location>>	INS-0465		INS-0466		INS-0467		INS-0468	
				Sample ID>>	0465-GW01-102714		0466-GW01-102814		0467-GW01-102114		0468-GW01-102414	
				Depth (ft)>>	23 - 27		22 - 26		32 - 36		32 - 36	
				Sample Date>>	10/27/2014		10/28/2014		10/21/2014		10/24/2014	
		RBSLs										
Analyte*	Units	MCL / RSL	Commercial/Industrial VISL	Residential VISL		RL		RL		RL		RL
SVOC												
1,4-Dioxane (p-Dioxane)	µg/L	0.46	~~180000~~	4000	**4.64**	1.15	1.05 U	1.05	**5.05**	1.08	**2.52**	1.11
Isophorone	µg/L	78	NA	NA	5.75 U	5.75	5.26 U	5.26	5.38 UJ	5.38	2.78 U	5.56
Naphthalene	µg/L	0.17	310	7.2	5.75 U	5.75	5.26 U	5.26	5.38 UJ	5.38	2.78 U	5.56
VOC												
1,1-Dichloroethane	µg/L	2.8	430	9.9	1 U	1	1 U	1	**6.44**	1	0.125 U	1
1,1-Dichloroethene	µg/L	7.8	1000	240	1 U	1	1 U	1	**2.73**	1	0.5 U	1
1,2-Dichloroethane	µg/L	5	130	30	1 U	1	1 U	1	1 U	1	0.25 U	1
Acetone	µg/L	1400	120000000	~~29000000~~	5 UJ	5	5 UJ	5	5 U	5	2.5 UJ	5
Benzene	µg/L	5	92	2.1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chlorobenzene	µg/L	100	2400	570	1 U	1	1 U	1	1 U	1	0.125 U	1
Chloroform	µg/L	80	46	1.1	1 U	1	1 U	1	**1.07**	1	0.125 U	1
Dichlorodifluoromethane	µg/L	20	41	9.9	1 UJ	1	1 UJ	1	1 UJ	1	0.25 UJ	1
Ethylbenzene	µg/L	700	220	49	1 U	1	1 U	1	1 U	1	0.25 U	1
Tetrachloroethene	µg/L	5	340	21	1 U	1	1 U	1	1 U	1	0.25 U	1
Toluene	µg/L	1000	110000	~~26000~~	1 U	1	1 U	1	1 U	1	0.25 U	1
Trichlorofluoromethane	µg/L	520	NA	NA	1 U	1	1 U	1	1 U	1	0.25 U	1

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Table 2. Summary of Phase II Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
		Location>>	INS-0465		INS-0466		INS-0466		INS-0467		INS-0468	
		Sample ID>>	0465-GW02-102714		0466-GW02-102814		0466-GW02-102814D		0467-GW02-102114		0468-GW02-102414	
		Depth (ft)>>	44 - 47		42 - 46		42 - 46		42 - 46		41 - 45	
		Sample Date>>	10/27/2014		10/27/2014		10/28/2014		10/21/2014		10/24/2014	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL		RL
SVOC												
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**14.7**	11.1	**7.02**	1.08	**5.58**	1.12	**22.2 K**	10.8	**3.61**	1.27
Isophorone	µg/L	78	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
Naphthalene	µg/L	0.17	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
VOC												
1,1-Dichloroethane	µg/L	2.8	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
1,1-Dichloroethene	µg/L	7	1 U	1	1 U	1	1 U	1	1 U	1	0.5 U	1
1,2-Dichloroethane	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Acetone	µg/L	1400	5 UJ	5	5 UJ	5	5 UJ	5	5 U	5	2.5 UJ	5
Benzene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chlorobenzene	µg/L	100	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chloroform	µg/L	80	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Dichlorodifluoromethane	µg/L	20	1 UJ	1	1 UJ	1	1 UJ	1	1 UJ	1	0.25 UJ	1
Ethylbenzene	µg/L	700	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Tetrachloroethene	µg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Toluene	µg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Trichlorofluoromethane	µg/L	520	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentrations are greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

µg/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UJ flag indicates the constituent was not detected above an estimated reporting detection limit.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

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Table 3. Summary of Phase III Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results						
		RBSLs			Location>>	INS-0469		INS-0469		INS-0470	
					Sample ID>>	0469-GW01-021015		0469-GW01-021015S		0470-GW01-021115	
					Depth (ft)>>	33 - 37		33 - 37		18 - 22	
			Commercial /Industrial	Residential	Sample Date>>	2/10/2015		2/10/2015		2/11/2015	
Analyte[a]	Units	MCL / RSL	VISL	VISL			RL		RL		RL
SVOC			13000	2400							
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000		3.46	1.19	2.3	0.11	5.19	1.33

					Shallow Interval Results						
		RBSLs			Location>>	INS-0470		INS-0471		INS-0471	
					Sample ID>>	0470-GW01-021115S		0471-GW01-021215		0471-GW01-021215D	
					Depth (ft)>>	18 - 22		34 - 38		34 - 38	
			Commercial /Industrial	Residential	Sample Date>>	2/11/2015		2/12/2015		2/12/2015	
Analyte[a]	Units	MCL / RSL	VISL	VISL			RL		RL		RL
SVOC			13000	2400							
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000		4.2	0.5	5.13	1.06	5.41	1.06

					Shallow Interval Results				
		RBSLs			Location>>	INS-0471		INS-0471	
					Sample ID>>	0471-GW01-021215DS		0471-GW01-021215S	
					Depth (ft)>>	34 - 38		34 - 38	
			Commercial /Industrial	Residential	Sample Date>>	2/12/2015		2/12/2015	
Analyte[a]	Units	MCL / RSL	VISL	VISL			RL		RL
SVOC			13000	2400					
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000		4.4	0.11	4.4	0.12

Table 3. Summary of Phase III Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results					
Deep Interval Results		**Location>>**	INS-0470		INS-0470		INS-0471	
		Sample ID>>	0470-GW02-021115		0470-GW02-021115S		0471-GW02-021215S	
		Depth (ft)>>	46 - 50		46 - 50		44 - 48	
		Sample Date>>	2/11/2015		2/11/2015		2/12/2015	
Analyte[a]	**Units**	**MCL / RSL**		RL		RL		RL
SVOC								
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**3.48**	1.08	**2.3**	0.11	**3.3**	0.11

Notes:
Risk-based screening levels (RBSLs) included for comparison are:
The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06
The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06
for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is
Bold results indicate detected concentrations.
No shallow interval concentration is greater than the residential or commercial/industrial VISL.
Grey shaded results indicate concentration detected above the MCL/RSL.
µg/L = micrograms per liter

Table 5. Summary of Phase V Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte[a]	Units	MCL / RSL	Commercial /Industrial VISL	Residential VISL		RL		RL		RL		RL		RL
SVOC														
1,4-Dioxane (p-Dioxane)	µg/L	0.46	180000	4000	0.20 U	0.21	0.49	0.2	7.7	0.2	3.4	0.2	0.20 U	0.2
Isophorone	µg/L	78	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	310	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC														
1,1-Dichloroethane	µg/L	2.8	430	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	1000	240	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	130	30	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	120000000	28000000	5 U	5	5 U	5	5 U	5	5 U	5	0.5 U	5
Benzene	µg/L	5	92	2.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	2400	570	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	86	1.10	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	41	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	220	49	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	340	21	30	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	110000	16000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
	Location>>		INS-0553		INS-0554		INS-0555		INS-0555	
	Sample ID>>		0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-0121160	
	Depth (ft)>>		51-55		51-55		47-51		47-51	
	Sample Date>>		1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte[a]	Units	MCL / RSL		RL		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**0.24**	0.21	0.22 U	0.21	**0.48**	0.21	**0.47**	0.21
Isophorone	µg/L	78	1 U	1	1 U	1	R	1	R	1
Naphthalene	µg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC										
1,1-Dichloroethane	µg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	5 U	5	22	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

REPORTED BUT GENERALLY INCONSEQUENTIAL - NOT WORTH MENTIONING AS A DATA GAP

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Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
	Location>>		INS-0573		INS-0574		TW-10S		TW-10S		TW-106	
	Sample ID>>		0573-GW01-012116		0574-GW01-012116		TW10S-GW-011416		TW10S-GW-011416D		TW106-GW-011416	
	Depth (ft)>>		46-50		47-51		48-58		48-58		48-58	
	Sample Date>>		1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte[a]	Units	MCL / RSL		RL		RL		RL		RL		RL
SVOC												
1,4-Dioxane (p-Dioxane)	µg/L	0.46	**0.57**		**2.5**		0.21 U	0.21	0.2 U	0.2	**1.7**	0.2
Isophorone	µg/L	78	1 U		1 U		1 U	1	1 U	1	1 U	1
Naphthalene	µg/L	0.17	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
VOC												
1,1-Dichloroethane	µg/L	2.8	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/L	1400	5.0 U		5.0 U		5 U	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	µg/L	100	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	µg/L	80	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	**17 J**	0.5
Ethylbenzene	µg/L	700	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	1000	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

Underlined results indicate shallow concentrations detected above the Residential VISL.

µg/L = micrograms per liter

NA = Not applicable

R flag indicates the data were not of sufficient quality for reporting.

U flag indicates the constituent was not detected above the reporting detection limit.

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011816		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte*	Units	MCL / RSL	Commercial/ Industrial VISL	Residential VISL		RL		RL		RL		RL		RL
VOC														
1,1,2,2-Tetrachloroethane	µg/L	0.076	206	4.6	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	µg/L	5	36	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	µg/L	15	180	43	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	µg/L	5	140	3.3	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	µg/L	120	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	µg/L	75	170	3.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	13000000	3000000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2-Hexanone	µg/L	38	49000	12000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	µg/L	6300	3300000	780000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	µg/L	80	51	1.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	µg/L	7.5	89	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	µg/L	810	6600	1600	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	µg/L	5	24	0.54	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	µg/L	190	1300	310	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	µg/L	80	18	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	µg/L	5	25000	970	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	µg/L	100	56000	13000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	µg/L	100	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	µg/L	5	8.2	1.6	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	µg/L	2	29	0.24	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	µg/L	10000	2300	550	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC														
2,4,5-Trichlorophenol	µg/L	1200	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4,6-Trichlorophenol	µg/L	4.1	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dichlorophenol	µg/L	46	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dimethylphenol	µg/L	360	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dinitrophenol	µg/L	39	NA	NA	31 UJ	31	30 U	30	30 U	30	R	30	30 U	30
2,4-Dinitrotoluene	µg/L	0.24	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2,6-Dinitrotoluene	µg/L	0.049	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Chloronaphthalene	µg/L	750	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Chlorophenol	µg/L	91	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2-Methylnaphthalene	µg/L	36	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.052 U	0.051	0.052 U	0.052

OK

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte*	Units	MCL / RSL	Commercial/ Industrial VISL	Residential VISL		RL		RL		RL		RL		RL
SVOC (continued)														
2-Methylphenol	µg/L	930	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2-Nitroaniline	µg/L	190	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Nitrophenol	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
3,3'-Dichlorobenzidine	µg/L	0.13	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
3-Nitroaniline	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4,6-Dinitro-2-methylphenol	µg/L	1.5	NA	NA	15 U	15	15 U	15	15 U	15	R	15	15 U	15
4-Bromophenyl phenyl ether	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Chloro-3-methylphenol	µg/L	1400	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
4-Chloroaniline	µg/L	0.37	NA	NA	4 U	4	4 U	4	4 U	4	4 U	4	4 U	4
4-Chlorophenyl phenyl ether	µg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Nitroaniline	µg/L	3.8	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Nitrophenol	µg/L	42	0.0000011	NA	31 U	31	30 U	30	30 U	30	R	30	30 U	30
Acenaphthene	µg/L	530	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acenaphthylene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Anthracene	µg/L	1800	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Benzo (a) anthracene	µg/L	0.012	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.052	0.052 U	0.052
Benzo (a) pyrene	µg/L	0.2	NA	NA	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052 U	0.5
Benzo (b) fluoranthene	µg/L	0.034	NA	NA	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052 U	0.5
Benzo (g,h,i) perylene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Benzo(k)fluoranthene	µg/L	0.34	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bis (2-chloroethoxy) methane	µg/L	59	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Bis (2-chloroethyl) ether	µg/L	0.014	850	20	0.052 U	0.052	0.051 U	0.051	0.051 U	0.051	0.05 U	0.051	0.051 UJ	0.051
Bis (2-chloroisopropyl) ether	µg/L	710	610	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Bis (2-ethylhexyl) phthalate	µg/L	6	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Butyl benzylphthalate	µg/L	16	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Chrysene	µg/L	3.4	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Di-n-butylphthalate	µg/L	900	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Di-n-octylphthalate	µg/L	200	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Dibenzo (a,h) anthracene	µg/L	0.0034	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibenzofuran	µg/L	7.9	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Diethyl phthalate	µg/L	15000	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Dimethyl phthalate	µg/L	NA	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Ethyl ether	µg/L	3900	NA	NA	0.5 U	0.5	3 K	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	µg/L	800	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Results									
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
				Sample Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
		RBSLs												
Analyte*	Units	MCL / RSL	Commercial/ Industrial VISL	Residential VISL		RL		RL		RL		RL		RL
SVOC (continued)														
Fluorene	µg/L	290	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Hexachlorobenzene	µg/L	1	0.65	0.15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Hexachlorobutadiene	µg/L	0.14	21	0.47	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Hexachlorocyclopentadiene	µg/L	50	5.2	1.2	15 U	15	15 U	15	15 U	15	15 U	15	15 U	15
Hexachloroethane	µg/L	0.33	110	2.6	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Indeno (1,2,3-c,d) pyrene	µg/L	0.034	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
n-Nitrosodi-n-propylamine	µg/L	0.011	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
n-Nitrosodiphenylamine	µg/L	12	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Nitrobenzene	µg/L	0.14	5000	110	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
p-Cresol	µg/L	1900	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
Pentachlorophenol	µg/L	1	NA	NA	5 U	5	5 U	5	5 U	5	R	5	5 U	5
Phenanthrene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Phenol	µg/L	5800	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
Pyrene	µg/L	120	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.051	0.052 U	0.052
Metal														
Arsenic, dissolved	mg/L	0.05	NA	NA	--		0.0643	0.02	0.131	0.02	0.02 U	0.02	0.02 U	0.02
Barium, dissolved	mg/L	2	NA	NA	--		0.562	0.005	0.668	0.005	1.58	0.005	0.0901	0.005
Cadmium, dissolved	mg/L	0.005	NA	NA	--		0.005 U	0.005	0.005 U	0.005	0.005 U	0.005	0.005 U	0.005
Chromium, dissolved	mg/L	0.1	NA	NA	--		0.015 U	0.015	0.015 U	0.015	0.015 U	0.015	0.015 U	0.015
Lead, dissolved	mg/L	0.015	NA	NA	--		0.015 U	0.015	0.015 U	0.015	0.015 U	0.015	0.015 U	0.015
Mercury, dissolved	mg/L	0.002	0.0061	0.0015	--		0.0002 U	2E-04	0.0002 U	2E-04	0.0002 U	2E-04	0.0002 U	2E-04
Selenium, dissolved	mg/L	0.05	NA	NA	--		0.02 U	0.02	0.02 U	0.02	0.02 U	0.02	0.02 U	0.02
Silver, dissolved	mg/L	0.094	NA	NA	--		0.005 U	0.005	0.005 U	0.005	0.005 U	0.005	0.005 U	0.005

OK

0.380

.00

.052

.000052

Arsenic 0.052 ug/L

.000052

Barium 380 ug/L .380 mg/L

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
		Sample Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL
VOC										
1,1,2,2-Tetrachloroethane	µg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	µg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	µg/L	120	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	µg/L	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	µg/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	5 U	5	5.5	5	5 U	5	5 U	5
2-Hexanone	µg/L	38	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	µg/L	6300	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	µg/L	7.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	µg/L	810	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	µg/L	190	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	µg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	µg/L	10000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC										
2,4,5-Trichlorophenol	µg/L	1200	--		--		1 U	1	1 U	1
2,4,6-Trichlorophenol	µg/L	4.1	--		--		1 U	1	1 U	1
2,4-Dichlorophenol	µg/L	46	--		--		1 U	1	1 U	1
2,4-Dimethylphenol	µg/L	360	--		--		1 U	1	1 U	1
2,4-Dinitrophenol	µg/L	39	--		--		31 U	31	31 U	31
2,4-Dinitrotoluene	µg/L	0.24	--		--		R	5	R	5
2,6-Dinitrotoluene	µg/L	0.049	--		--		R	1	R	1
2-Chloronaphthalene	µg/L	750	--		--		R	1	R	1
2-Chlorophenol	µg/L	91	--		--		1 U	1	1 U	1
2-Methylnaphthalene	µg/L	36	--		--		R	0.5	R	0.5

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
		Sample Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL
SVOC (continued)										
2-Methylphenol	µg/L	930	--		--		1 U	1	1 U	1
2-Nitroaniline	µg/L	190	--		--		R	1	R	1
2-Nitrophenol	µg/L	NA	--		--		1 U	1	1 U	1
3,3'-Dichlorobenzidine	µg/L	0.13	--		--		R	5	R	5
3-Nitroaniline	µg/L	NA	--		--		R	1	R	1
4,6-Dinitro-2-methylphenol	µg/L	1.5	--		--		16 U	16	15 U	15
4-Bromophenyl phenyl ether	µg/L	NA	--		--		R	1	R	1
4-Chloro-3-methylphenol	µg/L	1400	--		--		1 U	1	1 U	1
4-Chloroaniline	µg/L	0.37	--		--		R	4	R	4
4-Chlorophenyl phenyl ether	µg/L	NA	--		--		R	1	R	1
4-Nitroaniline	µg/L	3.8	--		--		R	1	R	1
4-Nitrophenol	µg/L	42	--		--		31 U	31	31 U	31
Acenaphthene	µg/L	530	--		--		R	0.5	R	0.5
Acenaphthylene	µg/L	NA	--		--		R	0.5	R	0.5
Anthracene	µg/L	1800	--		--		R	0.5	R	0.5
Benzo (a) anthracene	µg/L	0.012	--		--		R	0.5	R	0.5
Benzo (a) pyrene	µg/L	0.2	--		--		R	0.5	R	0.5
Benzo (b) fluoranthene	µg/L	0.034	--		--		R	0.5	R	0.5
Benzo (g,h,i) perylene	µg/L	NA	--		--		R	0.5	R	0.5
Benzo(k)fluoranthene	µg/L	0.34	--		--		R	0.5	R	0.5
Bis (2-chloroethoxy) methane	µg/L	59	--		--		R	1	R	1
Bis (2-chloroethyl) ether	µg/L	0.014	--		--		0.052 U	0.05	0.051 U	0.05
Bis (2-chloroisopropyl) ether	µg/L	710	--		--		R	1	R	1
Bis (2-ethylhexyl) phthalate	µg/L	6	--		--		R	5	R	5
Butyl benzylphthalate	µg/L	16	--		--		R	5	R	5
Chrysene	µg/L	3.4	--		--		R	0.5	R	0.5
Di-n-butylphthalate	µg/L	900	--		--		R	5	R	5
Di-n-octylphthalate	µg/L	200	--		--		R	5	R	5
Dibenzo (a,h) anthracene	µg/L	0.0034	--		--		R	0.5	R	0.5
Dibenzofuran	µg/L	7.9	--		--		R	1	R	1
Diethyl phthalate	µg/L	15000	--		--		R	5	R	5
Dimethyl phthalate	µg/L	NA	--		--		R	5	R	5
Ethyl ether	µg/L	3900	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	µg/L	800	--		--		R	0.5	R	0.5

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results							
	Location>>		INS-0553		INS-0554		INS-0555		INS-0555	
	Sample ID>>		0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
	Depth (ft)>>		51-55		51-55		47-51		47-51	
	Sample Date>>		1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL
SVOC (continued)										
Fluorene	µg/L	290	--		--		R	0.5	R	0.5
Hexachlorobenzene	µg/L	1	--		--		R	0.5	R	0.5
Hexachlorobutadiene	µg/L	0.14	--		--		R	1	R	1
Hexachlorocyclopentadiene	µg/L	50	--		--		R	16	R	15
Hexachloroethane	µg/L	0.33	--		--		R	5	R	5
Indeno (1,2,3-c,d) pyrene	µg/L	0.034	--		--		R	0.5	R	0.5
n-Nitrosodi-n-propylamine	µg/L	0.011	--		--		R	1	R	1
n-Nitrosodiphenylamine	µg/L	12	--		--		R	1	R	1
Nitrobenzene	µg/L	0.14	--		--		R	1	R	1
p-Cresol	µg/L	1900	--		--		1 U	1	1 U	1
Pentachlorophenol	µg/L	1	--		--		5 U	5	5 U	5
Phenanthrene	µg/L	NA	--		--		R	0.5	R	0.5
Phenol	µg/L	5800	--		--		1 U	1	1 U	1
Pyrene	µg/L	120	--		--		R	0.5	R	0.5

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
	Location>>		INS-0573		INS-0574		TW-105		TW-105		TW-106	
	Sample ID>>		0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
	Depth (ft)>>		46-50		47-51		48-58		48-58		48-58	
	Sample Date>>		1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL		RL
VOC												
1,1,2,2-Tetrachloroethane	µg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	µg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	µg/L	120	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	µg/L	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	µg/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2-Hexanone	µg/L	38	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	µg/L	6300	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	µg/L	7.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	µg/L	810	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	µg/L	190	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	µg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	µg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	µg/L	10000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC												
2,4,5-Trichlorophenol	µg/L	1200	--		1 U	1	--		--		--	
2,4,6-Trichlorophenol	µg/L	4.1	--		1 U	1	--		--		--	
2,4-Dichlorophenol	µg/L	46	--		1 U	1	--		--		--	
2,4-Dimethylphenol	µg/L	360	--		1 U	1	--		--		--	
2,4-Dinitrophenol	µg/L	39	--		30 UJ	30	--		--		--	
2,4-Dinitrotoluene	µg/L	0.24	--		5 U	5	--		--		--	
2,6-Dinitrotoluene	µg/L	0.049	--		1 U	1	--		--		--	
2-Chloronaphthalene	µg/L	750	--		1 U	1	--		--		--	
2-Chlorophenol	µg/L	91	--		1 U	1	--		--		--	
2-Methylnaphthalene	µg/L	36	--		0.5 U	0.5	--		--		--	

Table 6. Summary of Additional Analyses - Phase V
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
	Location>>		INS-0573		INS-0574		TW-105		TW-105		TW-106	
	Sample ID>>		0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
	Depth (ft)>>		46-50		47-51		48-58		48-58		48-58	
	Sample Date>>		1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL		RL
SVOC (continued)												
2-Methylphenol	µg/L	930	--		1 U	1	--		--		--	
2-Nitroaniline	µg/L	190	--		1 U	1	--		--		--	
2-Nitrophenol	µg/L	NA	--		1 U	1	--		--		--	
3,3'-Dichlorobenzidine	µg/L	0.13	--		5 U	5	--		--		--	
3-Nitroaniline	µg/L	NA	--		1 U	1	--		--		--	
4,6-Dinitro-2-methylphenol	µg/L	1.5	--		15 U	15	--		--		--	
4-Bromophenyl phenyl ether	µg/L	NA	--		1 U	1	--		--		--	
4-Chloro-3-methylphenol	µg/L	1400	--		1 U	1	--		--		--	
4-Chloroaniline	µg/L	0.37	--		4 U	4	--		--		--	
4-Chlorophenyl phenyl ether	µg/L	NA	--		1 U	1	--		--		--	
4-Nitroaniline	µg/L	3.8	--		1 U	1	--		--		--	
4-Nitrophenol	µg/L	42	--		30 U	30	--		--		--	
Acenaphthene	µg/L	530	--		0.5 U	0.5	--		--		--	
Acenaphthylene	µg/L	NA	--		0.5 U	0.5	--		--		--	
Anthracene	µg/L	1800	--		0.5 U	0.5	--		--		--	
Benzo (a) anthracene	µg/L	0.012	--		0.5 U	0.5	--		--		--	
Benzo (a) pyrene	µg/L	0.2	--		0.5 U	0.5	--		--		--	
Benzo (b) fluoranthene	µg/L	0.034	--		0.5 U	0.5	--		--		--	
Benzo (g,h,i) perylene	µg/L	NA	--		0.5 U	0.5	--		--		--	
Benzo(k)fluoranthene	µg/L	0.34	--		0.5 U	0.5	--		--		--	
Bis (2-chloroethoxy) methane	µg/L	59	--		1 U	1	--		--		--	
Bis (2-chloroethyl) ether	µg/L	0.014	--		0.051 U	0.051	--		--		--	
Bis (2-chloroisopropyl) ether	µg/L	710	--		1 U	1	--		--		--	
Bis (2-ethylhexyl) phthalate	µg/L	6	--		5 U	5	--		--		--	
Butyl benzylphthalate	µg/L	16	--		5 U	5	--		--		--	
Chrysene	µg/L	3.4	--		0.5 U	0.5	--		--		--	
Di-n-butylphthalate	µg/L	900	--		5 U	5	--		--		--	
Di-n-octylphthalate	µg/L	200	--		5 U	5	--		--		--	
Dibenzo (a,h) anthracene	µg/L	0.0034	--		0.5 U	0.5	--		--		--	
Dibenzofuran	µg/L	7.9	--		1 U	1	--		--		--	
Diethyl phthalate	µg/L	15000	--		5 U	5	--		--		--	
Dimethyl phthalate	µg/L	NA	--		5 U	5	--		--		--	
Ethyl ether	µg/L	3900	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	µg/L	800	--		0.5 U	0.5	--		--		--	

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Results									
	Location>>		INS-0573		INS-0574		TW-105		TW-105		TW-106	
	Sample ID>>		0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
	Depth (ft)>>		46-50		47-51		48-58		48-58		48-58	
	Sample Date>>		1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL		RL
SVOC (continued)												
Fluorene	µg/L	290	--		0.5 U	0.5	--		--		--	
Hexachlorobenzene	µg/L	1	--		0.5 U	0.5	--		--		--	
Hexachlorobutadiene	µg/L	0.14	--		1 U	1	--		--		--	
Hexachlorocyclopentadiene	µg/L	50	--		15 U	15	--		--		--	
Hexachloroethane	µg/L	0.33	--		5 U	5	--		--		--	
Indeno (1,2,3-c,d) pyrene	µg/L	0.034	--		0.5 U	0.5	--		--		--	
n-Nitrosodi-n-propylamine	µg/L	0.011	--		1 U	1	--		--		--	
n-Nitrosodiphenylamine	µg/L	12	--		1 U	1	--		--		--	
Nitrobenzene	µg/L	0.14	--		1 U	1	--		--		--	
p-Cresol	µg/L	1900	--		1 U	1	--		--		--	
Pentachlorophenol	µg/L	1	--		5 U	5	--		--		--	
Phenanthrene	µg/L	NA	--		0.5 U	0.5	--		--		--	
Phenol	µg/L	5800	--		1 U	1	--		--		--	
Pyrene	µg/L	120	--		0.5 U	0.5	--		--		--	

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 18 degrees Celsius, is compared to

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

Italicized results indicate concentration detected above the Residential VISL.

mg/L = milligrams per liter

µg/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit

UJ flag indicates the analyte was below the reported sample quantitation limit. However, the reported value is approximate.

K flag indicates the analyte was positively identified, but the associated numerical value may be biased high.

R flag indicates the sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet the quality control criteria. The presence or absence of the analyte cannot be verified.

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Vapor Intrusion Investigation Data

Table 2-1. Athletic Facility Area Sampling Results
Eastern Property Boundary Vapor Intrusion Investigation
UCC Institute Facility, Institute, West Virginia

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Max

Analyte	Screening Level[a]	INST-AF-AA01	INST-AF-IA01	INST-AF-IA02	INST-AF-IA03	INST-AF-IA04	INST-AF-IA05	INST-AF-IA06		INST-AF-IA07	INST-AF-IA08	INST-AF-IA09	INST-AF-IA10
	Sample ID	AF-AA1-062015	AF-IA1-062015	AF-IA2-062015	AF-IA3-062015	AF-IA4-062015	AF-IA5-062015	AF-IA6-06202015	AF-IA6-06202015D	AF-IA7-062015	AF-IA8-062015	AF-IA9-062015	AF-IA10-062015
	Sample Date	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015
VOCs (µg/m³)													
1,1-Dichloroethane	77	0.148 U	0.148 U	0.146 U	0.151 U	0.146 U	0.152 U	0.155 U	0.148 U	0.143 U	0.139 U	0.149 U	0.143 U
1,1-Dichloroethene	880	0.145 U	0.145 U	0.143 U	0.148 U	0.143 U	0.149 U	0.152 U	0.145 U	0.14 U	0.136 U	0.146 U	0.14 U
1,4-Dioxane (p-Dioxane)	25	3.3 U	3.3 U	3.24 U	3.35 U	3.24 U	3.39 U	3.45 U	3.3 U	3.19 U	3.1 U	3.32 U	3.19 U
Benzene	16	0.585 U	0.585 U	0.575 U	0.595 U	0.575 U	0.601 U	0.611 U	0.585 U	0.566 U	0.549 U	0.588 U	0.566 U
Chlorobenzene	220	0.169 U	0.496	0.501	0.171 U	0.166 U	0.173 U	0.176 U	0.169 U	0.163 U	0.158 U	0.17 U	0.163 U
Chloroform	0.53	0.179 U	0.179 U	0.176 U	0.182 U	0.184	0.22 B	0.195 B	0.191 B	0.173 U	0.168 U	0.18 U	0.173 U
Trichlorofluoromethane	--	1.18	0.852	0.863	0.903	0.909	1.09	1.5	1.39	1.33	1.22	1.23	1.2
VOCs, Total	--	1.18	1.348	1.364	0.903	1.093	1.31	1.695	1.581	1.33	1.22	1.23	1.2

0.501
0.184
1.5

treat as ND

Notes:

a : Screening levels are based on USEPA regional screening levels (RSLs; USEPA 2015b) for indoor air for a commercial/industrial exposure scenario.
The RSLs are based on a 1E-05 (1×10^{-5}) target carcinogenic risk for current and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

-- : Not available
NA = Not analyzed
B = The analyte was detected in the associated method and/or calibration blank.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
µg/m³ = Micrograms per Cubic Meter
Bold indicates the analyte was detected
Shading indicates the result exceeded screening criteria (Note there are no representative cases)

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• Detected values were re-screened against the USEPA commercial VISLs for indoor air based on a target risk of 1.0E-06 and HQ of 0.1 (based on May 2016 RSLs).

Table 2-2, Convocation Center Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

dup dup dup dup split sample

Analyte	Unit	Screening Levels[a] Commercial/Industrial Indoor Air RSL	Screening Levels[a] Commercial/Industrial Soil Gas VISL	Screening Levels[a] Residential Soil Gas VISL	Indoor Air		Crawl Space Air		Indoor Air																		Exterior Soil Gas		
Location>					INST-CC-IA01		INST-CC-CS01		INST-CC-IA01	INST-CC-IA02	INST-CC-IA03	INST-CC-IA04	INST-CC-IA05	INST-CC-IA06	INST-CC-IA07		INST-CC-IA08	INST-CC-IA09	INST-CC-IA10	INST-CC-IA11	INST-CC-IA12	INST-CC-IA13	INST-CC-IA14	INST-CC-IA15		IRS-8572		
Sample ID>					CC-IA1-06202015	CC-IA1-06202015D	CC-CS1-06202015	CC-CS1-06202015D	CC-IA1-06202015	CC-IA2-06202015	CC-IA3-06202015	CC-IA4-06202015	CC-IA5-06202015	CC-IA6-06202015	CC-IA7-06202015	CC-IA7-06202015D	CC-IA8-06202015	CC-IA9-06202015	CC-IA10-06202015	CC-IA11-06202015	CC-IA12-06202015	CC-IA13-06202015	CC-IA14-06202015	CC-IA14-06202015D	CC-IA15-06202015	0572-01-012016	0572-02-029016	0572-02-029016S
Sample Depth (feet)>					0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	5 - 6	12 - 13	12 - 13
Sample Date>					6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	1/30/2016	2/5/2016	2/5/2016
1,1,1-Trichloroethane	ug/m³	22000		1700000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.91 U	4.91 U	5.5 UJ
1,1,2,2-Tetrachloroethane	ug/m³	1.1		1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.18 U	6.18 U	6.9 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/m³	130000		1000000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.9 U	6.9 U	15 UJ
1,1,2-Trichloroethane	ug/m³	0.88		5.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.91 U	4.91 U	5.5 UJ
1,1-Dichloroethane	ug/m³	77		58	0.17 U	0.156 U	0.168 U	0.152 U	0.148 U	0.155 U	0.156 U	0.159 U	0.152 U	0.147 U	0.148 U	0.147 U	0.154 U	0.143 U	0.145 U	0.156 U	0.18 U	0.156 U	0.155 U	0.162 U	0.137 UJ	3.64 U	3.64 U	4 UJ
1,1-Dichloroethene	ug/m³	880		7000	0.167 U	0.152 U	0.165 U	0.149 U	0.146 U	0.152 U	0.152 U	0.156 U	0.149 U	0.144 U	0.145 U	0.144 U	0.151 U	0.14 U	0.142 U	0.152 U	0.177 U	0.153 U	0.152 U	0.159 U	0.134 UJ	3.57 U	3.57 U	4 UJ
1,2,4-Trichlorobenzene	ug/m³	8.8		20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.68 U	8.68 U	15 UJ
1,2,4-Trimethylbenzene	ug/m³	35		240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.43 U	4.43 U	4.9 UJ
1,2-Dibromoethane (EDB)	ug/m³	0.2		0.16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.92 U	6.92 U	7.7 UJ
1,2-Dichlorobenzene	ug/m³	880		7000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.41 U	5.41 U	6 UJ
1,2-Dichloroethane	ug/m³	4.7		3.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.64 U	3.64 U	4 UJ
1,2-Dichloropropane	ug/m³	12		8.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.16 U	4.16 U	4.6 UJ
1,2-Dichlorotetrafluoroethane	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.29 U	6.29 U	7 UJ
1,2,5-Trimethylbenzene	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.43 U	4.43 U	4.9 UJ
1,3-Dichlorobenzene	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.41 U	5.41 U	6 UJ
1,4-Dichlorobenzene	ug/m³	11		9.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.41 U	5.41 U	6 UJ
1,4-Dioxane (p-Dioxane)	ug/m³	25		19	3.81 U	3.46 U	3.74 U	3.39 U	3.32 U	3.45 U	3.46 U	3.54 U	3.38 U	3.28 U	3.3 U	3.28 U	3.43 U	3.19 U	3.23 U	3.46 U	4.03 U	3.7 U	3.45 U	3.61 U	3.04 UJ	3.24 U	3.24 U	3.6 UJ
2-Butanone	ug/m³	22000		17000000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.9	2.65 U	3.9 UJ
2-Hexanone	ug/m³	130		1000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.69 U	3.69 U	8.2 UJ
2-Methylnaphthalene	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.24 U	5.24 U	--
4-Methyl-2-pentanone	ug/m³	13000		1000000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.69 U	3.69 U	8.1 UJ
Acetone	ug/m³	140000		11000000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	138	6.38 NJ	6.8 J
Acrylonitrile	ug/m³	1.8		1.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.95 U	1.95 U	4.1 UJ
Benzene	ug/m³	12		12	0.675 U	0.614 U	0.663 U	0.601 U	0.588 U	0.613 U	0.618 U	0.627 U	0.601 U	0.582 U	0.585 U	0.583 U	0.608 U	0.566 U	0.573 U	0.614 U	0.717 U	0.617 U	0.611 U	0.64 U	0.54 UJ	38	1.68 U	3.2 UJ
Benzyl chloride	ug/m³	2.5		1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.66 U	4.66 U	5.2 UJ
Bis (2-chloroisopropyl) ether	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.21 U	6.21 U	--
Bromodichloromethane	ug/m³	0.3		2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.03 U	6.03 U	6.7 UJ
Bromoform	ug/m³	110		85	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.3 U	9.3 U	10 UJ
Bromomethane	ug/m³	22		170	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.5 U	3.5 U	3.9 UJ
Carbon disulfide	ug/m³	3100		24000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	28.6	2.8 U	3.1 UJ
Carbon tetrachloride	ug/m³	20		16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.66 U	5.66 U	6.3 UJ
Chlorobenzene	ug/m³	220		1700	0.194 U	0.177 U	0.193 U	0.175 U	0.17 U	0.176 U	0.177 U	0.181 U	0.173 U	0.168 U	0.169 U	0.312	0.175 U	0.163 U	0.165 U	0.177 U	0.205 U	0.189 U	0.176 U	0.184 U	0.155 UJ	4.14 U	4.14 U	4.6 UJ
Chloroethane	ug/m³	44000		330000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.38 U	2.38 U	2.6 UJ
Chloroform	ug/m³	0.3		4.1	0.208 U	0.188 U	0.203 U	0.184 U	0.18 U	0.187 U	0.188 U	0.192 U	0.258	0.178 U	0.179 U	0.178 U	0.186 U	0.173 U	0.175 U	0.188 U	0.218 U	0.201 U	0.187 U	0.196 U	0.165 UJ	4.4 U	4.4 U	4.9 UJ
Chloromethane	ug/m³	390		3100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.86 U	1.86 U	2.1 UJ
cis-1,2-Dichloroethylene	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.57 U	3.57 U	4 UJ
cis-1,3-Dichloropropene	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.09 U	4.09 U	4.5 UJ
Dibromochloromethane	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.67 U	7.67 U	8.5 UJ
Dichlorodifluoromethane	ug/m³	440		3500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	118	121	210 J
Ethylbenzene	ug/m³	49		77	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.67	3.91 U	4.3 UJ
Hexachlorobutadiene	ug/m³	5.6		4.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.49 U	5.49 U	31 UJ
m,p-Xylene	ug/m³	440		3500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14.8	7.82 U	8.1
Methylene chloride	ug/m³	3600		3400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.13 U	3.13 U	3.5 UJ
n-Butylbenzene	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.94 U	4.94 U	5.5 UJ
n-Hexane	ug/m³	3100		24000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.18	3.17 U	3.5 UJ
n-Propylbenzene	ug/m³	4400		35000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.42 U	4.42 U	4.9 UJ
Naphthalene	ug/m³	3.6		2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.72 U	4.72 U	5.2 UJ
o-Xylene	ug/m³	440		3500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.32	3.91 U	4.3 J
Styrene	ug/m³	4400		35000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.83 U	3.83 U	4.3 UJ
tert-Butyl Methyl Ether	ug/m³	430		3600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.25 U	3.25 U	3.6 UJ
Tetrachloroethene	ug/m³	380		320	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.11 U	8.11 U	8.9 UJ
Toluene	ug/m³	22000		2100000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	27.6	3.38 U	3.8 UJ
trans-1,2-Dichloroethylene	ug/m³	NA		66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.57 U	3.57 U	4 UJ
trans-1,3-Dichloropropene	ug/m³	NA		NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.09 U	4.09 U	4.5 UJ
Trichloroethylene	ug/m³	0.3		16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.83 U	4.83 U	5.4 UJ
Trichlorofluoromethane	ug/m³	NA		NA	0.886	1.09	5.48	5	1.4	1.19	1.54	1.54	1.16	1.14	1.85	1.85	1.27	1.19	1.28	1.22	1.17	8.74	10.7	9.77	1.94 J	26.8	8.06	11 J
Vinyl acetate	ug/m³	580		4000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.17 U	3.17 U	3.5 UJ
Vinyl chloride	ug/m³	28		2.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.3 U	2.3 U	2.6 UJ
VOCs, Total	ug/m³	NA		NA	0.886	1.09	5.48	5	1.4	1.19	1.54	1.54	1.416	1.14	1.85	1.402	1.27	1.19	1.28	1.22	1.17	8.74	10.7	9.77	1.94	178.09	187.04	240.9

Notes:

a Screening levels are based on USEPA regional screening levels (RSLs): USEPA 2015b) for indoor air for a commercial/industrial exposure scenario.
The RSLs are based on a 1E-06 (1 x 10) target carcinogenic risk for current exposure scenarios and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

b Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03.
a 1E-06 (1 x 10-6) target carcinogenic risk for hypothetical, future residential exposure. a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

-- = Not analyzed

B = The analyte was detected in the associated method and/or calibration blank.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

NA = Not available

NJ = The analyte indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate

ug/m³ = Micrograms per Cubic Meter

Bold indicates the analyte was detected

Shading indicates the result exceeded Commercial/Industrial Indoor Air RSL (Note there are no regulatory criteria)

Highlighted results indicate concentration was detected above the Residential Soil Gas VISL

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* Detected results were compared to the USEPA Commercial Indoor Air VISL, Commercial Exterior Soil gas VISL, and residential Soil gas VISL based on a target Risk of 1.0E-06 and HQ = 0.1 (May 2016 RSLs)

Target Risk 1.0E-06
HQ = 0.1
May 2016

Table 2-3. Eastern Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

split sample

Analyte	Unit	RBSLs[a] Commercial/Industrial Soil Gas VISL	RBSLs[a] Residential Soil Gas VISL	INS-0569 0569-01-011516 5 - 6 1/15/2016	INS-0569 0569-02-011416 13 - 14 1/14/2016	INS-0571 0571-01-020516 5 - 6 2/5/2016	INS-0571 0571-01-020516S 5 - 6 2/5/2016	INS-0571 0571-02-012016 11 - 12 1/20/2016
1,1,1-Trichloroethane	µg/m³	730000	170000	4.99 U	5.38 U	4.77 U	5.5 UJ	4.55 UJ
1,1,2,2-Tetrachloroethane	µg/m³	30	1.6	6.28 U	6.77 U	6.01 U	6.9 UJ	5.73 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/m³	4300000	1000000	7.02 U	7.56 U	6.7 U	15 UJ	6.39 UJ
1,1,2-Trichloroethane	µg/m³	29	5.8	4.99 U	5.38 U	4.77 U	5.5 UJ	4.55 UJ
1,1-Dichloroethane	µg/m³	2600	58	3.71 U	3.99 U	3.54 U	4 UJ	3.38 UJ
1,1-Dichloroethene	µg/m³	29000	7000	3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
1,2,4-Trichlorobenzene	µg/m³	300	70	6.79 U	7.32 U	6.49 U	15 UJ	6.19 UJ
1,2,4-Trimethylbenzene	µg/m³	1000 100	240 24	**13.2**	4.85 U	4.3 U	**6.8 J**	**21.4 J**
1,2-Dibromoethane (EDB)	µg/m³	0.8	0.16	7.03 U	7.58 U	6.72 U	7.7 UJ	6.41 UJ
1,2-Dichlorobenzene	µg/m³	29000	7000	5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,2-Dichloroethane	µg/m³	180	3.6	3.71 U	3.99 U	3.54 U	4 UJ	3.38 UJ
1,2-Dichloropropane	µg/m³	410	9.4	4.23 U	4.56 U	4.04 U	4.6 UJ	3.85 UJ
1,2-Dichlorotetrafluoroethane	µg/m³	NA	NA	6.4 U	6.9 U	6.12 U	7 UJ	5.83 UJ
1,3,5-Trimethylbenzene	µg/m³	NA	NA	**5.35**	4.85 U	4.3 U	**17 J**	**7.3 J**
1,3-Dichlorobenzene	µg/m³	NA	NA	5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,4-Dichlorobenzene	µg/m³	370	8.5	5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,4-Dioxane (p-Dioxane)	µg/m³	930	19	3.3 U	3.56 U	3.15 U	3.6 UJ	3.01 UJ
2-Butanone	µg/m³	710000 7400	170000 17,000	**9.45**	**24.4**	2.58 U	5.9 UJ	**3.39 J**
2-Hexanone	µg/m³	4400	1000	3.75 U	4.04 U	3.58 U	8.2 UJ	3.42 UJ
2-Methylnaphthalene	µg/m³	NA	NA	5.32 U	5.74 U	5.09 U	--	4.85 UJ
4-Methyl-2-pentanone	µg/m³	440000	100000	3.75 U	4.04 U	3.58 U	8.2 UJ	3.42 UJ
Acetone	µg/m³	4200000	1100000 110,000	**8.65 NJ**	**108 NJ**	**19.3**	**11 8**	**14.8 J**
Acrylonitrile	µg/m³	60	1.4	1.99 U	2.14 U	1.9 U	4.3 UJ	1.81 UJ
Benzene	µg/m³	520 52	12	2.92 U	**4.88 NJ**	2.79 U	3.2 UJ	2.66 UJ
Benzyl chloride	µg/m³	85	1.9	4.74 U	5.11 U	4.53 U	5.2 UJ	4.32 UJ
Bis (2-chloroisopropyl) ether	µg/m³	NA	NA	6.4 U	6.9 U	6.12 U	--	5.84 UJ
Bromodichloromethane	µg/m³	110	2.5	6.13 U	6.61 U	5.86 U	6.7 UJ	5.59 UJ
Bromoform	µg/m³	3700	85	9.46 U	10.2 U	9.04 U	10 UJ	8.62 UJ
Bromomethane	µg/m³	730	170	3.55 U	3.83 U	3.4 U	3.9 UJ	3.24 UJ
Carbon disulfide	µg/m³	100000 10,000	24000 2400	2.85 U	3.07 U	2.72 U	**3.7 J**	2.6 UJ
Carbon tetrachloride	µg/m³	660	16	5.76 U	6.21 U	5.5 U	6.3 UJ	5.25 UJ
Chlorobenzene	µg/m³	7300	1700	4.21 U	4.54 U	4.03 U	4.6 UJ	3.84 UJ
Chloroethane	µg/m³	1,500000	350000	2.42 U	2.6 U	2.31 U	2.6 UJ	2.2 UJ
Chloroform	µg/m³	180	4.1	4.47 U	4.82 U	4.27 U	4.9 UJ	4.07 UJ
Chloromethane	µg/m³	13000	3100	1.89 U	2.04 U	1.81 U	2.1 UJ	1.72 UJ
cis-1,2-Dichloroethylene	µg/m³	NA	NA	3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
cis-1,3-Dichloropropene	µg/m³	NA	NA	4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 UJ

Table 2-3. Eastern Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

Dibromochloromethane	µg/m³	NA	*NA*	7.8 U	8.4 U	7.45 U	8.5 UJ	7.1 UJ
Dichlorodifluoromethane	µg/m³	[illegible]	*3500*	4.53 U	4.88 U	4.33 U	4.9 UJ	4.12 UJ
Ethylbenzene	µg/m³	[illegible] 1100	*37*	**4.86**	4.28 U	3.8 U	**5.5 J**	3.62 UJ
Hexachlorobutadiene	µg/m³	[illegible]	*4.3*	9.65 U	10.4 U	9.22 U	21 UJ	8.79 UJ
m,p-Xylene	µg/m³	[illegible] 1500	*3500* 350	**25.1**	8.57 U	7.6 U	**9.4 J**	7.24 UJ
Methylene chloride	µg/m³	[illegible]	*3400*	3.18 U	3.43 U	3.04 U	3.5 UJ	2.9 UJ
n-Butylbenzene	µg/m³	NA	*NA*	5.03 U	5.42 U	4.8 U	5.5 UJ	4.58 UJ
n-Hexane	µg/m³	[illegible] 40,000	*24000* 3400	3.23 U	**13.7 NJ**	3.08 U	3.5 UJ	2.94 UJ
n-Propylbenzene	µg/m³	[illegible]	*35000*	4.5 U	4.85 U	4.3 U	4.9 UJ	4.1 UJ
Naphthalene	µg/m³	[illegible]	*2.8*	4.8 U	5.17 U	4.59 U	5.2 UJ	4.37 UJ
o-Xylene	µg/m³	[illegible] 1,800	*3500* 350	**7.55**	4.28 U	3.8 U	**9.5 J**	3.62 UJ
Styrene	µg/m³	[illegible]	*35000*	3.9 U	4.2 U	3.73 U	4.3 UJ	3.55 UJ
tert-Butyl Methyl Ether	µg/m³	[illegible]	*360*	3.3 U	3.56 U	3.15 U	3.6 UJ	3.01 UJ
Tetrachloroethene	µg/m³	[illegible] 160	*360* 140	6.21 U	**27**	5.93 U	6.8 UJ	5.66 UJ
Toluene	µg/m³	[illegible] 13,000	*170000* 1700	**18.9**	**53.7**	3.3 U	**5.5 J**	3.14 UJ
Trans-1,2-Dichloroethylene	µg/m³	NA	*NA*	3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
trans-1,3-Dichloropropene	µg/m³	NA	*NA*	4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 UJ
Trichloroethylene	µg/m³	[illegible]	*16*	4.92 U	5.3 U	4.7 U	5.4 UJ	4.48 UJ
Trichlorofluoromethane	µg/m³	[illegible]	*NA*	**5.89**	**10.6**	4.91 U	5.6 UJ	4.69 UJ
Vinyl acetate	µg/m³	[illegible]	*7000*	3.22 U	3.47 U	3.08 U	3.5 UJ	2.94 UJ
Vinyl chloride	µg/m³	[illegible]	*7.7*	2.34 U	2.52 U	2.24 U	2.6 UJ	2.13 UJ
VOCs, Total	µg/m³	NA	*NA*	**98.95**	**242.28**	**19.3**	**68.4**	**46.89**

Notes:

a : Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03,
a 1E-06 (1 x 10-6) target carcinogenic risk for hypothetical, future residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 200

-- = Not analyzed

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

NA = Not available

NJ = The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.

µg/m³ = Micrograms per Cubic Meter

Bold indicates the analyte was detected

Blue colored results indicate concentration was detected above the Commercial/Industrial Soil Gas VISL (Note there are no representative cases)

Italicized results indicate concentration was detected above the Residential Soil Gas VISL (Note there are no representative cases)

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- Detected constituents were re-screened against the USEPA commercial and residential VISL target exterior soil gas concentration based on a target risk 1.0E-06 and HQ = 0.1 (based on May 2016 RSLs)

- No exceedance

Table 2-4. Faculty Housing Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

no exceed

Indoor Air

					Outdoor Air			Subslab Soil Vapor				Crawl Space Air							
				Location=>	INST FR-AA01			INST FR-SS01			INST FR-SS02	INST FR-CS01			INST FR-IA01		INST FR-IA02		
				Sample ID=>	FR-AA1-06182015	FR-AA1-012616	FR-AA01-012716S	FR-SS01-012516S	FR-SS01-020316	FR-SS01-020416S	FR-SS02-020318	FR-CS1-012616	FR-CS1-012616	FR-CS01-012716S	FR-IA1-06182015	FR-IA1-012616	FR-IA2-06182015	FR-IA2-012716	FR-IA3-06182015
				Sample Depth (feet)=>	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0
				Sample Date=>	6/20/2015	1/26/2016	1/26/2016	1/28/2016	2/3/2016	2/3/2016	2/3/2016	1/26/2016	1/26/2016	1/26/2016	6/20/2015	1/26/2016	6/20/2015	1/27/2016	6/20/2015
		Screening Levels**																	
Analyte	Unit	Residential Indoor Air RSL	Residential Soil Gas VSL	Residential Soil Gas VSL															
1,1,1-Trichloroethane	ug/m³	5200	[illegible]	1700000	--	0.188 UJ	0.273 UJ	0.273 UJ	4.8 U	5.5 U	5.44 U	0.18 U	0.18 U	0.273 U	--	0.222 U	--	0.206 U	--
1,1,2,2-Tetrachloroethane	ug/m³	0.048	--	2.6	--	0.236 UJ	6.9 UJ	6.9 UJ	6.84 U	6.8 U	6.88 U	0.229 U	0.229 U	6.9 U	--	0.278 U	--	0.26 U	--
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/m³	31000	[illegible]	1000000	--	8.51 J	0.787 J	0.865 J	6.74 U	35 U	7.64 U	0.598	0.533	0.775	--	0.352	--	0.312	--
1,1,2-Trichloroethane	ug/m³	0.18	--	5.8	--	0.188 UJ	0.273 UJ	0.273 UJ	4.8 U	5.5 U	5.44 U	0.18 U	0.18 U	0.273 U	--	0.222 U	--	0.206 U	--
1,1-Dichloroethane	ug/m³	1.8	--	58	0.152 U	0.139 UJ	0.202 UJ	0.202 UJ	3.56 U	4 U	4.03 U	0.141 U	0.141 U	0.202 U	0.152 U	0.165 U	0.164 U	0.153 U	0.146 U
1,1-Dichloroethene	ug/m³	210	--	7000	0.149 U	0.138 UJ	0.198 UJ	0.198 UJ	3.49 U	4 U	3.95 U	0.138 U	0.138 U	0.198 U	0.205	0.161 U	0.201	0.15 U	0.215
1,2,4-Trichlorobenzene	ug/m³	2.1	--	70	--	0.255 UJ	15 UJ	15 UJ	6.53 U	15 U	7.4 U	0.258 U	0.368	15 U	--	0.302 U	--	0.281 U	--
1,2,4-Trimethylbenzene	ug/m³	7.3	--	240	--	0.169 UJ	0.246 UJ	1.11 J	4.33 U	4.9 U	4.9 U	0.171 U	0.241	0.246 U	--	0.246	--	0.186 U	--
1,2-Dibromoethane (EDB)	ug/m³	0.0042	--	0.16	--	0.264 UJ	0.384 UJ	0.384 UJ	6.76 U	7.7 U	7.66 U	0.267 U	0.267 U	0.384 U	--	0.313 U	--	0.291 U	--
1,2-Dichlorobenzene	ug/m³	210	--	7000	--	0.207 UJ	0.301 UJ	0.301 UJ	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U	--	0.245 U	--	0.228 U	--
1,2-Dichloroethane	ug/m³	0.11	--	2.6	--	0.139 UJ	0.202 UJ	0.202 UJ	3.56 U	4 U	4.03 U	0.141 U	0.141 U	0.202 U	--	0.165 U	--	0.153 U	--
1,2-Dichloropropane	ug/m³	0.26	--	9.4	--	0.158 UJ	0.231 UJ	0.231 UJ	4.07 U	4.6 U	4.61 U	0.161 U	0.161 U	0.231 U	--	0.188 U	--	0.175 U	--
1,2-Dichlorotetrafluoroethane	ug/m³	NA	--	NA	--	0.24 UJ	7 UJ	7 UJ	6.35 U	7 U	6.97 U	0.243 U	0.243 U	7 U	--	0.284 U	--	0.265 U	--
1,3,5-Trimethylbenzene	ug/m³	NS	--	NA	--	0.169 UJ	4.9 UJ	4.9 UJ	4.33 U	4.9 U	4.9 U	0.171 U	0.171 U	4.9 U	--	0.2 U	--	0.186 U	--
1,3-Dichlorobenzene	ug/m³	NS	--	NA	--	0.207 UJ	0.301 UJ	0.301 UJ	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U	--	0.245 U	--	0.228 U	--
1,4-Dichlorobenzene	ug/m³	0.26	--	8.3	--	0.207 UJ	0.301 UJ	0.786 J	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U	--	0.245 U	--	0.228 U	--
1,4-Dioxane (p-Dioxane)	ug/m³	0.56	--	20	3.39 U	3.1 UJ	3.6 UJ	3.6 UJ	3.17 U	3.5 U	3.59 U	3.13 U	3.13 U	3.6 U	3.39 U	3.7 U	3.65 U	3.41 U	3.38 U
2-Butanone	ug/m³	5200	--	170000	--	0.663 J	5.9 UJ	5.9 UJ	2.59 U	5.9 U	2.94 U	1.23 J	0.608 J	5.9 U	--	0.861	--	1.84	--
2-Hexanone	ug/m³	31	--	1000	--	3.52 UJ	8.2 UJ	8.2 UJ	3.6 U	8.2 U	4.08 U	3.55 U	3.56 U	8.2 U	--	4.2 U	--	3.98 U	--
2-Methylnaphthalene	ug/m³	NA	--	NA	--	10 UJ	--	--	5.12 U	--	5.8 U	10.1 U	10.1 U	--	--	11.9 U	--	11 U	--
4-Methyl-2-pentanone	ug/m³	3100	--	100000	--	0.33 J	8.2 UJ	8.2 UJ	3.6 U	8.2 U	4.08 U	2.33	2.2	8.2 U	--	2.79	--	3.04	--
Acetone	ug/m³	32000	--	1100000	--	13.2 J	21.7	28 J	2.09 U	7.2	2.37 U	12.5 J	9.78 J	18	--	13.4 J	--	8.12 J	--
Acrylonitrile	ug/m³	0.041	--	1.4	--	1.87 UJ	0.109 UJ	0.109 UJ	1.91 U	4.3 U	2.16 U	1.89 U	1.89 U	0.109 U	--	2.2 U	--	2.05 U	--
Benzene	ug/m³	0.36	--	32	0.601 U	0.601 J	0.855 J	0.674 J	2.81 U	3.2 U	3.18 U	0.585	0.627	0.822	0.601 U	0.709	0.647 U	0.342	0.585
Benzyl chloride	ug/m³	0.057	--	1.9	--	0.178 UJ	5.2 UJ	5.2 UJ	4.56 U	5.2 U	5.16 U	0.218	0.18 U	5.2 U	--	0.211 U	--	0.196 U	--
Bis (2-chloroisopropyl) ether	ug/m³	NS	--	NA	--	6.01 UJ	--	--	6.16 U	--	6.97 U	6.08 U	6.08 U	--	--	7.1 U	--	6.62 U	--
Bromodichloromethane	ug/m³	0.076	--	2.5	--	0.23 UJ	0.335 UJ	0.335 UJ	5.9 U	6.7 U	6.68 U	0.233 U	0.233 U	0.335 U	--	0.273 U	--	0.254 U	--
Bromoform	ug/m³	2.6	--	85	--	1.78 UJ	10 UJ	10 UJ	9.69 U	10 U	10.3 U	1.8 U	1.8 U	10 U	--	2.1 U	--	1.98 U	--
Bromomethane	ug/m³	5.2	--	170	--	0.668 UJ	3.9 UJ	3.9 UJ	3.42 U	3.9 U	3.87 U	0.675 U	0.675 U	3.9 U	--	0.79 U	--	0.735 U	--
Carbon disulfide	ug/m³	730	--	24000	--	0.107 UJ	3.1 UJ	0.81 J	2.74 U	3.1 U	3.1 U	0.108 U	0.108 U	3.1 U	--	0.127 U	--	0.118 U	--
Carbon tetrachloride	ug/m³	0.47	--	16	--	2.16 UJ	0.752 J	0.765 J	5.54 U	6.3 U	6.27 U	2.19 U	2.19 U	0.754	--	2.56 U	--	2.38 U	--
Chlorobenzene	ug/m³	52	--	1700	0.173 U	0.158 UJ	4.6 UJ	4.6 UJ	4.05 U	4.6 U	4.59 U	0.16 U	0.16 U	4.6 U	0.173 U	0.187 U	0.186 U	0.174 U	0.166 U
Chloroethane	ug/m³	10000	--	350000	--	0.0907 UJ	0.132 UJ	0.132 UJ	2.32 U	2.6 U	2.63 U	0.0918 U	0.0918 U	0.132 U	--	0.107 U	--	0.0999 U	--
Chloroform	ug/m³	0.12	--	4.1	0.184 U	0.168 UJ	0.244 UJ	0.542 J	4.3 U	4.9 U	4.87 U	0.17 U	0.17 U	0.244 U	0.184 U	0.199 U	0.198 U	0.185 U	0.176 U
Chloromethane	ug/m³	94	--	3300	--	1.77 UJ	2.1 UJ	2.1 UJ	1.82 U	2.1 U	2.06 U	1.8 U	1.8 U	2.1 U	--	2.1 U	--	1.55 U	--
cis-1,2-Dichloroethylene	ug/m³	NA	--	NA	--	0.156 UJ	0.198 UJ	0.198 UJ	3.49 U	4 U	3.95 U	0.138 U	0.138 U	0.198 U	--	0.163 U	--	0.15 U	--
cis-1,3-Dichloropropene	ug/m³	NA	--	NA	--	0.158 UJ	4.5 UJ	4.5 UJ	3.99 U	4.5 U	4.52 U	0.158 U	0.158 U	4.5 U	--	0.185 U	--	0.172 U	--
Dibromochloromethane	ug/m³	NA	--	NA	--	0.793 UJ	8.5 UJ	8.5 UJ	7.49 U	8.5 U	8.49 U	0.296 U	0.296 U	8.5 U	--	0.347 U	--	0.322 U	--
Dichlorodifluoromethane	ug/m³	100	--	3500	--	2.39 J	3.75 J	3.66 J	4.35 U	4.9 U	4.93 U	2.38 J	2.5 J	3.64 J	--	2.58	--	0.458 U	--
Ethylbenzene	ug/m³	1.1	--	37	--	0.185 UJ	0.281 J	2.23 J	3.87 U	4.3 U	4.33 U	0.151 U	0.163	0.504	--	0.177 U	--	0.408	--
Hexachlorobutadiene	ug/m³	0.13	--	4.3	--	0.363 UJ	21 UJ	21 UJ	9.28 U	21 U	10.5 U	0.367 U	0.367 U	21 U	--	0.429 U	--	0.399 U	--
m,p-Xylene	ug/m³	100	--	3500	--	0.39 J	0.755 J	7.03 J	7.64 U	4.3 U	8.66 U	0.455	0.49	1.32	--	0.481	--	1.21	--
Methylene chloride	ug/m³	100	--	3400	--	5.97 UJ	0.868 J	320 J	3.86 U	3.5 U	3.96 U	6.04 U	6.08 U	4.1	--	7.2 U	--	6.57 U	--
n-Butylbenzene	ug/m³	NA	--	NA	--	0.189 UJ	5.5 UJ	5.5 UJ	4.83 U	5.5 U	5.47 U	0.191 U	0.191 U	5.5 U	--	0.223 U	--	0.208 U	--
n-Hexane	ug/m³	730	--	24000	--	0.649 J	3.5 UJ	9.8 J	3.1 U	3.5 U	3.51 U	0.67	0.771	3.5 U	--	1.15	--	1.69	--
n-Propylbenzene	ug/m³	1000	--	35000	--	0.169 UJ	4.9 UJ	4.9 UJ	4.32 U	4.3 U	4.9 U	0.171 U	0.171 U	4.9 U	--	0.2 U	--	0.186 U	--
Naphthalene	ug/m³	0.083	--	2.8	--	0.18 UJ	0.262 UJ	0.368 J	4.23 U	5.2 U	5.23 U	0.182 U	0.583 J	0.262 U	--	0.286	--	0.198 U	--
o-Xylene	ug/m³	100	--	3500	--	0.149 UJ	0.823 J	4.05 J	3.82 U	4.3 U	4.33 U	0.197	0.193	0.831	--	0.202	--	0.674	--
Styrene	ug/m³	1000	--	35000	--	0.146 UJ	0.213 UJ	0.213 UJ	3.75 U	4.3 U	4.25 U	0.148 U	0.148 U	0.213 U	--	0.173 U	--	0.161 U	--
tert-Butyl Methyl Ether	ug/m³	11	--	380	--	0.124 UJ	0.18 UJ	0.192 J	3.17 U	3.6 U	3.59 U	0.125 U	0.125 U	0.18 U	--	0.147 U	--	0.136 U	--
Tetrachloroethylene	ug/m³	11	--	360	--	0.233 UJ	0.339 UJ	7.85 J	5.97 U	6.8 U	6.76 U	0.236 U	0.236 U	0.339 U	--	0.276 U	--	0.257 U	--
Toluene	ug/m³	5200	--	170000	--	0.617 J	0.963 J	3.91 J	3.32 U	3.8 U	3.76 U	1.43	2.53	2.12	--	1.46	--	1.98	--
Trans-1,2-Dichloroethylene	ug/m³	NA	--	NA	--	0.156 UJ	0.198 UJ	0.198 UJ	3.49 U	4 U	3.95 U	0.138 U	0.138 U	0.198 U	--	0.161 U	--	0.15 U	--
Trans-1,3-Dichloropropene	ug/m³	NA	--	NA	--	0.158 UJ	4.5 UJ	4.5 UJ	3.99 U	4.5 U	4.52 U	0.158 U	0.158 U	4.5 U	--	0.185 U	--	0.172 U	--
Trichloroethylene	ug/m³	0.48	--	16	--	0.185 U	0.269 UJ	0.269 UJ	4.72 U	5.4 U	5.35 U	0.187 U	0.187 U	0.269 U	--	0.218 U	--	0.203 U	--
Trichlorofluoromethane	ug/m³	NA	--	NA	0.972	1.17 J	5.6 UJ	5.6 UJ	6	19	7.6	1.18	1.26	5.6 U	1.17	1.27	1.1	1.3	1.17
Vinyl acetate	ug/m³	210	--	7000	--	0.303 UJ	3.5 UJ	3.5 UJ	3.1 U	3.5 U	3.51 U	0.306 U	0.306 U	3.5 U	--	0.358 U	--	0.333 U	--
Vinyl chloride	ug/m³	0.17	--	7.7	--	0.0879 UJ	0.128 UJ	0.128 UJ	2.25 U	2.6 U	2.55 U	0.0889 U	0.0889 U	0.128 U	--	0.104 U	--	0.0967 U	--
VOCs, Total	ug/m³	NA	--	NA	0.972	21.49	30.432	396.762	6	26.2	7.6	23.791	21.308	32.866	1.375	35.38	1.301	21.916	1.368

Table 2-4. Faculty Housing Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

				Indoor Air										Exterior Soil Gas							
			Location>>	INST-FR-IA03			INST-FR-IA04		INST-FR-IA05			INST-FR-IA06		INS-0560		INS-0562		INS-0564		INS-0565	
			Sample ID>>	FR-IA3-012516	FR-IA03-012716S	FR-IA03-012716DS	FR-IA4-061920I5	FR-IA4-012516	FR-IA5-062220I5	FR-IA5-012516	FR-IA5-061920I5	FR-IA6-061920I5D	FR-IA6-012516	0560-01-011416	0560-02-011416	0562-01-012416	0562-02-012416	0564-01-012416	0564-02-020516	0565-02-012916	0565-02-012916D
			Sample Depth (feet)>>	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	5 - 6	16 - 17	5 - 6	11 - 12	5 - 6	12.5 - 13.5	16 - 17	16 - 17
			Sample Date>>	1/26/2016	1/26/2016	1/26/2016	6/20/2015	1/26/2016	6/22/2015	1/26/2016	6/20/2015	6/20/2015	1/26/2016	1/14/2016	1/13/2016	1/14/2016	1/14/2016	1/14/2016	2/5/2016	1/19/2016	1/19/2016
		Screening Levels[a]																			
Analyte	Unit	Residential Indoor Air RSL	Commercial/Industrial Indoor Air RSL	Residential Soil Gas VISL																	
1,1,1-Trichloroethane	ug/m³	5200	[illegible]	170000	0.214 U	0.273 U	0.273 U	--	0.185 UJ	--	0.181 UJ	--	--	0.216 U	5.11 U	4.72 UJ	5.77 U	4.94 U	5.06 U	5.5 U	5.77 U	5.71 U
1,1,2,2-Tetrachloroethane	ug/m³	0.048	[illegible]	1.6	0.27 U	6.9 U	6.9 U	--	0.233 UJ	--	0.228 UJ	--	--	0.272 U	5.42 U	5.84 UJ	7.26 U	6.21 U	6.35 U	6.9 U	12.3 U	12.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/m³	31000	[illegible]	100000	0.518	[illegible]	0.383	--	0.511 J	--	0.333 J	--	--	0.507	7.17 U	6.53 UJ	8.11 U	6.94 U	7.09 U	15 U	13.7 U	13.6 U
1,1,2-Trichloroethane	ug/m³	0.18	[illegible]	5.8	0.218 U	0.273 U	0.273 U	--	0.185 UJ	--	0.181 UJ	--	--	0.216 U	5.11 U	4.72 UJ	5.77 U	4.94 U	5.05 U	5.5 U	5.77 U	5.71 U
1,1-Dichloroethane	ug/m³	1.8	[illegible]	58	0.159 U	0.202 U	0.202 U	0.147 U	0.138 UJ	0.146 U	0.138 UJ	0.156 U	0.142 UJ	0.161 U	3.79 U	3.5 UJ	5.23	3.68 U	3.75 U	4 U	7.25 U	7.2 U
1,1-Dichloroethene	ug/m³	210	[illegible]	7000	0.156 U	0.198 U	0.198 U	0.186	0.135 UJ	0.142 U	0.134 UJ	0.156	0.138 J	0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
1,2,4-Trichlorobenzene	ug/m³	2.1	[illegible]	70	0.291 U	3.6 U	3.6 U	--	0.252 UJ	--	0.246 UJ	--	--	0.294 U	6.94 U	6.42 UJ	7.85 U	6.72 U	6.87 U	15 U	13.3 U	13.2 U
1,2,4-Trimethylbenzene	ug/m³	7.3	[illegible]	240	0.12	0.26	0.246 U	--	0.274 J	--	0.163 UJ	--	--	0.195 U	25.2	4.25 UJ	5.2 U	4.45 U	48.4	4.9 U	8.8 U	8.75 U
1,2-Dibromoethane (EDB)	ug/m³	0.0047	[illegible]	0.16	0.302 U	0.383 U	0.384 U	--	0.261 UJ	--	0.255 UJ	--	--	0.305 U	7.15 U	6.64 UJ	8.13 U	6.98 U	7.11 U	7.7 U	13.8 U	13.7 U
1,2-Dichlorobenzene	ug/m³	210	[illegible]	7000	0.236 U	0.301 U	0.301 U	--	0.204 UJ	--	0.199 UJ	--	--	0.239 U	5.63 U	5.2 UJ	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,2-Dichloroethane	ug/m³	0.11	[illegible]	3.6	0.159 U	0.2	0.202 U	--	0.138 UJ	--	0.134 UJ	--	--	0.161 U	3.79 U	3.5 UJ	38.7	42.6	3.75 U	4 U	7.25 U	7.2 U
1,2-Dichloropropane	ug/m³	0.28	[illegible]	9.4	0.181 U	0.231 U	0.231 U	--	0.157 UJ	--	0.153 UJ	--	--	0.183 U	4.32 U	4 UJ	147	[illegible]	4.28 U	4.6 U	8.27 U	8.23 U
1,2-Dichlorotetrafluoroethane	ug/m³	NA	[illegible]	NA	0.274 U	7 U	7 U	--	0.238 UJ	--	0.232 UJ	--	--	0.277 U	6.54 U	6.04 UJ	7.4 U	6.33 U	6.47 U	7 U	12.5 U	12.4 U
1,3,5-Trimethylbenzene	ug/m³	NS	[illegible]	NA	0.153 U	4.9 U	4.9 U	--	0.167 UJ	--	0.163 UJ	--	--	0.195 U	8.3	4.25 UJ	5.2 U	4.45 U	18.3	4.9 U	8.8 U	8.75 U
1,3-Dichlorobenzene	ug/m³	NS	[illegible]	NA	0.236 U	0.301 U	0.301 U	--	0.204 UJ	--	0.199 UJ	--	--	0.239 U	5.63 U	5.2 UJ	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,4-Dichlorobenzene	ug/m³	0.26	[illegible]	8.8	0.236 U	0.301 U	0.301 U	--	0.204 UJ	--	0.199 UJ	--	--	0.239 U	5.63 U	5.2 UJ	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,4-Dioxane (p-Dioxane)	ug/m³	0.56	[illegible]	19	3.54 U	3.6 U	3.6 U	3.26 U	3.05 UJ	3.23 U	2.99 UJ	3.48 U	3.17 UJ	3.57 U	3.37 U	3.12 UJ	3.81 U	3.26 U	3.34 U	3.6 U	6.45 U	5.41 U
2-Butanone	ug/m³	5200	[illegible]	170000	0.828	5.9 U	5.9 U	--	0.549 J	--	1.38 J	--	--	1.26	2.76 U	9.12 J	3.12 U	2.67 U	2.73 U	5.9 U	9.99	11.2
2-Hexanone	ug/m³	31	[illegible]	1000	4.03 U	8.2 U	8.2 U	--	3.48 UJ	--	3.4 UJ	--	--	4.06 U	3.83 U	3.54 UJ	4.33 U	3.71 U	3.79 U	8.2 U	7.33 U	7.28 U
2-Methylnaphthalene	ug/m³	NA	[illegible]	NA	11.4 U	--	--	--	9.88 UJ	--	9.68 UJ	--	--	11.5 U	5.44 U	5.03 UJ	6.15 U	5.26 U	5.38 U	--	10.4 U	10.4 U
4-Methyl-2-pentanone	ug/m³	3100	[illegible]	100000	4.84	8.2 U	8.2 U	--	2.68 J	--	2.66 J	--	--	2.48	3.83 U	3.54 UJ	4.33 U	3.71 U	3.79 U	8.2 U	7.33 U	7.28 U
Acetone	ug/m³	32000	[illegible]	110000	14.41	19	20	--	10.3 J	--	15.7 J	--	--	18 J	33.3 NJ	38.9 NJ	6.38 NJ	9.26 NJ	7.2 NJ	6.9	32.4 NJ	32.7 NJ
Acrylonitrile	ug/m³	0.041	[illegible]	1.4	2.13 UJ	0.236 J	0.106 UJ	--	1.84 UJ	--	1.8 UJ	--	--	2.15 UJ	2.03 U	1.88 UJ	2.3 U	1.96 U	2.01 U	4.3 U	3.89 U	3.86 U
Benzene	ug/m³	0.36	[illegible]	12	0.637	0.927	0.848	0.801	0.623 J	0.572 U	0.6 J	0.618 U	0.552 UJ	0.684 U	5.62	2.86 NJ	3.38 U	3.09 U	9.94	3.2 U	5.22 U	5.69 U
Benzyl chloride	ug/m³	0.057	[illegible]	2.9	0.303 U	5.2 U	5.2 U	--	0.176 UJ	--	0.172 UJ	--	--	0.205 U	4.84 U	4.48 UJ	5.48 U	4.69 U	4.79 U	5.2 U	9.27 U	9.22 U
Bis(2-chloroisopropyl) ether	ug/m³	NA	[illegible]	NA	5.87 U	--	--	--	5.34 UJ	--	5.8 UJ	--	--	6.94 U	6.55 U	6.05 UJ	7.4 U	6.33 U	6.48 U	--	12.5 U	12.5 U
Bromodichloromethane	ug/m³	0.076	[illegible]	2.5	0.268 U	0.335 U	0.335 U	--	0.228 UJ	--	0.222 UJ	--	--	0.266 U	6.27 U	5.79 UJ	7.09 U	6.07 U	6.2 U	6.7 U	12 U	11.9 U
Bromoform	ug/m³	2.6	[illegible]	85	2.01 U	10 U	10 U	--	1.76 UJ	--	1.71 UJ	--	--	2.05 U	5.87 U	5.34 UJ	6.91 U	5.38 U	5.57 U	10 U	18.5 U	18.4 U
Bromomethane	ug/m³	5.2	[illegible]	170	0.762 U	3.9 U	3.9 U	--	0.68 UJ	--	0.644 UJ	--	--	0.77 U	3.63 U	3.36 UJ	4.14 U	3.52 U	3.59 U	3.9 U	6.85 U	6.91 U
Carbon disulfide	ug/m³	730	[illegible]	23000	0.122 U	3.1 U	3.1 U	--	0.106 UJ	--	0.103 UJ	--	--	0.124 U	2.31 U	2.09 UJ	2.39 U	2.02 U	2.08 U	3.2	5.57 U	5.54 U
Carbon tetrachloride	ug/m³	0.47	[illegible]	16	2.47 U	0.972	0.726	--	2.14 UJ	--	2.09 UJ	--	--	2.5 U	5.89 U	5.44 UJ	15	5.7 U	5.82 U	6.3 U	11.3 U	11.2 U
Chlorobenzene	ug/m³	52	[illegible]	1700	0.181 U	4.6 U	4.6 U	0.167 U	0.156 UJ	0.165 U	0.153 UJ	0.178 U	0.162 UJ	0.183 U	4.31 U	3.98 UJ	4.87 U	4.17 U	4.26 U	4.6 U	8.24 U	8.15 U
Chloroethane	ug/m³	10000	[illegible]	350000	0.104 U	0.223	0.137 U	--	0.0887 UJ	--	0.0875 UJ	--	--	0.105 U	2.47 U	2.28 UJ	2.73 U	2.39 U	2.44 U	2.6 U	4.73 U	4.7 U
Chloroform	ug/m³	0.12	[illegible]	4.2	0.192 U	0.39	0.244 U	0.218	0.166 UJ	0.175 U	0.162 UJ	0.189 U	0.172 UJ	0.194 U	4.57 U	4.22 UJ	5.16 U	4.42 U	4.52 U	4.9 U	8.74 U	8.69 U
Chloromethane	ug/m³	94	[illegible]	3100	3.03 U	2.1 U	2.1 U	--	1.75 UJ	--	1.71 UJ	--	--	2.05 U	1.93 U	1.79 UJ	2.18 U	1.87 U	1.91 U	2.1 U	3.7 U	4.83 NJ
cis-1,2-Dichloroethylene	ug/m³	NS	[illegible]	NA	0.158 U	0.198 U	0.198 U	--	0.135 UJ	--	0.134 UJ	--	--	0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
cis-1,3-Dichloropropene	ug/m³	NA	[illegible]	NA	0.178 U	4.5 U	4.5 U	--	0.154 UJ	--	0.15 UJ	--	--	0.18 U	4.25 U	3.92 UJ	4.8 U	4.11 U	4.2 U	4.5 U	8.13 U	8.08 U
Dibromochloromethane	ug/m³	NA	[illegible]	NS	0.338 U	8.5 U	8.5 U	--	0.289 UJ	--	0.282 UJ	--	--	0.328 U	7.97 U	7.36 UJ	9.01 U	7.71 U	7.88 U	8.5 U	15.2 U	15.2 U
Dichlorodifluoromethane	ug/m³	100	[illegible]	3500	2.42	3.95	3.52	--	2.4 J	--	2.47 J	--	--	2.41	4.63 U	4.28 UJ	5.23 U	4.48 U	4.58 U	4.9 U	8.85 U	8.8 U
Ethylbenzene	ug/m³	1.1	[illegible]	37	0.177	0.869	0.763	--	0.373 J	--	0.144 UJ	--	--	0.172 U	9.85	3.75 UJ	4.59 U	3.93 U	18.8	4.6	7.77 U	7.73 U
Hexachlorobutadiene	ug/m³	0.12	[illegible]	4.3	0.414 U	24 U	24 U	--	0.358 UJ	--	0.35 UJ	--	--	0.418 U	9.87 U	9.12 UJ	11.2 U	9.55 U	9.76 U	21 U	18.9 U	18.8 U
m,p-Xylene	ug/m³	100	[illegible]	3500	0.579	1.96	1.8	--	0.552 J	--	0.459 J	--	--	0.446	49	7.51 UJ	9.14 U	7.86 U	39.8	12	15.5 U	15.5 U
Methylene chloride	ug/m³	200	[illegible]	7000	6.82 U	0.751	0.695 U	--	5.9 UJ	--	5.76 UJ	--	--	6.89 U	3.25 U	3 UJ	3.68 U	3.14 U	3.22 U	3.3 U	6.22 U	6.18 U
n-Butylbenzene	ug/m³	NA	[illegible]	NA	5.216 U	5.5 U	5.5 U	--	0.186 UJ	--	0.182 UJ	--	--	0.218 U	5.14 U	4.75 UJ	5.81 U	4.97 U	5.08 U	5.5 U	9.83 U	9.77 U
n-Hexane	ug/m³	730	[illegible]	24000	0.882	3.5 U	3.5 U	--	1.81 J	--	0.903 J	--	--	0.871	32.8	7.85 NJ	3.73 U	3.19 U	35.4	3.5 U	9.28 NJ	9.57 NJ
n-Propylbenzene	ug/m³	1000	[illegible]	35000	0.193 U	4.9 U	4.9 U	--	0.167 UJ	--	0.163 UJ	--	--	0.195 U	4.6 U	4.25 UJ	5.2 U	4.45 U	7.15	4.9 U	8.8 U	8.75 U
Naphthalene	ug/m³	0.083	[illegible]	2.9	0.206 U	0.267 U	0.262 U	--	0.178 UJ	--	0.174 UJ	--	--	0.208 U	4.91 U	4.53 UJ	5.55 U	4.75 U	4.85 U	5.2 U	9.38 U	9.33 U
o-Xylene	ug/m³	100	[illegible]	3500	0.396	1.31	1.31	--	0.227 J	--	0.183 J	--	--	0.203	14.9	3.75 UJ	4.59 U	3.93 U	30.4	8	7.77 U	7.73 U
Styrene	ug/m³	1000	[illegible]	35000	0.467 U	0.213 U	0.213 U	--	0.145 UJ	--	0.141 UJ	--	--	0.169 U	3.95 U	3.68 UJ	4.51 U	3.86 U	3.94 U	4.3 U	7.63 U	7.58 U
tert-Butyl Methyl Ether	ug/m³	11	[illegible]	360	0.142 U	0.687 J	0.18 U	--	0.122 UJ	--	0.12 UJ	--	--	0.143 U	3.37 U	3.12 UJ	3.81 U	3.26 U	3.34 U	3.6 U	6.45 U	6.42 U
Tetrachloroethene	ug/m³	11	[illegible]	360	0.356 U	0.353	0.339 U	--	0.23 UJ	--	0.225 UJ	--	--	0.269 U	6.35 U	5.86 UJ	7.17 U	6.14 U	6.28 U	6.8 U	12.1 U	12.1 U
Toluene	ug/m³	5200	[illegible]	170000	1.83 J	2.35 J	2.37	--	1.47 J	--	1.38 J	--	--	1.45	47.5	5.14 J	3.99 U	3.41 U	62.8	160	3,068	1,087
Trans-1,2-Dichloroethylene	ug/m³	NA	[illegible]	NA	0.156 U	0.198 U	0.198 U	--	0.135 UJ	--	0.131 UJ	--	--	0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
trans-1,3-Dichloropropene	ug/m³	NA	[illegible]	NA	0.178 U	4.5 U	4.5 U	--	0.154 UJ	--	0.15 UJ	--	--	0.18 U	4.25 U	3.92 UJ	4.8 U	4.11 U	4.2 U	4.5 U	8.13 U	8.08 U
Trichloroethylene	ug/m³	0.48	[illegible]	16	0.211 U	0.269 U	0.269 U	--	0.182 UJ	--	0.178 UJ	--	--	0.213 U	8.52	4.77 UJ	5.68 U	4.97 U	8.3	5.4 U	9.63 U	9.56 U
Trichlorofluoromethane	ug/m³	NA	[illegible]	NA	1.18	5.6 U	5.6 U	1.11	1.17 J	0.909	1.23 J	0.943	1.18 J	1.18	5.26 U	4.86 UJ	5.94 U	5.09 U	5.2 U	5.6 U	307	309
Vinyl acetate	ug/m³	210	[illegible]	7000	0.346 U	3.5 U	3.5 U	--	0.299 UJ	--	0.292 UJ	--	--	0.349 U	3.29 U	3.04 UJ	3.73 U	3.19 U	3.26 U	3.5 U	6.3 U	6.27 U
Vinyl chloride	ug/m³	0.17	[illegible]	2.7	0.1 U	0.128 U	0.128 U	--	0.0868 UJ	--	0.0848 UJ	--	--	0.101 U	2.38 U	2.21 UJ	2.7 U	2.31 U	2.37 U	2.6 U	4.58 U	4.55 U
VOCs, Total	ug/m³	NA	[illegible]	NA	28.007	35.398	32.021	2.168	21.935	0.909	27.833	1.099	1.378	28.257	205.09	83.67	309.11	806.06	358.69	192.5	1,438.88	1,427.80

Table 3-4. Faculty Housing Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

Notes:
a = Screening levels are based on USEPA regional screening levels (RSLs, USEPA 2015b) for indoor air for a residential exposure scenario.
The RSLs are based on a 1E-06 (1 x 10 $^{-6}$) target carcinogenic risk for current exposure scenarios and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).
b = Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03.
a 1E-06 (1 x 10-6) target carcinogenic risk for residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).
-- = Not analyzed
B = The analyte was detected in the associated method and/or calibration blank
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
NA = Not available
NJ = This analyte indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
µg/m^3 = Micrograms per Cubic Meter
Bold indicates the analyte was detected
Shading indicates the result exceeded Residential Indoor Air RSL
[illegible]
Highlighted results indicate concentration was detected above the Residential Soil Gas VISL

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Soil Gas COPC Summary
Campus Assessment

Campus Location				Faculty Housing				Fleming Hall	Quad	Dawson Hall	JKS Hall		Student Union	
Client Sample ID	Units	VISL Residential Limit	VISL Commercial Limit	FR-AA1-012816*	VP-1	VP-3	VP-4	VP-5	VP-8	VP-7	VP-9	VP-10	VP-11	VP-13
Depth				0-6	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'
Date Collected				1/28/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016
Analyte				Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
ACETONE	µg/m³	1.80E+05	4.50E+06	21 J	187	186	328	169	115	199	295	236	73.7	49.8
BENZENE	µg/m³	13	520	0.601 J	19.4	84.7	78.4	33.1	28	88.3	87.8	88.3	18.8	33.1
CARBON DISULFIDE	µg/m³	2.40E+04	1.00E+05	0.107 UJ	3.98	140	110	30.3	118	384	602	318	112	85.9
CHLOROBENZENE	µg/m³	1700	7300	0.158 UJ	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	<0.924	1.5
CHLOROMETHANE	µg/m³	3100	1.30E+04	1.77 UJ	<0.413	1.03	<0.413	<0.413	<0.413	<0.413	<0.413	1.15	<0.413	<0.413
CYCLOHEXANE	µg/m³	2.10E+05	8.80E+05	NS	<0.689	28.8	13.4	1.18	4.35	5.8	7.86	5.06	4.58	8.47
1,3-DICHLOROBENZENE	µg/m³	NE	NE	0.207 UJ	<1.2	2.28	4.51	3.46	6.98	6.54	7.48	3.1	2.95	2.43
1,1-DICHLOROETHENE	µg/m³	7000	2.90E+04	0.136 UJ	<0.793	0.959	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793
TRANS-1,2-DICHLOROETHENE	µg/m³	NE	NE	0.136 UJ	<0.793	3	1.9	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793
ETHANOL	µg/m³	NE	NE	NS	549	435	547	489	1440	1330	687	359	451	257
ETHYLBENZENE	µg/m³	37	1600	0.149 UJ	<0.867	4.48	3.24	<0.867	1.76	<0.867	1.1	<0.867	<0.867	1.17
4-ETHYLTOLUENE	µg/m³	NE	NE	NS	<0.982	2.44	2.04	1.5	3.12	1.88	2.35	1.59	1.02	1.02
TRICHLOROFLUOROMETHANE	µg/m³	NE	NE	1.17 J	1.34	1.56	1.53	2.58	1.98	1.88	2.18	22	27.6	2.16
DICHLORODIFLUOROMETHANE	µg/m³	3500	1.50E+04	2.39 J	1.75	2.03	4.03	2.49	2.14	2.31	2.32	2.17	2.23	2.8
HEPTANE	µg/m³	NE	NE	NS	1.89	13.9	33.3	4.12	21.5	7.47	18.3	17.8	3.53	7.55
N-HEXANE	µg/m³	2.40E+05	1.00E+05	NS	2.03	29.7	24.2	8.36	16.5	30.4	38.6	23.7	15.2	17.2
METHYLENE CHLORIDE	µg/m³	3400	8.80E+04	5.97 UJ	<0.694	4.12	4.16	1.72	1.67	2.23	2.12	4.01	4.1	3
2-BUTANONE (MEK)	µg/m³	1.70E+06	7.30E+06	0.693 J	3.78	5.79	4.99	5.47	10.2	9.52	6.48	4.15	10.1	<3.69
NAPHTHALENE	µg/m³	2.6	120	0.18 UJ	<3.3	12.4	20	8.08	16.2	10.9	15.2	18.6	<3.3	16.8
2-PROPANOL	µg/m³	7000	2.90E+04	NS	<3.07	8.16	8.33	3.69	11.1	4.86	<3.07	<3.07	<3.07	<3.07
PROPENE	µg/m³	1.00E+05	4.40E+05	NS	126	296	132	184	649	1210	1040	258	49.3	66.7
STYRENE	µg/m³	3.50E+05	1.50E+06	0.146 UJ	<0.851	1.67	2.29	<0.851	2.48	0.859	0.926	<0.851	<0.851	<0.851
TETRACHLOROETHENE	µg/m³	380	5600	0.233 UJ	<1.36	1.49	1.62	<1.36	2.38	<1.36	1.82	<1.36	<1.36	<1.36
TOLUENE	µg/m³	1.70E+05	7.30E+05	0.617 J	2.32	48.5	53.7	4.87	50.8	9.52	21.3	18.1	11.4	13.4
1,2,4-TRIMETHYLBENZENE	µg/m³	240	1000	0.189 UJ	<0.982	2.45	2.25	1.64	3.04	1.89	2.43	1.67	<0.982	1.95
1,3,5-TRIMETHYLBENZENE	µg/m³	NE	NE	NS	<0.982	<0.982	<0.982	<0.982	1.04	<0.982	<0.982	<0.982	<0.982	<0.982
2,2,4-TRIMETHYLPENTANE	µg/m³	NE	NE	NS	<0.934	9.68	8.65	<0.934	2.56	5.37	7.08	6.87	4.18	6.64
VINYL CHLORIDE	µg/m³	5.6	930	0.0879 UJ	<0.511	11.8	8.27	<0.511	<0.511	<0.511	<0.511	<0.511	<0.511	0.917
M&P-XYLENE	µg/m³	3500	1.50E+04	0.39 J	<1.73	15.3	10.2	2.05	5.4	2.05	3.35	2.18	<1.73	4.88
O-XYLENE	µg/m³	3500	1.50E+04	0.149 UJ	<0.867	5.97	4.75	0.925	2.32	<0.867	1.22	<0.867	<0.867	2.54

Indicates analyte included on DOW's RCRA analyte list

Indicates analyte exceeds Residential VISL screening limit

µg/m³ = micrograms per cubic meter

* Ambient air sample collected by DOW outside vacant faculty residence on 1/28/16

ENVIROPROBE

Attachment 2

Select Figures from CH2M Hill Reports

INQUIRY #: 4395961.4
YEAR: 1955
= 750'
N
EDR

INQUIRY #: 4395961.4
YEAR: 1971
= 500'
N
EDR

Historical Topographic Map

N	TARGET QUAD NAME: SAINT ALBANS MAP YEAR: 1958 SERIES: 7.5 SCALE: 1:24000	SITE NAME: UCC Institute Fac.Eastern Boundary Investigation ADDRESS: HWY I-64 and State Route 25 Dunbar, WV 25064 LAT/LONG: 38.3795 / -81.7665	CLIENT: CH2M Hill, Inc. CONTACT: Brett Fishwild INQUIRY#: 4395961.1 RESEARCH DATE: 08/28/2015

October 1990
WVSU Property
Legend
Feature 1
Go Mart Inc
Institute
Institute
Kingdom Hall-Jehovah's Witness
Lakin Field
Shawnee Park
Shawnee Regional Park
W V State Police Academy
WVSU
WVSU
West Virginia State University
West Virginia State University
Institute
Institute
25
Lesse St
Fairlawn Ave
Douglas St
Ave A
Barron Dr
College Dr
Washington Ave
Lincoln Ave
Elm St
Vernon St
King St
Carver St
Smith Ave
N
1000 ft
Google Earth
Image U.S. Geological Survey

0 450 900
Feet

Note:
* Indicates at least 20 feet of fly ash noted in boring impacting measured thickness. Locations were not contoured.
RCRA = Resource Conservation and Recovery Act

Figure 4
Silt/Clay Thickness
Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V
Union Carbide Corporation Institute Facility
Institute, West Virginia

ch2m

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIG4_SILTCLAY_THICKNESS.MXD AESPEJO 3/30/2016 1:50:03 PM

Note:
* Indicates at least 20 feet of fly ash noted in boring potentially impacting measured thickness.
> Bedrock (refusal) was not identified in the boring. As permeable units lie on the bedrock surface, the estimated thickness is greater than the value shown.
RCRA = Resource Conservation and Recovery Act

Figure 5
Saturated Permeable Aquifer Thickness
Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V
Union Carbide Corporation Institute Facility
Institute, West Virginia

ch2m

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIG5_SATURATED_PERM_AQUIFER.MXD AESPEJO 3/30/2016 1:52:48 PM

Summary of Fill in Borings	
INS-0387	8 ft of fill in top of boring
INS-0388	fill from 10 to 11.5 ft bgs
INS-0469	~10 ft of fill, fly ash at 16.5 to 18 ft bgs
INS-0470	fly ash from 8 to 34.5 ft bgs
INS-0563	fly ash from 9 to 10 ft bgs (NR from 0 to 9 ft bgs)
INS-0566	fly ash from 1.5 to 5 ft bgs & 24 to 25 ft bgs; NR to 26.5 ft bgs
TW-107	fly ash fill estimated to 27.5 ft bgs (NR 0-6.5, 15-19, & 20-27.5 ft bgs)
TW-108	fill from 6 to 17 ft bgs

Notes:
ft - feet
bgs - below ground surface
EOB - end of boring
NR - no recovery

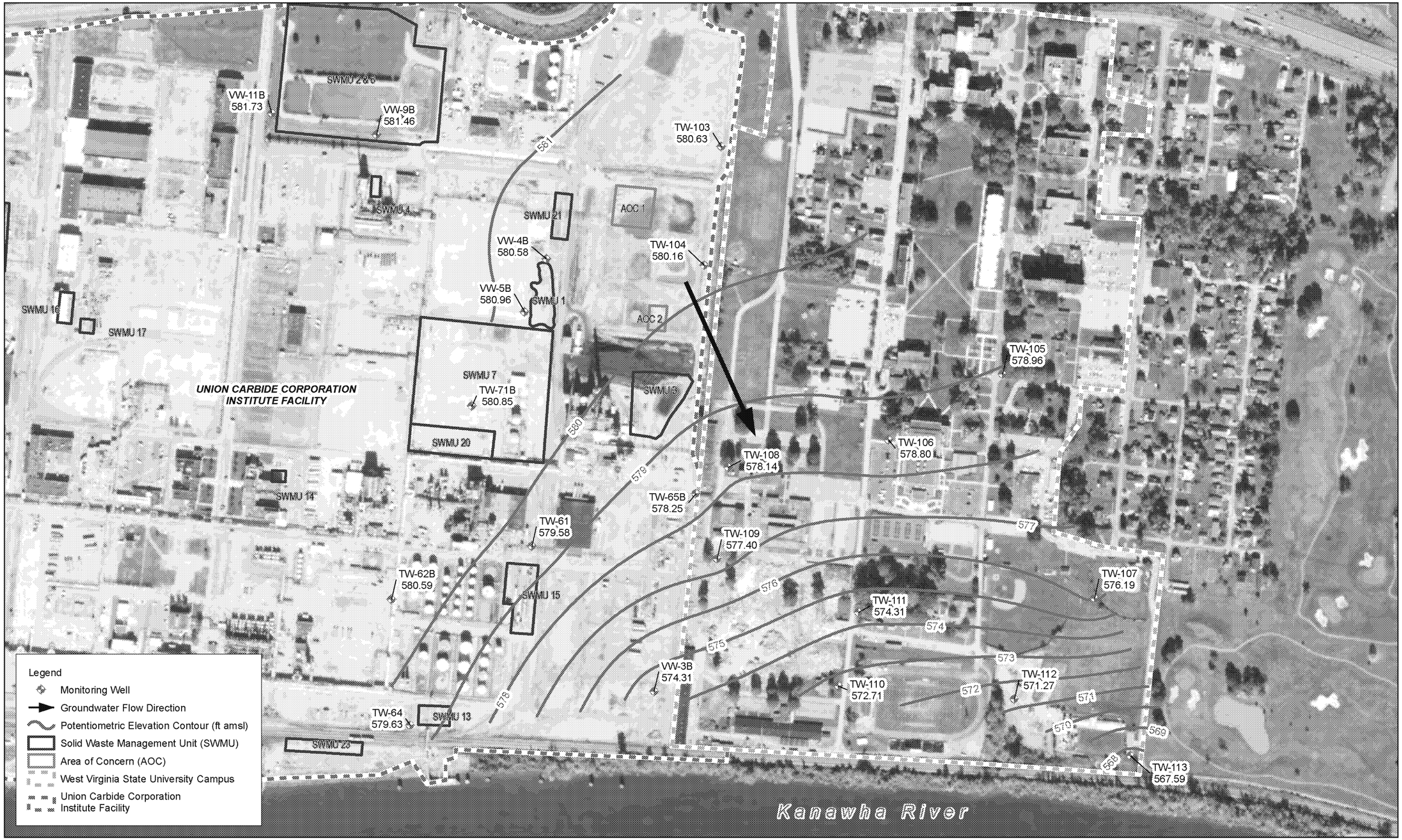
0 400 800
Feet

Notes:
Historic drainage features digitized from a 1955 aerial photograph and 1958 topographic map
RCRA = Resource Conservation and Recovery Act

Figure 6
Historical Surface Water Drainage Features and Impoundments
Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V
Union Carbide Corporation Institute Facility
Institute, West Virginia

ch2m

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIG6_HISTORICAL_SURFACE_WATER_DRAINAGE_FEATURES.MXD AESPEJO 4/6/2016 12:57:37 PM



0 400 800
Feet

Notes:
ft amsl = feet above mean sea level
RCRA = Resource Conservation and Recovery Act

Figure 7
Potentiometric Surface Map - August 7, 2015
Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V
Union Carbide Corporation Institute Facility
Institute, West Virginia

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MKE \\LAKEFRONT\PROJGIS\DOW\INSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIGURE 07 - EASTERN BNDRY POT MAP.MXD AESPEJO 3/22/2016 9:24:33 PM

0 400 800
Feet

Notes:
RSL = Regional Screening Level
*Data is from 2010 groundwater sampling.
RCRA = Resource Conservation and Recovery Act

Qualifiers:
J = Indicate the reported concentration is estimated.
L = The analyte was positively identified, but the associated numerical value may be biased low.
< = The constituent was not detected above the reporting detection limit.
UJ = Indicate the constituent was not detected above an estimated reporting detection limit.

Figure 8
Distribution of 1,4-Dioxane in Shallow Groundwater
Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V
Union Carbide Corporation Institute Facility
Institute, West Virginia

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MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIG8_1,4_DIOXANE.MXD AESPEJO 3/31/2016 11:02:37 AM

0 400 800
Feet

Notes:
RSL = Regional Screening Level
*Data is from 2014 groundwater sampling.
Blue font presents sample results from Phase V (January 2016).
RCRA = Resource Conservation and Recovery Act

Qualifiers:
< = The constituent was not detected above the reporting detection limit.

Figure 9
Distribution of 1,1-Dichloroethane in Deep Groundwater
Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V
Union Carbide Corporation Institute Facility
Institute, West Virginia

ch2m

MKE \\LAKEFRONT\PROJ\GIS\DOW\INSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIG9_1,1_DICHLOROETHANE.MXD AESPEJO 3/30/2016 6:55:37 PM

0 400 800
Feet

Notes:
RSL = Regional Screening Level
*Data is from 2014 groundwater sampling.
**Data is from 2012 groundwater sampling.
***Data is from 2010 groundwater sampling.
Blue font presents sample results from Phase V (January 2016).
RCRA = Resource Conservation and Recovery Act

Qualifiers:
J = Indicate the reported concentration is estimated.
K = Indicate the reported concentration is biased high.
< = The constituent was not detected above the reporting detection limit.
UJ = Indicate the constituent was not detected above an estimated reporting detection limit.

Figure 10
Distribution of 1,4-Dioxane in Deep Groundwater
Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V
Union Carbide Corporation Institute Facility
Institute, West Virginia

ch2m

MKE \\LAKEFRONT\PROJGIS\DOW\INSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIG10_1.4_DIOXANE.MXD AESPEJO 3/31/2016 5:46:40 PM

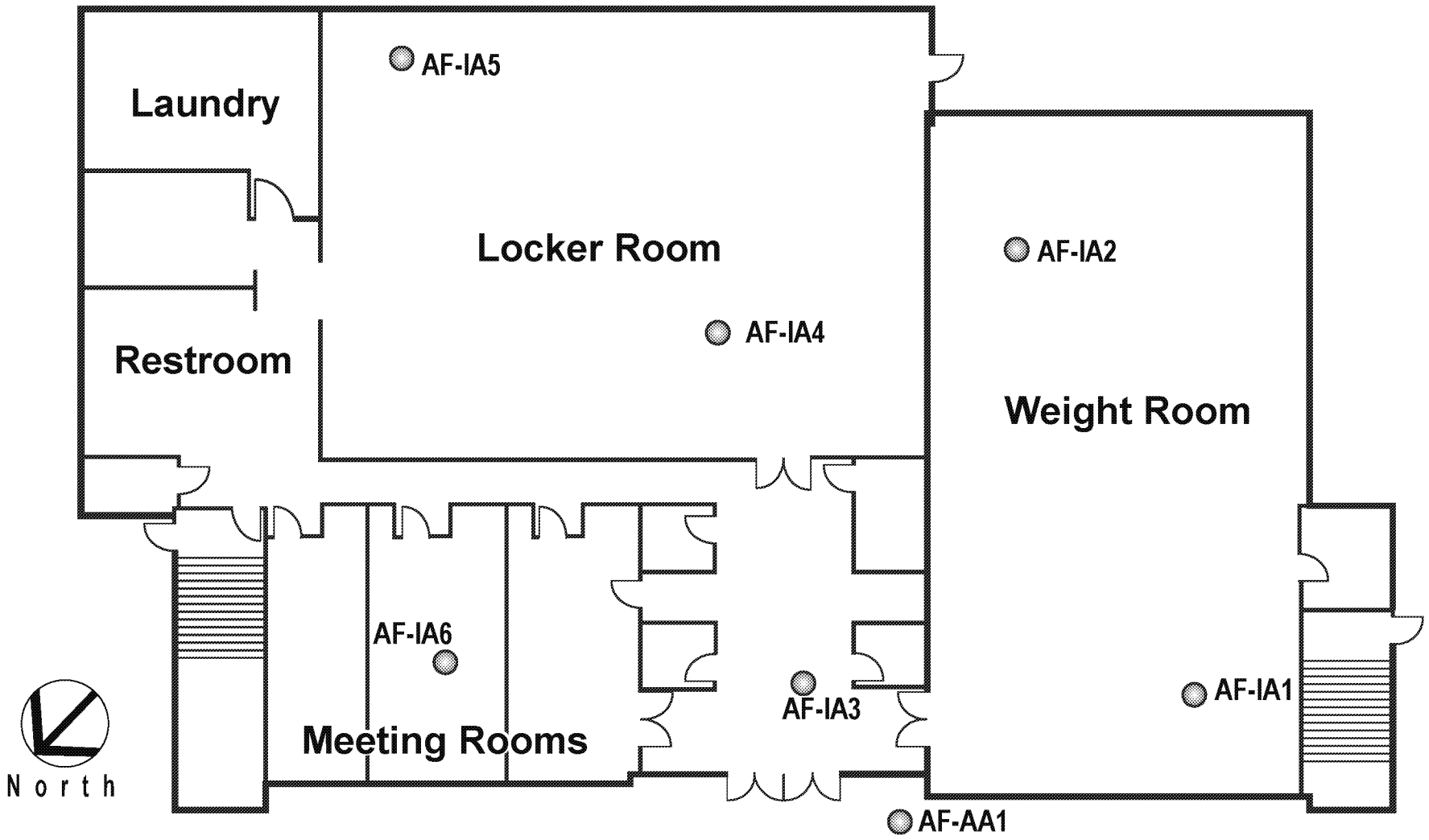

Figure 4a
Athletic Facility - First Floor Air Sample Locations
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

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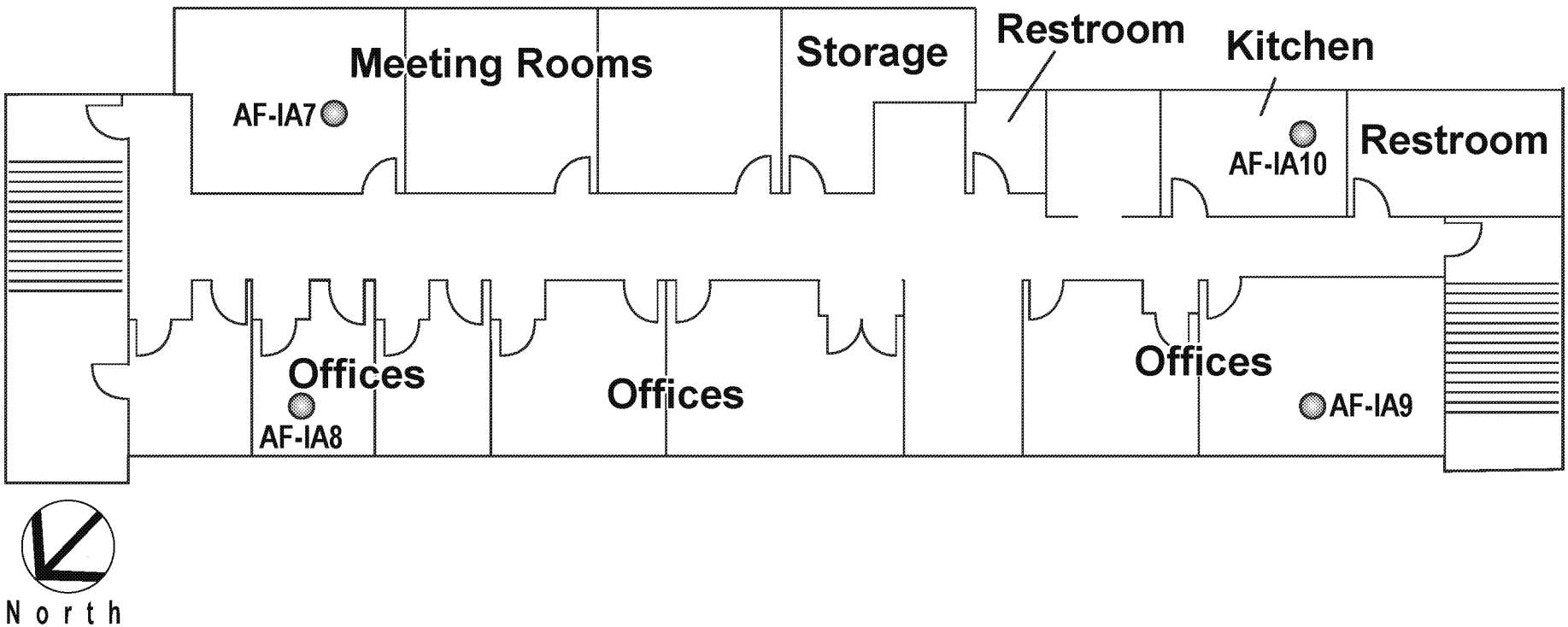

Figure 4b
Athletic Facility - Second Floor Air Sample Locations
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

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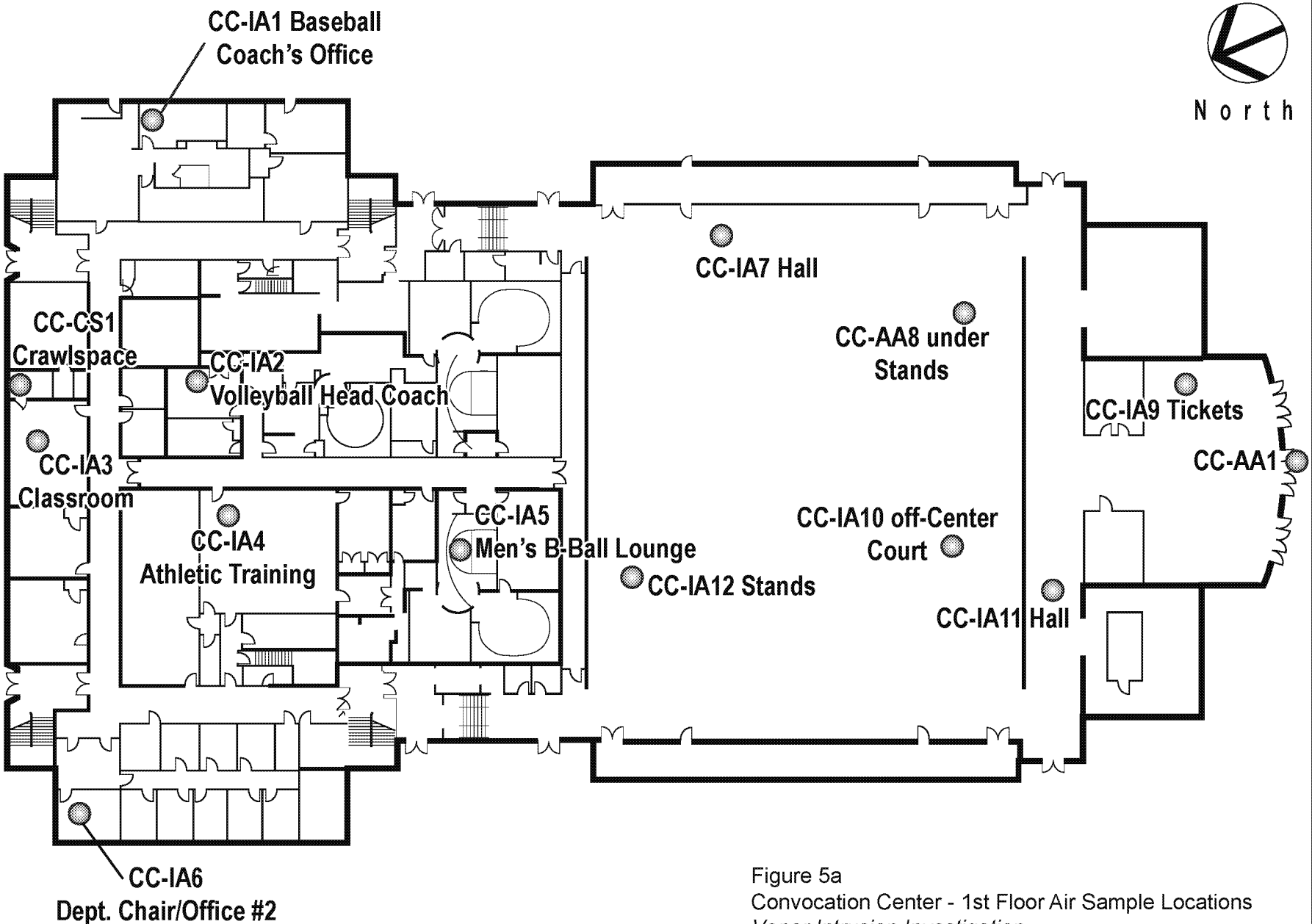

Figure 5a
Convocation Center - 1st Floor Air Sample Locations
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

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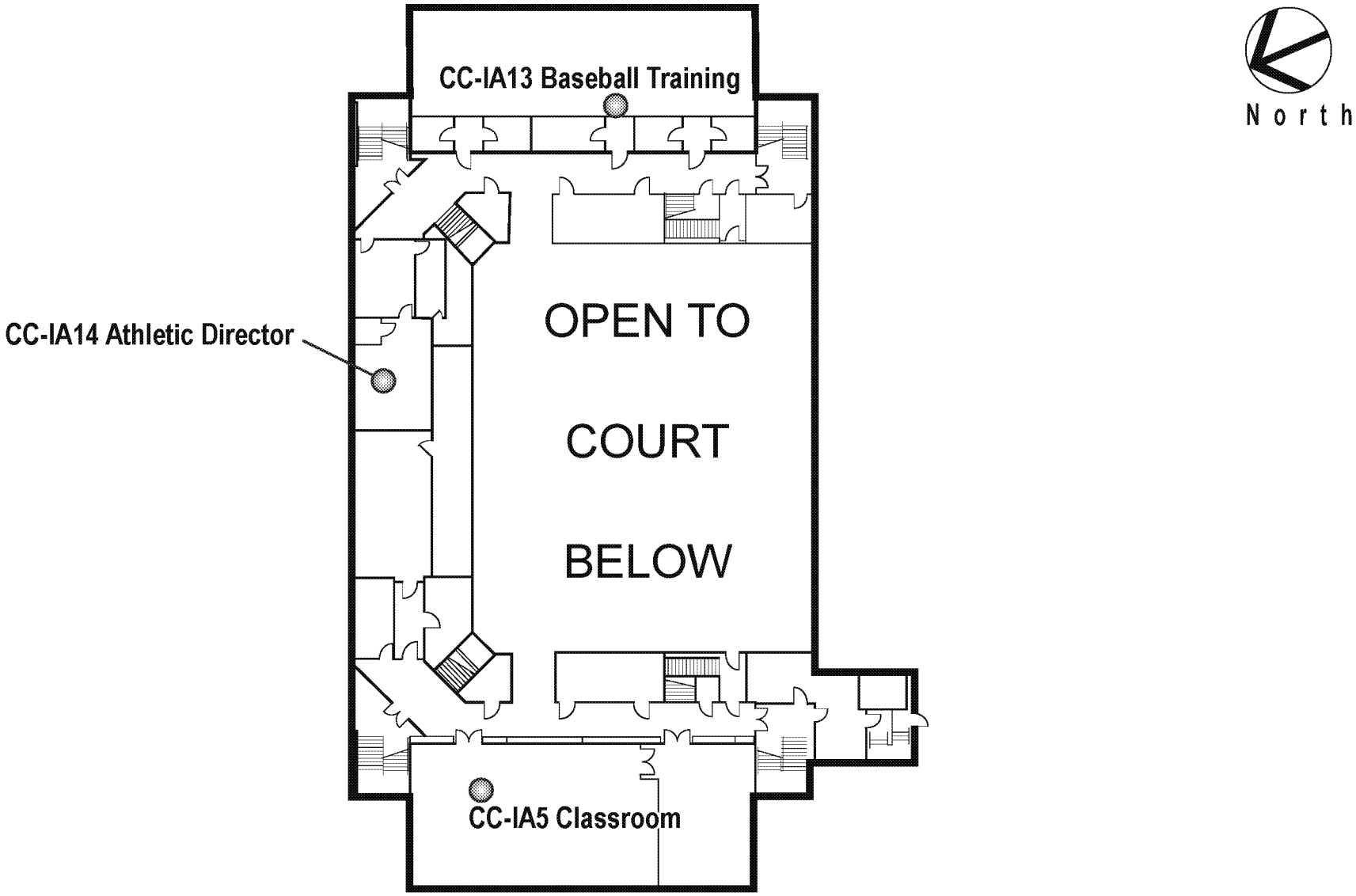

Figure 5b
Convocation Center - 2nd Floor Air Sample Locations
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

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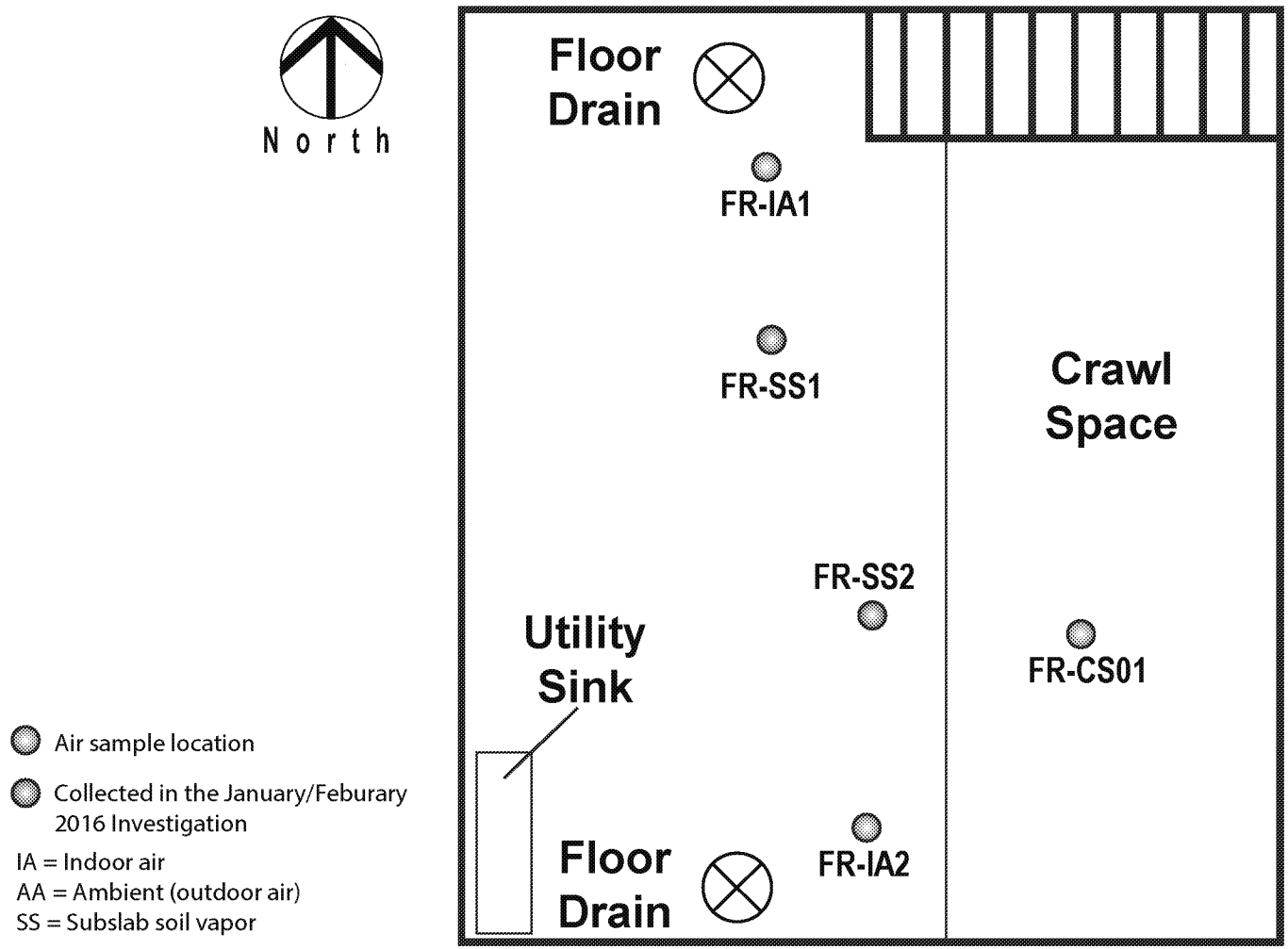

Figure 6a
Unoccupied Faculty Residence - Basement Air Sample Locations *Vapor Intrusion Investigation*
West Virginia State University, Institute, West Virginia

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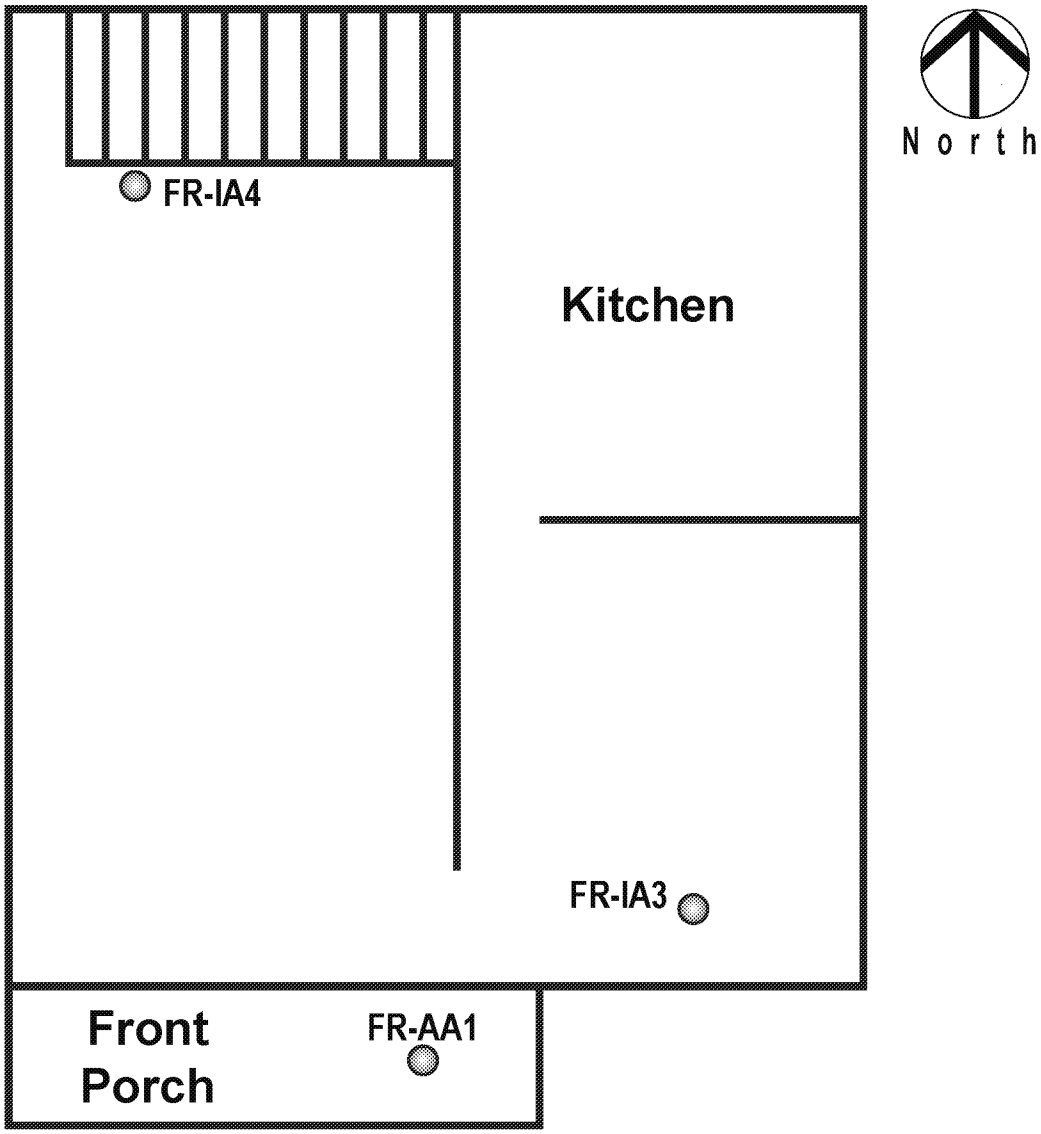

Figure 6b
Unoccupied Faculty Residence - Ground Floor Air Sample Locations *Vapor Intrusion Investigation*
West Virginia State University, Institute, West Virginia

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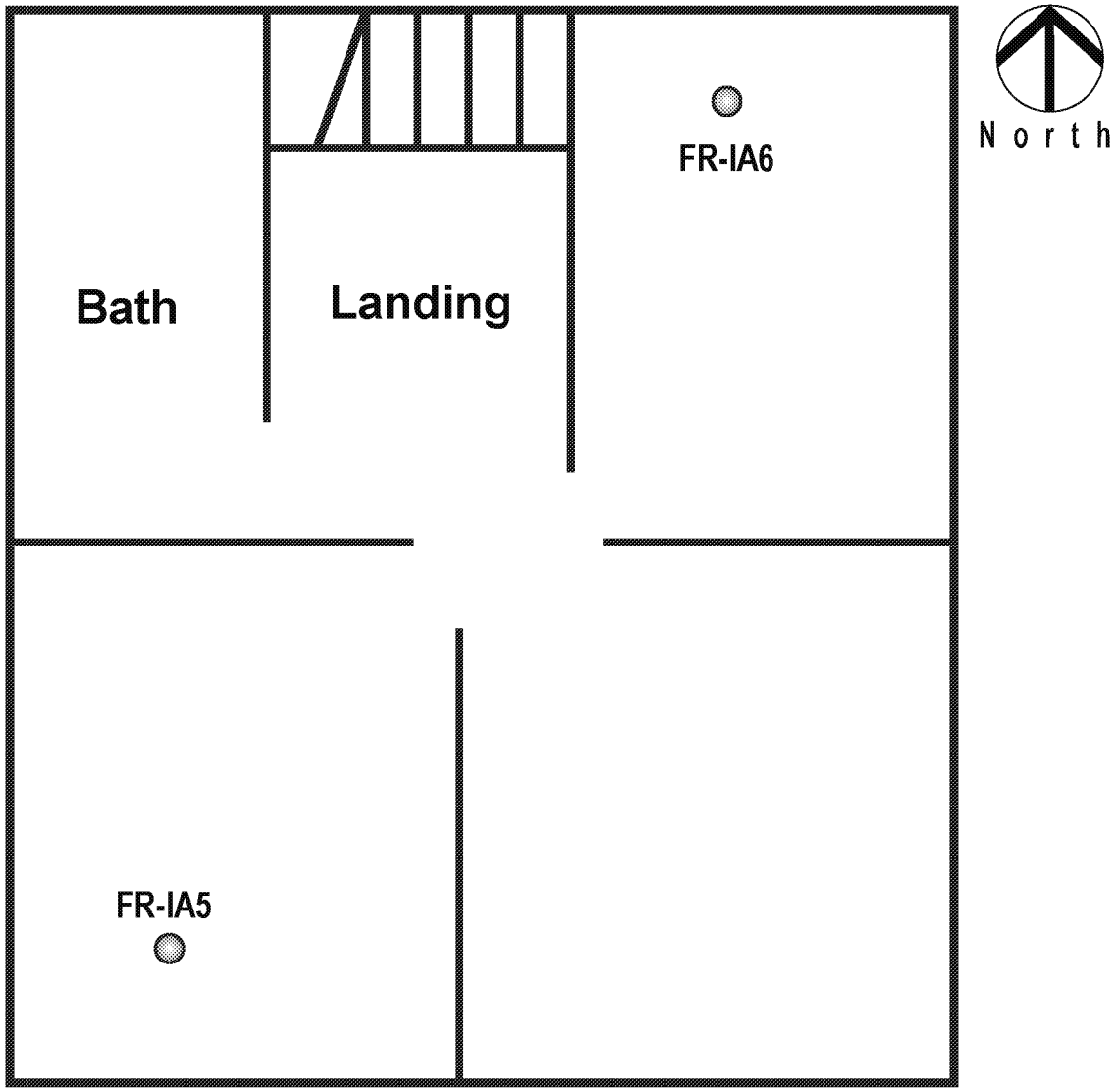

Figure 6c
Unoccupied Faculty Residence - Second Floor Air Sample Locations
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

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