FINAL REPORT
VESTAL WATER SUPPLY WELL 1-1 SUPERFUND SITE
AREA 4, OPERABLE UNIT 2
(AKA VESTAL CHLORINATED SOLVENT SITE)
HUMAN HEALTH RISK ASSESSMENT
BROOME COUNTY, NEW YORK

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LIST OF ACRONYMS AND ABBREVIATIONS

95UCL	95% upper confidence limit on the arithmetic mean
ABS_{GI}	Absorption fraction
ADAF	Age-dependent adjustment factors
Ah	Arylhydrocarbon
ATSDR	Agency for Toxic Substances and Disease Registry
BaP	Benzo(a)pyrene
bgs	Below ground surface
BW	Body weight
CAF	Cancer adjustment factor for Trichloroethylene
CLP	Contract Laboratory Program
COPC	Chemical of potential concern
CSM	Conceptual Site Model
CTE	Central tendency exposure
DI	Daily intake
DI_L	Daily intake averaged over a lifetime
DL	Dioxin-like
DNAPL	Dense non-aqueous phase liquids
DQO	Data Quality Objective
EPC	Exposure point concentration
ESAT	Environmental Services Assistance Team
ERT	Environmental Response Team
EU	Exposure unit
FID	Flame ionization detector
GIS	Geographic information system
HEAST	Health Effects Assessment Summary Tables
HHRA	Human health risk assessment
HI	Hazard Index
HQ	Hazard Quotient
IBM	International Business Machines Corporation
ICs	Institutional controls
IRIS	Integrated Risk Information System
IUR	Inhalation unit risk
kg	Kilogram
KM	Kaplan-Meier
LNAPL	Light non-aqueous phase liquid
LOAEL	Lowest observed adverse effect level
m^3/day	Cubic meter per day
m^3/kg	Cubic meter per kilogram
MAF	Mutagen adjustment factor for Trichloroethylene
mg/kg	Milligrams per kilogram
mg/kg-day	Milligrams per kilogram body weight per day
mg/m^3	Milligrams per cubic meter

MOA	Mode of action
MRLs	Minimal risk levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Non-detect
NHL	non-Hodgkin Lymphoma
NOAEL	No observed adverse effect level
NY	New York
NYSDEC	New York State Department of Environmental Conservation
OSWER	Office of Solid Waste and Emergency Response
OU-1	Operable Unit 1
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PPRTV	Provisional Peer Reviewed Toxicity Value
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QL	Quantitation Limit
RA	Risk assessment
RAGS	Risk Assessment Guidance for Superfund
REAC	Response Engineering and Analytical Contract
RfC	Reference concentration
RfD	Reference dose
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting limit
RME	Reasonable maximum exposure
ROD	Record of Decision
RPD	Relative Percent Difference
RPF	Relative potency factor
RSL	Regional screening level
SERAS	Scientific Engineering Response and Analytical Services
SF	Slope factor for Cancer
SMP	Site management plan
STSC	Superfund Technical Support Center
SVE	Soil vapor extraction
SVOC	Semi-volatile organic compound
S4VM	Stage 4 validation done manually
TCA	1,1,1-trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-*para*-dioxin
TCE	Trichloroethylene
TEF	Toxicity equivalency factor
TEQ	Toxicity equivalent
TIC	Tentatively identified compound
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
U.S. EPA	United States Environmental Protection Agency

VF	Volatilization factor
VOC	Volatile organic compound
WOE	Weight of evidence
µg/kg	Microgram per kilogram
µg/m^3	Microgram per cubic meter
µg/mg	Micrograms per milligram
%	Percent

1.0 OVERVIEW

The purpose of this report is to provide a human health risk assessment (HHRA) for the Vestal Water Supply Well 1-1 Superfund Site, Operable Unit 2, Area 4 (Area 4 or the Site) (a.k.a. the Vestal Chlorinated Solvent Site). Components of this HHRA include identifying site-related contaminants and potential routes of human exposure that are considered as part of an exposure assessment, as well as a toxicity assessment and risk characterization. This HHRA was developed in accordance with the following United States Environmental Protection Agency (U.S. EPA) Guidance documents:

- *Risk Assessment Guidance for Superfund (RAGS): Human Health Evaluation Manual, Part A* (U.S. EPA 1989) and associated guidance documents.

- *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors* (U.S. EPA 1991a).

- *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part D (Standard Planning, Reporting and Review of Superfund Risk Assessments)* (U.S. EPA 2001).

- *Human Health Toxicity Values in Superfund Risk Assessments (Office of Solid Waste and Emergency Response [OSWER] Directive 9285.7-53). December 5, 2003* (U.S. EPA 2003).

- *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment. Final* (U.S. EPA 2004).

- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. Final* (U.S. EPA 2009a).

- *Exposure Factors Handbook* (U.S. EPA 2011a).

- *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors (OSWER Directive 9200.1-120). February 6, 2014* (U.S. EPA 2014).

The HHRA consists of seven sections, as follows:

Section 1 Overview

Section 2 Site Characterization: This section provides a brief description of the site location, land use, site history, and site investigations and responses to date that are relevant to the exposure assessment. This section also summarizes the basis for human health concerns and the site data that were utilized in the risk assessment.

Section 3 Exposure Assessment: This section presents a conceptual site model (CSM) and identifies potentially complete exposure pathways and receptors, and receptor-specific exposure parameters.

Section 4 Toxicity Assessment: This section describes the toxicity values that were used to evaluate risks associated with exposure to a chemical of potential concern (COPC).

Section 5 Risk Characterization: This section characterizes non-cancer hazards and cancer risks associated with exposures to chemicals of interest in site soil.

Section 6 Uncertainty Characterization: This section identifies the primary sources of uncertainty in the HHRA and discusses the likely magnitude and direction of the uncertainty attributable to these uncertainties.

Section 7 References: This section provides citations for the documents and scientific publications referenced in the HHRA.

This HHRA is documented in accordance with the Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual Part D (RAGS D) (U.S. EPA 2001). RAGS D Series Tables 1 to 9 included at the end of this report summarize the conceptual site model, the COPC screen, the exposure point concentration (EPC) values, exposure parameter values, toxicity factors and risk estimates.

2.0 SITE CHARACTERIZATION

2.1 Site Location

The Vestal Water Supply Well 1-1 Superfund Site is located in southwestern Broome County, New York (NY), about 10 miles west of Binghamton. The Vestal Water Supply Well 1-1 Superfund Site consists of the Vestal Water Supply Well 1-1 (operable unit 1 [OU-1]) and the two areas responsible for the contamination at Well 1-1 (operable unit 2). This report covers one of the two source areas, Area 4. The other source area, Area 2, has already been remediated. Area 4 is located at 200 Stage Road in the Town of Vestal, NY in the Stage Road Industrial Park. Area 4 is generally flat and lies 1,180 feet south of the Susquehanna River, within the 500-year flood plain. Several marshy areas and drainage ditches bound the Site to the north, east, and south.

Area 4 is underlain by silty sands with some gravel, which are probably recent alluvial deposits of the Susquehanna River. The shallow overburden at the Site includes fill material and alluvial deposits down to an average depth of approximately 19 feet. Reported water levels approximately 16 to 20 feet below ground surface (bgs) appear to represent the piezometric surface of a gravelly semi-confined unit underlying the fine-grained surficial soil (Lockheed Martin/Response Engineering and Analytical Contract [REAC] 2007; Lockheed Martin/REAC 2009).

2.2 Land Use

Area 4 and nearby properties are located within the Stage Road Industrial Park, which is zoned for commercial-light industry. These properties are likely to continue to be zoned and used for commercial-light industrial activities (U.S. EPA 1990; Lockheed Martin/Scientific Engineering Response and Analytical Services contract [SERAS] 2012a).

Area 4 consists of a large one-story building with an area covering approximately 60,000 square feet, an adjacent parking lot and surrounding open space. The building was used to manufacture transformers and later electronic circuit boards. The circuit board manufacturing operations ceased in May 2002. From 2007 through 2013, the building was used to recycle electronic equipment. The building is currently used for storage and automotive accessory installs.

2.3 Site History

In 1978, a chemical spill at the International Business Machines Corporation (IBM) plant in Endicott, NY led to a testing program for all drinking water wells in the vicinity for organic compounds. The Vestal Water Supply Well 1-1 is located just south of the Susquehanna River and 1,500 feet northwest of Area 4. Until 1980, Well 1-1 was the main source of drinking water for several areas of the Town of Vestal. As a result of the testing in response to the IBM spill, chlorinated solvents were discovered in Well 1-1, and it was taken out of service. Subsequent investigation determined that the IBM spill was not the source of the volatile organic compounds (VOCs) found in Well 1-1.

A remedial investigation/feasibility study (RI/FS) conducted by the New York State Department of Environmental Conservation (NYSDEC) in 1986 focused on the contamination of groundwater by VOCs in the Vestal Well 1-1 study area. This RI/FS indicated that the source of the VOC contamination in groundwater was apparently in the Stage Road Industrial Park area. A second RI/FS conducted by the U.S. EPA in 1988/89 confirmed that the VOC contamination originated from the Stage Road Industrial Park Area (U.S. EPA 1990), and indicated that releases of VOCs had occurred in at least two of four potential source areas.

Following the RI/FS, a risk assessment (RA) was conducted to address the potential impacts to human health associated with soil exposure from the Site in the absence of remedial actions (U.S. EPA 1990). This RA concluded that the lifetime cancer risks from potential soil exposure at the Site to construction workers were within the acceptable cancer risk range (10^{-6} to 10^{-4}). Noncancer hazards were above a level of concern (hazard index [HI] > 1) for the reasonable maximum exposure (RME) construction worker. The primary risk drivers were 1,1-Dichloroethylene, Trichloroethylene (TCE), and 1,1-Dichloroethane. In addition, exposure to contaminated groundwater immediately below the surface of the Site resulted in cancer risks approximating 10^{-4} and HIs of greater than 1. The primary risk drivers in groundwater were 1,1-Dichloroethylene, TCE, and 1,1-Dichloroethane, polychlorinated biphenyls (PCBs) and acetone (U.S. EPA 1990).

2.4 Site Investigations and Response Actions

Between 1986 and 2002, a series of subsurface investigations were conducted to determine the distribution of VOCs in subsurface soils and groundwater, and to design a soil vapor extraction (SVE) system for removing the contamination. In 2003, a full-scale SVE system was installed to treat the identified source of the contamination. After three years of SVE operation, approximately 2,000 pounds of VOCs had been removed from the subsurface with no further indication of contaminant mass removal.

During a closeout soil sampling event in 2005, elevated concentrations of 1,1,1-trichloroethane (TCA) and TCE were detected in subsurface soils in the two areas located in the parking lot that had been treated via the SVE system. Additional soil and groundwater samples were collected in 2006 by REAC personnel. Analytical results indicated significant VOC contamination in soil (maximum concentrations of TCA and TCE were in the low percent [%] range, by weight), despite the operation of the SVE system (Lockheed Martin/REAC 2007).

Between 2006 and 2009, follow-up investigations delineated the two source areas in the parking lot located just south of the building. The horizontal extent of soil contamination was found to extend beneath the building. An additional contaminant source northeast of the building was partially delineated. Observations indicated that at least one monitoring well in this area contained free product (light non-aqueous phase liquid [LNAPL]; Lockheed Martin/SERAS 2012a).

In 2009, additional monitoring wells were installed at the Site; soils were tested for PCBs as required for off-Site transport and disposal of investigation-derived wastes. Aroclors 1254 and 1260 were detected in several samples down to an approximate depth of 16.5 feet; measured concentrations exceeded NY State unrestricted use soil cleanup objectives (0.1 milligrams per kilogram [mg/kg]; NYSDEC 2006) and the U.S.

EPA risk-based concentration for exposure to residential soil based on a cancer risk of 1×10^{-6} or one in a million (0.24 mg/kg; U.S. EPA 2015a). It is believed these contaminants were constituents present in dense non-aqueous phase liquid (DNAPL) that was previously released to (or spilled onto) the ground surface at the Site. Other chemicals (solvents) or compounds in the DNAPL increased the mobility of the PCBs through co-solvency, and caused them to vertically migrate through the shallow overburden (Lockheed Martin/SERAS 2012a).

Additional soil sampling was conducted in December 2012 to determine the nature and extent of PCB, semi-volatile organic compound (SVOC) and VOC contamination in the three primary source areas (the two areas in the parking lot south of the building and one area northeast of the building) at Area 4. In July 2013, subsurface soil samples were collected beneath the building on the northeast side to further delineate this area.

In addition, sub slab soil gas sampling was conducted at the on-Site building and at several properties near the Site. The sub slab soil gas samples from these properties were evaluated using the Region 2 risk-based Vapor Intrusion Matrix and a determination was made that additional sampling is needed to continue to monitor some of these properties for vapor intrusion. The most recent vapor intrusion sampling event occurred in January 2015 (Lockheed Martin SERAS 2015).

A CSM was developed for the Site in June 2015 (Lockheed Martin/SERAS 2015). In this CSM the lateral extent of the primary COCs across the Site at various depth intervals was illustrated using Geographic Information System (GIS) software. It was noted that only trace amounts of contaminants (primarily below cleanup levels) were detected in overburden deposits at depths greater than 25 feet. The CSM further concluded that most of the subsurface contamination resides between 5 and 25 feet bgs. The majority of samples acquired for analysis during previous field investigations were collected at depths of 5 feet or greater, which was based on field screening with a flame ionization detector (FID), visual observations, and noticeable odors. However, a total of 41 near-surface samples, ranging in depths from 0.8 to 4.7 feet, were collected from 40 borings. Most of the shallow samples either had non-detect concentrations (below reporting limits) or concentrations that were less than the contaminant cleanup goals. Two soil borings (4.5 feet) exceeded the TCA cleanup goal (0.17 mg/kg) and four soil borings (two at 4.5 feet, one at 1.7 feet and one at 2.0 feet) exceeded the TCE cleanup goal (0.14 mg/kg) (Lockheed Martin/SERAS 2015).

2.5 Basis for Human Health Concerns

Numerous studies have documented the presence of VOCs in surface and subsurface soil at this Site; SVOCs and PCBs have also been identified. There is a potential for exposure to Site-related COPCs in soil. Future residents, as well as current and future outdoor workers or trespassers may be exposed to surface soils (down to one foot bgs) at the Site through incidental ingestion, dermal contact, and/or inhalation. Construction workers may be exposed to both surface and subsurface soil (from 0 to 10 feet bgs) at the Site through incidental ingestion, dermal contact, and/or inhalation.

Exposure to groundwater will not be evaluated in this HHRA. The water table occurs roughly 14 feet bgs; contact with groundwater is unlikely. Additionally, groundwater is currently being treated as described in the 1986 OU-1 Record of Decision (ROD) (U.S. EPA 1986a). As stated in the ROD, a packed column air

stripping system was constructed in 1990 on Well 1-1 to return the well to full service as the primary water supply well for Vestal Water District 1.

2.6 Site-Specific Chemical Data to be Utilized in the HHRA

Between 2006 and 2009, U.S. EPA Environmental Response Team (ERT) and REAC personnel drilled 127 shallow soil borings in Area 4, which ranged from 0.8 to 30 feet in depth (averaging 18.8 feet) (Lockheed Martin/REAC 2007, Lockheed Martin/REAC 2008a, Lockheed Martin/REAC 2008b, Lockheed Martin/REAC 2009). Over 360 soil samples were collected from these borings. Cores were screened for VOCs in the field and samples collected at varying depths from each boring were submitted for analysis of VOCs.

During August and September 2006, 56 soil borings (SB-001 through SB-056) were drilled at the Site as an initial effort for defining the extent of subsurface contamination (Lockheed Martin/REAC, 2007). Individual borehole depths ranged from 15 to 30 feet with an average depth of 21 feet. A total of 133 soil samples were collected for analysis of VOCs.

In November and December 2007, an additional 54 soil borings (SB-057 through SB-110) were drilled at the Site to further define the horizontal and vertical extents of subsurface contamination (Lockheed Martin/REAC, 2008a). Individual borehole depths ranged from 15 to 25 feet with an average depth of 19 feet. A total of 153 soil samples were collected for analysis of VOCs.

In May and June 2008, nine soil borings (SB-111 through SB-119), all 20 feet in depth, were drilled around the northeast corner of the Site building to investigate the extent of subsurface contamination within this area based on initial detections in previous borings (i.e., in SB-095 and SB-096). A total of 39 soil samples were collected from the nine borings for analysis of VOCs (Lockheed Martin/REAC, 2008b).

In March 2009, eight additional soil borings (SB-120 through SB-127) were drilled around the northeast corner of the Site building to further characterize the nature and extent of subsurface VOC contamination that was previously determined to be unique to this specific area (Lockheed Martin/REAC, 2009). Individual borehole depths ranged from 16.5 to 25 feet with an average depth of 23 feet. A total of 27 soil samples were collected for analysis of VOCs.

In addition to VOCs, previous subsurface soil sampling investigations at the Site (prior to 1990) by other parties detected low concentrations of both PCBs and SVOCs in a very limited number of samples (U.S. EPA 1990). More recently, the U.S. EPA ERT/REAC and ERT/SERAS found low concentrations of PCBs in a limited number of samples that were analyzed for waste characterization, which was required for off-Site transport and proper disposal of investigation-derived wastes (Lockheed Martin/SERAS 2012a).

To further characterize the horizontal and vertical extent of additional contaminants of concern at the site (namely, PCBs [i.e., Aroclors] and SVOCs) 264 soil samples were collected from 44 borings in December 2012 (Lockheed Martin/SERAS, 2013; Figure 4). Individual borehole depths ranged from 20 to 30 feet with an average depth of 24 feet. A total of 13 surface samples (between 0 and 1-foot depth) were additionally collected at 13 borehole locations for analysis of VOCs.

In July 2013 (Lockheed Martin/SERAS, 2014; Figure 5), nine (9) directional (i.e. horizontal) borings were drilled beneath the northeast corner of the building to assess the horizontal and vertical extent of contamination in subsurface deposits. Drilling occurred along three primary lines, with three depths or depth intervals investigated per line (10-11 feet; 16 feet; and 21-25 feet). Horizontal traverses beneath the building ranged from 5 to 43 feet. A total of 18 subsurface samples were collected during this sampling event and submitted for analysis of VOCs, SVOCs and PCBs (Lockheed Martin/SERAS 2014).

Based on potential receptors and exposure pathways (see RAGS D Series Table 1), only soil data collected at a depth of 0 to 10 feet bgs during the six sampling events conducted between 2006 and 2013 described above were considered for use in this risk assessment.

2.7 Data Quality Assessment

The process for identifying COPCs to be evaluated in the HHRA includes steps for planning and implementing the collection of samples, evaluation of the quality and quantity of data and whether it is useful to meet project objectives, and an evaluation of the usability of collected data. Appendix A contains the Data Usability Worksheets completed for this project, which summarize field sampling methods, analytical techniques, and the Data Quality Objectives (DQOs) identified for this Site. The data used in this risk assessment meet the DQOs established in Appendix A.

Analytical data quality was established through the use of standard field sampling and analytical laboratory procedures that were defined in the Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP) (Lockheed Martin/SERAS 2012b). Prior to field sampling activities, the laboratory quantitation limits (QLs) were evaluated against project-specific action limits to determine whether the analytical methods were sufficient to meet data quality objectives; QLs for most COPCs were below the action limits. All chemical data were validated according to U.S. EPA guidance (U. S. EPA 2008). A detailed discussion of the data quality assurance/quality control (QA/QC) evaluation and data validation methods to support the HHRA is provided in Appendix B. Copies of the data validation reports are provided in Appendix C.

The following criteria were used to assess data usability:

- Estimated values flagged with a “J” or an “NJ” qualifier were treated as unqualified detected concentrations.
- Data qualified with an “R” were not used in the risk assessment. Only 1% of the data collected during the various sampling events were rejected.
- Only detected Aroclors were used to calculate total Aroclor concentrations for each sample.
- Only detected PCB congener concentrations (dioxin-like [DL] and non-DL) were used to calculate Total PCB Congener concentrations for each sample.
- Non-detected (ND) values (for all analytes except some PCB congeners; see discussion in Section 3.3) were included in the exposure concentration calculations.

3.0 EXPOSURE ASSESSMENT

In general, receptors can be exposed to chemicals in a variety of environmental media (e.g., soil, water, food, air), and these exposures can occur through several routes (e.g., ingestion, inhalation, dermal contact). This section summarizes the environmental media and COPCs at the Site, identifies potential human exposure pathways, and describes the methods that were used to quantify exposure from each pathway.

3.1 Site Conceptual Model

Table 1.1 presents potential exposure scenarios that were considered for evaluation in the HHRA. These exposure scenarios are described in more detail below.

3.1.1 Exposure Areas

The Site consists of a large one-story building, with an area covering approximately 60,000 square feet, an adjacent parking lot, and surrounding open space. Based on its small area, the Site was addressed as a single exposure unit (EU).

3.1.2 Environmental Media Evaluated in the HHRA

Between 1988 and 2013, a number of investigations have been conducted to characterize this Site; all studies have shown the presence of VOCs in soil and groundwater. Contact with surface soil in the source area northeast of the building is possible. The pavement covering the source areas on the south side of the building is damaged in some areas; it may also be disturbed or removed during remedial activities. Contact with surface soil underlying the pavement on the south side of the building is possible. Construction workers may be exposed to subsurface soils at depths typical of basements (0 to 10 feet). Surface soil (0 to 1 foot) and subsurface soil (1 to 10 feet) were evaluated in this risk assessment. In addition, a potential future residential exposure pathway was evaluated to support remedial decisions in the absence of Institutional Controls (ICs) such as deed restrictions on the property or in the event that soil removed from the area is not managed consistent with the Site Management Plan (SMP).

Exposure to groundwater was not evaluated in this HHRA. The water table occurs roughly 14 feet bgs; contact with groundwater is unlikely. Additionally, groundwater is currently being treated as outlined in the 1986 ROD for OU-1 (U.S. EPA 1986a).

The potential for volatile COPCs in soils to affect indoor air quality via vapor intrusion is being addressed separately by ERT using the Region 2 Matrix approach. Vapor Intrusion was not evaluated in this HHRA. U.S. EPA has sent letters to owners of properties sampled for vapor intrusion and further evaluation of properties exceeding the U.S. EPA Region 2 risk-based Vapor Intrusion Matrix Values are on-going.

3.1.3 Exposed Populations

Area 4 and nearby properties are located within the Stage Road Industrial Park and are currently zoned for commercial-light industry. These properties are likely to continue to be zoned and used for commercial-

light industrial activities in the future. However, a future residential exposure scenario was evaluated quantitatively in this assessment to determine the need for a deed restriction to limit the future land use. In addition, current and/or future worker and trespasser scenarios were evaluated quantitatively in this assessment.

The primary receptors of concern at the Site are construction workers, outdoor workers, teenage trespassers, and potential future residents. Outdoor workers, trespassers (ages 7 to 18 years), and potential future residents, including a young child (1 to 6 years of age) and an adult (older than 18 years), may be exposed to Site-related contaminants present in surface soil (i.e., depths of 0 to 1 foot) and to volatiles in air off-gassing from surface soil or subsurface soil excavated to the surface and not managed consistent with a SMP for contaminated soils. Construction workers may be exposed to surface soil or subsurface soil (i.e., depths of 0 to 10 feet) or subsurface soil excavated to the surface and not managed under a SMP for contaminated soils. A summary of the various receptor groups considered for inclusion in the HHRA is presented in RAGS Part D Table 1.1, along with a brief rationale for their inclusion/exclusion (U.S. EPA 2001).

3.1.4 Exposure Pathways Evaluated in the HHRA

Potential exposure pathways for the receptors listed above include contact with COPCs in surface and subsurface soil via incidental ingestion, dermal contact with soil, and inhalation exposure to volatile COPCs in outdoor air.

Additional information on exposure pathways that were evaluated in this HHRA is presented in Table 1.1.

3.2 Selection of Chemicals of Potential Concern

The RAGS Part D Table 2 series (2.1 and 2.2, for surface and surface and subsurface soils combined, respectively; U.S. EPA 1989) summarize the analytical data used to identify COPCs for this risk assessment. COPCs are identified based on a screening analysis that used the U.S. EPA June 2015 regional screening levels (RSLs) for residential soil as directed by Region 2 EPA (U.S. EPA 2015a).

Chemicals are selected as COPCs if their maximum detected concentration in a given medium (surface or surface plus subsurface soil) is greater than the relevant residential RSL. RSLs correspond to an exposure scenario where soil concentrations on residential properties will result in a calculated cancer risk of 1×10^{-6} or a hazard quotient (HQ) of 0.1, whichever is lower. In addition, all chemicals detected on-Site and classified as a Group A carcinogen (U.S. EPA 1986b, U.S. EPA 1989) or classified as "carcinogenic to humans" using more recent weight of evidence (WOE) descriptions (U.S. EPA 2005a) are selected as COPCs[1]. Benzene was not detected in any sample, however it was carried through the risk assessment as

[1] U.S. EPA updated the WOE descriptions and its approach for evaluating the carcinogenic potential of environmental contaminants (U.S. EPA 2005a). However, some chemicals do not currently reflect these new classifications as they are being updated through the Integrated Risk Information System (IRIS) process. The WOE Classifications identified in IRIS are provided and include both Group categories and WOE narratives and descriptors consistent with the Cancer Guidelines of 2005 (U.S. EPA 2005a).

it is classified as a known human carcinogen. Three analytes classified as Group B, probable human carcinogens, or classified as "likely to be carcinogenic to humans" had screening concentrations lower than the reporting limit (RL); none of the three COPCs (1,2,3-trichloropropane, dibenzo[a,h]anthracene and n-nitroso-di-n-propylamine) were detected on-Site. These three COPCs were not evaluated quantitatively, but are addressed in the uncertainty section.

For PCBs, DL congeners were flagged as COPCs based on contribution to the toxicity equivalent (TEQ) for 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD); screening concentrations for non-dioxin-like PCB congeners were compared to the cancer-based RSL for 'polychlorinated biphenyls (high risk)'of 0.23 mg/kg. Screening concentrations for individual Aroclors were compared to the corresponding RSLs where available. Soil samples were analyzed for individual Aroclor mixtures and individual PCB congeners (DL and non-DL). The laboratory reported calculated concentrations for Total Aroclor and Total PCB Congeners as the sum of detected values across the individual Aroclors or across the individual congeners (DL and non-DL), respectively. The screening concentrations for Total Aroclor and Total PCBs were compared to the noncancer-based RSL for Aroclor-1254 of 0.12 mg/kg. If Total Aroclor or Total PCB Congeners were identified as COPCs, then any detected Aroclor or PCB congener included in the sums of those respective values were also identified as COPCs.

Additional information about the screening process and decision criteria used to select COPCs is provided in Tables 2.1 and 2.2 and associated footnotes.

3.3 Calculation of Exposure Point Concentrations

An EPC is an estimate of the concentration of a COPC in a site medium, averaged over the area to which a receptor is exposed. U.S. EPA (1992) recommends that the 95% upper confidence limit of the arithmetic mean (95UCL) be used as the EPC for quantifying exposure and risk at a location for both the RME and the Central Tendency Exposed (CTE) individual (U.S. EPA 1992). The approach to calculate a 95UCL depends on a number of factors, including the number of data points available, the shape of the data distribution, and the degree of censoring (i.e., samples below the detection limit) (U.S. EPA 2002). Because of the complexity of this process, U.S. EPA has developed a software application called ProUCL version 5.0 to assist in the estimation of 95UCL values (U.S. EPA 2013). ProUCL calculates 95UCLs for a data set using several different strategies and recommends which 95UCL is preferred based on the properties of the data set. A minimum of five samples and two distinct detected values are required to calculate a 95UCL in ProUCL. If the minimum data requirements for ProUCL are not met, the EPC is set equal to the maximum detected value. If ProUCL provides more than one "recommended" 95UCL to use (e.g., Chebyshev or Bootstrap), the higher recommended value is used as the EPC.

Total Aroclor was identified as a COPC in both datasets (surface soil and surface + subsurface soil). As described above, the laboratory reported Total Aroclor concentrations as the sum of detected values across the individual Aroclors for each sample. The laboratory did not report a concentration (or a detection limit) for Total Aroclor for samples where no individual Aroclors were detected. ProUCL was used as described above to calculate 95UCL values for the individual Aroclors identified as COPCs and for Total Aroclor. Given that the 95UCL values for Total Aroclor are based only on detected concentrations, as opposed to the 95UCL values for the individual Aroclors which are based on all available data (detects and non-

detects), the EPC values for Total Aroclors are not the direct sums of the EPCs for the individual Aroclors identified as COPCs, and are considerably higher.

In the case of the 12 DL PCB congeners, the EPC is based on a single toxicity-weighted concentration value, the TEQ (U.S. EPA, 2010a). A discussion of TEQs and how they are calculated is provided in Section 4.6. The U.S. EPA Advanced Kaplan-Meier (KM) Calculator (U.S. EPA 2015b), a macro-driven Excel spreadsheet developed for use in conjunction with the UFP-QAPP dioxin soil sampling template (U.S. EPA 2011b), was used to calculate the EPCs for the DL-PCB congeners. The mathematical techniques used in the KM Calculator are based on Helsel (2005). The KM Calculator was chosen to facilitate the mathematical computations involved with handling non-detect and estimated values in the calculation of representative means and standard deviations. The KM Calculator was developed by the U.S. EPA to support the calculation of TEQs and 95UCLs based on those TEQs (U.S. EPA 2015b). The KM Calculator spreadsheet and TEQ output is provided in Appendix D. Only one or two congeners were detected for one surface soil sample and two subsurface soil samples submitted for congener analysis. The KM Calculator requires a minimum of three detected congeners to calculate a KM-TEQ. For the samples where the congener data were insufficient to calculate a KM-TEQ, the three TEQ values calculated using substitution values of 0, half the RL, or the RL were entered into ProUCL to calculate a 95UCL. The maximum detected concentration was used for quantifying risks from TEQ.

The assessment for DL PCBs was further evaluated in the uncertainty section by comparing the estimated cancer risks for DL PCBs and non-DL PCBs to determine if there is an enhancement of DL PCBs. The non-DL PCB concentrations for each sample were calculated by summing across the detected non-DL PCB congeners in each sample similar to the approach used to calculate Total PCB concentrations by the laboratory. Comparison of risks between DL and non-DL PCBs followed the process outlined in the 1996 Reassessment of PCB Toxicity (U.S. EPA 1996) where cancer risks for DL PCBs are compared with cancer risk for non-DL PCBs and with total cancer risk. The individual risks are then evaluated to determine whether enhancement has occurred.

Concentrations of chemicals in air resulting from volatilization from soil were estimated using chemical-specific volatilization factors (VF) cited in the U.S. EPA June 2015 RSLs for residential soil (U.S. EPA 2015a). These values were used to compute EPCs for air using the following equation:

EPC (air) = EPC (soil) * 1000 micrograms per milligram (µg/mg) * 1/VF

Where:
EPC (air) = exposure point concentration in air (micrograms per cubic meter; $\mu g/m^3$)
EPC (soil) = Exposure point concentration in soil (mg/kg) (Tables 3.1 and 3.2)
VF = Chemical-specific Volatilization Factor (cubic meters per kilogram; m^3/kg)

The RAGS D Table 3 series (3.1 and 3.2 for surface soil and surface plus subsurface soil and 3.3 and 3.4 for air concentrations calculated using surface and surface plus subsurface soil concentrations, respectively) present the calculated EPCs.

3.4 Exposure Parameters

Exposure parameters are used to estimate how much of a COPC might be taken into the body under a given exposure scenario. There are differences among individuals in intake rates, body weights, exposure frequencies, and exposure durations that determine the actual extent of chemical exposure.

Typically, the HHRA addresses intakes that are "average" or otherwise near the central portion of the range of possible exposures, and intakes that are near the upper end of the range (e.g., the 95th percentile). These two exposure estimates are referred to as the CTE and RME, respectively. Both CTE and RME are evaluated in this HHRA, but the RME exposure assessment is used as the basis of the decision. When selecting CTE parameters, the intake values are based on mean or median values, so that the CTE represents the "typical" or "average" exposure. When selecting RME parameters, some of the intake variables are selected to provide a "reasonable" maximum estimate of the daily intake (U.S. EPA 1989). In other words, some inputs are set equal to mean values (e.g., body weight [BW]), and some inputs are set equal to high end values (e.g., ingestion rates, exposure frequency, and exposure duration), such that the resulting combination yields an estimate that is considered a RME (U.S. EPA 1989; 1991a; 2014). As noted above, because exposure parameters (e.g., intake rates, BW, and exposure frequency) may change as a function of age, different values are used for children, adolescents and adults. The RAGS D Tables 4.1 to 4.5A detail the RME and CTE exposure parameters that were used in the HHRA for the Site.

4.0 TOXICITY ASSESSMENT

The basic objective of a toxicity assessment is to identify what adverse health effects a chemical causes, and how the appearance of these adverse effects depends on exposure level. In addition, the toxic effects of a chemical frequently depend on the route of exposure (oral, inhalation, dermal) and the duration of exposure (subchronic, chronic, or lifetime). Thus, a full description of the toxic effects of a chemical includes a listing of what adverse health effects the chemical may cause, and how the occurrence of these effects depends upon dose, route, and duration of exposure.

The toxicity assessment process is usually divided into two parts: the first characterizes and quantifies the non-cancer effects of the chemical, while the second addresses the cancer effects of the chemical. This two-part approach is employed because there may be major differences in the time-course of action and the shape of the dose-response curve for cancer and non-cancer effects.

Non-Cancer Evaluation

At sufficient dose levels, all chemicals have the potential to cause a variety of adverse health effects. In characterizing the non-cancer effects of a chemical, the key parameter to consider is the threshold dose at which an adverse effect first becomes evident. EPA uses a chronic Reference Dose (RfD) for oral exposures and a Reference Concentration (RfC) for inhalation exposures. These values, RfD and RfC, represent an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level that the human population, including sensitive subpopulations, can be exposed to which is unlikely to be without an appreciable risk of adverse health effects during a lifetime. The toxicity values are based on available studies in animals and/or humans.

The development of the RfD or RfC for a specific chemical involves the identification of the highest dose level that does not cause observable adverse effects or the No Observed Adverse Effect Level (NOAEL). If a NOAEL was not identified, a lowest-observed-adverse-effect-level (LOAEL), may be used. This dose level is then divided by uncertainty factors, selected based on the toxicological data, ranging from 1 to 3,000. The individual uncertainty factors range from 1 to 10 and account for: variation in sensitivity among members of the human population, uncertainty involved in extrapolating from animal data to humans, extrapolation from less than chronic NOAELs to chronic NOAELs, the uncertainty involved in extrapolation from LOAELs to NOAELs, and the uncertainty associated with extrapolation from animal data when the data base is incomplete.

EPA's goal of protection is a HQ (e.g., exposure dose/RfD) = 1. Chemicals may be combined to determine a total HI. The goal of protection of the mixture is a HI = 1. At or below a HQ = 1 or HI = 1 there is less concern regarding the adverse health effects while above a HQ = 1 or HI = 1 there is greater concern. The calculated HQ and HI are not predictors of a specific disease.

Cancer Evaluation

For cancer effects, the toxicity assessment process has two components. The first is a qualitative evaluation of the WOE that the chemical does or does not cause cancer in humans. Previously, this evaluation was performed by the U.S. EPA using the system summarized below:

WOE	Meaning	Description
A	Known human carcinogen	Sufficient evidence of cancer in humans.
B1	Probable human carcinogen	Suggestive evidence of cancer incidence in humans.
B2	Probable human carcinogen	Sufficient evidence of cancer in animals, but lack of data or insufficient data in humans.
C	Possible human carcinogen	Suggestive evidence of carcinogenicity in animals
D	Cannot be evaluated	No evidence or inadequate evidence of cancer in animals or humans
E	Not carcinogenic to humans	Strong evidence that it does not cause cancer in humans

More recently, the U.S. EPA has developed a revised classification system for characterizing the WOE for carcinogens (U.S. EPA 2005a). However, this system has not yet been implemented for a number of chemicals, so the older classification scheme is retained for use in this assessment.

For chemicals which are classified in Group A, B1, B2, or C, the second part of the toxicity assessment is to describe the carcinogenic potency of the chemical. This is done by quantifying how the number of cancers observed in exposed animals or humans increases as the dose increases. Typically, it is assumed that the dose response curve for cancer has no threshold, arising from the origin and increasing linearly until high doses are reached. Thus, the most convenient descriptor of cancer potency is the slope of the dose-response curve at low doses (where the slope is still linear). This is referred to as the Slope Factor (SF), which has dimensions of risk of cancer per unit dose.

Estimating the cancer SF is often complicated by the fact that observable increases in cancer incidence usually occur only at relatively high doses, frequently in the part of the dose-response curve that is no longer linear. Thus, it is necessary to use mathematical models to extrapolate from the observed high dose data to the desired (but un-measurable) slope at low dose. In order to account for the uncertainty in this extrapolation process, U.S. EPA typically chooses to employ the upper 95UCL of the slope as the SF. That is, there is a 95% probability that the true cancer potency is lower than the value chosen for the SF and a 5% probability that the risks are underestimated.

For inhalation exposures, cancer risk is characterized by an Inhalation Unit Risk (IUR) value. This value represents the upper-bound excess lifetime cancer risk estimated to result from continuous lifetime exposure to a chemical at a concentration of 1 $\mu g/m^3$ in air.

4.1 Toxicity Values for Oral and Inhalation Exposures

U.S. EPA (2003) describes the recommended hierarchy for selecting toxicity values for use in human health risk assessment at Superfund sites. Generally, the first preference is for U.S. EPA consensus values as listed in the Integrated Risk Information System (IRIS), an electronic database containing human health assessments for various chemicals developed by U.S. EPA's IRIS program (available online at http://www.epa.gov/iris/). If values are not available from IRIS, then the next preference is to seek Provisional Peer Reviewed Toxicity Values (PPRTVs) for Superfund developed by U.S. EPA's Superfund Technical Support Center (STSC). If PPRTVs are not available, toxicity values may be obtained from other sources, such as the Agency for Toxic Substances and Disease Registry's (ATSDR) minimal risk levels (MRLs) (available online at http://www.atsdr.cdc.gov/mrls/index.asp), California EPA's Toxicity Criteria Database (available online at http://www.oehha.ca.gov/risk/ChemicalDB/index.asp), U.S. EPA's Health Effects Assessment Summary Tables (HEAST) (U.S. EPA 1997), and other sources.

Non-cancer and cancer oral toxicity values that were used in this risk assessment are summarized in RAGS D Tables 5.1 and 6.1, and inhalation non-cancer and cancer toxicity values are listed in RAGS D Tables 5.2 and 6.2. Table 5.3 lists toxicity equivalence factor (TEF) values used for PCBs with DL toxicity. There are several COPCs for which toxicity values are not available. As appropriate, the HHRA will address these COPCs qualitatively in the uncertainty section of the report.

A route to route extrapolation was used to establish a non-cancer RfC for PCBs consistent with the HEAST guidance. The extrapolated RfC was calculated as:

Extrapolated RfC (milligrams per cubic meter [mg/m^3]) =

RfD(oral) (mg/kg-day) * 1/Inhalation Rate (cubic meters per day [m^3/day]) * BW (kilogram; kg)

A body weight of 80 kg was utilized in the calculation (U.S. EPA 2014). The uncertainty associated with this approach is discussed in Section 6.6.

4.2 Toxicity Values for Dermal Exposures

Oral toxicity factors are expressed in terms of toxicity per unit dose of chemical ingested, rather than in terms of toxicity per unit amount of chemical absorbed. However, the equations for characterizing dermal contact with chemicals provide exposure values that are based on absorbed dose rather than ingested dose. Thus, oral RfD and cancer SF values must be adjusted for use in evaluating dermal exposures based on recommendations in RAGS Part E (U.S. EPA, 2004) as follows:

RfD(dermal) = RfD(oral) · Oral absorption fraction

SF(dermal) = SF(oral) / Oral absorption fraction

RAGS D Table 5.1 lists the absorption fractions (ABS_{GI}) used to adjust oral toxicity values for use in assessing dermal exposure, as recommended by U.S. EPA (2004). If chemical-specific absorption fractions are not available, a value of 1.0 was assumed, consistent with U.S. EPA (2004) guidance. For the COPCs identified at this site, oral adjustments were assumed to be 1.

4.3 Evaluation of Carcinogens with Mutagenic Mode of Action

For chemicals identified as having a mutagenic mode of action (MOA) for carcinogenesis, cancer risks were estimated in accordance with the *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (U.S. EPA 2005b). In brief, because age-specific data are not available for these chemicals, default age-dependent adjustment factors (ADAFs) were applied to the non-age-dependent cancer toxicity factors to account for differences in potency that may occur from exposure during early life (up to age 16). The supplemental guidance further indicates that any grouping of ages in the exposure assessment will need to be integrated with the ADAF age groupings to derive age group-specific risk estimates.

The Supplemental Guidance identifies 12 chemicals that have a mutagenic MOA for carcinogenesis (http://www.epa.gov/swerrims/riskassessment/sghandbook/chemicals.htm). Of the COPCs selected for this assessment, polycyclic aromatic hydrocarbons (PAHs), TCE, and vinyl chloride are identified as having a mutagenic MOA. Vinyl chloride is the only chemical with appropriate dose-response data for evaluating the differential susceptibility from early life exposure (U.S. EPA 2000a). Thus, cancer risk for a young child (ages 1-6) and an adolescent (ages 7-18) exposed to vinyl chloride in soil and in air was calculated using the toxicity factors based on continuous exposure from birth without additional ADAF adjustment. The uncertainty associated with this approach for calculation of risk for the adolescent trespasser population is discussed in Section 6. Cancer risk for a young child (ages 1-6) and an adolescent (ages 7-18) exposed to PAHs in soil and in air was calculated by applying the ADAF approach to account for early-life susceptibility as described in U.S. EPA (2005b). Cancer risk for these receptors exposed to TCE was calculated in accordance with U.S. EPA (2011c) as described below.

U.S. EPA classifies TCE as "carcinogenic to humans" based on evidence pertaining to a causal relationship between exposure and kidney cancer, liver cancer, and non-Hodgkin lymphoma (NHL) (U.S. EPA 2011c). U.S. EPA IRIS has concluded that TCE is carcinogenic by a MOA for induction of kidney tumors, but data are not sufficient to establish a MOA for other TCE-induced cancers. Thus, the ADAF adjustment for TCE applies only to the kidney cancer component of the total cancer risk estimate. For the risk assessment, TCE

was evaluated following U.S. EPA IRIS guidance to use toxicity value adjustment factors for cancer (CAF) and mutagens (MAF) for oral and inhalation exposures to TCE (U.S. EPA 2011c, 2015c).

The ADAFs recommended in U.S. EPA (2005b) were applied to the different age intervals as:

Age Interval (years)	**ADAF**
0 - < 2	10
2 - < 16	3
16 - 18	1

Tables 4.2A and 4.5A summarize the age-adjusted exposure factors for assessing exposure to mutagenic chemicals in the risk assessment but the ADAFs are applied only for the toxicity values. Age-specific body weights were used as recommended by U.S. EPA (2011a) for the ages 0 - 6, 7 - <11, 11 - <16, and 16 – 18 years (Tables 4.2A and 4.5A).

4.4 Relative Potency Factors for Evaluation of Toxicity of Polycyclic Aromatic Hydrocarbons

A relative potency factor (RPF) approach was used to assess cancer risk from exposure to a PAH mixture (U.S. EPA 1993, U.S. EPA 2010b). This approach provides a cancer risk estimate for PAH mixtures by summing doses of component PAHs after scaling the doses (with RPFs) relative to the potency of an index PAH (Benzo[a]pyrene; BaP). Interim RPFs for risk evaluation for oral exposure to PAHs classified as B2 carcinogens (probable human carcinogens) are provided in U.S. EPA (1993). The RPFs recommended in U.S. EPA (1993) are:

Compound	Relative Potency
Benzo(a)pyrene	1
Benzo(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenzo(a,h)anthracene	1
Ideno(1,2,3-cd)pyrene	0.1

4.5 Toxicity Values for PCB Mixtures

PCBs consist of 209 individual congeners. Aroclors are commercial mixtures of PCB congeners that contain many of the individual congeners in varying ratios. When Aroclors are released into the environment, the original congener composition of the PCB mixture changes due to differential fate and transport processes (U.S. EPA 1996). The assessment approach outlined in U.S. EPA (1996) characterizes the potency of PCB mixtures, which include both DL-congeners and non-DL congeners. Chemical analyses of environmental samples often report PCB concentrations in terms of the Aroclor mixture(s) they most closely resemble. U.S. EPA has developed RfDs for some (but not all) Aroclors, and when corresponding RfDs are available, the Aroclor-specific concentration data are compared to the Aroclor-specific RfD to

assess potential non-cancer effects as described previously. For the surface soil dataset, Aroclor-1254, Aroclor-1260, and Total Aroclor were flagged as COPCs. For the surface + subsurface soil dataset, Aroclor-1016, Aroclor-1254, Aroclor-1260 and Total Aroclor were flagged as COPCs. An RfD is available for Aroclor-1254 and Aroclor-1016. In the absence of an RfD for Aroclor-1260, the oral RfD for Aroclor-1254 was used. No RfC value is available for PCBs. For this assessment, an RfC value based on route-to-route extrapolation using the RfD of 0.2 mg/kg-day for high-risk PCBs was calculated for quantifying inhalation risks to the individual Aroclor mixtures identified as COPCs.

In U.S. EPA (1996), a range of cancer slope factors and inhalation unit risks were developed for use in PCB risk assessments with upper bound values equal to 2 (per milligram per kilogram per day; $[mg/kg\text{-}day]^{-1}$) for oral exposures and 5.7E-04 $(\mu g/m^3)^{-1}$ for inhalation exposures; these values were applied to the Total Aroclor concentration data to assess PCB cancer risks.

4.6 Toxicity Values for TCDD-like Congeners

Individual DL-congeners were measured in a subset of the samples collected in 2012. When individual DL-congener results are available, the data are consolidated into a single toxicity-weighted concentration value. This concentration, referred to as the TEQ (TCDD equivalent concentration for DL PCBs), is equal to the concentration of TCDD that would be of equivalent toxicity to humans. The relative potency of an individual congener compared to TCDD is expressed in terms of the TEF. In December, 2010, U.S. EPA released the *Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds* (U.S. EPA 2010a) summarizing the TEF values developed by a panel of experts assembled by the World Health Organization (van den Berg *et al.* 2006). Table 5.3 lists the current consensus TEF values for mammals (including humans) for the subset of 12 PCB congeners that act by a mechanism similar to TCDD. Note that TEFs are often based on limited data, and so they are only approximations of the relative toxicity of each congener, rounded up (in order to be conservative) to the nearest half order of magnitude. Also note that most TEFs are based on relative binding affinity of the congener for the arylhydrocarbon (Ah) receptor, and so do not account for potential differences between congeners with regard to absorption and distribution to target tissues. Detected congeners are multiplied by their TEF and summed to calculate a TEQ for each sample.

None of the non-DL PCBs were flagged as COPCs in this assessment (all were either not detected or detected concentrations were below the RSL). However, consistent with the 1996 Reassessment of PCB Carcinogenicity (U.S. EPA, 1996) a separate analysis was conducted to compare risks from exposure to DL-PCBs and non-DL PCBs. Risks from exposures to DL PCBs were calculated using the SF for dioxin of 156,000 $(mg/kg\text{-}day)^{-1}$ (U.S. EPA, 1985). Risks from exposure to non-DL PCBs were calculated using the SF for high risk PCBs of 2 $(mg/kg\text{-}day)^{-1}$. This comparison is discussed in Section 6.7.

5.0 RISK CHARACTERIZATION

5.1 Non-Cancer Approach

The potential for non-cancer effects is evaluated by comparing the estimated exposure intake or dose for a receptor over a specified time period to a reference dose that represents the threshold exposure below

which it is unlikely for even sensitive populations to experience adverse health effects (U.S. EPA 1989). This ratio of estimated exposure dose to RfD is called a HQ. If the HQ for a chemical is equal to or less than 1, there is less concern about non-cancer health effects. If the HQ exceeds 1, there is some possibility that non-cancer effects may occur. Non-cancer HQs for each chemical are calculated as described below (USEPA 1989):

$$HQ = DI / RfD$$

where:

DI = Daily intake (mg/kg-day) averaged over a chronic exposure duration.

RfD = Reference dose (mg/kg-day).

5.2 Cancer Approach

Cancer risks are expressed as the increased risk of developing cancer as a result of a given exposure to a given chemical. These "excess" cancer risks are summed across all carcinogenic chemicals and all exposure pathways for each receptor category. In general, U.S. EPA considers excess cancer risks less than 1 in 1 million (expressed as 1E-06) to be so small as to be negligible, and risks above 1E-04 to be sufficiently large that some action may be necessary (U.S. EPA 1991b). Excess cancer risks between 1E-04 and 1E-06 are generally evaluated on a case-by-case basis, and U.S. EPA may determine that risks in this range warrant remedial action. The excess risk of cancer from ingestion and dermal exposure to a chemical is calculated as follows (U.S. EPA 1989):

$$\text{Excess cancer risk} = 1 - \exp(-DI_L \cdot SF)$$

where:

exp = The exponential.

DI_L = Daily intake, averaged over a lifetime (mg/kg-day).

SF = Slope factor $(mg/kg\text{-}day)^{-1}$.

In most cases (except when the product of $DI_L \cdot SF$ is larger than about 0.01), this equation may be accurately approximated by the following:

$$\text{Excess cancer risk} = DI_L \cdot SF$$

5.3 Combining Risks Across Chemicals and Exposure Pathways

In this HHRA, the risks and HQs for the CTE and RME receptors are summed across all pathways and all chemicals. These results are provided in RAGS D Series 7 Tables. For non-carcinogenic effects, an

initial estimate of the total non-cancer hazard is derived simply by summing the HQ values across all chemicals to calculate a HI. If the HI is less than 1, non-cancer hazards are not considered to be significant. If the HI is greater than 1, then it may be appropriate to examine individual chemical HQs and only sum HQs for COPCs that affect the same target tissue or organ system (e.g., the liver). This approach would produce HIs for chemicals that affect the same target organs and have the same mode of action, consistent with U.S. EPA (1989) guidance because chemicals that only cause toxicity in different tissues are not likely to produce additive effects. Target-organ-specific HIs are presented in the RAGS D Series 9 Tables for those chemicals for which target organ information was readily available. Table 9.7 summarizes the cancer risks and noncancer hazards by chemical for each receptor.

For Aroclors, non-cancer HQs were calculated for the individual Aroclors and cancer risks were calculated for Total Aroclor. This approach avoids double counting for exposure to Aroclors when summing risks or HQ values across chemicals and/or routes of exposure.

5.4 Non-Cancer Summary

The total HI for the RME construction worker is 2E+00 (Tables 7.4 RME and 9.4 RME). This exceedance (HI>1) is primarily due to dermal exposure to Aroclor-1260 in the subsurface soil. Total HI values for all other receptors were less than 1.

5.4.1 Construction Worker

Data for Aroclor-1260 considered in this assessment include 68 soil samples (26 samples collected at a depth of 0 to 12 inches and 42 samples collected at depth of 1 to 10 feet bgs), only eight of which included detectable concentrations of Aroclor-1260 (EPC concentration of 3,493 micrograms per kilogram [µg/kg] based on eight samples with detectable concentrations ranging from 8.6 to 31,000 µg/kg; Tables 2.2 and 3.2). Only one out of eight of the detected samples had a concentration (31,000 µg/kg) that exceeded the residential soil screening level (240 µg/kg). This sample was collected at a depth of 5 to 6 feet from location 064-0012. Concentrations ranged from 8.6 to 130 µg/kg when this sample is excluded, indicating that sample 064-0012 may represent an outlier. Exclusion of this outlier results in an EPC of 25.7 µg/kg. The total HI for an RME construction worker based on this EPC is less than 1 (HI=0.3).

5.5 Cancer Summary

Cancer risks for all receptors were below or within the acceptable risk range of 1E-04 to 1E-06 (1 in ten thousand to 1 in a million) established under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as described in further detail below.

5.5.1 Future Resident – Adult

Total cancer risk for the future adult resident CTE scenario is below the risk range established by the NCP (2E-07; Tables 7.1 CT and 9.1.CT). Total cancer risk for the future adult resident RME scenario is within the cancer risk range established by the NCP (1E-06; Tables 7.1 RME and 9.1.RME).

5.5.2 Future Resident – Child

Total cancer risks for the future child resident are within the cancer risk range established by the NCP; 4E-06 for the CTE scenario (Tables 7.2 CT and 9.2.CT) and 1E-05 for the RME scenario (Tables 7.2 RME and 9.2.RME). The cancer risk to the future RME child is driven by ingestion of and dermal contact to benzo(a)pyrene (risks are 9E-06 and 3E-06 for ingestion and dermal exposures, respectively; Table 9.2.RME).

5.5.3 Future Resident

To calculate cancer risk reflective of a typical residential exposure (26 years; U.S. EPA 2014), cancer risk for the potential future RME resident child and adult were summed (Tables 7.3 and 9.3). The total cancer risk for the potential future resident is within the cancer risk range established by the NCP (2E-05). As mentioned above, the primary risk drivers are ingestion and dermal exposures to benzo(a)pyrene as a child.

5.5.4 Construction Worker

Total cancer risks for the construction worker are within the cancer risk range established by the NCP for both the CTE (4E-06; Tables 7.4 CT and 9.4 CT) and RME (2E-05; Tables 7.4 RME and 9.4 RME) scenarios. The primary risk driver is ingestion of and dermal contact with Total Aroclor.

5.5.5 Outdoor Worker

Total cancer risks for the outdoor worker are below the risk range established by the NCP; 3E-07 for the CTE scenario (Tables 7.5 CT and 9.5 CT) and 9E-07 for the RME scenario (Table 7.5 RME and 9.5 RME).

5.5.6 Trespasser - Adolescent

Total cancer risks for the adolescent trespasser are below the risk range established by the NCP; 1E-07 for the CTE scenario (Tables 7.6 CT and 9.6 RME) and 4E-07 for the RME scenario (Tables 7.6 RME and 9.6 RME).

6.0 UNCERTAINTY CHARACTERIZATION

Quantitative evaluation of human health risks due to environmental contamination is frequently limited by uncertainty regarding a number of key inputs, including chemical concentrations in the environment, the true level of human contact with contaminated media, and the true dose-response relationships for non-cancer and cancer effects in humans. This uncertainty is usually addressed by making assumptions or estimates for uncertain parameters based on available information. Because of these assumptions and estimates, the results of non-cancer hazard and cancer risk calculations are themselves uncertain, and it is

important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment. The following sections review the main sources of uncertainty in the non-cancer hazard and cancer risk calculations performed for Area 4.

6.1 Chemicals Not Evaluated

As discussed above, non-cancer hazards and cancer risk were quantified only for a selected subset (the COPCs) of chemicals detected in Site soil. While omission of other chemicals might tend to underestimate total non-cancer hazards and cancer risks, this is not a significant source of uncertainty because the chemicals that were excluded were present at concentrations well below a level of concern.

Additionally, toxicity factors are needed to quantify non-cancer hazards and cancer risks from exposure to chemicals detected in environmental media. Toxicity factors are not available for some of the chemicals detected at the Vestal Site. Four chemicals were not detected (1,2,3-Trichloropropane, dibenzo(a,h)anthracene, hexachlorocyclopentadiene, and n-nitroso-di-n-propylamine), however the RLs for these chemicals were above the residential soil RSL. The omission of these chemicals might tend to underestimate total non-cancer hazards and cancer risks.

6.2 Receptor Populations Not Evaluated

Several receptor populations were not evaluated quantitatively in this risk assessment (see Table 1.1). Risks to indoor workers from vapor intrusion, and risks to all receptor populations from ingestion of groundwater at the Site are being addressed separately.

6.3 Exposure Pathways Not Evaluated

As discussed above, humans may be exposed to site-related chemicals by a number of pathways. All of the exposure pathways identified in Table 1.1 for exposure to soil were evaluated quantitatively in this assessment for the receptor populations considered, except inhalation of air by indoor workers; this pathway is being addressed separately. Exposure to environmental media other than soil was not evaluated in this risk assessment, since this is being addressed separately.

6.4 Exposure Point Concentrations

U.S. EPA (1989, 1992) recommends that the EPC estimate be based on the 95UCL of the mean. This approach ensures that the "true" EPC is unlikely to be greater than the estimated EPC used in non-cancer hazard and cancer risk calculations. In addition, when calculated 95UCLs exceed the maximum detected concentration (due to limited data, etc.), the maximum detected concentration is used as the EPC, thereby assuring that the EPC is within the range of concentrations actually observed at the site.

When data are plentiful and inter-sample variability is not large, the 95UCL may be only slightly higher than the mean of the data. However, when data are sparse or are highly variable, the 95UCL may be far greater than the mean of the available data. At this site, the 95UCL for several COPCs (e.g., Aroclor-1260,

Total Aroclor; Table 3.2) was substantially higher than the sample mean. Such EPCs reflect the uncertainty that exists when data are sparse or highly variable.

In the case of inhalation risks, measured air data were not available so airborne concentrations were estimated using a screening level soil-to-air transfer model. In general, such predicted values have high uncertainty compared to measured values, so the actual concentrations of volatile COPCs in air are uncertain, and true values might be either higher or lower than calculated.

6.5 Human Exposure Parameters

Many of the required exposure parameters used to calculate exposure doses/intakes are not known with certainty and must be estimated from limited data or knowledge. In general, when exposure data were limited or absent, the exposure parameters were chosen in a way that was intended to be conservative (health-protective). This approach is intended to produce results that are unlikely to underestimate actual exposure and non-cancer hazard or cancer risk.

6.6 Uncertainties in Toxicity Values

Toxicity information for many chemicals is often limited. Consequently, there are varying degrees of uncertainty associated with toxicity values (i.e., cancer SFs, RfDs). For example, uncertainties can arise from the following sources:

- Extrapolation from animal studies to humans
- Extrapolation from high dose to low dose
- Extrapolation from continuous exposure to intermittent exposure
- Limited or inconsistent toxicity studies

U.S. EPA intentionally uses conservative approaches to develop toxicity factors to ensure that any uncertainties are more likely to result in an overestimation rather than an underestimation of non-cancer hazard or cancer risk.

The inhalation toxicity factors for Aroclors are based on route-to-route extrapolations using the oral toxicity factors. Inhalation factors derived based on route-to-route extrapolation using toxicity values derived for oral exposures are inherently uncertain due to a difference in factors that govern pulmonary absorption. Thus, there is potential to underestimate toxicity when extrapolating from the oral route to the inhalation route.

For vinyl chloride, cancer risk the adolescent trespasser (7-18 years) is based on toxicity factors derived for application when evaluating continuous lifetime exposure from birth. U.S. EPA guidance identifies an adult as persons greater than age 16 years. The SF for vinyl chloride based on continuous exposure from birth is approximately 2 times higher than the SF for vinyl chloride based on continuous exposure during adulthood. Therefore, although using the value based on continuous exposure from birth may overestimate risk for an adolescent receptor, it is the most conservative approach.

6.7 Uncertainties in Risk Estimates

Because non-cancer hazard or cancer risk estimates for a chemical are derived by combining uncertain estimates of exposure and toxicity (see above), the hazard or risk estimates for each chemical are more uncertain than either the exposure estimate or the toxicity estimate alone. Additional uncertainty arises from the issue of how to combine hazard or risk estimates across different chemicals. In some cases, the effects caused by one chemical do not influence the effects caused by other chemicals. In other cases, the effects of one chemical may interact with effects of other chemicals, causing responses that are approximately additive, greater than additive (synergistic), or less than additive (antagonistic). In most cases, available toxicity data are not sufficient to define what type of interaction is expected, so U.S. EPA generally assumes that effects are additive for carcinogens that act on all target organs/tissues and for non-carcinogens that act on the same target organ/tissue (U.S. EPA 2000b).

6.7.1 Aroclors

For Aroclors, Total Aroclor (calculated as the sum of detected Aroclors) was identified as a COPC in both datasets. As such, the individual Aroclors that contributed to the Total Aroclor concentrations in any given sample were carried through as COPCs (Aroclors 1254 and 1260 for the surface soil dataset, and Aroclors 1016, 1254 and 1260 for the surface + subsurface dataset). In a given sample, one or more of these may have contributed to the Total Aroclor concentration. Given the nature of the dataset, the EPCs for Total Aroclor do not account for non-detects, whereas the EPCs for the individual Aroclors that are based on 95UCL values do incorporate non-detects (as described in Section 3.3). Thus, non-cancer HIs for Aroclors based on summing across the HQs for the individual Aroclors is less than what would be calculated if we calculated an HQ based on the EPC for Total Aroclors instead. However, if the non-cancer HI were calculated based on Total Aroclor, it would still be less than 1 for all receptors except the construction worker. In this case, the non-cancer HIs for the construction worker for Total Aroclor would be 2.6 and 14 for the CTE and RME receptors, respectively. These values likely overestimate non-cancer hazards.

To evaluate the uncertainty associated with the EPCs for Aroclors, EPCs were also calculated for 1) total Aroclors based on assigning the highest reporting level across the individual Aroclors for each sample where Total Aroclor was not calculated (e.g., all individual Aroclors within a particular sample were ND; 0.04 mg/kg for surface soil and 3.5 mg/kg for surface+subsurface soil), and 2) individual Aroclors based only on detected values. The resulting EPCs are as follows:

Exposure Point	Aroclor	EPC (mg/kg)		
		Based on Series 3 Tables	Total Aroclor = ND substituted with RL	Individual Aroclors detected only
Surface Soil (0 to 12 inches)	Aroclor-1254	0.048	--	0.12
	Aroclor-1260	0.079	--	0.079
	Total Aroclor	0.199	0.0382	--
Surface + subsurface soil (0 to 10 feet)	Aroclor-1016	0.36	--	0.36
	Aroclor-1254	0.0335	--	0.147
	Aroclor-1260	3.493	--	28.08
	Total Aroclor	28.41	3.535	--

Using EPCs for Total Aroclor based on assigning the maximum RL across the individual Aroclors for each sample to calculate non-cancer HIs for the CTE and RME construction worker, results in HIs of 0.3 and 1.7, respectively. Using EPCs for the individual Aroclors based on detected values only to calculate non-cancer HIs for the CTE and RME construction worker, results in HIs of 1.9 and 7, respectively.

6.7.2 PCB Congeners

For PCBs, the dioxin-like nature of some PCB congeners raises a concern for cumulative exposure. As per U.S. EPA guidance (U.S. EPA 1996), it is important to evaluate individual PCB congeners to account for possible enhancement by DL or highly toxic congeners so as not to underestimate the toxicity of a mixture. The calculated EPCs for DL PCBs (calculated as TEQ) and non-DL PCBs are as follows:

Exposure Point	EPC		
	Units	TEQ (DL PCBs)	Non-DL PCBs
Surface soil (0 to 12 inches)	mg/kg	9.74E-07	7.91E-03
Surface+subsurface soil (0 to 10 feet)	mg/kg	1.29E-05	7.16E-02
Air (offgassing from surface soil)	$\mu g/m^3$	4.97E-10	1.01E-05
Air (offgassing from surface+subsurface soil)	$\mu g/m^3$	6.6E-09	9.12E-05

PCB-126 was not detected in any sample. The average RLs were 8.4E-06 mg/kg and 3.0E-05 mg/kg for the surface soil and surface + subsurface soil datasets, respectively.

Based on the EPCs for TEQ and Non-DL PCBs, the calculated cancer risks for RME receptors are as follows:

Receptor	Cancer Risk	
	TEQ (DL PCBs) based on: SF = 156,000 $(mg/kg\text{-}day)^{-1}$ IUR = 38 $(\mu g/m^3)^{-1}$	Non-DL PCBs based on: SF = 2 $(mg/kg\text{-}day)^{-1}$ IUR = 5.7E-04 $(\mu g/m^3)^{-1}$
Future Adult resident	6E-08	1E-08
Future Child resident	2E-07	2E-08
Construction worker	9E-08	9E-09
Outdoor worker	5E-08	7E-09
Trespasser	1E-08	3E-09

As shown above, calculated cancer risks are expected to be four to ten times higher for DL PCB congeners than for non-DL PCB congeners. The above comparison supports the evaluation of TEQ in this assessment to account for enhancement by DL PCB congeners. However, cancer risks based on TEQ are below a level of concern (risk < 1E-06) for all receptors evaluated in this assessment. In addition, the maximum detected concentration of Total PCBs did not exceed the residential soil RSL (based on the noncancer-based RSL for Aroclor-1254 of 0.12 mg/kg), further indicating that DL PCBs are not a significant risk driver.

7.0 REFERENCES

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TABLES
Vestal Water Supply Well 1-1 Superfund Site
Area 4, Operable Unit 2
Final Report
November 2015

Table 1.1
Selection of Exposure Pathways
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil	Soils collected up to a depth of 10 feet[a]	Vestal Site	Resident	Adult / Child	Ingestion Dermal Inhalation	On-Site	Quantitative	Although there are no current residents at the Site, potential future residential development is possible without a deed restriction limiting future land use. Therefore, incidental ingestion of and dermal contact with contaminated soil by future residential populations will be evaluated quantitatively.
									VOCs are a COPC at this site; off-gassing from exposed soil is possible. Therefore, this pathway will be evaluated quantitatively.
Current/Future				Construction Worker	Adult	Ingestion Dermal	On-Site	Quantitative	Incidental ingestion of and dermal contact with contaminated soil during work activities is possible. Therefore, this pathway will be evaluated quantitatively.
						Inhalation		Quantitative	VOCs are a COPC at this site; off-gassing from exposed soil is possible. Therefore, this pathway will be evaluated quantitatively.
Current/Future				Outdoor Worker	Adult	Ingestion Dermal	On-Site	Quantitative	Incidental ingestion of and dermal contact with contaminated soil during work activities is possible. Therefore, this pathway will be evaluated quantitatively
						Inhalation		Quantitative	VOCs are a COPC at this site; off-gassing from exposed soil is possible. Therefore, this pathway will be evaluated quantitatively.
Current/Future				Trespasser	Teenager (7-18 yrs)	Ingestion Dermal	On-Site	Quantitative	Incidental ingestion of and dermal contact with contaminated soil while tresspassing is possible. Therefore, this pathway will be evaluated quantitatively.
						Inhalation		Quantitative	VOCs are a COPC at this site; off-gassing from exposed soil is possible. Therefore, this pathway will be evaluated quantitatively.
Current/Future				Indoor Worker	Adult	Inhalation	On-Site	None	The potential for vapor intrusion from soil gas into indoor air in the building is being addressed using the Regional Matrix for Vapor Intrusion separately.
Current/Future	Groundwater	Groundwater	Vestal Site	Resident	Adult / Child	Ingestion	On-Site	None	Groundwater is being addressed under the OU-1 ROD and will not be quantitatively addressed in this HHRA.
				Construction Worker	Adult	Ingestion	On-Site	None	Groundwater is being addressed under the OU-1 ROD and will not be quantitatively addressed in this HHRA.
				Outdoor Worker	Adult	Ingestion	On-Site	None	Groundwater is being addressed under the OU-1 ROD and will not be quantitatively addressed in this HHRA.
				Trespasser	Teenager (7-18 yrs)	Ingestion	On-Site	None	Groundwater is being addressed under the OU-1 ROD and will not be quantitatively addressed in this HHRA.

[a] Exposure to the soils at the Vestal site will differ for individual receptors based on sample depth. Potential future residents and current and potential future outdoor workers are assumed to be exposed to surface soils (soil samples collected from the top 1 foot) including subsurface soil beneath the existing on-site building and subsurface soils excavated to the surface and not managed consistent with the Site Management Plan for contaminated soils. Current or potential future construction workers are assumed to be exposed to surface plus subsurface soils (samples collected from the top 10 feet of soil including subsurface soil beneath the on-site building and subsurface soil excavated to the surface and not managed consistent with the Site Management Plan for contaminated soil). Trespassers are assumed to be exposed to surface soils (soil samples collected from the top 1 foot).

VOC = Volatile Organic Compound; COPC = Contaminant of Potential Concern; HHRA = Human Health Risk Assessment; OU = Operable Unit; ROD = Record of Decision

Table 2.1
Occurrence, Distribution and Selection of Contaminants of Potential Concern in Surface Soil
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Time Frame: Current/Future
Medium: Surface Soil (0 to 12 inches)
Exposure Medium: Surface Soil
Exposure Point: Surface Soil at the Vestal Site

CAS Registry Number	Analyte[c]	Minimum Detected Value	Minimum Qualifier	Maximum Detected Value	Maximum Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Screening Concentration	EPA Residential Soil RSL[a]		COPC Flag	Rationale for Selection[b]
630-20-6	1,1,1,2-Tetrachloroethane							0 / 1	5.32E-03 / 5.32E-03		2	C	N	ND
71-55-6	1,1,1-Trichloroethane	0.0176		0.0176		mg/kg	SB-001	1 / 16	5.00E-03 / 6.80E-03	0.0176	810	NC	N	BSL
79-34-5	1,1,2,2-Tetrachloroethane							0 / 15	5.00E-03 / 6.80E-03		0.6	C	N	ND
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane							0 / 14	5.00E-03 / 6.80E-03		4000	NC	N	ND
79-00-5	1,1,2-Trichloroethane							0 / 15	5.00E-03 / 6.80E-03		0.15	NC	N	ND
92-52-4	1,1'-Biphenyl							0 / 26	1.90E-01 / 2.30E-01		4.7	NC	N	ND
75-34-3	1,1-Dichloroethane							0 / 16	5.00E-03 / 6.80E-03		3.6	C	N	ND
75-35-4	1,1-Dichloroethene							0 / 15	5.00E-03 / 6.80E-03		23	NC	N	ND
563-58-6	1,1-Dichloropropene							0 / 1	5.32E-03 / 5.32E-03				N	ND/NV
87-61-6	1,2,3-Trichlorobenzene							0 / 15	5.00E-03 / 6.80E-03		6.3	NC	N	ND
96-18-4	1,2,3-Trichloropropane							0 / 1	5.32E-03 / 5.32E-03		0.0051	C	N	RL ASL
95-94-3	1,2,4,5-Tetrachlorobenzene	0.1	J	0.1	J	mg/kg	064-0025	1 / 26	1.90E-01 / 2.30E-01	0.1	2.3	NC	N	BSL
120-82-1	1,2,4-Trichlorobenzene							0 / 15	5.00E-03 / 6.80E-03		5.8	NC	N	ND
95-63-6	1,2,4-Trimethylbenzene							0 / 1	5.32E-03 / 5.32E-03		5.8	NC	N	ND
96-12-8	1,2-Dibromo-3-chloropropane							0 / 15	5.00E-03 / 6.80E-03		0.0053	C	N	ND
106-93-4	1,2-Dibromoethane							0 / 15	5.00E-03 / 6.80E-03		0.036	C	N	ND
95-50-1	1,2-Dichlorobenzene							0 / 15	5.00E-03 / 6.80E-03		180	NC	N	ND
107-06-2	1,2-Dichloroethane							0 / 15	5.00E-03 / 6.80E-03		0.46	C	N	ND
78-87-5	1,2-Dichloropropane							0 / 15	5.00E-03 / 6.80E-03		1	C	N	ND
108-67-8	1,3,5-Trimethylbenzene							0 / 1	5.32E-03 / 5.32E-03		78	NC	N	ND
541-73-1	1,3-Dichlorobenzene							0 / 15	5.00E-03 / 6.80E-03				N	ND/NV
142-28-9	1,3-Dichloropropane							0 / 1	5.32E-03 / 5.32E-03		160	NC	N	ND
106-46-7	1,4-Dichlorobenzene							0 / 15	5.00E-03 / 6.80E-03		2.6	C	N	ND
123-91-1	1,4-Dioxane							0 / 14	1.00E-01 / 1.40E-01		5.3	C	N	ND
594-20-7	2,2-Dichloropropane							0 / 1	5.32E-03 / 5.32E-03				N	ND/NV
108-60-1	2,2'-Oxybis(1-chloropropane)							0 / 26	1.90E-01 / 2.30E-01		4.9	C	N	ND
58-90-2	2,3,4,6-Tetrachlorophenol	0.22		0.22		mg/kg	064-0025	1 / 26	1.90E-01 / 2.30E-01	0.22	190	NC	N	BSL
95-95-4	2,4,5-Trichlorophenol							0 / 26	1.90E-01 / 2.30E-01		630	NC	N	ND
88-06-2	2,4,6-Trichlorophenol							0 / 26	1.90E-01 / 2.30E-01		6.3	NC	N	ND
120-83-2	2,4-Dichlorophenol							0 / 26	1.90E-01 / 2.30E-01		19	NC	N	ND
105-67-9	2,4-Dimethylphenol							0 / 26	1.90E-01 / 2.30E-01		130	NC	N	ND
51-28-5	2,4-Dinitrophenol							0 / 26	3.70E-01 / 4.40E-01		13	NC	N	ND
121-14-2	2,4-Dinitrotoluene							0 / 26	1.90E-01 / 2.30E-01		1.7	C	N	ND
606-20-2	2,6-Dinitrotoluene							0 / 26	1.90E-01 / 2.30E-01		0.36	C	N	ND
78-93-3	2-Butanone							0 / 15	5.32E-03 / 1.40E-02		2700	NC	N	ND
91-58-7	2-Chloronaphthalene							0 / 26	1.90E-01 / 2.30E-01		480	NC	N	ND
95-57-8	2-Chlorophenol							0 / 26	1.90E-01 / 2.30E-01		39	NC	N	ND
95-49-8	2-Chlorotoluene							0 / 1	5.32E-03 / 5.32E-03				N	ND/NV
591-78-6	2-Hexanone							0 / 15	5.32E-03 / 1.40E-02		20	NC	N	ND
91-57-6	2-Methylnaphthalene	0.19	J	0.19	J	mg/kg	064-0025	1 / 26	1.90E-01 / 2.30E-01	0.19	24	NC	N	BSL
95-48-7	2-Methylphenol							0 / 26	1.90E-01 / 2.30E-01		320	NC	N	ND
2051-61-8	2-MoCB							0 / 5	1.95E-06 / 1.04E-05				N	ND/NV
88-74-4	2-Nitroaniline							0 / 26	3.70E-01 / 4.40E-01		63	NC	N	ND
88-75-5	2-Nitrophenol							0 / 26	1.90E-01 / 2.30E-01				N	ND/NV
91-94-1	3,3'-Dichlorobenzidine							0 / 26	1.90E-01 / 2.30E-01		1.2	C	N	ND
99-09-2	3-Nitroaniline							0 / 26	3.70E-01 / 4.40E-01				N	ND/NV
534-52-1	4,6-Dinitro-2-methylphenol							0 / 26	3.70E-01 / 4.40E-01		0.51	NC	N	ND
101-55-3	4-Bromophenyl-phenylether							0 / 26	1.90E-01 / 2.30E-01				N	ND/NV
59-50-7	4-Chloro-3-methylphenol							0 / 26	1.90E-01 / 2.30E-01		630	NC	N	ND
106-47-8	4-Chloroaniline							0 / 26	1.90E-01 / 2.30E-01		2.7	C	N	ND
7005-72-3	4-Chlorophenyl-phenylether							0 / 26	1.90E-01 / 2.30E-01				N	ND/NV
106-43-4	4-Chlorotoluene							0 / 1	5.32E-03 / 5.32E-03				N	ND/NV
13029-08-8	4-DiCB							0 / 5	3.90E-06 / 2.08E-05				N	ND/NV
108-10-1	4-Methyl-2-pentanone							0 / 15	5.32E-03 / 1.40E-02		530	NC	N	ND
106-44-5	4-Methylphenol							0 / 26	1.90E-01 / 2.30E-01		630	NC	N	ND
100-01-6	4-Nitroaniline							0 / 26	3.70E-01 / 4.40E-01		25	NC	N	ND
100-02-7	4-Nitrophenol							0 / 26	3.70E-01 / 4.40E-01				N	ND/NV
83-32-9	Acenaphthene							0 / 26	1.90E-01 / 2.30E-01		360	NC	N	ND
208-96-8	Acenaphthylene							0 / 26	1.90E-01 / 2.30E-01		170 [d]	NC	N	ND
67-64-1	Acetone							0 / 15	1.00E-02 / 2.13E-02		6100	NC	N	ND
98-86-2	Acetophenone							0 / 26	1.90E-01 / 2.30E-01		780	NC	N	ND
120-12-7	Anthracene	0.092	J	0.092	J	mg/kg	064-0019	1 / 26	1.90E-01 / 2.30E-01	0.092	1800	NC	N	BSL
12674-11-2	Aroclor-1016							0 / 26	3.70E-02 / 4.40E-02		0.41	NC	N	ND
11104-28-2	Aroclor-1221							0 / 26	3.70E-02 / 4.40E-02		0.17	C	N	ND
11141-16-5	Aroclor-1232							0 / 26	3.70E-02 / 4.40E-02		0.17	C	N	ND
53469-21-9	Aroclor-1242							0 / 26	3.70E-02 / 4.40E-02		0.23	C	N	ND
12672-29-6	Aroclor-1248							0 / 26	3.70E-02 / 4.40E-02		0.23	C	N	ND
11097-69-1	Aroclor-1254	0.052	NJ	0.12		mg/kg	064-0110	2 / 26	3.70E-02 / 4.40E-02	0.12	0.12	NC	Y	ASL, TA
11096-82-5	Aroclor-1260	0.015	J	0.079	NJ	mg/kg	064-0110	2 / 26	3.70E-02 / 4.40E-02	0.079	0.24	C	Y	TA
37324-23-5	Aroclor-1262							0 / 26	3.70E-02 / 4.40E-02				N	ND/NV
11100-14-4	Aroclor-1268							0 / 26	3.70E-02 / 4.40E-02				N	ND/NV
11097-69-1	Total Aroclor	0.015	J	0.199	J	mg/kg	064-0110	3 / 26		0.199	0.12	NC	Y	ASL
1912-24-9	Atrazine							0 / 26	1.90E-01 / 2.30E-01		2.4	C	N	ND
100-52-7	Benzaldehyde							0 / 26	1.90E-01 / 2.30E-01		780	NC	N	ND
71-43-2	Benzene							0 / 15	5.00E-03 / 6.80E-03		1.2	C	Y	KHC
56-55-3	Benzo(a)anthracene	0.091	J	0.21		mg/kg	064-0019	2 / 26	1.90E-01 / 2.30E-01	0.21	0.16	C	Y	ASL
50-32-8	Benzo(a)pyrene	0.17	J	0.17	J	mg/kg	064-0019	1 / 26	1.90E-01 / 2.30E-01	0.17	0.016	C	Y	ASL
205-99-2	Benzo(b)fluoranthene	0.083	J	0.19	J	mg/kg	064-0019	2 / 26	1.90E-01 / 2.30E-01	0.19	0.16	C	Y	ASL
191-24-2	Benzo(g,h,i)perylene	0.098	J	0.098	J	mg/kg	064-0019	1 / 26	1.90E-01 / 2.30E-01	0.098	170 [d]	NC	N	BSL
207-08-9	Benzo(k)fluoranthene	0.087	J	0.16	J	mg/kg	064-0019	2 / 26	1.90E-01 / 2.30E-01	0.16	1.6	C	N	BSL
111-91-1	Bis(2-chloroethoxy)methane							0 / 26	1.90E-01 / 2.30E-01		19	NC	N	ND
111-44-4	Bis(2-chloroethyl)ether							0 / 26	1.90E-01 / 2.30E-01		0.23	C	N	ND
117-81-7	Bis(2-ethylhexyl)phthalate	0.097	J	0.22		mg/kg	064-0025	10 / 26	1.90E-01 / 2.30E-01	0.22	39	C	N	BSL
108-86-1	Bromobenzene							0 / 1	5.32E-03 / 5.32E-03				N	ND/NV
74-97-5	Bromochloromethane							0 / 14	5.00E-03 / 6.80E-03		15	NC	N	ND
75-27-4	Bromodichloromethane							0 / 15	5.00E-03 / 6.80E-03		0.29	C	N	ND
75-25-2	Bromoform							0 / 15	5.00E-03 / 6.80E-03		19	C	N	ND
74-83-9	Bromomethane							0 / 15	5.00E-03 / 6.80E-03		0.68	NC	N	ND
85-68-7	Butylbenzylphthalate							0 / 26	1.90E-01 / 2.30E-01		290	C	N	ND
105-60-2	Caprolactam							0 / 26	1.90E-01 / 2.30E-01		3100	NC	N	ND
86-74-8	Carbazole							0 / 26	1.90E-01 / 2.30E-01				N	ND/NV
75-15-0	Carbon disulfide							0 / 15	5.00E-03 / 6.80E-03		77	NC	N	ND
56-23-5	Carbon tetrachloride							0 / 15	5.00E-03 / 6.80E-03		0.65	C	N	ND
108-90-7	Chlorobenzene							0 / 15	5.00E-03 / 6.80E-03		28	NC	N	ND
75-00-3	Chloroethane							0 / 15	5.00E-03 / 6.80E-03		1400	NC	N	ND
67-66-3	Chloroform							0 / 15	5.00E-03 / 6.80E-03		0.32	C	N	ND
74-87-3	Chloromethane							0 / 15	5.00E-03 / 6.80E-03		11	NC	N	ND
218-01-9	Chrysene	0.087	J	0.22		mg/kg	064-0019	2 / 26	1.90E-01 / 2.30E-01	0.22	16	C	N	BSL
156-59-2	cis-1,2-Dichloroethene	0.00397	J	0.00397	J	mg/kg	SB-001	1 / 16	5.00E-03 / 6.80E-03	0.00397	16	NC	N	BSL
10061-01-5	cis-1,3-Dichloropropene							0 / 15	5.00E-03 / 6.80E-03				N	ND/NV
110-82-7	Cyclohexane							0 / 14	5.00E-03 / 6.80E-03		650	NC	N	ND
53-70-3	Dibenzo(a,h)anthracene							0 / 26	1.90E-01 / 2.30E-01		0.016	C	N	RL ASL
132-64-9	Dibenzofuran							0 / 26	1.90E-01 / 2.30E-01		7.3	NC	N	ND
124-48-1	Dibromochloromethane							0 / 15	5.00E-03 / 6.80E-03		0.75	C	N	ND
74-95-3	Dibromomethane							0 / 1	5.32E-03 / 5.32E-03				N	ND/NV
75-71-8	Dichlorodifluoromethane							0 / 15	5.00E-03 / 6.80E-03		8.7	NC	N	ND
84-66-2	Diethylphthalate							0 / 26	1.90E-01 / 2.30E-01		5100	NC	N	ND
131-11-3	Dimethylphthalate							0 / 26	1.90E-01 / 2.30E-01				N	ND/NV
84-74-2	Di-n-butylphthalate	0.082	J	0.094	J	mg/kg	064-0009	2 / 26	1.90E-01 / 2.30E-01	0.094	630	NC	N	BSL
117-84-0	Di-n-octylphthalate							0 / 26	1.90E-01 / 2.30E-01		63	NC	N	ND
	PCB Congeners													
60145-21-3	103-PeCB							0 / 5	4.87E-06 / 2.60E-05		0.23	C	N	ND
56558-16-8	104-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
32598-14-4	105-PeCB	0.00000637		0.000222		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000222	0.23	C	Y	TEQ
70424-69-0	106-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
70424-68-9	107-PeCB	0.0000226		0.0000386		mg/kg	064-0113	2 / 5	3.90E-06 / 2.08E-05	0.0000386	0.23	C	N	BSL
70362-41-3/ 70424-70-3	108-PeCB/124-PeCB	0.0000278		0.0000278		mg/kg	064-0113	1 / 5	3.90E-06 / 2.08E-05	0.0000278	0.23	C	N	BSL
33146-45-1	10-DiCB							0 / 5	3.90E-06 / 2.08E-05		0.23	C	N	ND
38380-03-9/ 74472-38-1	110-PeCB/115-PeCB	0.0000264		0.000785		mg/kg	064-0113	5 / 5	3.90E-06 / 2.08E-05	0.000785	0.23	C	N	BSL
39635-32-0	111-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
74472-36-9	112-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
74472-37-0	114-PeCB	0.0000113		0.0000113		mg/kg	064-0113	1 / 5	1.95E-06 / 1.04E-05	0.0000113	0.23	C	Y	TEQ
31508-00-6	118-PeCB	0.0000134		0.000534		mg/kg	064-0113	5 / 5	3.90E-06 / 2.08E-05	0.000534	0.23	C	Y	TEQ
2050-67-1	11-DiCB							0 / 5	4.87E-05 / 2.60E-04		0.23	C	N	ND
68194-12-7	120-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
56558-18-0	121-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
76842-07-4	122-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
65510-44-3	123-PeCB	0.0000116		0.0000116		mg/kg	064-0113	1 / 5	1.95E-06 / 1.04E-05	0.0000116	0.23	C	Y	TEQ
57465-28-8	126-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	Y	TEQ
39635-33-1	127-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
38380-07-3/ 41411-63-6	128-HxCB/166-HxCB	0.00000475		0.000214		mg/kg	064-0113	5 / 5	3.90E-06 / 2.08E-05	0.000214	0.23	C	N	BSL
55215-18-4/ 35065-28-2/ 74472-44-9	129-HxCB/138-HxCB/163-HxCB	0.0000292		0.00124		mg/kg	064-0113	5 / 5	5.85E-06 / 3.12E-05	0.00124	0.23	C	N	BSL
2974-92-7/ 2974-90-5	12-DiCB/13-DiCB							0 / 5	7.79E-06 / 4.17E-05		0.23	C	N	ND
52663-66-8	130-HxCB	0.00000232		0.0000729		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.0000729	0.23	C	N	BSL
61798-70-7	131-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
38380-05-1	132-HxCB	0.0000094		0.000221		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000221	0.23	C	N	BSL
35694-04-3	133-HxCB	0.0000123		0.0000138		mg/kg	064-0113	2 / 5	1.95E-06 / 1.04E-05	0.0000138	0.23	C	N	BSL
52704-70-8	134-HxCB	0.0000109		0.0000278		mg/kg	064-0113	3 / 5	1.95E-06 / 1.04E-05	0.0000278	0.23	C	N	BSL
52744-13-5/ 52663-63-5	135-HxCB/151-HxCB	0.00000966		0.000183		mg/kg	064-0113	5 / 5	3.90E-06 / 2.08E-05	0.000183	0.23	C	N	BSL
38411-22-2	136-HxCB	0.00000307		0.0000546		mg/kg	064-0113, 064-0073	5 / 5	1.95E-06 / 1.04E-05	0.0000546	0.23	C	N	BSL
35694-06-5	137-HxCB	0.00000234		0.0000593		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.0000593	0.23	C	N	BSL
56030-56-9/ 59291-64-4	139-HxCB/140-HxCB							0 / 5	3.90E-06 / 2.08E-05		0.23	C	N	ND
52712-04-6	141-HxCB	0.000039		0.000128		mg/kg	064-0113	4 / 5	3.90E-06 / 2.08E-05	0.000128	0.23	C	N	BSL
41411-61-4	142-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
68194-15-0	143-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
68194-14-9	144-HxCB	0.0000179		0.0000237		mg/kg	064-0113	2 / 5	1.95E-06 / 1.04E-05	0.0000237	0.23	C	N	BSL
74472-40-5	145-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
51908-16-8	146-HxCB	0.0000042		0.000127		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000127	0.23	C	N	BSL
68194-13-8/ 38380-04-0	147-HxCB/149-HxCB	0.0000224		0.000526		mg/kg	064-0073	5 / 5	7.79E-06 / 4.17E-05	0.000526	0.23	C	N	BSL
74472-41-6	148-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
34883-41-5	14-DiCB							0 / 5	3.90E-06 / 2.08E-05		0.23	C	N	ND
68194-08-1	150-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
68194-09-2	152-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
35065-27-1/ 59291-65-5	153-HxCB/168-HxCB	0.00002		0.000688		mg/kg	064-0113	5 / 5	7.79E-06 / 4.17E-05	0.000688	0.23	C	N	BSL
60145-22-4	154-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
33979-03-2	155-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
38380-08-4/ 69782-90-7	156-HxCB/157-HxCB	0.0000471		0.000151		mg/kg	064-0113	4 / 5	3.90E-06 / 2.08E-05	0.000151	0.23	C	Y	TEQ
74472-42-7	158-HxCB	0.00000352		0.000111		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000111	0.23	C	N	BSL
39635-35-3	159-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
2050-68-2	15-DiCB							0 / 5	1.95E-05 / 1.04E-04		0.23	C	N	ND
41411-62-5	160-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
74472-43-8	161-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
39635-34-2	162-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND
74472-45-0	164-HxCB	0.000023		0.0000777		mg/kg	064-0113	4 / 5	1.95E-06 / 1.04E-05	0.0000777	0.23	C	N	BSL
74472-46-1	165-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23	C	N	ND

CAS Registry Number	Analyte[c]	Minimum Detected Value	Minimum Qualifier	Maximum Detected Value	Maximum Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Screening Concentration	EPA Residential Soil RSL[a]	COPC Flag	Rationale for Selection[b]
52663-72-6	167-HxCB	0.000017		0.0000555		mg/kg	064-0113	4 / 5	1.95E-06 / 1.04E-05	0.0000555	0.23 C	Y	TEQ
32774-16-6	169-HxCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	Y	TEQ
38444-78-9	16-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
35065-30-6	170-HpCB	0.00000754		0.000171		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000171	0.23 C	N	BSL
52663-71-5/ 68194-16-1	171-HpCB/173-HpCB	0.0000433		0.0000454		mg/kg	064-0113	2 / 5	3.90E-06 / 2.08E-05	0.0000454	0.23 C	N	BSL
52663-74-8	172-HpCB	0.00000252		0.0000294		mg/kg	064-0073	4 / 5	1.95E-06 / 1.04E-05	0.0000294	0.23 C	N	BSL
38411-25-5	174-HpCB	0.00000869		0.000152		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.000152	0.23 C	N	BSL
40186-70-7	175-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
52663-65-7	176-HpCB	0.0000108		0.0000128		mg/kg	064-0073	2 / 5	1.95E-06 / 1.04E-05	0.0000128	0.23 C	N	BSL
52663-70-4	177-HpCB	0.00000486		0.0000935		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.0000935	0.23 C	N	BSL
52663-67-9	178-HpCB	0.00000217		0.0000349		mg/kg	064-0073	4 / 5	1.95E-06 / 1.04E-05	0.0000349	0.23 C	N	BSL
52663-64-6	179-HpCB	0.00000398		0.0000542		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.0000542	0.23 C	N	BSL
37680-66-3	17-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
35065-29-3/ 69782-91-8	180-HpCB/193-HpCB	0.0000195		0.00033		mg/kg	064-0073	5 / 5	3.90E-06 / 2.08E-05	0.00033	0.23 C	N	BSL
74472-47-2	181-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
60145-23-5	182-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
52663-69-1/ 52712-05-7	183-HpCB/185-HpCB	0.0000066		0.0000907		mg/kg	064-0073	5 / 5	3.90E-06 / 2.08E-05	0.0000907	0.23 C	N	BSL
74472-48-3	184-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
74472-49-4	186-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
52663-68-0	187-HpCB	0.0000112		0.000205		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.000205	0.23 C	N	BSL
74487-85-7	188-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
39635-31-9	189-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	Y	TEQ
37680-65-2/ 35693-92-6	18-TrCB/30-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
41411-64-7	190-HpCB	0.0000117		0.0000356		mg/kg	064-0113	3 / 5	1.95E-06 / 1.04E-05	0.0000356	0.23 C	N	BSL
74472-50-7	191-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
74472-51-8	192-HpCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
35694-08-7	194-OcCB	0.00000691		0.0000853		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.0000853	0.23 C	N	BSL
52663-78-2	195-OcCB	0.00000214		0.0000315		mg/kg	064-0073	4 / 5	1.95E-06 / 1.04E-05	0.0000315	0.23 C	N	BSL
42740-50-1	196-OcCB	0.00000345		0.0000373		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.0000373	0.23 C	N	BSL
33091-17-7/ 52663-73-7	197-OcCB/200-OcCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
68194-17-2/ 52663-75-9	198-OcCB/199-OcCB	0.00000893		0.000134		mg/kg	064-0073	5 / 5	3.90E-06 / 2.08E-05	0.000134	0.23 C	N	BSL
38444-73-4	19-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
2051-60-7	1-MoCB	0.0000264		0.0000337		mg/kg	064-0113	2 / 5	4.87E-06 / 2.60E-05	0.0000337	0.23 C	N	BSL
40186-71-8	201-OcCB	0.0000107		0.0000107		mg/kg	064-0073	1 / 5	1.95E-06 / 1.04E-05	0.0000107	0.23 C	N	BSL
2136-99-4	202-OcCB	0.00000242		0.0000335		mg/kg	064-0073	4 / 5	1.95E-06 / 1.04E-05	0.0000335	0.23 C	N	BSL
52663-76-0	203-OcCB	0.00000568		0.0000693		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.0000693	0.23 C	N	BSL
74472-52-9	204-OcCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
74472-53-0	205-OcCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
40186-72-9	206-NoCB	0.00000949		0.000212		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.000212	0.23 C	N	BSL
52663-79-3	207-NoCB	0.0000145		0.0000177		mg/kg	064-0113	2 / 5	1.95E-06 / 1.04E-05	0.0000177	0.23 C	N	BSL
52663-77-1	208-NoCB	0.00000331		0.0000918		mg/kg	064-0073	5 / 5	1.95E-06 / 1.04E-05	0.0000918	0.23 C	N	BSL
2051-24-3	209-DeCB	0.00000725		0.000577		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000577	0.23 C	N	BSL
38444-84-7/ 7012-37-5	20-TrCB/28-TrCB							0 / 5	1.95E-05 / 1.04E-04		0.23 C	N	ND
55702-46-0/ 38444-86-9	21-TrCB/33-TrCB							0 / 5	7.79E-06 / 4.17E-05		0.23 C	N	ND
38444-85-8	22-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
55720-44-0	23-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
55702-45-9	24-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
55712-37-3	25-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
38444-81-4/ 15862-07-4	26-TrCB/29-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
38444-76-7	27-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
16606-02-3	31-TrCB							0 / 5	9.74E-06 / 5.21E-05		0.23 C	N	ND
38444-77-8	32-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
37680-68-5	34-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
37680-69-6	35-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
38444-87-0	36-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
38444-90-5	37-TrCB							0 / 5	1.95E-05 / 1.04E-04		0.23 C	N	ND
53555-66-1	38-TrCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
38444-88-1	39-TrCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
2051-62-9	3-MoCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
38444-93-8/ 41464-46-4	40-TeCB/71-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
52663-59-9	41-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
36559-22-5	42-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
70362-46-8	43-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
41464-39-5/ 2437-79-8/ 33284-54-7	44-TeCB/47-TeCB/65-TeCB							0 / 5	5.85E-06 / 3.12E-05		0.23 C	N	ND
70362-45-7/ 68194-04-7	45-TeCB/51-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
41464-47-5	46-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
70362-47-9	48-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
41464-40-8/ 60233-24-1	49-TeCB/69-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
62796-65-0/ 41464-41-9	50-TeCB/53-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
35693-99-3	52-TeCB	0.00000464		0.000146		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000146	0.23 C	N	BSL
15968-05-5	54-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
74338-24-2	55-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
41464-43-1	56-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
70424-67-8	57-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
41464-49-7	58-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
74472-33-6/ 54230-22-7/ 32598-12-2	59-TeCB/62-TeCB/75-TeCB							0 / 5	5.85E-06 / 3.12E-05		0.23 C	N	ND
16605-91-7	5-DiCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
33025-41-1	60-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
33284-53-6/ 32598-11-1/ 32690-93-0/ 70362-48-0	61-TeCB/70-TeCB/74-TeCB/76-TeCB	0.0000443		0.000137		mg/kg	064-0113	3 / 5	7.79E-06 / 4.17E-05	0.000137	0.23 C	N	BSL
74472-34-7	63-TeCB							0 / 5	4.87E-06 / 2.60E-05		0.23 C	N	ND
52663-58-8	64-TeCB	0.0000136		0.0000228		mg/kg	064-0113	2 / 5	1.95E-06 / 1.04E-05	0.0000228	0.23 C	N	BSL
32598-10-0	66-TeCB	0.0000295		0.0000354		mg/kg	064-0113	2 / 5	4.87E-06 / 2.60E-05	0.0000354	0.23 C	N	BSL
73575-53-8	67-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
73575-52-7	68-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
25569-80-6	6-DiCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
41464-42-0	72-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
74338-23-1	73-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
32598-13-3	77-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	Y	TEQ
70362-49-1	78-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
41464-48-6	79-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
33284-50-3	7-DiCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
33284-52-5	80-TeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
70362-50-4	81-TeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	Y	TEQ
52663-62-4	82-PeCB	0.000037		0.000037		mg/kg	064-0113	1 / 5	4.87E-06 / 2.60E-05	0.000037	0.23 C	N	BSL
60145-20-2	83-PeCB	0.0000162		0.0000242		mg/kg	064-0113	2 / 5	1.95E-06 / 1.04E-05	0.0000242	0.23 C	N	BSL
52663-60-2	84-PeCB	0.00000285		0.0000988		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.0000988	0.23 C	N	BSL
65510-45-4 18259-05-7/ 68194-11-6	85-PeCB/116-PeCB/117-PeCB	0.0000395		0.000122		mg/kg	064-0113	4 / 5	5.85E-06 / 3.12E-05	0.000122	0.23 C	N	BSL
55312-69-1/ 38380-02-8/ 41464-51-1/ 74472-35-8/ 56558-17-9/ 74472-39-2	86-PeCB/87-PeCB/97-PeCB/109-PeCB/119-PeCB/125-PeCB	0.0000942		0.000286		mg/kg	064-0113	4 / 5	1.17E-05 / 6.25E-05	0.000286	0.23 C	N	BSL
55215-17-3/68194-05-8	88-PeCB/91-PeCB	0.0000487		0.0000545		mg/kg	064-0113	2 / 5	3.90E-06 / 2.08E-05	0.0000545	0.23 C	N	BSL
73575-57-2	89-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
34883-43-7	8-DiCB							0 / 5	1.95E-05 / 1.04E-04		0.23 C	N	ND
68194-07-0/ 37680-73-2/ 68194-10-5	90-PeCB/101-PeCB/113-PeCB	0.0000115		0.000421		mg/kg	064-0113	5 / 5	5.85E-06 / 3.12E-05	0.000421	0.23 C	N	BSL
52663-61-3	92-PeCB	0.000003		0.000097		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000097	0.23 C	N	BSL
73575-56-1/ 39485-83-1	93-PeCB/100-PeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
73575-55-0	94-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
38379-99-6	95-PeCB	0.0000117		0.000343		mg/kg	064-0113	5 / 5	3.90E-06 / 2.08E-05	0.000343	0.23 C	N	BSL
73575-54-9	96-PeCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
60233-25-2/ 68194-06-9	98-PeCB/102-PeCB							0 / 5	3.90E-06 / 2.08E-05		0.23 C	N	ND
38380-01-7	99-PeCB	0.00000511		0.000245		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.000245	0.23 C	N	BSL
34883-39-1	9-DiCB							0 / 5	1.95E-06 / 1.04E-05		0.23 C	N	ND
1336-36-3	Total PCB Congeners	0.000313		0.0101		mg/kg	064-0113	5 / 5	1.95E-06 / 1.04E-05	0.0101	0.12 C	N	BSL
100-41-4	Ethylbenzene							0 / 15	5.00E-03 / 6.80E-03		5.8 C	N	ND
206-44-0	Fluoranthene	0.097	J	0.51		mg/kg	064-0019	4 / 26	1.90E-01 / 2.30E-01	0.51	240 NC	N	BSL
86-73-7	Fluorene							0 / 26	1.90E-01 / 2.30E-01		240 NC	N	ND
118-74-1	Hexachlorobenzene							0 / 26	1.90E-01 / 2.30E-01		0.21 C	N	ND
87-68-3	Hexachlorobutadiene							0 / 27	5.32E-03 / 2.30E-01		1.2 NC	N	ND
77-47-4	Hexachlorocyclopentadiene							0 / 26	1.90E-01 / 2.30E-01		0.18 NC	N	RL ASL
67-72-1	Hexachloroethane							0 / 26	1.90E-01 / 2.30E-01		1.8 NC	N	ND
193-39-5	Indeno(1,2,3-cd)pyrene	0.095	J	0.095	J	mg/kg	064-0019	1 / 26	1.90E-01 / 2.30E-01	0.095	0.16 C	N	BSL
78-59-1	Isophorone							0 / 26	1.90E-01 / 2.30E-01		570 C	N	ND
98-82-8	Isopropylbenzene							0 / 15	5.00E-03 / 6.80E-03		190 NC	N	ND
79-20-9	Methyl acetate							0 / 14	5.00E-03 / 6.80E-03		7800 NC	N	ND
1634-04-4	Methyl tert-butyl ether							0 / 15	5.00E-03 / 6.80E-03		47 C	N	ND
108-87-2	Methylcyclohexane							0 / 14	5.00E-03 / 6.80E-03			N	ND/NV
75-09-2	Methylene chloride	0.0029	J	0.027		mg/kg	064-0051	3 / 15	5.00E-03 / 6.80E-03	0.027	35 NC	N	BSL
91-20-3	Naphthalene	1.2		1.2		mg/kg	064-0025	1 / 27	5.32E-03 / 2.30E-01	1.2	3.8 C	N	BSL
104-51-8	n-Butylbenzene							0 / 1	5.32E-03 / 5.32E-03			N	ND/NV
98-95-3	Nitrobenzene							0 / 26	1.90E-01 / 2.30E-01		5.1 C	N	ND
621-64-7	N-Nitroso-di-n-propylamine							0 / 26	1.90E-01 / 2.30E-01		0.078 C	N	RL ASL
86-30-6	N-Nitrosodiphenylamine							0 / 26	1.90E-01 / 2.30E-01		110 C	N	ND
103-65-1	n-Propylbenzene							0 / 1	5.32E-03 / 5.32E-03		380 NC	N	ND
95-47-6	o-Xylene							0 / 15	5.00E-03 / 6.80E-03		65 NC	N	ND
108-38-3/106-42-3/179601-23-1	p&m-Xylene							0 / 15	5.00E-03 / 1.06E-02		55	N	ND
87-86-5	Pentachlorophenol							0 / 26	3.70E-01 / 4.40E-01		1 C	N	ND
85-01-8	Phenanthrene	0.088	J	0.42		mg/kg	064-0019	3 / 26	1.90E-01 / 2.30E-01	0.42	170 [d] NC	N	BSL
108-95-2	Phenol							0 / 26	1.90E-01 / 2.30E-01		1900 NC	N	ND
99-87-6	p-Isopropyltoluene							0 / 1	5.32E-03 / 5.32E-03			N	ND/NV
129-00-0	Pyrene	0.098	J	0.34		mg/kg	064-0019	3 / 26	1.90E-01 / 2.30E-01	0.34	180 NC	N	BSL
135-98-8	sec-Butylbenzene							0 / 1	5.32E-03 / 5.32E-03		780 ND	N	ND
100-42-5	Styrene							0 / 15	5.00E-03 / 6.80E-03		600 NC	N	ND
98-06-6	tert-Butylbenzene							0 / 1	5.32E-03 / 5.32E-03			N	ND/NV
127-18-4	Tetrachloroethene							0 / 15	5.00E-03 / 6.80E-03		8.1 NC	N	ND
108-88-3	Toluene							0 / 15	5.00E-03 / 6.80E-03		490 NC	N	ND
156-60-5	trans-1,2-Dichloroethene							0 / 16	5.00E-03 / 6.80E-03		160 NC	N	ND
10061-02-6	trans-1,3-Dichloropropene							0 / 15	5.00E-03 / 6.80E-03			N	ND/NV
79-01-6	Trichloroethene	0.0447	J	0.0447	J	mg/kg	SB-001	1 / 16	5.00E-03 / 6.80E-03	0.0447	0.41 NC	Y	KHC
75-69-4	Trichlorofluoromethane							0 / 15	5.00E-03 / 6.80E-03		73 NC	N	ND
75-01-4	Vinyl chloride							0 / 15	5.00E-03 / 6.80E-03		0.059 C	Y	KHC

[a]Screening toxicity values are the USEPA Regional Screening Levels (RSLs) for Residential Soil (June 2015). RSLs correspond to 1E-06 cancer risk or a hazard quotient of 0.1, whichever is lower.

[b]Selection Rationale Codes:

ASL = At or above screening level
BSL = Below screening level
KHC = Known Human carcinogen
ND = Not detected
EN = Essential nutrient
NV = No toxicity value or RSL; this chemical cannot be evaluated quantitatively in the risk assessment
TA = Component of total Aroclor which is identified as a COPC.
TEQ = Toxicity equivalent; Relative potency of individual congeners compared to 2,3,7,8-TCDD (USEPA 2010). Compound is included because it is a contributor to TEQ fo
2,3,7,8-TCDD per WHO (2005). Dioxin-like PCB congeners were evaluated using the EPA TEQ calculator which applies the mathematical techniques described by Helsel
(2005).
RL ASL = Reporting level above screening level, will be addressed as an uncertainty

[c]Total Aroclor and Total PCB Congeners concentrations were calculated by summing detected individual Aroclors or individual PCB congeners, respectively. No RL reported for Total Aroclors. The screening concentrations for Total Aroclor and Total PCB Congeners were compared to the RSL for Aroclor-1254. Screening concentrations for non-dioxin-like PCB congeners were compared to the RSL for Polychlorinated Biphenyls (high risk).

[d]No screening value available, the screening value for pyrene was used as a surrogate.

Table 2.2
Occurrence, Distribution and Selection of Contaminants of Potential Concern in Surface and Subsurface Soils
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Time Frame: Current/Future
Medium: Surface and Subsurface Soil (0 to 10 feet)
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Subsurface Soil at the Vestal Site

CAS Registry Number	Analyte[c]	Minimum Detected Value	Minimum Qualifier	Maximum Detected Value	Maximum Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Screening Concentration		COPC Flag	Rationale for Selection[b]
630-20-6	1,1,1,2-Tetrachloroethane							0 / 35	4.28E-03 / 6.33E-01		2	C N	ND
71-55-6	1,1,1-Trichloroethane	0.000636		1.64		mg/kg	SB-009	30 / 108	4.28E-03 / 6.33E-01	1.64	810	NC N	BSL
79-34-5	1,1,2,2-Tetrachloroethane							0 / 49	4.28E-03 / 6.33E-01		0.6	C N	ND
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane							0 14	5.00E-03 6.80E-03		4000	NC N	ND
79-00-5	1,1,2-Trichloroethane							0 / 49	4.28E-03 / 6.33E-01		0.15	NC N	ND
92-52-4	1,1'-Biphenyl							0 / 67	1.40E-01 / 2.50E-01		4.7	NC N	ND
75-34-3	1,1-Dichloroethane	0.00195	J	0.132		mg/kg	SB-001	11 / 108	4.28E-03 / 6.33E-01	0.132	3.6	C N	BSL
75-35-4	1,1-Dichloroethene	0.00175	J	0.114		mg/kg	SB-004	6 / 49	4.28E-03 / 6.33E-01	0.114	23	NC N	BSL
563-58-6	1,1-Dichloropropene							0 / 35	4.28E-03 / 6.33E-01			N	ND/NV
87-61-6	1,2,3-Trichlorobenzene	0.000982		0.0744	J	mg/kg	SB-009	4 / 49	4.28E-03 / 6.33E-01	0.0744	6.3	NC N	BSL
96-18-4	1,2,3-Trichloropropane							0 / 35	4.28E-03 / 6.33E-01		0.0051	C N	ND
95-94-3	1,2,4,5-Tetrachlorobenzene	0.1	J	0.1	J	mg/kg	064-0025	1 / 67	1.40E-01 / 2.50E-01	0.1	2.3	NC N	BSL
120-82-1	1,2,4-Trichlorobenzene	0.000861		0.22	J	mg/kg	SB-009	5 / 49	4.28E-03 / 6.33E-01	0.22	5.8	NC N	BSL
95-63-6	1,2,4-Trimethylbenzene	0.00165	J	107	J	mg/kg	SB-116, 9.5'	13 / 40	4.28E-03 / 3.16E+00	107	5.8	NC Y	ASL
96-12-8	1,2-Dibromo-3-chloropropane							0 / 49	4.28E-03 / 6.33E-01		0.0053	C N	ND
106-93-4	1,2-Dibromoethane							0 / 49	4.28E-03 / 6.33E-01		0.036	C N	ND
95-50-1	1,2-Dichlorobenzene							0 / 49	4.28E-03 / 6.33E-01		180	NC N	ND
107-06-2	1,2-Dichloroethane							0 / 49	4.28E-03 / 6.33E-01		0.46	C N	ND
78-87-5	1,2-Dichloropropane							0 / 49	4.28E-03 / 6.33E-01		1	C N	ND
108-67-8	1,3,5-Trimethylbenzene	0.00464		45.9	J	mg/kg	SB-115, 6.9'	13 / 40	4.28E-03 / 6.33E-01	45.9	78	NC N	BSL
541-73-1	1,3-Dichlorobenzene							0 / 49	4.28E-03 / 6.33E-01			N	ND/NV
142-28-9	1,3-Dichloropropane							0 / 35	4.28E-03 / 6.33E-01		160	NC N	ND
106-46-7	1,4-Dichlorobenzene							0 / 49	4.28E-03 / 6.33E-01		2.6	C N	ND
123-91-1	1,4-Dioxane							0 18	1.00E-01 1.70E-01		5.3	C N	ND
594-20-7	2,2-Dichloropropane							0 / 35	4.28E-03 / 6.33E-01			N	ND/NV
108-60-1	2,2'-Oxybis(1-chloropropane)							0 / 65	1.40E-01 / 2.50E-01		4.9	C N	ND
58-90-2	2,3,4,6-Tetrachlorophenol	0.22		0.22		mg/kg	064-0025	1 / 67	1.40E-01 / 2.50E-01	0.22	190	NC N	BSL
95-95-4	2,4,5-Trichlorophenol							0 / 67	1.40E-01 / 2.50E-01		630	NC N	ND
88-06-2	2,4,6-Trichlorophenol							0 / 67	1.40E-01 / 2.50E-01		6.3	NC N	ND
120-83-2	2,4-Dichlorophenol							0 / 67	1.40E-01 / 2.50E-01		19	NC N	ND
105-67-9	2,4-Dimethylphenol							0 / 67	1.40E-01 / 2.50E-01		130	NC N	ND
51-28-5	2,4-Dinitrophenol							0 / 67	3.60E-01 / 1.20E+00		13	NC N	ND
121-14-2	2,4-Dinitrotoluene							0 / 67	1.40E-01 / 2.50E-01		1.7	C N	ND
606-20-2	2,6-Dinitrotoluene							0 / 67	1.40E-01 / 2.50E-01		0.36	C N	ND
78-93-3	2-Butanone	0.00331	J	0.00331	J	mg/kg	1002	1 / 49	4.28E-03 / 6.33E-01	0.00331	2700	NC N	BSL
91-58-7	2-Chloronaphthalene							0 / 67	1.40E-01 / 2.50E-01		480	NC N	ND
95-57-8	2-Chlorophenol							0 / 65	1.40E-01 / 2.50E-01		39	NC N	ND
95-49-8	2-Chlorotoluene							0 / 35	4.28E-03 / 6.33E-01			N	ND/NV
591-78-6	2-Hexanone							0 / 49	4.28E-03 / 6.33E-01		20	NC N	ND
91-57-6	2-Methylnaphthalene	0.12	J	0.36		mg/kg	064-007	5 / 68	1.40E-01 / 2.50E-01	0.36	24	NC N	BSL
95-48-7	2-Methylphenol							0 / 65	1.40E-01 / 2.50E-01		320	NC N	ND
2051-61-8	2-MoCB	0.00189		0.00189		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.00189		N	NV
88-74-4	2-Nitroaniline							0 / 67	1.40E-01 / 4.90E-01		63	NC N	ND
88-75-5	2-Nitrophenol							0 / 67	1.40E-01 / 2.50E-01			N	ND/NV
91-94-1	3,3'-Dichlorobenzidine							0 / 68	1.40E-01 / 2.50E-01		1.2	C N	ND
101-55-3	4-Bromophenyl-phenylether							0 / 68	1.40E-01 / 2.50E-01			N	ND/NV
59-50-7	4-Chloro-3-methylphenol							0 / 67	1.40E-01 / 2.50E-01		630	NC N	ND
106-47-8	4-Chloroaniline							0 / 67	1.40E-01 / 2.50E-01		2.7	C N	ND
7005-72-3	4-Chlorophenyl-phenylether							0 / 67	1.40E-01 / 2.50E-01			N	ND/NV
106-43-4	4-Chlorotoluene							0 / 35	4.28E-03 / 6.33E-01			N	ND/NV
13029-08-8	4-DiCB	0.00225		0.00225		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.00225		N	NV
108-10-1	4-Methyl-2-pentanone							0 / 49	4.28E-03 / 6.33E-01		530	NC N	ND
106-44-5	4-Methylphenol							0 / 65	1.40E-01 / 2.50E-01		630	NC N	ND
100-01-6	4-Nitroaniline							0 / 67	1.40E-01 / 4.90E-01		25	NC N	ND
100-02-7	4-Nitrophenol							0 / 67	1.40E-01 / 4.90E-01			N	ND/NV
99-09-2	3-Nitroaniline							0 / 67	1.40E-01 / 4.90E-01			N	ND/NV
534-52-1	4,6-Dinitro-2-methylphenol							0 / 68	3.60E-01 / 1.20E+00		0.51	NC N	ND
83-32-9	Acenaphthene							0 / 67	1.40E-01 / 2.50E-01		360	NC N	ND
208-96-8	Acenaphthylene							0 / 67	1.40E-01 / 2.50E-01		170[d]	NC N	ND
67-64-1	Acetone	0.00286		0.14	J	mg/kg	SB-007	12 / 49	1.00E-02 / 2.53E+00	0.14	6100	NC N	BSL
98-86-2	Acetophenone							0 / 65	1.40E-01 / 2.50E-01		780	NC N	ND
120-12-7	Anthracene	0.092	J	0.092	J	mg/kg	064-0019	1 / 68	1.40E-01 / 2.50E-01	0.092	1800	NC N	BSL
12674-11-2	Aroclor-1016	0.36		0.36		mg/kg	064-0012	1 / 68	3.60E-02 / 4.90E-02	0.36	0.41	NC Y	TA
11104-28-2	Aroclor-1221							0 / 68	3.60E-02 / 8.50E-02		0.17	C N	ND
11141-16-5	Aroclor-1232							0 / 68	3.60E-02 / 4.90E-02		0.17	C N	ND
53469-21-9	Aroclor-1242							0 / 68	3.60E-02 / 4.90E-02		0.23	C N	ND
12672-29-6	Aroclor-1248							0 / 68	3.60E-02 / 4.90E-02		0.23	C N	ND
11097-69-1	Aroclor-1254	0.029	J	0.12		mg/kg	064-0110	3 / 68	3.60E-02 / 4.90E-02	0.12	0.12	NC Y	ASL, TA
11096-82-5	Aroclor-1260	0.0086	J	31		mg/kg	064-0012	8 / 68	3.60E-02 / 4.90E-02	31	0.24	C Y	ASL, TA
37324-23-5	Aroclor-1262							0 / 68	3.60E-02 / 4.90E-02			N	ND/NV
11100-14-4	Aroclor-1268							0 / 68	3.60E-02 / 4.90E-02			N	ND/NV
11097-69-1	Total Aroclor	0.0086	J	31.36		mg/kg	064-0012	8 / 68	/	31.36	0.12	NC Y	ASL
1912-24-9	Atrazine							0 / 68	1.40E-01 / 2.50E-01		2.4	C N	ND
100-52-7	Benzaldehyde							0 / 65	1.40E-01 / 2.50E-01		780	NC N	ND
71-43-2	Benzene							0 / 49	4.28E-03 / 6.33E-01		1.2	C Y	KHC
56-55-3	Benzo(a)anthracene	0.091	J	0.25		mg/kg	064-0020	3 / 68	1.40E-01 / 2.50E-01	0.25	0.16	C Y	ASL
50-32-8	Benzo(a)pyrene	0.17	J	0.21	J	mg/kg	064-0020	2 / 68	1.40E-01 / 2.50E-01	0.21	0.016	C Y	ASL
205-99-2	Benzo(b)fluoranthene	0.083	J	0.23		mg/kg	064-0020	3 / 68	1.40E-01 / 2.50E-01	0.23	0.16	C Y	ASL
191-24-2	Benzo(g,h,i)perylene	0.098	J	0.11	J	mg/kg	064-0020	2 / 68	1.40E-01 / 2.50E-01	0.11	170[d]	NC N	BSL
207-08-9	Benzo(k)fluoranthene	0.087	J	0.2	J	mg/kg	064-0020	3 / 68	1.40E-01 / 2.50E-01	0.2	1.6	C N	BSL
111-91-1	Bis(2-chloroethoxy)methane							0 / 67	1.40E-01 / 2.50E-01		19	NC N	ND
111-44-4	Bis(2-chloroethyl)ether							0 / 65	1.40E-01 / 2.50E-01		0.23	C N	ND
117-81-7	Bis(2-ethylhexyl)phthalate	0.087	J	2.3		mg/kg	064-0035	19 / 68	1.40E-01 / 2.50E-01	2.3	39	C N	BSL
108-86-1	Bromobenzene							0 / 35	4.28E-03 / 6.33E-01			N	ND/NV
74-97-5	Bromochloromethane							0 14	5.00E-03 6.80E-03		15	NC N	ND
75-27-4	Bromodichloromethane							0 / 49	4.28E-03 / 6.33E-01		0.29	C N	ND
75-25-2	Bromoform							0 / 49	4.28E-03 / 6.33E-01		19	C N	ND
74-83-9	Bromomethane	0.773		1.19		mg/kg	SB-112, 9.5'	2 / 51	4.28E-03 / 6.33E-01	1.19	0.68	NC Y	ASL
85-68-7	Butylbenzylphthalate							0 / 68	1.40E-01 / 2.50E-01		290	C N	ND
105-60-2	Caprolactam							0 / 67	1.40E-01 / 2.50E-01		3100	NC N	ND
86-74-8	Carbazole							0 / 68	1.40E-01 / 2.50E-01			N	ND/NV
75-15-0	Carbon disulfide							0 / 49	4.28E-03 / 6.33E-01		77	NC N	ND
56-23-5	Carbon tetrachloride							0 / 49	4.28E-03 / 6.33E-01		0.65	C N	ND
108-90-7	Chlorobenzene							0 / 49	4.28E-03 / 6.33E-01		28	NC N	ND
75-00-3	Chloroethane							0 / 49	4.28E-03 / 6.33E-01		1400	NC N	ND
67-66-3	Chloroform	0.00146	J	0.00146	J	mg/kg	SB-001	1 / 49	4.28E-03 / 6.33E-01	0.00146	0.32	C N	BSL
74-87-3	Chloromethane	0.169		0.169		mg/kg	SB-112, 9.5'	1 / 50	4.28E-03 / 6.33E-01	0.169	11	NC N	BSL
218-01-9	Chrysene	0.087	J	0.27		mg/kg	064-0020	3 / 68	1.40E-01 / 2.50E-01	0.27	16	C N	BSL
156-59-2	cis-1,2-Dichloroethene	0.000676		0.924		mg/kg	SB-012a	28 / 109	4.28E-03 / 6.33E-01	0.924	16	NC N	BSL
10061-01-5	cis-1,3-Dichloropropene							0 / 49	4.28E-03 / 6.33E-01			N	ND/NV
110-82-7	Cyclohexane							0 14	5.00E-03 6.80E-03		650	NC N	ND
53-70-3	Dibenzo(a,h)anthracene							0 / 68	1.40E-01 / 2.50E-01		0.016	C N	RL ASL
132-64-9	Dibenzofuran							0 / 67	1.40E-01 / 2.50E-01		7.3	NC N	ND
124-48-1	Dibromochloromethane							0 / 49	4.28E-03 / 6.33E-01		0.75	C N	ND
74-95-3	Dibromomethane							0 / 35	4.28E-03 / 6.33E-01			N	ND/NV
75-71-8	Dichlorodifluoromethane							0 / 49	4.28E-03 / 6.33E-01		8.7	NC N	ND
84-66-2	Diethylphthalate	0.22		0.67		mg/kg	BH1-10	4 / 67	1.40E-01 / 2.50E-01	0.67	5100	NC N	BSL
131-11-3	Dimethylphthalate							0 / 67	1.40E-01 / 2.50E-01			N	ND/NV
84-74-2	Di-n-butylphthalate	0.082	J	0.16	J	mg/kg	064-0007	4 / 68	1.40E-01 / 2.50E-01	0.16	630	NC N	BSL
117-84-0	Di-n-octylphthalate							0 / 68	1.40E-01 / 2.50E-01		63	NC N	ND
	PCB Congeners												
60145-21-3	103-PeCB							0 / 9	4.87E-06 / 2.47E-04		0.23	C N	ND
56558-16-8	104-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
32598-14-4	105-PeCB	0.00000637		0.00135		mg/kg	064-0084	7 / 9	1.95E-06 / 9.89E-05	0.00135	0.12	C Y	TEQ
70424-69-0	106-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
70424-68-9	107-PeCB	0.0000226		0.000188		mg/kg	064-0084	3 / 9	3.90E-06 / 1.98E-04	0.000188	0.23	C N	BSL
70362-41-3/ 70424-70-3	108-PeCB/124-PeCB	0.0000278		0.000133		mg/kg	064-0084	2 / 9	3.90E-06 / 1.98E-04	0.000133	0.23	C N	BSL
33146-45-1	10-DiCB	0.00021		0.00021		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.00021	0.23	C N	BSL
38380-03-9/ 74472-38-1	110-PeCB/115-PeCB	0.0000264		0.00432		mg/kg	064-0084	9 / 9	3.90E-06 / 1.98E-04	0.00432	0.23	C N	BSL
39635-32-0	111-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
74472-36-9	112-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
74472-37-0	114-PeCB	0.0000113		0.0000827		mg/kg	064-0084	2 / 9	1.95E-06 / 9.89E-05	0.0000827	0.12	C Y	TEQ
31508-00-6	118-PeCB	0.0000134		0.00326		mg/kg	064-0084	9 / 9	3.90E-06 / 1.98E-04	0.00326	0.12	C Y	TEQ
2050-67-1	11-DiCB							0 / 9	4.87E-05 / 2.47E-03		0.23	C N	ND
68194-12-7	120-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
56558-18-0	121-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
76842-07-4	122-PeCB	0.0000334		0.0000334		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000334	0.23	C N	BSL
65510-44-3	123-PeCB	0.0000116		0.0000397		mg/kg	064-0084	2 / 9	1.95E-06 / 9.89E-05	0.0000397	0.12	C Y	TEQ
57465-28-8	126-PeCB							0 / 9	1.95E-06 / 9.89E-05		3.7E-05	C Y	TEQ
39635-33-1	127-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
38380-07-3/ 41411-63-6	128-HxCB/166-HxCB	0.00000475		0.000705		mg/kg	064-0084	7 / 9	3.90E-06 / 1.98E-04	0.000705	0.23	C N	BSL
55215-18-4/ 35065-28-2/ 74472-44-9	129-HxCB/138-HxCB/163-HxCB	0.0000292		0.0052		mg/kg	064-0084	9 / 9	5.85E-06 / 2.97E-04	0.0052	0.23	C N	BSL
2974-92-7/ 2974-90-5	12-DiCB/13-DiCB							0 / 9	7.79E-06 / 3.95E-04		0.23	C N	ND
52663-66-8	130-HxCB	0.00000232		0.000309		mg/kg	064-0084	7 / 9	1.95E-06 / 9.89E-05	0.000309	0.23	C N	BSL
61798-70-7	131-HxCB	0.0000888		0.0000888		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000888	0.23	C N	BSL
38380-05-1	132-HxCB	0.0000094		0.00162		mg/kg	064-0084	9 / 9	1.95E-06 / 9.89E-05	0.00162	0.23	C N	BSL
35694-04-3	133-HxCB	0.0000123		0.0000611		mg/kg	064-0084	3 / 9	1.95E-06 / 9.89E-05	0.0000611	0.23	C N	BSL
52704-70-8	134-HxCB	0.00000984		0.000286		mg/kg	064-0084	5 / 9	1.95E-06 / 9.89E-05	0.000286	0.23	C N	BSL
52744-13-5/ 52663-63-5	135-HxCB/151-HxCB	0.00000966		0.00146		mg/kg	064-0084	9 / 9	3.90E-06 / 1.98E-04	0.00146	0.23	C N	BSL
38411-22-2	136-HxCB	0.00000307		0.000527		mg/kg	064-0084	9 / 9	1.95E-06 / 9.89E-05	0.000527	0.23	C N	BSL
35694-06-5	137-HxCB	0.00000234		0.000253		mg/kg	064-0084	7 / 9	1.95E-06 / 9.89E-05	0.000253	0.23	C N	BSL
56030-56-9/ 59291-64-4	139-HxCB/140-HxCB	0.0000914		0.0000914		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000914	0.23	C N	BSL
52712-04-6	141-HxCB	0.000039		0.001		mg/kg	064-0084	8 / 9	3.90E-06 / 1.98E-04	0.001	0.23	C N	BSL
41411-61-4	142-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
68194-15-0	143-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
68194-14-9	144-HxCB	0.0000102		0.000352		mg/kg	064-0084	6 / 9	1.95E-06 / 9.89E-05	0.000352	0.23	C N	BSL
74472-40-5	145-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
51908-16-8	146-HxCB	0.0000042		0.00067		mg/kg	064-0084	9 / 9	1.95E-06 / 9.89E-05	0.00067	0.23	C N	BSL
68194-13-8/ 38380-04-0	147-HxCB/149-HxCB	0.0000224		0.00338		mg/kg	064-0084	9 / 9	7.79E-06 / 3.95E-04	0.00338	0.23	C N	BSL
74472-41-6	148-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
34883-41-5	14-DiCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C N	ND
68194-08-1	150-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
68194-09-2	152-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
35065-27-1/ 59291-65-5	153-HxCB/168-HxCB	0.000020000		0.0037		mg/kg	064-0084	9 / 9	7.79E-06 / 3.95E-04	0.0037	0.23	C N	BSL
60145-22-4	154-HxCB	0.0000503		0.0000503		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000503	0.23	C N	BSL
33979-03-2	155-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
38380-08-4/ 69782-90-7	156-HxCB/157-HxCB	0.0000256		0.000709		mg/kg	064-0084	6 / 9	3.90E-06 / 1.98E-04	0.000709	0.12	C Y	TEQ
74472-42-7	158-HxCB	0.00000352		0.00064		mg/kg	064-0084	8 / 9	1.95E-06 / 9.89E-05	0.00064	0.23	C N	BSL
39635-35-3	159-HxCB	0.000034		0.000034		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.000034	0.23	C N	BSL
2050-68-2	15-DiCB							0 / 9	1.95E-05 / 9.89E-04		0.23	C N	ND
41411-62-5	160-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
74472-43-8	161-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
39635-34-2	162-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
74472-45-0	164-HxCB	0.0000201		0.00037		mg/kg	064-0084	7 / 9	1.95E-06 / 9.89E-05	0.00037	0.23	C N	BSL
74472-46-1	165-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C N	ND
52663-72-6	167-HxCB	0.0000117		0.00025		mg/kg	064-0084	6 / 9	1.95E-06 / 9.89E-05	0.00025	0.12	C Y	TEQ

CAS Registry Number	Analyte[c]	Minimum Detected Value	Minimum Qualifier	Maximum Detected Value	Maximum Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Screening Concentration		COPC Flag	Rationale for Selection[b]
32774-16-6	169-HxCB							0 / 9	1.95E-06 / 9.89E-05		0.00012	C	Y TEQ
38444-78-9	16-TrCB	0.0000809		0.0000809		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000809	0.23	C	N BSL
35065-30-6	170-HpCB	0.00000754		0.0013		mg/kg	064-0084	9 / 9	1.95E-06 / 9.89E-05	0.0013	0.23	C	N BSL
52663-71-5/ 68194-16-1	171-HpCB/173-HpCB	0.0000294		0.000549		mg/kg	064-0084	6 / 9	3.90E-06 / 1.98E-04	0.000549	0.23	C	N BSL
52663-74-8	172-HpCB	0.00000252		0.000281		mg/kg	064-0084	8 / 9	1.95E-06 / 9.89E-05	0.000281	0.23	C	N BSL
38411-25-5	174-HpCB	0.00000869		0.00136		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.00136	0.23	C	N BSL
40186-70-7	175-HpCB	0.000111		0.000111		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.000111	0.23	C	N BSL
52663-65-7	176-HpCB	0.0000108		0.00022		mg/kg	064-0084	6 / 9	1.95E-06 / 9.89E-05	0.00022	0.23	C	N BSL
52663-70-4	177-HpCB	0.00000486		0.000624		mg/kg	064-0084	9 / 9	1.95E-06 / 9.89E-05	0.000624	0.23	C	N BSL
52663-67-9	178-HpCB	0.00000217		0.000266		mg/kg	064-0158	8 / 9	1.95E-06 / 9.89E-05	0.000266	0.23	C	N BSL
52663-64-6	179-HpCB	0.00000398		0.000596		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.000596	0.23	C	N BSL
37680-66-3	17-TrCB	0.0000885		0.0000885		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000885	0.23	C	N BSL
35065-29-3/ 69782-91-8	180-HpCB/193-HpCB	0.0000195		0.003		mg/kg	064-0084	9 / 9	3.90E-06 / 1.98E-04	0.003	0.23	C	N BSL
74472-47-2	181-HpCB	0.000027		0.000027		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.000027	0.23	C	N BSL
60145-23-5	182-HpCB	0.000022		0.000022		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.000022	0.23	C	N BSL
52663-69-1/ 52712-05-7	183-HpCB/185-HpCB	0.0000066		0.00126		mg/kg	064-0084	9 / 9	3.90E-06 / 1.98E-04	0.00126	0.23	C	N BSL
74472-48-3	184-HpCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
74472-49-4	186-HpCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
52663-68-0	187-HpCB	0.0000112		0.00181		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.00181	0.23	C	N BSL
74487-85-7	188-HpCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
39635-31-9	189-HpCB	0.0000983		0.0000983		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000983	0.12	C	Y TEQ
37680-65-2/ 35693-92-6	18-TrCB/30-TrCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
41411-64-7	190-HpCB	0.0000117		0.000364		mg/kg	064-0084	7 / 9	1.95E-06 / 9.89E-05	0.000364	0.23	C	N BSL
74472-50-7	191-HpCB	0.000103		0.000103		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.000103	0.23	C	N BSL
74472-51-8	192-HpCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
35694-08-7	194-OcCB	0.00000691		0.00103		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.00103	0.23	C	N BSL
52663-78-2	195-OcCB	0.00000214		0.000334		mg/kg	064-0158	8 / 9	1.95E-06 / 9.89E-05	0.000334	0.23	C	N BSL
42740-50-1	196-OcCB	0.00000345		0.000572		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.000572	0.23	C	N BSL
33091-17-7/ 52663-73-7	197-OcCB/200-OcCB	0.000137		0.000137		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.000137	0.23	C	N BSL
68194-17-2/ 52663-75-9	198-OcCB/199-OcCB	0.00000893		0.00134		mg/kg	064-0158	9 / 9	3.90E-06 / 1.98E-04	0.00134	0.23	C	N BSL
38444-73-4	19-TrCB	0.0000276		0.0000276		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000276	0.23	C	N BSL
2051-60-7	1-MoCB	0.0000264		0.0413	J	mg/kg	064-0084	3 / 9	4.87E-06 / 2.47E-04	0.0413	0.23	C	N BSL
40186-71-8	201-OcCB	0.0000107		0.000156		mg/kg	064-0158	5 / 9	1.95E-06 / 9.89E-05	0.000156	0.23	C	N BSL
2136-99-4	202-OcCB	0.00000242		0.000277		mg/kg	064-0158	8 / 9	1.95E-06 / 9.89E-05	0.000277	0.23	C	N BSL
52663-76-0	203-OcCB	0.00000568		0.000849		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.000849	0.23	C	N BSL
74472-52-9	204-OcCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
74472-53-0	205-OcCB	0.0000572		0.0000572		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000572	0.23	C	N BSL
40186-72-9	206-NoCB	0.00000949		0.000595		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.000595	0.23	C	N BSL
52663-79-3	207-NoCB	0.0000145		0.0000382		mg/kg	064-0084	3 / 9	1.95E-06 / 9.89E-05	0.0000382	0.23	C	N BSL
52663-77-1	208-NoCB	0.00000331		0.000135		mg/kg	064-0158	9 / 9	1.95E-06 / 9.89E-05	0.000135	0.23	C	N BSL
2051-24-3	209-DeCB	0.00000725		0.000577		mg/kg	064-0113	7 / 9	1.95E-06 / 9.89E-05	0.000577	0.23	C	N BSL
38444-84-7/ 7012-37-5	20-TrCB/28-TrCB							0 / 9	1.95E-05 / 9.89E-04		0.23	C	N ND
55702-46-0/ 38444-86-9	21-TrCB/33-TrCB							0 / 9	7.79E-06 / 3.95E-04		0.23	C	N ND
38444-85-8	22-TrCB	0.0000632		0.0000632		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000632	0.23	C	N BSL
55720-44-0	23-TrCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
55702-45-9	24-TrCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
55712-37-3	25-TrCB	0.0000231		0.0000231		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000231	0.23	C	N BSL
38444-81-4/ 15862-07-4	26-TrCB/29-TrCB	0.0000478		0.0000478		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000478	0.23	C	N BSL
38444-76-7	27-TrCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
16606-02-3	31-TrCB	0.000203		0.000203		mg/kg	064-0084	1 / 9	9.74E-06 / 4.94E-04	0.000203	0.23	C	N BSL
38444-77-8	32-TrCB	0.0000444		0.0000444		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000444	0.23	C	N BSL
37680-68-5	34-TrCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
37680-69-6	35-TrCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
38444-87-0	36-TrCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
38444-90-5	37-TrCB							0 / 9	1.95E-05 / 9.89E-04		0.23	C	N ND
53555-66-1	38-TrCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
38444-88-1	39-TrCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
2051-62-9	3-MoCB	0.00444		0.00444		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.00444	0.23	C	N BSL
38444-93-8/ 41464-46-4	40-TeCB/71-TeCB	0.000144		0.000144		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.000144	0.23	C	N BSL
52663-59-9	41-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
36559-22-5	42-TeCB	0.0000749		0.0000749		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000749	0.23	C	N BSL
70362-46-8	43-TeCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
41464-39-5/ 2437-79-8/ 33284-54-7	44-TeCB/47-TeCB/65-TeCB	0.000771		0.000771		mg/kg	064-0084	1 / 9	5.85E-06 / 2.97E-04	0.000771	0.23	C	N BSL
70362-45-7/ 68194-04-7	45-TeCB/51-TeCB	0.000055		0.000055		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.000055	0.23	C	N BSL
41464-47-5	46-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
70362-47-9	48-TeCB	0.0000654		0.0000654		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000654	0.23	C	N BSL
41464-40-8/ 60233-24-1	49-TeCB/69-TeCB	0.000392		0.000392		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.000392	0.23	C	N BSL
62796-65-0/ 41464-41-9	50-TeCB/53-TeCB	0.0000656		0.0000656		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000656	0.23	C	N BSL
35693-99-3	52-TeCB	0.00000464		0.00182		mg/kg	064-0084	9 / 9	1.95E-06 / 9.89E-05	0.00182	0.23	C	N BSL
15968-05-5	54-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
74338-24-2	55-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
41464-43-1	56-TeCB	0.000164		0.000164		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.000164	0.23	C	N BSL
70424-67-8	57-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
41464-49-7	58-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
74472-33-6/ 54230-22-7/ 32598-12-2	59-TeCB/62-TeCB/75-TeCB							0 / 9	5.85E-06 / 2.97E-04		0.23	C	N ND
16605-91-7	5-DiCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
33025-41-1	60-TeCB	0.0000679		0.0000679		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000679	0.23	C	N BSL
33284-53-6/ 32598-11-1/ 32690-93-0/ 70362-48-0	61-TeCB/70-TeCB/74-TeCB/76-TeCB	0.0000443		0.00158		mg/kg	064-0084	4 / 9	7.79E-06 / 3.95E-04	0.00158	0.23	C	N BSL
74472-34-7	63-TeCB							0 / 9	4.87E-06 / 2.47E-04		0.23	C	N ND
52663-58-8	64-TeCB	0.0000136		0.000258		mg/kg	064-0084	3 / 9	1.95E-06 / 9.89E-05	0.000258	0.23	C	N BSL
32598-10-0	66-TeCB	0.0000295		0.000355		mg/kg	064-0084	3 / 9	4.87E-06 / 2.47E-04	0.000355	0.23	C	N BSL
73575-53-8	67-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
73575-52-7	68-TeCB	0.0000208		0.0000208		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000208	0.23	C	N BSL
25569-80-6	6-DiCB	0.0000945		0.0000945		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000945	0.23	C	N BSL
41464-42-0	72-TeCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
74338-23-1	73-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
32598-13-3	77-TeCB	0.0000204		0.0000204		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000204	0.038	C	Y TEQ
70362-49-1	78-TeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
41464-48-6	79-TeCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
33284-50-3	7-DiCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
33284-52-5	80-TeCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
70362-50-4	81-TeCB	0.0000319		0.0000319		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000319	0.012	C	Y TEQ
52663-62-4	82-PeCB	0.000037		0.000371		mg/kg	064-0084	2 / 9	4.87E-06 / 2.47E-04	0.000371	0.23	C	N BSL
60145-20-2	83-PeCB	0.0000162		0.000165		mg/kg	064-0084	3 / 9	1.95E-06 / 9.89E-05	0.000165	0.23	C	N BSL
52663-60-2	84-PeCB	0.00000285		0.000902		mg/kg	064-0084	7 / 9	1.95E-06 / 9.89E-05	0.000902	0.23	C	N BSL
65510-45-4 18259-05-7/ 68194-11-6	85-PeCB/116-PeCB/117-PeCB	0.0000395		0.000521		mg/kg	064-0084	5 / 9	5.85E-06 / 2.97E-04	0.000521	0.23	C	N BSL
55312-69-1/ 38380-02-8/ 41464-51-1/ 74472-35-8/ 56558-17-9/ 74472-39-2	86-PeCB/87-PeCB/97-PeCB/109-PeCB/119-PeCB/125-PeCB	0.000067		0.00259		mg/kg	064-0084	6 / 9	1.17E-05 / 5.93E-04	0.00259	0.23	C	N BSL
55215-17-3/68194-05-8	88-PeCB/91-PeCB	0.0000487		0.000379		mg/kg	064-0084	3 / 9	3.90E-06 / 1.98E-04	0.000379	0.23	C	N BSL
73575-57-2	89-PeCB	0.0000288		0.0000288		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000288	0.23	C	N BSL
34883-43-7	8-DiCB	0.000256		0.000256		mg/kg	064-0084	1 / 9	1.95E-05 / 9.89E-04	0.000256	0.23	C	N BSL
68194-07-0/ 37680-73-2/ 68194-10-5	90-PeCB/101-PeCB/113-PeCB	0.0000115		0.00371		mg/kg	064-0084	9 / 9	5.85E-06 / 2.97E-04	0.00371	0.23	C	N BSL
52663-61-3	92-PeCB	0.000003		0.000639		mg/kg	064-0084	7 / 9	1.95E-06 / 9.89E-05	0.000639	0.23	C	N BSL
73575-56-1/ 39485-83-1	93-PeCB/100-PeCB							0 / 9	3.90E-06 / 1.98E-04		0.23	C	N ND
73575-55-0	94-PeCB							0 / 9	1.95E-06 / 9.89E-05		0.23	C	N ND
38379-99-6	95-PeCB	0.0000117		0.00262		mg/kg	064-0084	9 / 9	3.90E-06 / 1.98E-04	0.00262	0.23	C	N BSL
73575-54-9	96-PeCB	0.0000226		0.0000226		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000226	0.23	C	N BSL
60233-25-2/ 68194-06-9	98-PeCB/102-PeCB	0.0000831		0.0000831		mg/kg	064-0084	1 / 9	3.90E-06 / 1.98E-04	0.0000831	0.23	C	N BSL
38380-01-7	99-PeCB	0.00000511		0.00143		mg/kg	064-0084	8 / 9	1.95E-06 / 9.89E-05	0.00143	0.23	C	N BSL
34883-39-1	9-DiCB	0.0000287		0.0000287		mg/kg	064-0084	1 / 9	1.95E-06 / 9.89E-05	0.0000287	0.23	C	N BSL
1336-36-3	Total PCB Congeners	0.000313		0.116		mg/kg	064-0084	9 / 9	1.95E-06 / 9.89E-05	0.116	0.12	C	N BSL
100-41-4	Ethylbenzene	0.000582		5.56	J	mg/kg	SB-116, 9.5'	8 / 52	4.28E-03 / 6.33E-01	5.56	5.8	C	N BSL
206-44-0	Fluoranthene	0.097	J	0.51	J	mg/kg	064-0020	5 / 68	1.40E-01 / 2.50E-01	0.51	240	NC	N BSL
86-73-7	Fluorene							0 / 67	1.40E-01 / 2.50E-01		240	NC	N ND
118-74-1	Hexachlorobenzene							0 / 68	1.40E-01 / 2.50E-01		0.21	C	N ND
87-68-3	Hexachlorobutadiene							0 / 102	4.28E-03 / 6.33E-01		1.2	C	N ND
77-47-4	Hexachlorocyclopentadiene							0 / 67	1.40E-01 / 2.50E-01		0.18	NC	N ND
67-72-1	Hexachloroethane							0 / 65	1.40E-01 / 2.50E-01		1.8	C	N ND
193-39-5	Indeno(1,2,3-cd)pyrene	0.095	J	0.11	J	mg/kg	064-0020	2 / 68	1.40E-01 / 2.50E-01	0.11	0.16	C	N BSL
78-59-1	Isophorone							0 / 67	1.40E-01 / 2.50E-01		570	C	N ND
98-82-8	Isopropylbenzene	0.000436		5.76	J	mg/kg	SB-116, 9.5'	10 / 52	4.28E-03 / 6.33E-01	5.76	190	NC	N BSL
79-20-9	Methyl acetate							0 / 14	5.00E-03 / 6.80E-03		7800	NC	N ND
1634-04-4	Methyl tert-butyl ether							0 / 49	4.28E-03 / 6.33E-01		47	C	N ND
108-87-2	Methylcyclohexane							0 / 14	5.00E-03 / 6.80E-03				N ND/NV
75-09-2	Methylene chloride	0.0029	J	0.027		mg/kg	064-0051	3 / 49	4.28E-03 / 6.33E-01	0.027	35	NC	N BSL
91-20-3	Naphthalene	0.00076		12.6	J	mg/kg	SB-115, 6.9'	15 / 106	4.28E-03 / 6.33E-01	12.6	3.8	C	Y ASL
104-51-8	n-Butylbenzene							0 / 35	4.28E-03 / 6.33E-01				N ND/NV
98-95-3	Nitrobenzene							0 / 67	1.40E-01 / 2.50E-01		5.1	C	N ND
621-64-7	N-Nitroso-di-n-propylamine							0 / 65	1.40E-01 / 2.50E-01		0.078	C	N RL ASL
86-30-6	N-Nitrosodiphenylamine							0 / 68	1.40E-01 / 2.50E-01		110	C	N ND
103-65-1	n-Propylbenzene	0.00132		12.8	J	mg/kg	SB-116, 9.5'	10 / 38	4.28E-03 / 6.33E-01	12.8	380	NC	N BSL
95-47-6	o-Xylene	0.000689		6.98	J	mg/kg	SB-116, 9.5'	9 / 52	4.28E-03 / 6.33E-01	6.98	65	NC	N BSL
108-38-3/106-42-3	p&m-Xylene	0.00273		11.2	J	mg/kg	SB-127, 6.5'	11 / 52	5.00E-03 / 1.27E+00	11.2	55	NC	N BSL
87-86-5	Pentachlorophenol							0 / 68	1.40E-01 / 4.90E-01		1	C	N ND
85-01-8	Phenanthrene	0.088	J	0.42		mg/kg	064-0007	6 / 68	1.40E-01 / 2.50E-01	0.42	170[d]	NC	N BSL
108-95-2	Phenol							0 / 65	1.40E-01 / 2.50E-01		1900	NC	N ND
99-87-6	p-Isopropyltoluene	0.00235		19.6	J	mg/kg	SB-115, 6.9'	13 / 41	4.28E-03 / 6.33E-01	19.6			N NV
129-00-0	Pyrene	0.098	J	0.34		mg/kg	064-0019	4 / 68	1.40E-01 / 2.50E-01	0.34	180	NC	N BSL
135-98-8	sec-Butylbenzene	0.00144		11.3	J	mg/kg	SB-116, 9.5'	13 / 41	4.28E-03 / 6.33E-01	11.3	780	NC	N BSL
100-42-5	Styrene							0 / 49	4.28E-03 / 6.33E-01		600	NC	N ND
98-06-6	tert-Butylbenzene							0 / 35	4.28E-03 / 6.33E-01				N ND/NV
127-18-4	Tetrachloroethene	0.00724		0.00724		mg/kg	SB-001	1 / 49	4.28E-03 / 6.33E-01	0.00724	8.1	NC	N BSL
108-88-3	Toluene	0.000898		0.406	J	mg/kg	SB-115, 6.9'	11 / 50	4.28E-03 / 6.33E-01	0.406	490	NC	N BSL
156-60-5	trans-1,2-Dichloroethene	0.00157	J	0.00752		mg/kg	SB-001	4 / 108	4.28E-03 / 6.33E-01	0.00752	160	NC	N BSL
10061-02-6	trans-1,3-Dichloropropene							0 / 49	4.28E-03 / 6.33E-01				N ND/NV
79-01-6	Trichloroethene	0.000659		1.95		mg/kg	SB-009	43 / 110	4.28E-03 / 6.33E-01	1.95	0.41	NC	Y ASL
75-69-4	Trichlorofluoromethane							0 / 49	4.28E-03 / 6.33E-01		73	NC	N ND
75-01-4	Vinyl chloride	0.00116		0.00116		mg/kg	BH3-10	1 / 49	4.28E-03 / 6.33E-01	0.00116	0.059	C	Y KHC

[a]Screening toxicity values are the USEPA Regional Screening Levels (RSLs) for Residential Soil (June 2015). RSLs correspond to 1E-06 cancer risk or a hazard quotient of 0.1, whichever is lower.

[b]Selection Rationale Codes:

ASL = At or above screening level
BSL = Below screening level
KHC = Known Human carcinogen
ND = Not detected
EN = Essential nutrient
NV = No toxicity value or RSL; this chemical cannot be evaluated quantitatively in the risk assessment
TA = Component of Total Aroclor which is identified as a COPC.

TEQ = Toxicity equivalent; Relative potency of individual congeners compared to 2,3,7,8-TCDD (USEPA 2010). Compound is included because it is a contributor to TEQ for 2,3,7,8-TCDD per WHO (2005). Dioxin-like PCB congeners were evaluated using the EPA TEQ calculator which applies the mathematical techniques described by Helsel (2005).
RL ASL = Reporting level above screening level, will be addressed as an uncertainty

[c]Total Aroclor and Total PCB Congeners concentrations were calculated by summing detected individual Aroclors or individual PCB congeners, respectively. No RL reported for Total Aroclors. The screening concentrations for Total Aroclor and Total PCB Congeners were compared to the RSL for Aroclor-1254. Screening concentrations for non-dioxin-like PCB congeners were compared to the RSL for Polychlorinated Biphenyls (high risk).

[d]No screening value available, the screening value for pyrene was used as a surrogate.

Table 3.1
Medium-Specific Exposure Point Concentration Summary for Surface Soil
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Time Frame: Current/Future
Medium: Surface Soil (0 to 12 inches)
Exposure Medium: Surface Soil (0 to 12 inches)
Exposure Point: Surface Soil at the Vestal Site

Analyte	Maximum Detected Concentration (mg/kg)	Qualifier	Detection Frequency	Arithmetic Mean Detected Concentration (mg/kg)	Standard Deviation (mg/kg)	95% UCL[a] (mg/kg)	UCL Statistic[a]	Selected Exposure Point Concentration for both RME and CT risks		
								Value	Units	Rationale[a]
Aroclor-1254	0.12		2 / 26	0.086	0.05	0.05	95% KM (t) UCL	0.0484	mg/kg	UCL-NP
Aroclor-1260	0.079	NJ	2 / 26	0.047	0.05	---	---	0.0790	mg/kg	Max
Total Aroclor[b]	0.199	J	3 / 3	0.089	0.10	—	—	0.199	mg/kg	Max
Benzene	ND		0 / 15	ND	—	—	—	0.007	mg/kg	Max RL
Benzo(a)anthracene	0.21		2 / 26	0.151	0.08	0.11	95% KM (t) UCL	0.11	mg/kg	UCL-NP
Benzo(a)pyrene	0.17	J	1 / 26	0.170	—	—	—	0.17	mg/kg	Max
Benzo(b)fluoranthene	0.19	J	2 / 26	0.137	0.08	0.151	95% KM (t) UCL	0.15	mg/kg	UCL-NP
Trichloroethene	0.0447	J	1 / 16	0.005	0.010	—	—	0.04470	mg/kg	Max
Vinyl chloride	ND		0 / 15	ND	—	—	—	0.007	mg/kg	Max RL
Dioxin-Like PCBs TEQ[c]	9.74E-07	J	— / —	—	—	—	—	9.74E-07	mg/kg	Max

ND = Not detected
J = Estimated value
Max RL = Maximum reporting limit
mg/kg = milligrams per kilogram
NJ = Presumptively present at approximate quantity
UCL = Upper confidence limit

[a] Based on recommendations from ProUCL, version 5.0.00 software (U.S. EPA 2013); includes non-detects treated per recommendations for each statistical method:
UCL = Upper confidence limit; UCL-P = Parametric UCL; UCL-NP = Nonparametric UCL
95% KM (BCA) UCL = UCL based on bias-corrected accelerated bootstrap method
95% KM (t) UCL = UCL based on Kaplan-Meier method using the t-distribution cutoff value
95% Student's-t UCL = UCL based on Student's-t statistic
95% Hall's Bootstrap UCL = UCL based on Hall's bootstrap method
95% Chebyshev (Mean, Sd) UCL = UCL obtained using classical sample mean and standard deviation

[b] Total Aroclor concentrations were calculated by summing across individual detected aroclors in each sample. EPC is based on detected concentrations only. Aroclors 1254 and 1260 were the only Aroclors detected in surface soil.

[c] In one of the five samples submitted for congener analysis, only one congener was detected. A minimum of three detected congeners is needed to calculate a KM TEQ value. Mean and UCL values calculated using three substitution methods for NDs were considered. The maximum detected concentration was selected as the EPC. Arithmetic mean is based on evaluating NDs at the RL.

Table 3.2
Medium-Specific Exposure Point Concentration Summary for Soil (0 to 10 feet)
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Time Frame: Current/Future
Medium: Surface and Subsurface Soil (0 to 10 feet)
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Soil at the Vestal Site

Analyte	Maximum Detected Concentration (mg/kg)	Qualifier	Detection Frequency			Arithmetic Mean Detected Concentration (mg/kg)	Standard Deviation (mg/kg)	95% UCL[a] (mg/kg)	UCL Statistic[a]	Selected Exposure Point Concentration for both RME and CT risks		
										Value	Units	Rationale[a]
1,2,4-Trimethylbenzene	107		13	/	39	19.31	37.95	24.35	95% Adjusted Gamma KM-UCL	24.35	mg/kg	UCL-NP
Aroclor-1016	0.36		1	/	68	0.360	---	---	---	0.36	mg/kg	Max
Aroclor-1254	0.12		3	/	68	0.022	0.013	0.0335	95% KM (t) UCL	0.0335	mg/kg	UCL-NP
Aroclor-1260	31		8	/	68	0.478	3.757	3.493	97.5% KM (Chebyshev) UCL	3.493 [e]	mg/kg	UCL-NP
Total Aroclor[c]	31.36		8	/	8	3.979	11.064	28.41	97.5% Chebyshev(Mean, Sd) UCL[b]	28.41	mg/kg	UCL-NP
Benzene	ND		0	/	45	ND	—	—	—	0.633	mg/kg	Max RL
Benzo(a)anthracene	0.25		3	/	68	0.184	0.083	0.102	95% KM (t) UCL	0.102	mg/kg	UCL-NP
Benzo(a)pyrene	0.21	J	2	/	68	0.190	0.028	0.107	95% KM (t) UCL	0.107	mg/kg	UCL-NP
Benzo(b)fluoranthene	0.23		3	/	68	0.168	0.076	0.0958	95% KM (t) UCL	0.0958	mg/kg	UCL-NP
Bromomethane	1.19	J	2	/	36	0.982	0.295	0.15	95% KM (t) UCL	0.15	mg/kg	UCL-NP
Naphthalene	12.6	J	15	/	106	2.055	3.448	0.83	95% Approximate Gamma KM-UCL	0.83	mg/kg	UCL-P
Trichloroethene	1.95		42	/	94	0.222	0.442	0.304	97.5% KM (Chebyshev) UCL	0.304	mg/kg	UCL-P
Vinyl Chloride	0.00116		1	/	34	0.001	—	—	—	0.00116	mg/kg	Max
Dioxin-Like PCBs TEQ[d]	1.29E-05	J	—	/	—	—	—	—	—	1.29E-05	mg/kg	Max

ND = Not detected
J = Estimated value
Max RL = Maximum reporting limit
mg/kg = milligrams per kilogram
UCL = Upper confidence limit

[a] Based on recommendations from ProUCL, version 5.0.00 software (U.S. EPA 2013); includes non-detects treated per recommendations for each statistical method:
UCL = Upper confidence limit; UCL-P = Parametric UCL; UCL-NP = Nonparametric UCL
95% KM (BCA) UCL = UCL based on bias-corrected accelerated bootstrap method
95% KM (t) UCL = UCL based on Kaplan-Meier method using the t-distribution cutoff value
95% KM (Chebyshev) UCL = UCL based on Kaplan-Meier method using the Chebyshev inequality
95% KM (% Bootstrap) UCL = UCL based on percentile bootstrap method
95% Adjusted Gamma KM-UCL = UCL based on Kaplan-Meier method adjusted for level significance
95% Approximate Gamma KM-UCL = UCL based on Kaplan-Meier method using chi-square approximation
95% Student's-t UCL = UCL based on Student's-t statistic
95% Hall's Bootstrap UCL = UCL based on Hall's bootstrap method
95% Chebyshev (Mean, Sd) UCL = UCL obtained using classical sample mean and standard deviation

[b] The recommended UCL value based on the 95% Hall's Bootstrap method yielded an unreasonably large UCL value, as per ProUCL guidance (U.S. EPA 2013), the 97.5% Chebyshev (Mean, Sd) UCL was used instead.

[c] Total Aroclor concentrations were calculated by summing across individual detected aroclors in each sample. EPC is based on the 95UCL for those samples with detected aroclor concentrations only. Aroclors 1016, 1254 and 1260 were the only Aroclors detected in surface plu subsurface soil.

[d] In three of the nine samples submitted for congener analysis, only one congener was detected. A minimum of three detected congeners is needed to calculate a KM TEQ value. Mean and UCL values calculated using three substitution methods for NDs were considered. The max value is selected as the EPC value to evaluate cancer risks and non-cancer hazards from exposures to TEQ.

[e] The calculated EPC for Total Aroclors is influenced by the measured concentration in a single sample, 31 mg/kg. This sample was collected at a depth of 5 to 6 feet from location 064-0012. Effects of the results from including this sample in the EPC calculations are discussed in Section 5.4.1.

Table 3.3
Medium-Specific Exposure Point Concentration Summary
Air EPC Calculated using Volatile Contaminant EPC in Surface Soil
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Time Frame: Current/Future
Medium: Air
Exposure Medium: Air
Exposure Point: Offgassing of Volatiles from Surface Soil

Analyte	Soil Exposure Point Concentration (mg/kg)	Volatilization Factor (m^3/kg)[c]	Air Exposure Point Concentration ($\mu g/m^3$)[a]
Aroclor-1254	0.0484	8.43E+05	5.74E-05
Aroclor-1260	0.0790	1.31E+06	6.03E-05
Total Aroclor	0.199	8.43E+05	2.36E-04
Benzene	0.0068	3.54E+03	1.92E-03
Benzo(a)anthracene	0.11	4.41E+06	2.49E-05
Trichloroethene	0.0447	2.21E+03	2.02E-02
Vinyl chloride	0.0068	9.56E+02	7.11E-03
Dioxin-Like PCBs TEQ[b]	9.74E-07	1.96E+06	4.97E-10

[a]Air EPC calculated using the formula: C(air) = EPC (Soil) * 1000 µg/mg * 1/VF

Where: EPC (soil) = Soil Exposure Point Concentration (mg/kg)
VF = Volatilization factor (m^3/kg)

[b]VF for TEQ based on the VF for 2,3,7,8-TCDD.

Table 3.4
Medium-Specific Exposure Point Concentration Summary
Air EPC Calculated using Volatile Contaminant EPC in Soil (0 to 10 ft)
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Time Frame: Current/Future
Medium: Air
Exposure Medium: Air
Exposure Point: Offgassing of Volatiles from Surface Soil and Excavated Subsurface Soil at the Vestal Site

Analyte	Soil Exposure Point Concentration (mg/kg)	Volatilization Factor (m^3/kg)[c]	Air Exposure Point Concentration ($\mu g/m^3$)[a]
1,2,4-Trimethylbenzene	24.35	7.91E+03	3.08E+00
Aroclor-1016	0.36	5.86E+05	6.14E-04
Aroclor-1254	0.0335	8.43E+05	3.97E-05
Aroclor-1260	3.493	1.31E+06	2.67E-03
Benzene	0.633	3.54E+03	1.79E-01
Benzo(a)anthracene	0.102	4.41E+06	2.31E-05
Bromomethane	0.15	1.40E+03	1.07E-01
Naphthalene	0.83	4.63E+04	1.79E-02
Total Aroclor	28.41	8.43E+05	3.37E-02
Trichloroethene	0.304	2.21E+03	1.38E-01
Vinyl Chloride	0.00116	9.56E+02	1.21E-03
Dioxin-Like PCBs TEQ[b]	1.29E-05	1.96E+06	6.60E-09

[a]Air EPC calculated using the formula: C(air) = EPC (Soil) * 1000 µg/mg * 1/VF

Where: EPC (soil) = Soil Exposure Point Concentration (mg/kg)
VF = Volatilization factor (m^3/kg)

[b]VF for TEQ based on the VF for 2,3,7,8-TCDD.
[c]Volatilization factor values are from the USEPA Regional Screening Levels (RSLs) table for Residential Soil (June 2015).

Table 4.1
Values Used for Daily Intake Calculations for Adult Resident
Vestal Chlorinated Solvents Site

Scenario Time Frame: Future
Medium: Soil
Exposure Medium: Surface Soil (0-12")
Exposure Points: Vestal Site
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	Chronic Daily Intake (CDI) (mg/kg-day)=
	AT	Averaging time - non-carcinogens	days	7,300	USEPA, 1989	3,285	USEPA, 1989	CS x CF x IR x EF x ED / (BW x AT)
	BW	Body weight	kg	80	USEPA, 2014	80	USEPA, 2014	
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	
	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	
	ED	Exposure duration	years	20	USEPA, 2014	9	USEPA, 2011; BPJ[a]	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[b]	
	IR	Ingestion rate	mg soil/day	100	USEPA, 2014	50	USEPA, 1993[c]	
Dermal	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	Chronic Daily Intake (CDI) (mg/kg-day)=
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	CS x CF x SA x AF x EF x ED x ABS / (BW x AT)
	SA	Skin surface area available for contact	cm^2	6,032	USEPA, 2014	6,032	USEPA, 2014	
	AF	Sediment/soil-to-skin adherence factor	mg/cm^2	0.07	USEPA, 2014	0.01	USEPA, 2004	
	EF	Exposure frequency	days/year	350	USEPA, 1991a	256	USEPA 2011[b]	
	ED	Exposure duration	years	20	USEPA, 2014	9	USEPA, 2011; BPJ[a]	
	BW	Body weight	kg	80	USEPA, 2014	80	USEPA, 2014	
	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT	Averaging time - non-carcinogens	days	7,300	USEPA, 1989	3,285	USEPA, 1989	
	ABS	Dermal absorption factor - all COPCs	unitless	Chemical-specific, see Table 5.1	USEPA, 2004	Chemical-specific, see Table 5.1	USEPA, 2004	
Inhalation	CA	Chemical concentration in air	$\mu g/m^3$	See Table 3.3	NA	See Table 3.3	NA	Exposure Concentration (ug/m^3) = CA x ET x EF x ED / AT
	ET	Exposure time	hours/day	24	BPJ	24	BPJ	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[b]	
	ED	Exposure duration	years	20	USEPA, 2014	9	USEPA, 2011; BPJ[a]	
	AT	Averaging time - carcinogens	hours	613,200	USEPA, 1989	613,200	USEPA, 1989	
	AT	Averaging time - non-carcinogens	hours	175,200	USEPA, 1989	78,840	USEPA, 1989	

NA - not applicable; BPJ - based on professional judgement

[a] Based on average residential occupancy period of 12 years (Table 16-5). Assumes 3 years as a child and 9 years as an adult.

[b] Estimated by taking average percent of time spent at home (70%, see Table 16-16) and multiplying by 365 days/yr (0.70*365 days = 256 days/yr).

[c] CTE assumed to be half that of the RME receptor.

Table 4.2
Values Used for Daily Intake Calculations for Child Resident
Vestal Chlorinated Solvents Site

Scenario Time Frame: Future
Medium: Soil
Exposure Medium: Surface Soil (0-12")
Exposure Points: Vestal Site
Receptor Population: Resident
Receptor Age: Child (0-6 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	Chronic Daily Intake (CDI) (mg/kg-day)=
	AT	Averaging time - non-carcinogens	days	2,190	USEPA, 1989	1,095	USEPA, 1989	CS x CF x IR x EF x ED / (BW x AT)
	BW	Body weight	kg	15	USEPA, 2014	15	USEPA, 2014	
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	
	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	
	ED	Exposure duration	years	6	USEPA, 2014	3	USEPA, 2011; BPJ[a]	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[b]	
	IR	Ingestion rate	mg soil/day	200	USEPA, 2014	100	USEPA, 1993[c]	
Dermal	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	Chronic Daily Intake (CDI) (mg/kg-day)=
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	CS x CF x SA x AF x EF x ED x ABS / (BW x AT)
	SA	Skin surface area available for contact	cm^2	2,373	USEPA, 2014	2,373	USEPA, 2014	
	AF	Sediment/soil-to-skin adherence factor	mg/cm^2	0.2	USEPA, 2002	0.04	USEPA, 2004	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[b]	
	ED	Exposure duration	years	6	USEPA, 2014	3	USEPA, 2011; BPJ[a]	
	BW	Body weight	kg	15	USEPA, 2014	15	USEPA, 2014	
	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT	Averaging time - non-carcinogens	days	2,190	USEPA, 1989	1,095	USEPA, 1989	
	ABS	Dermal absorption factor - all COPCs	unitless	Chemical-specific, see Table 5.1	USEPA, 2004	Chemical-specific, see Table 5.1	USEPA, 2004	
Inhalation	CA	Chemical concentration in air	$\mu g/m^3$	See Table 3.3	NA	See Table 3.3	NA	Exposure Concentration (ug/m^3) = CA x ET x EF x ED / AT
	ET	Exposure time	hours/day	24	USEPA, 2014	24	BPJ	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[b]	
	ED	Exposure duration	years	6	USEPA, 2014	3	USEPA, 2011; BPJ[a]	
	AT	Averaging time - carcinogens	hours	613,200	USEPA, 1989	613,200	USEPA, 1989	
	AT	Averaging time - non-carcinogens	hours	52,560	USEPA, 1989	26,280	USEPA, 1989	

NA - not applicable; BPJ - based on professional judgement

[a] Based on average residential occupancy period of 12 years (Table 16-5). Assumes 3 years as a child and 9 years as an adult.

[b] Estimated by taking average percent of time spent at home (70%, see Table 16-16) and multiplying by 365 days/yr (0.70*365 days = 256 days/yr).

[c] CTE assumed to be half that of the RME receptor.

Table 4.2A
Values Used for Chronic Daily Intake Calculation (Carcinogens with a Mutagenic Mode of Action)
Vestal Chlorinated Solvents Site

Scenario Time Frame: Future
Medium: Soil
Exposure Medium: Surface Soil (0-12")
Exposure Points: Vestal Site
Receptor Population: Resident
Receptor Age: Child (0-6 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	Chronic Daily Intake (CDI) (mg/kg-day)=
	BW	Body weight	kg	10 (0< 2 years); 17 (2≤ 6 years)	USEPA, 2011	10 (0< 2 years); 16 (2≤ 3 years)	USEPA, 2011	CS x CF x IR x EF x ED / (BW x AT)
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	
	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	
	ED	Exposure duration	years	2 (0 < 2 years); 4 (2 ≤ 6 years)	USEPA, 2005	2 (0 < 2 years); 1 (2 ≤ 3 years)	USEPA, 2005	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[a]	
	IR	Ingestion rate	mg soil/day	200	USEPA, 2014	100	USEPA, 1993[b]	
Dermal	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	Chronic Daily Intake (CDI) (mg/kg-day)=
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	CS x CF x SA x AF x EF x ED x ABS / (BW x AT)
	SA	Skin surface area available for contact	cm^2	2,035 (0< 2 years); 2,591 (2≤ 6 years)	USEPA, 2011	2,035 (0< 2 years); 2,455 (2≤ 3 years)	USEPA, 2011	
	AF	Sediment/soil-to-skin adherence factor	mg/cm^2	0.2	USEPA, 2002	0.04	USEPA, 2004	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[a]	
	ED	Exposure duration	years	2 (0 < 2 years); 4 (2 ≤ 6 years)	USEPA, 2005	2 (0 < 2 years); 1 (2 ≤ 3 years)	USEPA, 2005	
	BW	Body weight	kg	10 (0< 2 years); 17 (2≤ 6 years)	USEPA, 2011	10 (0< 2 years); 16 (2≤ 3 years)	USEPA, 2011	
	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	ABS	Dermal absorption factor - all COPCs	unitless	Chemical-specific, see Table 5.1	USEPA, 2004	Chemical-specific, see Table 5.1	USEPA, 2004	
Inhalation	CA	Chemical concentration in air	$\mu g/m^3$	See Table 3.3	NA	See Table 3.3	NA	Exposure Concentration (ug/m^3) = CA x ET x EF x ED / AT
	ET	Exposure time	hours/day	24	BPJ	24	BPJ	
	EF	Exposure frequency	days/year	350	USEPA, 2014	256	USEPA 2011[a]	
	ED	Exposure duration	years	2 (0 < 2 years); 4 (2 ≤ 6 years)	USEPA, 2005	2 (0 < 2 years); 1 (2 ≤ 3 years)	USEPA, 2005	
	AT	Averaging time - carcinogens	hours	613,200	USEPA, 1989	613,200	USEPA, 1989	

NA - not applicable; BPJ - based on professional judgement

[a] Estimated by taking average percent of time spent at home (70%, see Table 16-16) and multiplying by 365 days/yr (0.70*365 days = 256 days/yr).

[b] CTE assumed to be half that of the RME receptor.

Table 4.3
Values Used for Daily Intake Calculations for Construction Worker
Vestal Chlorinated Solvents Site

Scenario Time Frame: Current/Future
Medium: Soil
Exposure Medium: Surface/Subsurface Soil (0-10')
Exposure Points: Vestal Site
Receptor Population: Construction Worker
Receptor Age: Adult (>18 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	Chronic Daily Intake (CDI) (mg/kg-day)=
	AT	Averaging time - non-carcinogens	days	365	USEPA, 1989	365	USEPA, 1989	CS x CF x IR x EF x ED / (BW x AT)
	BW	Body weight	kg	80	USEPA, 2014	80	USEPA, 2014	
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	
	CS	Chemical concentration in soil	mg/kg	See Table 3.2	NA	See Table 3.2	NA	
	ED	Exposure duration	years	1	BPJ	1	BPJ	
	EF	Exposure frequency	days/year	250	BPJ	125	BPJ	
	IR	Ingestion rate	mg soil/day	330	USEPA, 2002	165	BPJ[b]	
Dermal	CS	Chemical concentration in soil	mg/kg	See Table 3.2	NA	See Table 3.2	NA	Chronic Daily Intake (CDI) (mg/kg-day)=
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	CS x CF x SA x AF x EF x ED x ABS / (BW x AT)
	SA	Skin surface area available for contact	cm^2/event	3,527	USEPA, 2014	3,527	USEPA, 2014	
	AF	Sediment/soil-to-skin adherence factor[a]	mg/cm^2	0.3	USEPA, 2004	0.1	USEPA, 2004	
	EF	Exposure frequency	days/year	250	BPJ	125	BPJ	
	ED	Exposure duration	years	1	USEPA, 2004	1	USEPA, 2004	
	BW	Body weight	kg	80	USEPA, 2014	80	USEPA, 2014	
	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT	Averaging time - non-carcinogens	days	365	USEPA, 1989	365	USEPA, 1989	
	ABS	Dermal absorption factor - all COPCs	unitless	Chemical-specific, see Table 5.1	USEPA, 2004	Chemical-specific, see Table 5.1	USEPA, 2004	
Inhalation	CA	Chemical concentration in air	$\mu g/m^3$	See Table 3.4	NA	See Table 3.4	NA	Exposure Concentration (ug/m^3) = CA x ET x EF x ED / AT
	ET	Exposure time	hours/day	8	USEPA, 2014	8	USEPA, 2014	
	EF	Exposure frequency	days/year	250	BPJ	125	BPJ	
	ED	Exposure duration	years	1	USEPA, 2004	1	USEPA, 2004	
	AT	Averaging time - carcinogens	hours	613,200	USEPA, 1989	613,200	USEPA, 1989	
	AT	Averaging time - non-carcinogens	hours	8,760	USEPA, 1989	8,760	USEPA, 1989	

NA - not applicable; BPJ - based on professional judgement

[a]AF based exposure to face, forearms, and hands; values based on 95th percentile for RME and geometric mean for CTE receptors (USEPA, 2004, Exhibit C-3).

[b]CTE assumed to be half that of the RME receptor.

Table 4.4
Values Used for Daily Intake Calculations for Outdoor Worker
Vestal Chlorinated Solvents Site

Scenario Time Frame: Current/Future
Medium: Soil
Exposure Medium: Surface Soil (0-12")
Exposure Points: Vestal Site
Receptor Population: Outdoor Worker
Receptor Age: Adult (>18 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	Intake Equation/ Model Name
Ingestion	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	Chronic Daily Intake (CDI) (mg/kg-day)=
	AT	Averaging time - non-carcinogens	days	9,125	USEPA, 1989	9,125	CS x CF x IR x EF x ED / (BW x AT)
	BW	Body weight	kg	80	USEPA, 2014	80	
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	
	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	
	ED	Exposure duration	years	25	USEPA, 2014	25	
	EF	Exposure frequency	days/year	225	USEPA, 2014	113	
	IR	Ingestion rate	mg soil/day	100	USEPA, 2014	50	
Dermal	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	Chronic Daily Intake (CDI) (mg/kg-day)=
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	CS x CF x SA x AF x EF x ED x ABS / (BW x AT)
	SA	Skin surface area available for contact	cm^2	3,527	USEPA, 2014	3,527	
	AF	Sediment/soil-to-skin adherence factor	mg/cm^2	0.12	USEPA, 2014	0.1	
	EF	Exposure frequency	days/year	225	USEPA, 2014	113	
	ED	Exposure duration	years	25	USEPA, 2014	25	
	BW	Body weight	kg	80	USEPA, 2014	80	
	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	
	AT	Averaging time - non-carcinogens	days	9,125	USEPA, 1989	9,125	
	ABS	Dermal absorption factor - all COPCs	unitless	Chemical-specific, see Table 5.1	USEPA, 2004	Chemical-specific, see Table 5.1	
Inhalation	CA	Chemical concentration in air	$\mu g/m^3$	See Table 3.3	NA	See Table 3.3	Exposure Concentration (ug/m^3) = CA x ET x EF x ED / AT
	ET	Exposure time	hours/day	8	USEPA, 2014	8	
	EF	Exposure frequency	days/year	225	USEPA, 2014	113	
	ED	Exposure duration	years	25	USEPA, 2014	25	
	AT	Averaging time - carcinogens	hours	613,200	USEPA, 1989	613,200	
	AT	Averaging time - non-carcinogens	hours	8,760	USEPA, 1989	8,760	

NA - not applicable; BPJ - based on professional judgement

Table 4.5
Values Used for Daily Intake Calculations for Teenage Trespasser
Vestal Chlorinated Solvents Site

Scenario Time Frame: Current/Future
Medium: Soil
Exposure Medium: Surface Soil (0-12")
Exposure Points: Vestal Site
Receptor Population: Teenage Trespasser
Receptor Age: 7-18 years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	Chronic Daily Intake (CDI) (mg/kg-day)=
	AT	Averaging time - non-carcinogens	days	4,380	USEPA, 1989	3,285	USEPA, 1989	CS x CF x IR x EF x ED / (BW x AT)
	BW	Body weight	kg	52	USEPA, 2011	52	USEPA, 2011	
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	
	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	
	ED	Exposure duration[a]	years	12	USEPA, 1991	9	USEPA, 1991	
	EF	Exposure frequency[b]	days/year	96	BPJ	48	BPJ	
	IR	Ingestion rate	mg soil/day	50	USEPA, 1991a	25	USEPA, 1991a	
Dermal	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	Chronic Daily Intake (CDI) (mg/kg-day)=
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	CS x CF x SA x AF x EF x ED x ABS / (BW x AT)
	SA	Skin surface area available for contact	cm^2	5,100	USEPA, 2011	5,100	USEPA, 2011	
	AF	Sediment/soil-to-skin adherence factor	mg/cm^2	0.2	USEPA, 2004	0.2	USEPA, 2004	
	EF	Exposure frequency[b]	days/year	96	BPJ	48	BPJ	
	ED	Exposure duration[a]	years	12	USEPA, 1991	9	USEPA, 1991	
	BW	Body weight	kg	52	USEPA, 2011	52	USEPA, 2011	
	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT	Averaging time - non-carcinogens	days	4,380	USEPA, 1989	3,285	USEPA, 1989	
	ABS	Dermal absorption factor - all COPCs	unitless	Chemical-specific, see Table 5.1	USEPA, 2004	Chemical-specific, see Table 5.1	USEPA, 2004	
Inhalation	CA	Chemical concentration in air	$\mu g/m^3$	See Table 3.3	NA	See Table 3.3	NA	Exposure Concentration (ug/m^3) = CA x ET x EF x ED / AT
	ET	Exposure time	hours/day	2	BPJ	1	BPJ	
	EF	Exposure frequency[b]	days/year	96	BPJ	48	BPJ	
	ED	Exposure duration[a]	years	12	USEPA, 1991	9	USEPA, 1991	
	AT	Averaging time - carcinogens	hours	613,200	USEPA, 1989	613,200	USEPA, 1989	
	AT	Averaging time - non-carcinogens	hours	8,760	USEPA, 1989	8,760	USEPA, 1989	

NA - not applicable; BPJ - based on professional judgement

[a]ED for CT is approximately 75% of the RME value in parallel with EPA, 1991 recommendations of 12 and 9 years for RME and CT, respectively.

[b] Assumes exposure occurs over the course of 24 weeks (May to September) at a frequency of 2 visits/week for a CT visitor and 4 visits/week for an RME visitor.

Table 4.5A
Values Used for Chronic Daily Intake Calculation (Carcinogens with a Mutagenic Mode of Action)
Vestal Chlorinated Solvents Site

Scenario Time Frame: Current/Future
Medium: Soil
Exposure Medium: Surface Soil (0-12")
Exposure Points: Vestal Site
Receptor Population: Teenage Trespasser
Receptor Age: 7-18 years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	AT	Averaging time - carcinogens	days	25,550	USEPA, 1989	25,550	USEPA, 1989	Chronic daily intake (CDI) (mg/kg-day) = CS x CF x IR x FI x EF x ED x ADAF / (BW x AT)
	BW	Body weight	kg	31.8 (7 - <11 years); 56.8 (11 - <16 years); 71.6 (16 - ≤18 years)	USEPA, 2011	31.8 (7 - <11 years); 56.8 (11 - <16 years)	USEPA, 2011	
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	
	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	
	ED	Exposure duration	years	4 (7 - <11 years); 5 (11 - <16 years); 3 (16 - ≤18 years)	USEPA, 2011	4 (7 - <11 years); 5 (11 - <16 years)	USEPA, 2011	
	EF	Exposure frequency	days/year	39	BPJ[a]	20	BPJ[a]	
	IR	Ingestion rate	mg soil/day	50	USEPA, 1991a	25	USEPA, 1991a	
Dermal	ABS	Dermal absorption factor - all COPCs	unitless	Chemical-specific	USEPA, 2004	Chemical-specific	USEPA, 2004	Dermally Absorbed Dose (DAD, mg/kg-day) = CS x CF x SA x AF * EF * ED x ABS x ADAF / (AT * BW)
	AF	Sediment/soil-to-skin adherence factor[b]	mg/cm^2	0.2	USEPA, 2004, Exhibit C-3	0.2	USEPA, 2004, Exhibit C-3	
	AT	Averaging time - carcinogens	days	25,550	USEPA, 2004	25,550	USEPA, 2004	
	BW	Body weight	kg	31.8 (7 - <11 years); 56.8 (11 - <16 years); 71.6 (16 - ≤18 years)	USEPA, 2011	31.8 (7 - <11 years); 56.8 (11 - <16 years)	USEPA, 2011	
	CF	Conversion factor	kg/mg	0.000001	unit conversion	0.000001	unit conversion	
	CS	Chemical concentration in soil	mg/kg	See Table 3.1	NA	See Table 3.1	NA	
	ED	Exposure duration	years	4 (7 - <11 years); 5 (11 - <16 years); 3 (16 - ≤18 years)	USEPA, 1991a	4 (7 - <11 years); 5 (11 - <16 years)	USEPA, 1991a	
	EF	Exposure frequency	days/year	39	BPJ[a]	20	BPJ[a]	
	EV	Event frequency	events/day	1	USEPA, 2004	1	USEPA, 2004	
	SA	Skin surface area available for contact	cm^2/event	3,594 (7 - <11 years); 5,447 (11 - <16 years); 6,415 (16 - ≤18 years)	USEPA, 2011	3,594 (7 - <11 years); 5,447 (11 - <16 years)	USEPA, 2011	
Inhalation	CA	Chemical concentration in air	µg/m^3	See Table 3.3	NA	See Table 3.3	NA	Exposure Concentration (ug/m^3) = CA x ET x EF x ED / AT
	ET	Exposure time	hours/day	2	BPJ	1	BPJ	
	EF	Exposure frequency	days/year	100	USEPA, 2004	50	BPJ	
	ED	Exposure duration	years	4 (7 - <11 years); 5 (11 - <16 years); 3 (16 - ≤18 years)	USEPA, 1991a	4 (7 - <11 years); 5 (11 - <16 years)	USEPA, 1991a	
	AT	Averaging time - carcinogens	hours	613,200	USEPA, 1989	613,200	USEPA, 1989	
	AT	Averaging time - non-carcinogens	hours	8,760	USEPA, 1989	8,760	USEPA, 1989	

NA - not applicable; BPJ - based on professional judgement

[a] RME assumes exposure 3 days/week during the 13 weeks of summer; CT assumes half of RME.

[b] AF reflects the 50% value for 7-18 year old (shoreline play): hands, lower legs, forearms, face, and feet.

Table 5.1
Non-cancer Toxicity Data - Oral/Dermal
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Chemical of Potential Concern	CAS RN	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/ Modifying Factors	Data Source	
			Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/ YYYY)
Aroclor 1016	12674-11-2	Chronic	0.00007	mg/kg-day	1	0.00007	mg/kg-day	Developmental	100 / 1	I	1/1/1993
Aroclor 1254	11097-69-1	Chronic	0.00002	mg/kg-day	1	0.00002	mg/kg-day	immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	300 / 1	I	11/1/1996
Aroclor 1260[4]	11096-82-5	Chronic	0.00002	mg/kg-day	1	0.00002	mg/kg-day		300 / 1	I	11/1/1996
Benzene	71-43-2	Chronic	0.004	mg/kg-day	1	0.004	mg/kg-day	blood	300 / 1	I	4/17/2003
Benz[a]anthracene	56-55-3										
Benzo[a]pyrene	50-32-8										
Benzo[b]fluoranthene	205-99-2										
Bromomethane	74-83-9	Chronic	0.0014	mg/kg-day	1	0.0014	mg/kg-day	hyperplasia of forestomach	1000 / 1	I	7/1/1991
Dioxins/Furans TEQ	1746-01-6	Chronic	7E-10	mg/kg-day	1	7E-10	mg/kg-day	Decrease sperm count	30 / 1	I	2/17/2012
Naphthalene	91-20-3	Chronic	0.02	mg/kg-day	1	0.02	mg/kg-day	decrease body weight	3000 / 1	I	9/17/1998
Trichloroethene	79-01-6	Chronic	0.0005	mg/kg-day	1	0.0005	mg/kg-day	immune system/heart	Multiple [3]	I	9/28/2011
Trimethylbenzene-1,2,4	95-63-6										
Vinyl chloride	75-01-4	Chronic	0.003	mg/kg-day	1	0.003	mg/kg-day	liver	30 / 1	I	8/7/2000

Source: USEPA RSL Tables (June 2015); I = IRIS

[1]Oral Absorption Efficiencies were obtained from EPA 2004, Exhibit 4-1

[2]Absorbed Reference Doses for Dermal were derived using the Oral Reference Dose as follows: $RFD_{ABS} = RfD_o * ABS_{GI}$ (Equation 4.3 from USEPA 2004)

[3] The RfD for trichloroethene is based on three candidate RfD values, with UFs of 100, 1000 and 10

[4] The RfD for Aroclor 1254 is being used as a surrogate for Aroclor1260, as 1254 is representative of the highly chlorinated Aroclors.

Table 5.2
Non-cancer Toxicity Data -- Inhalation
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Chemical of Potential Concern	CAS RN	Chronic/ Subchronic	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	Data Source	
			Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Aroclor 1016[1]	12674-11-2	Chronic	5.00E-06	mg/m^3	immune system		I	11/1/1996
Aroclor 1254[1]	11097-69-1	Chronic	5.00E-06	mg/m^3	immune system		I	11/1/1996
Aroclor 1260[1]	11096-82-5	Chronic	5.00E-06	mg/m^3	immune system		I	11/1/1996
Benzene	71-43-2	Chronic	0.03	mg/m^3	Blood	300 / 1	I	4/17/2003
Benz[a]anthracene	56-55-3							
Bromomethane	74-83-9	Chronic	0.005	mg/m^3	lesions of olfactory epithelium and nasal cavity	100 / 1	I	10/1/1992
Dioxins/Furans TEQ[2]	1746-01-6	Chronic	4.00E-08	mg/m^3	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system		C	12/22/2011
Naphthalene	91-20-3	Chronic	0.003	mg/m^3	Nasal effects: hyperplasia and metaplasia in respiratory and olfactory epithelium	3000 / 1	I	9/17/1998
Trichloroethene	79-01-6	Chronic	0.002	mg/m^3	Decreased thymus weight; heart	Multiple[3]	I	9/28/2011
Trimethylbenzene-1,2,4	95-63-6	Chronic	0.007	mg/m^3	blood	3000 / 1	P	5/9/2000
Vinyl chloride	75-01-4	Chronic	0.1	mg/m^3	liver	30 / 1	I	8/7/2000

Source: USEPA RSL Tables (June 2015); I = IRIS, A = ATSDR, C = CalEPA, P=PPRTV

[1] No RfC value is provided in the RSL table for PCBs. The RfC for Aroclors used in this assessment is based on route-to-route extrapolation using the RfD of 0.00002 mg/kg-day and dividing by body weight (80kg) divided by inhalation rate ($20m^3$).
[2] The RfC for TEQ is based on 2,3,7,8-TCDD.
[3] The chronic RfC for trichloroethene is based on two candidate RfC values, with UFs of 100 and 10.

Table 5.3
Toxicity Equivalence Factors (TEF)
for Dioxin-like PCB Compounds
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Compound	TEF
Non-ortho substituted PCBs	
PCB-77	0.0001
PCB-81	0.0003
PCB-126	0.1
PCB-169	0.03
Mono-ortho substituted PCBs	
PCB-105	0.00003
PCB-114	0.00003
PCB-118	0.00003
PCB-123	0.00003
PCB-156	0.00003
PCB-157	0.00003
PCB-167	0.00003
PCB-189	0.00003

Sources:
Van den Berg et al. (2006)
USEPA (2010)
WHO's Web site on dioxin TEFs, available at:
http://www.who.int/ipcs/assessment/tef_update/en/.

Table 6.1
Cancer Toxicity Data -- Oral/Dermal
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Chemical of Potential Concern	CAS	Oral Cancer Slope Factor		Age Adjusted Oral Cancer Slope Factor[4]				Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Age Adjusted Cancer Slope Factor for Dermal[4]				Weight of Evidence/Cancer Guideline Description	Data Source	
		Value	Units	Age	ADAF	Value	Units		Value	Units	Age	ADAF	Value	Units		Source(s)	Dates(s) (MM/DD/YYYY)
Total Aroclor[5]	11097-69-1	2	$(mg/kg\text{-}day)^{-1}$					1	2	$(mg/kg\text{-}day)^{-1}$					B2	I	6/1/1997
Benzene	71-43-2	0.055	$(mg/kg\text{-}day)^{-1}$					1	0.055	$(mg/kg\text{-}day)^{-1}$					Known human carcinogen	I	1/19/2000
Benz[a]anthracene[3]	56-55-3	0.73	$(mg/kg\text{-}day)^{-1}$	0<2 years 2<16 years	10 3	7.3 2.19	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$	1	0.73	$(mg/kg\text{-}day)^{-1}$	0<2 years 2<16 years	10 3	7.3 2.19	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$	B2	E	3/1/1994
Benzo[a]pyrene[3]	50-32-8	7.3	$(mg/kg\text{-}day)^{-1}$	0<2 years 2<16 years	10 3	73 21.9	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$	1	7.3	$(mg/kg\text{-}day)^{-1}$	0<2 years 2<16 years	10 3	73 21.9	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$	B2	I	11/1/1994
Benzo[b]fluoranthene[3]	205-99-2	0.73	$(mg/kg\text{-}day)^{-1}$	0<2 years 2<16 years	10 3	7.3 2.19	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$	1	0.73	$(mg/kg\text{-}day)^{-1}$	0<2 years 2<16 years	10 3	7.3 2.19	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$	B2	E	3/1/1994
Bromomethane	74-83-9																
TEQ (DL PCBs)[4]	1746-01-6	156,000	$(mg/kg\text{-}day)^{-1}$					1	156,000	(mg/kg-day)-1					B2	H	9/1985
Non-DL PCBs[5]	1336-36-3	2	(mg/kg-day)-1					1	2	(mg/kg-day)-1					B2	I	6/1/1997
Naphthalene	91-20-3																
Trichloroethylene[3]	79-01-6	0.046 0.00933 0.0371	$(mg/kg\text{-}day)^{-1}$	0<2 years 2<16 years	10 3	0.0933 0.02799	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$	1	0.046	$(mg/kg\text{-}day)^{-1}$					Carcinogenic to humans	I	9/28/2011
Trimethylbenzene-1,2,4	95-63-6																
Vinyl chloride[7]	75-01-4	0.75 1.5	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$					1	0.75 1.5	$(mg/kg\text{-}day)^{-1}$ $(mg/kg\text{-}day)^{-1}$					A	I	8/7/2000

Source: USEPA RSL Tables (June 2015); I = IRIS, E = Environmental Criteria and Assessment Office, C = Cal EPA, H = HEAST.

[1]Oral Absorption Efficiencies were obtained from USEPA (2004, Exhibit 4-1).

[2]Absorbed Cancer Slope Factors for Dermal were derived using the Oral Cancer Slope Factors as follows: $SF_{ABS} = SF_o / ABS_{GI}$ (Equation 4.2 from USEPA 2004)

[3]The application of the ADAFs is limited to these specific chemicals with a mutagenic mode of action and are applied as follows: a 10-fold adjustment for ages 0 - <2 years, a 3-fold adjustment for ages 2 - <16 years; and no adjustment for ages 16 years and older.

[4]Oral cancer slope factor is based on the value derived by USEPA (1985) for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD).

[5]The SF used for Total Aroclor and non-DL PCBs is based on the toxicity value for high risk PCBs.

[6]The SF for trichloroethylene is based on a PBPK model-based route-to-route extrapolation of the inhalation unit risk estimate based on human kidney cancer risks and adjusted for potential risk from Non-Hodgson's lymphoma (NHL) and liver cancer. Trichloroethylene is carcinogenic by a MMOA for induction of kidney tumors. As a result, increased early-life susceptibility is assumed for kidney cancer and the ADAF approach is applied for the kidney cancer component of the total cancer risk. The SF for total cancer risk is 4.64E-02 per mg/kg-day, the SF for the kidney cancer component is 3.09E-02 per mg/kg-day, and the SF for the NHL+liver cancer component is 1.5E-02 per mg/kg-day.

[7]There are separate SFs for vinyl chloride based on continuous lifetime exposure during adulthood (0.75 per mg/kg-day), and continuous lifetime exposure from birth (1.5 per mg/kg-day). The latter accounts for any potential for differential potency in early lifestages, thus although vinyl chloride has a mutagenic mode of action, the ADAF approach is not applied in this case. The values shown are those based on the LED10 approach in accordance with U.S. EPA (2005a).

Weight of Evidence/Cancer Guideline Description

A = Human carcinogen. Sufficient evidence of cancer in humans.
B2 = Probably human carcinogen. Sufficient evidence of cancer in animals, but lack of data or insufficient data from humans.
C = Possible human carcinogen
D = Cannot be evaluated. No evidence or inadequate evidence of cancer in animals or humans.
E = Not classified

Table 6.2
Cancer Toxicity Data -- Inhalation
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Chemical of Potential Concern	CAS RN	Inhalation Unit Risk		Age Adjusted Inhalation Unit Risk[1]				Weight of Evidence/ Cancer Guideline Description	Data Source	
		Value	Units	Age	ADAF	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Total Aroclor[2]	11097-69-1	5.70E-04	$(\mu g/m^3)^{-1}$					B2	S	6/1/1997
Benzene	71-43-2	7.80E-06	$(\mu g/m^3)^{-1}$					Known human carcinogen	I	1/19/2000
Benz[a]anthracene[1]	56-55-3	1.10E-04	$(\mu g/m^3)^{-1}$	0<2 years 2<16 years	10 3	1.10E-03 3.30E-04	$(\mu g/m^3)^{-1}$ $(\mu g/m^3)^{-1}$	B2	C	6/4/2013
Bromomethane	74-83-9									
TEQ (DL PCBs)[3]	1746-01-6	3.80E+01	$(\mu g/m^3)^{-1}$					B2	C	7/21/2009
Non-DL PCBs[2]	1336-36-3	5.70E-04	$(\mu g/m^3)^{-1}$					B2	I	6/1/1997
Naphthalene	91-20-3	3.40E-05	$(\mu g/m^3)^{-1}$					B2	C	6/5/2013
Trichloroethylene[1,4]	79-01-6	4.10E-06 1.00E-06 3.10E-06	$(\mu g/m^3)^{-1}$	0<2 years 2<16 years	10 3	1.00E-05 3.00E-06	$(\mu g/m^3)^{-1}$ $(\mu g/m^3)^{-1}$	Carcinogenic to humans	I	9/28/2011
Trimethylbenzene-1,2,4	95-63-6									
Vinyl chloride[5]	75-01-4	4.40E-06 8.80E-06	$(\mu g/m^3)^{-1}$ $(\mu g/m^3)^{-1}$					A	I	8/7/2000

Source: USEPA RSL Tables (June 2015); I = IRIS, C = Cal EPA, S=RSL User's Guide (Section 5).

[1]These chemicals demonstrates a mutagenic mode of action (MMOA). An ADAF is applied as follows: a 10-fold adjustment for ages 0 - <2 years, a 3-fold adjustment for ages 2 - <16 years; and no adjustment for ages 16 years and older.

[2]The IUR for Total Aroclor and non-DL PCBs is based on the IUR value reported in the RSL table for high risk PCBs which was derived based on route-to-route extrapolation using the oral slope factor of 2 per mg/kg-day assuming a body weight of 70 kg and an inhalation rate of 20 m^3.

[3]The IUR for TEQ is based on 2,3,7,8-TCDD.

[4]The IUR for trichloroethylene is based on dose-response data in humans for renal cell carcinoma, non-Hodgkin's lymphoma, and liver tumors. Trichloroethylene is carcnogenic by a MMOA for induction of kidney tumors. As a result, increased early-life susceptibility is assumed for kidney cancer and the ADAF approach is applied for the kidney cancer component of the total cancer risk. The IUR for total cancer risk is 4.1E-06 $(\mu g/m^3)^{-1}$, the IUR for the kidney cancer component is 1E-06 $(\mu g/m^3)^{-1}$, and the IUR for the NHL+liver cancer component is 3.1E-06 $(\mu g/m^3)^{-1}$.

[5]There are separate IURs for vinyl chloride based on continuous lifetime exposure during adulthood (4.4E-06 per $\mu g/m^3$) and continuous lifetime exposure from birth (8.8E-06 per $\mu g/m^3$). The latter accounts for any potential for differential potency in early lifestages, thus although vinyl chloride has a mutagenic mode of action, the ADAF approach is not applied in this case. The values shown are those based on the LED10 approach in accordance with U.S. EPA (2005a).

Weight of Evidence/Cancer Guideline Description
A = Human carcinogen. Sufficient evidence of cancer in humans.
B2 = Probably human carcinogen. Sufficieint evidence of cancer in animals, but lack of data or insufficient data from humans.
C = Possible human carcinogen
D = Cannot be evaluated. No evidence or inadequate evidence of cancer in animals or humans.
E = Not classified

Table 7.1.CT
Central Tendency
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg						2.1E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-03
				Aroclor-1260	7.9E-02	mg/kg						3.5E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Total Aroclor	2.0E-01	mg/kg	1.1E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	2E-08					
				Benzene	6.8E-03	mg/kg	3.8E-10	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$	2E-11	3.0E-09	(mg/kg-day)	4.0E-03	(mg/kg-day)	7E-07
				Benzo(a)anthracene	1.1E-01	mg/kg	6.2E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	5E-09					
				Benzo(a)pyrene	1.7E-01	mg/kg	9.6E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7E-08					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	8.5E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	6E-09					
				Trichloroethene	4.5E-02	mg/kg	2.5E-09	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1E-10	2.0E-08	(mg/kg-day)	5.0E-04	(mg/kg-day)	4E-05
				Vinyl chloride	6.8E-03	mg/kg	3.8E-10	(mg/kg-day)	7.5E-01	$(mg/kg\text{-}day)^{-1}$	3E-10	3.0E-09	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-06
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	5.5E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	9E-09	4.3E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	6E-04
			Exp. Route Total								1E-07					3E-03
			Dermal	Aroclor-1254	4.8E-02	mg/kg						3.6E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-04
				Aroclor-1260	7.9E-02	mg/kg						5.8E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	3E-04
				Total Aroclor	2.0E-01	mg/kg	1.9E-09	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	4E-09					
				Benzene	6.8E-03	mg/kg										
				Benzo(a)anthracene	1.1E-01	mg/kg	9.7E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7E-10					
				Benzo(a)pyrene	1.7E-01	mg/kg	1.5E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1E-08					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	1.3E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1E-09					
				Trichloroethene	4.5E-02	mg/kg										
				Vinyl chloride	6.8E-03	mg/kg										
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	2.0E-15	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	3E-10	1.5E-14	(mg/kg-day)	7.0E-10	(mg/kg-day)	2E-05
			Exp. Route Total								2E-08					5E-04
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$						4.0E-08	(mg/m^3)	5.0E-06	(mg/m^3)	8E-03
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$						4.2E-08	(mg/m^3)	5.0E-06	(mg/m^3)	8E-03
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	2.1E-05	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$	1E-08					
				Benzene	1.9E-03	$(\mu g/m^3)$	1.7E-04	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$	1E-09	1.3E-06	(mg/m^3)	3.0E-02	(mg/m^3)	4E-05
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	2.2E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	2E-10					
				Trichloroethene	2.0E-02	$(\mu g/m^3)$	1.8E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	7E-09	1.4E-05	(mg/m^3)	2.0E-03	(mg/m^3)	7E-03
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	6.4E-04	$(\mu g/m^3)$	4.4E-06	$(ug/m^3)^{-1}$	3E-09	5.0E-06	(mg/m^3)	1.0E-01	(mg/m^3)	5E-05
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	4.5E-11	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$	2E-09	3.5E-13	(mg/m^3)	4.0E-08	(mg/m^3)	9E-06
			Exp. Route Total								3E-08					2E-02
Medium Total											2E-07					3E-02

Table 7.1.RME
Reasonable Maximum Exposure
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg						5.8E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	3E-03
				Aroclor-1260	7.9E-02	mg/kg						9.5E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-03
				Total Aroclor	2.0E-01	mg/kg	6.8E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1E-07					
				Benzene	6.8E-03	mg/kg	2.3E-09	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$	1E-10	8.2E-09	(mg/kg-day)	4.0E-03	(mg/kg-day)	2E-06
				Benzo(a)anthracene	1.1E-01	mg/kg	3.8E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Benzo(a)pyrene	1.7E-01	mg/kg	5.8E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	4E-07					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	5.2E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	4E-08					
				Trichloroethene	4.5E-02	mg/kg	1.5E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	7E-10	5.4E-08	(mg/kg-day)	5.0E-04	(mg/kg-day)	1E-04
				Vinyl chloride	6.8E-03	mg/kg	2.3E-09	(mg/kg-day)	7.5E-01	$(mg/kg\text{-}day)^{-1}$	2E-09	8.2E-09	(mg/kg-day)	3.0E-03	(mg/kg-day)	3E-06
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	3.3E-13	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	5E-08	1.2E-12	(mg/kg-day)	7.0E-10	(mg/kg-day)	2E-03
			Exp. Route Total								7E-07					9E-03
			Dermal	Aroclor-1254	4.8E-02	mg/kg						3.4E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Aroclor-1260	7.9E-02	mg/kg						5.6E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	3E-03
				Total Aroclor	2.0E-01	mg/kg	4.0E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	8E-08					
				Benzene	6.8E-03	mg/kg										
				Benzo(a)anthracene	1.1E-01	mg/kg	2.1E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2E-08					
				Benzo(a)pyrene	1.7E-01	mg/kg	3.2E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2E-07					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	2.8E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2E-08					
				Trichloroethene	4.5E-02	mg/kg										
				Vinyl chloride	6.8E-03	mg/kg										
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	4.2E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	7E-09	1.5E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	2E-04
			Exp. Route Total								4E-07					5E-03
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$						5.5E-08	(mg/m^3)	5.0E-06	(mg/m^3)	1E-02
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$						5.8E-08	(mg/m^3)	5.0E-06	(mg/m^3)	1E-02
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	6.5E-05	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$	4E-08					
				Benzene	1.9E-03	$(\mu g/m^3)$	5.3E-04	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$	4E-09	1.8E-06	(mg/m^3)	3.0E-02	(mg/m^3)	6E-05
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	6.8E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	8E-10					
				Trichloroethene	2.0E-02	$(\mu g/m^3)$	5.5E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	2E-08	1.9E-05	(mg/m^3)	2.0E-03	(mg/m^3)	1E-02
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	1.9E-03	$(\mu g/m^3)$	4.4E-06	$(ug/m^3)^{-1}$	9E-09	6.8E-06	(mg/m^3)	1.0E-01	(mg/m^3)	7E-05
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	1.4E-10	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$	5E-09	4.8E-13	(mg/m^3)	4.0E-08	(mg/m^3)	1E-05
			Exp. Route Total								8E-08					3E-02
Medium Total											1E-06					5E-02

Table 7.2.CT
Central Tendency
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe Future
Receptor Population Resident
Receptor Age: Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Non-Cancer Hazard Calculations				
					Value	Units	Age	Intake/Exposure Concentration		CSF/Unit Risk		Age Adjusted CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg									2.3E-07	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-02
				Aroclor-1260	7.9E-02	mg/kg									3.7E-07	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-02
				Total Aroclor	2.0E-01	mg/kg	0-6 years	3.99E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			7.98E-08					
				Benzene	6.8E-03	mg/kg	0-6 years	1.36E-09	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$			7.49E-11	3.2E-08	(mg/kg-day)	4.0E-03	(mg/kg-day)	8E-06
				Benzo(a)anthracene	1.1E-01	mg/kg	0<2 years	2.20E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1.61E-07					
							2<6 years	6.89E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	1.51E-08					
				Benzo(a)pyrene	1.7E-01	mg/kg	0<2 years	3.41E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+01	$(mg/kg\text{-}day)^{-1}$	2.49E-06					
							2<6 years	1.06E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	2.33E-07					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	0<2 years	3.03E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.21E-07					
							2<6 years	9.46E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2.07E-08					
				Trichloroethene[1]	4.5E-02	mg/kg	0<2 years	8.96E-09	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	9.3E-02	$(mg/kg\text{-}day)^{-1}$	8.36E-10	2.1E-07	(mg/kg-day)	5.0E-04	(mg/kg-day)	4E-04
							2<6 years	2.80E-09	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-02	$(mg/kg\text{-}day)^{-1}$	7.84E-11					
				Vinyl chloride	6.8E-03	mg/kg	0-6 years	1.36E-09	(mg/kg-day)	1.5E+00	$(mg/kg\text{-}day)^{-1}$			2.04E-09	3.2E-08	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-05
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	0-6 years	1.95E-13	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			3.04E-08	4.6E-12	(mg/kg-day)	7.0E-10	(mg/kg-day)	7E-03
			Exp. Route Total											3E-06					4E-02
			Dermal	Aroclor-1254	4.8E-02	mg/kg									3.0E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Aroclor-1260	7.9E-02	mg/kg									4.9E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Total Aroclor	2.0E-01	mg/kg	0-6 years	5.3E-09	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			1E-08					
				Benzene	6.8E-03	mg/kg													
				Benzo(a)anthracene	1.1E-01	mg/kg	0<2 years	2.3E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2E-08					
							2<6 years	8.8E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-09					
				Benzo(a)pyrene	1.7E-01	mg/kg	0<2 years	3.6E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+01	$(mg/kg\text{-}day)^{-1}$	3E-07					
							2<6 years	1.4E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	0<2 years	3.2E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2E-08					
							2<6 years	1.2E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	3E-09					
				Trichloroethene	4.5E-02	mg/kg													
				Vinyl chloride	6.8E-03	mg/kg													
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	0-6 years	5.6E-15	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			9E-10	1.3E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	2E-04
			Exp. Route Total											3E-07					4E-03
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$									4.0E-08	(mg/m^3)	5.0E-06	(mg/m^3)	8E-03
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$									4.2E-08	(mg/m^3)	5.0E-06	(mg/m^3)	8E-03
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	0-6 years	7.1E-06	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$			4E-09					
				Benzene	1.9E-03	$(\mu g/m^3)$	0-6 years	5.8E-05	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$			5E-10	1.3E-06	(mg/m^3)	3.0E-02	(mg/m^3)	4E-05
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	0<2 years	7.5E-07	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	1.1E-03	$(ug/m^3)^{-1}$	8E-10					
							2<6 years	7.5E-07	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	3.3E-04	$(ug/m^3)^{-1}$	2E-10					
				Trichloroethene[1]	2.0E-02	$(\mu g/m^3)$	0<2 years	4.1E-04	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	1.0E-05	$(ug/m^3)^{-1}$	4E-09	1.4E-05	(mg/m^3)	2.0E-03	(mg/m^3)	7E-03
							2<6 years	2.0E-04	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3.0E-06	$(ug/m^3)^{-1}$	6E-10					
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	0-6 years	1.4E-04	$(\mu g/m^3)$	8.8E-06	$(ug/m^3)^{-1}$			1E-09	5.0E-06	(mg/m^3)	1.0E-01	(mg/m^3)	5E-05
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	0-6 years	5.0E-12	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$			2E-10	3.5E-13	(mg/m^3)	4.0E-08	(mg/m^3)	9E-06
			Exp. Route Total											1E-08					2E-02
Medium Total														4E-06					6E-02

[1]Cancer risk from exposure to TCE is calculated in accordance with U.S. EPA (2011c) whereby the ADAF adjustment applies only to the kidney cancer component of the total cancer risk estimate.

Table 7.2.RME
Reasonable Maximum Exposure
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe Future
Receptor Population Resident
Receptor Age: Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Non-Cancer Hazard Calculations				
					Value	Units	Age	Intake/Exposure Concentration		CSF/Unit Risk		Age Adjusted CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg									6.2E-07	(mg/kg-day)	2.0E-05	(mg/kg-day)	3E-02
				Aroclor-1260	7.9E-02	mg/kg									1.0E-06	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-02
				Total Aroclor	2.0E-01	mg/kg	0-6 years	2.2E-07	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			4E-07					
				Benzene	6.8E-03	mg/kg	0-6 years	7.5E-09	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$			4E-10	8.7E-08	(mg/kg-day)	4.0E-03	(mg/kg-day)	2E-05
				Benzo(a)anthracene	1.1E-01	mg/kg	0<2 years	6.0E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	4E-07					
							2<6 years	7.1E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-07					
				Benzo(a)pyrene	1.7E-01	mg/kg	0<2 years	9.3E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+01	$(mg/kg\text{-}day)^{-1}$	7E-06					
							2<6 years	1.1E-07	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	2E-06					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	0<2 years	8.3E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	6E-07					
							2<6 years	9.7E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-07					
				Trichloroethene[1]	4.5E-02	mg/kg	0<2 years	2.4E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	9.3E-02	$(mg/kg\text{-}day)^{-1}$	2E-09	5.7E-07	(mg/kg-day)	5.0E-04	(mg/kg-day)	1E-03
							2<6 years	2.9E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-02	$(mg/kg\text{-}day)^{-1}$	8E-10					
				Vinyl chloride	6.8E-03	mg/kg	0-6 years	7.5E-09	(mg/kg-day)	1.5E+00	$(mg/kg\text{-}day)^{-1}$			1E-08	8.7E-08	(mg/kg-day)	3.0E-03	(mg/kg-day)	3E-05
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	0-6 years	1.1E-12	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			2E-07	1.2E-11	(mg/kg-day)	7.0E-10	(mg/kg-day)	2E-02
			Exp. Route Total											1E-05					1E-01
			Dermal	Aroclor-1254	4.8E-02	mg/kg									2.1E-07	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-02
				Aroclor-1260	7.9E-02	mg/kg									3.4E-07	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-02
				Total Aroclor	2.0E-01	mg/kg	0-6 years	7.2E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			1E-07					
				Benzene	6.8E-03	mg/kg													
				Benzo(a)anthracene	1.1E-01	mg/kg	0<2 years	1.6E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1E-07					
							2<6 years	2.4E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	5E-08					
				Benzo(a)pyrene	1.7E-01	mg/kg	0<2 years	2.5E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+01	$(mg/kg\text{-}day)^{-1}$	2E-06					
							2<6 years	3.7E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	8E-07					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	0<2 years	2.2E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2E-07					
							2<6 years	3.3E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	7E-08					
				Trichloroethene	4.5E-02	mg/kg													
				Vinyl chloride	6.8E-03	mg/kg													
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	0-6 years	7.6E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			1E-08	8.9E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	1E-03
			Exp. Route Total											3E-06					3E-02
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$									5.5E-08	(mg/m^3)	5.0E-06	(mg/m^3)	1E-02
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$									5.8E-08	(mg/m^3)	5.0E-06	(mg/m3)	1E-02
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	0-6 years	1.9E-05	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$			1E-08					
				Benzene	1.9E-03	$(\mu g/m^3)$	0-6 years	1.6E-04	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$			1E-09	1.8E-06	(mg/m^3)	3.0E-02	(mg/m^3)	6E-05
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	0<2 years	6.8E-07	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	1.1E-03	$(ug/m^3)^{-1}$	8E-10					
							2<6 years	1.4E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	3.3E-04	$(ug/m^3)^{-1}$	5E-10					
				Trichloroethene[1]	2.0E-02	$(\mu g/m^3)$	0<2 years	5.5E-04	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	1.0E-05	$(ug/m^3)^{-1}$	7E-09	1.9E-05	(mg/m^3)	2.0E-03	(mg/m^3)	1E-02
							2<6 years	1.1E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3.0E-06	$(ug/m^3)^{-1}$	7E-09					
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	0-6 years	5.8E-04	$(\mu g/m^3)$	8.8E-06	$(ug/m^3)^{-1}$			5E-09	6.8E-06	(mg/m^3)	1.0E-01	(mg/m^3)	7E-05
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	0-6 years	4.1E-11	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$			2E-09	4.8E-13	(mg/m^3)	4.0E-08	(mg/m^3)	1E-05
			Exp. Route Total											3E-08					3E-02
Medium Total														1E-05					2E-01

[1]Cancer risk from exposure to TCE is calculated in accordance with U.S. EPA (2011c) whereby the ADAF adjustment applies only to the kidney cancer component of the total cancer risk estimate.

Table 7.3
Reasonable Maximum Exposure
Calculation of Chemical Cancer Risks
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Future
Receptor Population: Resident (Child + Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							
					Value	Units	Age	Intake/Exposure Concentration		CSF/Unit Risk		Age Adjusted CSF/Unit Risk		Cancer Risk
								Value	Units	Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg								
				Aroclor-1260	7.9E-02	mg/kg								
				Total Aroclor	2.0E-01	mg/kg	child	2.2E-07	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			4E-07
							adult	6.8E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			1E-07
				Benzene	6.8E-03	mg/kg	child	7.5E-09	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$			4E-10
							adult	2.3E-09	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$			1E-10
				Benzo(a)anthracene	1.1E-01	mg/kg	0<2 years	6.0E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	4E-07
							2<6 years	7.1E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-07
							adult	3.8E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$			3E-08
				Benzo(a)pyrene	1.7E-01	mg/kg	0<2 years	9.3E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+01	$(mg/kg\text{-}day)^{-1}$	7E-06
							2<6 years	1.1E-07	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	2E-06
							adult	5.8E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$			4E-07
				Benzo(b)fluoranthene	1.5E-01	mg/kg	0<2 years	8.3E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	6E-07
							2<6 years	9.7E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-07
							adult	5.2E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$			4E-08
				Trichloroethene[1]	4.5E-02	mg/kg	0<2 years	2.4E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	9.3E-02	$(mg/kg\text{-}day)^{-1}$	2E-09
							2<6 years	2.9E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-02	$(mg/kg\text{-}day)^{-1}$	8E-10
							adult	1.5E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$			7E-10
				Vinyl chloride	6.8E-03	mg/kg	child	7.5E-09	(mg/kg-day)	1.5E+00	$(mg/kg\text{-}day)^{-1}$			1E-08
							adult	2.3E-09	(mg/kg-day)	7.5E-01	$(mg/kg\text{-}day)^{-1}$			2E-09
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	child	1.1E-12	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			2E-07
							adult	3.3E-13	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			5E-08
			Exp. Route Total											1E-05
			Dermal	Aroclor-1254	4.8E-02	mg/kg								
				Aroclor-1260	7.9E-02	mg/kg								
				Total Aroclor	2.0E-01	mg/kg	child	7.2E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			1E-07
							adult	4.0E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			8E-08
				Benzene	6.8E-03	mg/kg								
				Benzo(a)anthracene	1.1E-01	mg/kg	0<2 years	1.6E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1E-07
							2<6 years	2.4E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	5E-08
							adult	2.1E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$			2E-08
				Benzo(a)pyrene	1.7E-01	mg/kg	0<2 years	2.5E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+01	$(mg/kg\text{-}day)^{-1}$	2E-06
							2<6 years	3.7E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	8E-07
							adult	3.2E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$			2E-07
				Benzo(b)fluoranthene	1.5E-01	mg/kg	0<2 years	2.2E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2E-07
							2<6 years	3.3E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	7E-08
							adult	2.8E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$			2E-08
				Trichloroethene	4.5E-02	mg/kg								
				Vinyl chloride	6.8E-03	mg/kg								
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	child	7.6E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			1E-08
							adult	4.2E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			7E-09
			Exp. Route Total											4E-06
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$								
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$								
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	child	1.9E-05	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$			1E-08
							adult	6.5E-05	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$			4E-08
				Benzene	1.9E-03	$(\mu g/m^3)$	child	1.6E-04	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$			1E-09
							adult	5.3E-04	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$			4E-09
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	0<2 years	6.8E-07	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	1.1E-03	$(ug/m^3)^{-1}$	8E-10
							2<6 years	1.4E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	3.3E-04	$(ug/m^3)^{-1}$	5E-10
							adult	6.8E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$			8E-10
				Trichloroethene[1]	2.0E-02	$(\mu g/m^3)$	0<2 years	5.5E-04	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	1.0E-05	$(ug/m^3)^{-1}$	7E-09
							2<6 years	1.1E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3.0E-06	$(ug/m^3)^{-1}$	7E-09
							adult	5.5E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$			2E-08
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	child	5.8E-04	$(\mu g/m^3)$	8.8E-06	$(ug/m^3)^{-1}$			5E-09
							adult	1.9E-03	$(\mu g/m^3)$	4.4E-06	$(ug/m^3)^{-1}$			9E-09
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	child	4.1E-11	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$			2E-09
							adult	1.4E-10	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$			5E-09
			Exp. Route Total											1E-07
Medium Total														2E-05

[1]Cancer risk from exposure to TCE is calculated in accordance with U.S. EPA (2011c) whereby the ADAF adjustment applies only to the kidney cancer component of the total cancer risk estimate.

Table 7.4.CT
Central Tendency
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe Current/Future
Receptor Population Construction Worker
Receptor Age: Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil collected at a depth of 0 to 10 feet	Vestal Site	Ingestion	1,2,4-Trimethylbenzene	2.4E+01	mg/kg										
				Aroclor-1016	3.6E-01	mg/kg						2.5E-07	(mg/kg-day)	7.0E-05	(mg/kg-day)	4E-03
				Aroclor-1254	3.4E-02	mg/kg						2.4E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-03
				Aroclor-1260	3.5E+00	mg/kg						2.5E-06	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-01
				Total Aroclor	2.8E+01	mg/kg	2.9E-07	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	6E-07					
				Benzene	6.3E-01	mg/kg	6.4E-09	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$	4E-10	4.5E-07	(mg/kg-day)	4.0E-03	(mg/kg-day)	1E-04
				Benzo(a)anthracene	1.0E-01	mg/kg	1.0E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	8E-10					
				Benzo(a)pyrene	1.1E-01	mg/kg	1.1E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	8E-09					
				Benzo(b)fluoranthene	9.6E-02	mg/kg	9.7E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7E-10					
				Bromomethane	1.5E-01	mg/kg						1.1E-07	(mg/kg-day)	1.4E-03	(mg/kg-day)	8E-05
				Naphthalene	8.3E-01	mg/kg						5.9E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	3E-05
				Trichloroethene	3.0E-01	mg/kg	3.1E-09	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1E-10	2.1E-07	(mg/kg-day)	5.0E-04	(mg/kg-day)	4E-04
				Vinyl Chloride	1.2E-03	mg/kg	1.2E-11	(mg/kg-day)	7.2E-01	$(mg/kg\text{-}day)^{-1}$	8E-12	8.2E-10	(mg/kg-day)	3.0E-03	(mg/kg-day)	3E-07
				Dioxin-Like PCBs TEQ	1.3E-05	mg/kg	1.3E-13	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	2E-08	9.1E-12	(mg/kg-day)	7.0E-10	(mg/kg-day)	1E-02
			Exp. Route Total								6E-07					1E-01
			Dermal	1,2,4-Trimethylbenzene	2.4E+01	mg/kg										
				Aroclor-1016	3.6E-01	mg/kg						7.6E-08	(mg/kg-day)	7.0E-05	(mg/kg-day)	1E-03
				Aroclor-1254	3.4E-02	mg/kg						3.7E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Aroclor-1260	3.5E+00	mg/kg						3.8E-06	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-01
				Total Aroclor	2.8E+01	mg/kg	6.0E-06	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	3E-06					
				Benzene	6.3E-01	mg/kg										
				Benzo(a)anthracene	1.0E-01	mg/kg	2.0E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Benzo(a)pyrene	1.1E-01	mg/kg	2.1E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	3E-09					
				Benzo(b)fluoranthene	9.6E-02	mg/kg	1.9E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Bromomethane	1.5E-01	mg/kg										
				Naphthalene	8.3E-01	mg/kg						8.5E-07	(mg/kg-day)	2.0E-02	(mg/kg-day)	4E-05
				Trichloroethene	3.0E-01	mg/kg										
				Vinyl Chloride	1.2E-03	mg/kg										
				Dioxin-Like PCBs TEQ	1.3E-05	mg/kg	5.9E-13	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	4E-18	3.1E-12	(mg/kg-day)	7.0E-10	(mg/kg-day)	4E-03
			Exp. Route Total								3E-06					2E-01
			Inhalation	Aroclor-1016	6.1E-04	$(\mu g/m^3)$						7.0E-08	(mg/m^3)	5.0E-06	(mg/m^3)	1E-02
				Aroclor-1254	4.0E-05	$(\mu g/m^3)$						4.5E-09	(mg/m^3)	5.0E-06	(mg/m^3)	9E-04
				Aroclor-1260	2.7E-03	$(\mu g/m^3)$						3.0E-07	(mg/m^3)	5.0E-06	(mg/m^3)	6E-02
				Total Aroclor	3.4E-02	$(\mu g/m^3)$	5.5E-05	$(\mu g/m^3)$	5.7E-04	$(\mu g/m^3)^{-1}$	3E-08					
				Benzene	1.8E-01	$(\mu g/m^3)$	2.9E-04	$(\mu g/m^3)$	7.8E-06	$(\mu g/m^3)^{-1}$	2E-09	2.0E-05	(mg/m^3)	3.0E-02	(mg/m^3)	7E-04
				Benzo(a)anthracene	2.3E-05	$(\mu g/m^3)$	3.8E-08	$(\mu g/m^3)$	1.1E-04	$(\mu g/m^3)^{-1}$	4E-12					
				Bromomethane	1.1E-01	$(\mu g/m^3)$						1.2E-05	(mg/m^3)	5.0E-03	(mg/m^3)	2E-03
				Naphthalene	1.8E-02	$(\mu g/m^3)$	2.9E-05	$(\mu g/m^3)$	3.4E-05	$(\mu g/m^3)^{-1}$	1E-09	2.0E-06	(mg/m^3)	3.0E-03	(mg/m^3)	7E-04
				Trichloroethene	1.4E-01	$(\mu g/m^3)$	2.2E-04	$(\mu g/m^3)$	4.1E-06	$(\mu g/m^3)^{-1}$	9E-10	1.6E-05	(mg/m^3)	2.0E-03	(mg/m^3)	8E-03
				1,2,4-Trimethylbenzene	3.1E+00	$(\mu g/m^3)$						3.5E-04	(mg/m^3)	7.0E-03	(mg/m^3)	5E-02
				Vinyl Chloride	1.2E-03	$(\mu g/m^3)$	2.0E-06	$(\mu g/m^3)$	4.4E-06	$(\mu g/m^3)^{-1}$	9E-12	1.4E-07	(mg/m^3)	1.0E-01	(mg/m^3)	1E-06
				Dioxin-Like PCBs TEQ	6.6E-09	$(\mu g/m^3)$	1.1E-11	$(\mu g/m^3)$	3.8E+01	$(\mu g/m^3)^{-1}$	4E-10	7.5E-13	(mg/m^3)	4.0E-08	(mg/m^3)	2E-05
			Exp. Route Total								4E-08					1E-01
Medium Total											4E-06					5E-01

Table 7.4.RME
Reasonable Maximum Exposure
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe Current/Future
Receptor Population Construction Worker
Receptor Age: Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil collected at a depth of 0 to 10 feet	Vestal Site	Ingestion	1,2,4-Trimethylbenzene	2.4E+01	mg/kg										
				Aroclor-1016	3.6E-01	mg/kg						1.0E-06	(mg/kg-day)	7.0E-05	(mg/kg-day)	1E-02
				Aroclor-1254	3.4E-02	mg/kg						9.5E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-03
				Aroclor-1260	3.5E+00	mg/kg						9.9E-06	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-01
				Total Aroclor	2.8E+01	mg/kg	1.1E-06	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	2E-06					
				Benzene	6.3E-01	mg/kg	2.6E-08	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$	1E-09	1.8E-06	(mg/kg-day)	4.0E-03	(mg/kg-day)	4E-04
				Benzo(a)anthracene	1.0E-01	mg/kg	4.1E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	3E-09					
				Benzo(a)pyrene	1.1E-01	mg/kg	4.3E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Benzo(b)fluoranthene	9.6E-02	mg/kg	3.9E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	3E-09					
				Bromomethane	1.5E-01	mg/kg						4.2E-07	(mg/kg-day)	1.4E-03	(mg/kg-day)	3E-04
				Naphthalene	8.3E-01	mg/kg						2.3E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	1E-04
				Trichloroethene	3.0E-01	mg/kg	1.2E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	6E-10	8.6E-07	(mg/kg-day)	5.0E-04	(mg/kg-day)	2E-03
				Vinyl Chloride	1.2E-03	mg/kg	4.7E-11	(mg/kg-day)	7.2E-01	$(mg/kg\text{-}day)^{-1}$	3E-11	3.3E-09	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-06
				Dioxin-Like PCBs TEQ	1.3E-05	mg/kg	5.2E-13	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	8E-08	3.7E-11	(mg/kg-day)	7.0E-10	(mg/kg-day)	5E-02
			Exp. Route Total								2E-06					6E-01
			Dermal	1,2,4-Trimethylbenzene	2.4E+01	mg/kg										
				Aroclor-1016	3.6E-01	mg/kg						4.6E-07	(mg/kg-day)	7.0E-05	(mg/kg-day)	7E-03
				Aroclor-1254	3.4E-02	mg/kg						2.2E-07	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-02
				Aroclor-1260	3.5E+00	mg/kg						2.3E-05	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E+00
				Total Aroclor	2.8E+01	mg/kg	3.6E-05	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	2E-05					
				Benzene	6.3E-01	mg/kg										
				Benzo(a)anthracene	1.0E-01	mg/kg	1.2E-07	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2E-07					
				Benzo(a)pyrene	1.1E-01	mg/kg	1.3E-07	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2E-08					
				Benzo(b)fluoranthene	9.6E-02	mg/kg	1.1E-07	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2E-07					
				Bromomethane	1.5E-01	mg/kg										
				Naphthalene	8.3E-01	mg/kg						5.1E-06	(mg/kg-day)	2.0E-02	(mg/kg-day)	3E-04
				Trichloroethene	3.0E-01	mg/kg										
				Vinyl Chloride	1.2E-03	mg/kg										
				Dioxin-Like PCBs TEQ	1.3E-05	mg/kg	3.5E-12	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	2E-17	1.8E-11	(mg/kg-day)	7.0E-10	(mg/kg-day)	3E-02
			Exp. Route Total								2E-05					1E+00
			Inhalation	Aroclor-1016	6.1E-04	$(\mu g/m^3)$						1.4E-07	(mg/m^3)	5.0E-06	(mg/m^3)	3E-02
				Aroclor-1254	4.0E-05	$(\mu g/m^3)$						9.1E-09	(mg/m^3)	5.0E-06	(mg/m^3)	2E-03
				Aroclor-1260	2.7E-03	$(\mu g/m^3)$						6.1E-07	(mg/m^3)	5.0E-06	(mg/m^3)	1E-01
				Total Aroclor	3.4E-02	$(\mu g/m^3)$	1.1E-04	$(\mu g/m^3)$	5.7E-04	$(\mu g/m^3)^{-1}$	6E-08					
				Benzene	1.8E-01	$(\mu g/m^3)$	5.8E-04	$(\mu g/m^3)$	7.8E-06	$(\mu g/m^3)^{-1}$	5E-09	4.1E-05	(mg/m^3)	3.0E-02	(mg/m^3)	1E-03
				Benzo(a)anthracene	2.3E-05	$(\mu g/m^3)$	7.5E-08	$(\mu g/m^3)$	1.1E-04	$(\mu g/m^3)^{-1}$	8E-12					
				Bromomethane	1.1E-01	$(\mu g/m^3)$						2.4E-05	(mg/m^3)	5.0E-03	(mg/m^3)	5E-03
				Naphthalene	1.8E-02	$(\mu g/m^3)$	5.8E-05	$(\mu g/m^3)$	3.4E-05	$(\mu g/m^3)^{-1}$	2E-09	4.1E-06	(mg/m^3)	3.0E-03	(mg/m^3)	1E-03
				Trichloroethene	1.4E-01	$(\mu g/m^3)$	4.5E-04	$(\mu g/m^3)$	4.1E-06	$(\mu g/m^3)^{-1}$	2E-09	3.1E-05	(mg/m^3)	2.0E-03	(mg/m^3)	2E-02
				1,2,4-Trimethylbenzene	3.1E+00	$(\mu g/m^3)$						7.0E-04	(mg/m^3)	7.0E-03	(mg/m^3)	1E-01
				Vinyl Chloride	1.2E-03	$(\mu g/m^3)$	4.0E-06	$(\mu g/m^3)$	4.4E-06	$(\mu g/m^3)^{-1}$	2E-11	2.8E-07	(mg/m^3)	1.0E-01	(mg/m^3)	3E-06
				Dioxin-Like PCBs TEQ	6.6E-09	$(\mu g/m^3)$	2.2E-11	$(\mu g/m^3)$	3.8E+01	$(\mu g/m^3)^{-1}$	8E-10	1.5E-12	(mg/m^3)	4.0E-08	(mg/m^3)	4E-05
			Exp. Route Total								7E-08					3E-01
Medium Total											2E-05					2E+00

Blue highlight flags non-cancer HI values above a level of concern (HI>1E+00).

Table 7.5.CT
Central Tendency
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Current/Future
Receptor Population: Outdoor Worker
Receptor Age: Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg						9.4E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-04
				Aroclor-1260	7.9E-02	mg/kg						1.5E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	8E-04
				Total Aroclor	2.0E-01	mg/kg	1.4E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Benzene	6.8E-03	mg/kg	4.7E-10	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$	3E-11	1.3E-09	(mg/kg-day)	4.0E-03	(mg/kg-day)	3E-07
				Benzo(a)anthracene	1.1E-01	mg/kg	7.6E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	6E-09					
				Benzo(a)pyrene	1.7E-01	mg/kg	1.2E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	9E-08					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	1.0E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	8E-09					
				Trichloroethene	4.5E-02	mg/kg	3.1E-09	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1E-10	8.6E-09	(mg/kg-day)	5.0E-04	(mg/kg-day)	2E-05
				Vinyl chloride	6.8E-03	mg/kg	4.7E-10	(mg/kg-day)	7.5E-01	$(mg/kg\text{-}day)^{-1}$	4E-10	1.3E-09	(mg/kg-day)	3.0E-03	(mg/kg-day)	4E-07
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	6.7E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	1E-08	1.9E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	3E-04
			Exp. Route Total								1E-07					2E-03
			Dermal	Aroclor-1254	4.8E-02	mg/kg						9.2E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	5E-04
				Aroclor-1260	7.9E-02	mg/kg						1.5E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	8E-04
				Total Aroclor	2.0E-01	mg/kg	1.4E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Benzene	6.8E-03	mg/kg										
				Benzo(a)anthracene	1.1E-01	mg/kg	7.0E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	5E-09					
				Benzo(a)pyrene	1.7E-01	mg/kg	1.1E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	8E-08					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	9.6E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7E-09					
				Trichloroethene	4.5E-02	mg/kg										
				Vinyl chloride	6.8E-03	mg/kg										
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	1.4E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	2E-09	4.0E-14	(mg/kg-day)	7.0E-10	(mg/kg-day)	6E-05
			Exp. Route Total								1E-07					1E-03
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$						1.5E-07	(mg/m^3)	5.0E-06	(mg/m^3)	3E-02
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$						1.6E-07	(mg/m^3)	5.0E-06	(mg/m^3)	3E-02
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	8.7E-06	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$	5E-09					
				Benzene	1.9E-03	$(\mu g/m^3)$	7.1E-05	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$	6E-10	5.0E-06	(mg/m^3)	3.0E-02	(mg/m^3)	2E-04
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	9.2E-07	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	1E-10					
				Trichloroethene	2.0E-02	$(\mu g/m^3)$	7.5E-04	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3E-09	5.2E-05	(mg/m^3)	2.0E-03	(mg/m^3)	3E-02
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	2.6E-04	$(\mu g/m^3)$	4.4E-06	$(ug/m^3)^{-1}$	1E-09	1.8E-05	(mg/m^3)	1.0E-01	(mg/m^3)	2E-04
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	1.8E-11	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$	7E-10	1.3E-12	(mg/m^3)	4.0E-08	(mg/m^3)	3E-05
			Exp. Route Total								1E-08					9E-02
Medium Total											3E-07					9E-02

Table 7.5.RME
Reasonable Maximum Exposure
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Current/Future
Receptor Population: Outdoor Worker
Receptor Age: Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg						3.7E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Aroclor-1260	7.9E-02	mg/kg						6.1E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	3E-03
				Total Aroclor	2.0E-01	mg/kg	5.5E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1E-07					
				Benzene	6.8E-03	mg/kg	1.9E-09	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$	1E-10	5.2E-09	(mg/kg-day)	4.0E-03	(mg/kg-day)	1E-06
				Benzo(a)anthracene	1.1E-01	mg/kg	3.0E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2E-08					
				Benzo(a)pyrene	1.7E-01	mg/kg	4.7E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	3E-07					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	4.2E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	3E-08					
				Trichloroethene	4.5E-02	mg/kg	1.2E-08	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	6E-10	3.4E-08	(mg/kg-day)	5.0E-04	(mg/kg-day)	7E-05
				Vinyl chloride	6.8E-03	mg/kg	1.9E-09	(mg/kg-day)	7.5E-01	$(mg/kg\text{-}day)^{-1}$	1E-09	5.2E-09	(mg/kg-day)	3.0E-03	(mg/kg-day)	2E-06
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	2.7E-13	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	4E-08	7.5E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	1E-03
			Exp. Route Total								5E-07					6E-03
			Dermal	Aroclor-1254	4.8E-02	mg/kg						2.2E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-03
				Aroclor-1260	7.9E-02	mg/kg						3.6E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Total Aroclor	2.0E-01	mg/kg	3.2E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	6E-08					
				Benzene	6.8E-03	mg/kg										
				Benzo(a)anthracene	1.1E-01	mg/kg	1.7E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1E-08					
				Benzo(a)pyrene	1.7E-01	mg/kg	2.6E-08	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2E-07					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	2.3E-08	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2E-08					
				Trichloroethene	4.5E-02	mg/kg										
				Vinyl chloride	6.8E-03	mg/kg										
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	3.4E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$	5E-09	9.5E-14	(mg/kg-day)	7.0E-10	(mg/kg-day)	1E-04
			Exp. Route Total								3E-07					3E-03
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$						2.9E-07	(mg/m^3)	5.0E-06	(mg/m^3)	6E-02
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$						3.1E-07	(mg/m^3)	5.0E-06	(mg/m^3)	6E-02
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	1.7E-05	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$	1E-08					
				Benzene	1.9E-03	$(\mu g/m^3)$	1.4E-04	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$	1E-09	9.9E-06	(mg/m^3)	3.0E-02	(mg/m^3)	3E-04
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	1.8E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	2E-10					
				Trichloroethene	2.0E-02	$(\mu g/m^3)$	1.5E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	6E-09	1.0E-04	(mg/m^3)	2.0E-03	(mg/m^3)	5E-02
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	5.2E-04	$(\mu g/m^3)$	4.4E-06	$(ug/m^3)^{-1}$	2E-09	3.7E-05	(mg/m^3)	1.0E-01	(mg/m^3)	4E-04
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	3.6E-11	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$	1E-09	2.6E-12	(mg/m^3)	4.0E-08	(mg/m^3)	6E-05
			Exp. Route Total								2E-08					2E-01
Medium Total											9E-07					2E-01

Table 7.6.CT
Central Tendency
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe Current/Future
Receptor Population Teenage Trespasser
Receptor Age: Adolescent (7-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Non-Cancer Hazard Calculations				
					Value	Units	Age	Intake/Exposure Concentration		CSF/Unit Risk		Age Adjusted CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg									3.1E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-04
				Aroclor-1260	7.9E-02	mg/kg									5.0E-09	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-04
				Total Aroclor	2.0E-01	mg/kg	7-18 years	1.6E-09	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			3E-09					
				Benzene	6.8E-03	mg/kg	7-18 years	5.5E-11	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$			3E-12	4.3E-10	(mg/kg-day)	4.0E-03	(mg/kg-day)	1E-07
				Benzo(a)anthracene	1.1E-01	mg/kg	7<11 years	2.6E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	6E-10					
							11<16 years	1.8E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	4E-10					
				Benzo(a)pyrene	1.7E-01	mg/kg	7<11 years	4.1E-10	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	9E-09					
							11<16 years	2.9E-10	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	6E-09					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	7<11 years	3.6E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	8E-10					
							11<16 years	2.5E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	6E-10					
				Trichloroethene[1]	4.5E-02	mg/kg	7<11 years	1.1E-10	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-02	$(mg/kg\text{-}day)^{-1}$	7E-12	2.8E-09	(mg/kg-day)	5.0E-04	(mg/kg-day)	6E-06
							11<16 years	7.5E-11	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-02	$(mg/kg\text{-}day)^{-1}$	5E-12					
				Vinyl chloride	6.8E-03	mg/kg	7-18 years	5.5E-11	(mg/kg-day)	1.5E+00	$(mg/kg\text{-}day)^{-1}$			8E-11	4.3E-10	(mg/kg-day)	3.0E-03	(mg/kg-day)	1E-07
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	7-18 years	7.9E-15	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			1E-09	6.2E-14	(mg/kg-day)	7.0E-10	(mg/kg-day)	9E-05
			Exp. Route Total											2E-08					5E-04
			Dermal	Aroclor-1254	4.8E-02	mg/kg									1.7E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	9E-04
				Aroclor-1260	7.9E-02	mg/kg									2.9E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-03
				Total Aroclor	2.0E-01	mg/kg	7-18 years	9.2E-09	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			2E-08					
				Benzene	6.8E-03	mg/kg													
				Benzo(a)anthracene	1.1E-01	mg/kg	7<11 years	9.9E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-09					
							11<16 years	1.0E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-09					
				Benzo(a)pyrene	1.7E-01	mg/kg	7<11 years	1.5E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	3E-08					
							11<16 years	1.6E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	4E-08					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	7<11 years	1.4E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	3E-09					
							11<16 years	1.4E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	3E-09					
				Trichloroethene	4.5E-02	mg/kg													
				Vinyl chloride	6.8E-03	mg/kg													
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	7-18 years	9.7E-15	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			2E-09	7.5E-14	(mg/kg-day)	7.0E-10	(mg/kg-day)	1E-04
			Exp. Route Total											1E-07					2E-03
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$									2.8E-09	(mg/m^3)	5.0E-06	(mg/m^3)	6E-04
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$									3.0E-09	(mg/m^3)	5.0E-06	(mg/m^3)	6E-04
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	7-18 years	1.7E-07	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$			9E-11					
				Benzene	1.9E-03	$(\mu g/m^3)$	7-18 years	1.4E-06	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$			1E-11	9.5E-08	(mg/m^3)	3.0E-02	(mg/m^3)	3E-06
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	7<11 years	5.7E-07	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	3.3E-04	$(ug/m^3)^{-1}$	2E-10					
							11<16 years	7.1E-07	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-2}$	3.3E-04	$(ug/m^3)^{-2}$	2E-10					
				Trichloroethene[1]	2.0E-02	$(\mu g/m^3)$	7<11 years	4.6E-04	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3.0E-06	$(ug/m^3)^{-1}$	3E-09	1.0E-06	(mg/m^3)	2.0E-03	(mg/m^3)	5E-04
							11<16 years	5.8E-04	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3.0E-06	$(ug/m^3)^{-1}$	4E-09					
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	7-18 years	5.0E-06	$(\mu g/m^3)$	8.8E-06	$(ug/m^3)^{-1}$			4E-11	3.5E-07	(mg/m^3)	1.0E-01	(mg/m^3)	4E-06
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	7-18 years	3.5E-13	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$			1E-11	2.5E-14	(mg/m^3)	4.0E-08	(mg/m^3)	6E-07
			Exp. Route Total											7E-09					2E-03
Medium Total														1E-07					5E-03

[1]Cancer risk from exposure to TCE is calculated in accordance with U.S. EPA (2011c) whereby the ADAF adjustment applies only to the kidney cancer component of the total cancer risk estimate.

Table 7.6.RME
Reasonable Maximum Exposure
Calculation of Chemical Cancer Risks and Non-cancer Hazards
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe Current/Future
Receptor Population Teenage Trespasser
Receptor Age: Adolescent (7-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations							Non-Cancer Hazard Calculations				
					Value	Units	Age	Intake/Exposure Concentration		CSF/Unit Risk		Age Adjusted CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Ingestion	Aroclor-1254	4.8E-02	mg/kg									1.2E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	6E-04
				Aroclor-1260	7.9E-02	mg/kg									2.0E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	1E-03
				Total Aroclor	2.0E-01	mg/kg	7-18 years	8.6E-09	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			2E-08					
				Benzene	6.8E-03	mg/kg	7-18 years	2.9E-10	(mg/kg-day)	5.5E-02	$(mg/kg\text{-}day)^{-1}$			2E-11	1.7E-09	(mg/kg-day)	4.0E-03	(mg/kg-day)	4E-07
				Benzo(a)anthracene	1.1E-01	mg/kg	7<11 years	1.1E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-09					
							11<16 years	7.4E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-09					
							16≤18 years	3.5E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E-01	$(mg/kg\text{-}day)^{-1}$	3E-10					
				Benzo(a)pyrene	1.7E-01	mg/kg	7<11 years	1.6E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	4E-08					
							11<16 years	1.1E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	3E-08					
							16≤18 years	5.4E-10	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	4E-09					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	7<11 years	1.4E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	3E-09					
							11<16 years	1.0E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	2E-09					
							16≤18 years	4.8E-10	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E-01	$(mg/kg\text{-}day)^{-1}$	4E-10					
				Trichloroethene[1]	4.5E-02	mg/kg	7<11 years	4.3E-10	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	9.3E-02	$(mg/kg\text{-}day)^{-1}$	5E-11	1.1E-08	(mg/kg-day)	5.0E-04	(mg/kg-day)	2E-05
							11<16 years	3.0E-10	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	9.3E-02	$(mg/kg\text{-}day)^{-1}$	3E-11					
							16≤18 years	1.4E-10	(mg/kg-day)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-02	$(mg/kg\text{-}day)^{-1}$	7E-12					
				Vinyl chloride	6.8E-03	mg/kg	7-18 years	2.9E-10	(mg/kg-day)	1.5E+00	$(mg/kg\text{-}day)^{-1}$			4E-10	1.7E-09	(mg/kg-day)	3.0E-03	(mg/kg-day)	6E-07
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	7-18 years	4.2E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			7E-09	2.5E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	4E-04
			Exp. Route Total											1E-07					2E-03
			Dermal	Aroclor-1254	4.8E-02	mg/kg									3.5E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	2E-03
				Aroclor-1260	7.9E-02	mg/kg									5.7E-08	(mg/kg-day)	2.0E-05	(mg/kg-day)	3E-03
				Total Aroclor	2.0E-01	mg/kg	7-18 years	2.5E-08	(mg/kg-day)	2.0E+00	$(mg/kg\text{-}day)^{-1}$			5E-08					
				Benzene	6.8E-03	mg/kg													
				Benzo(a)anthracene	1.1E-01	mg/kg	7<11 years	2.0E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	4E-09					
							11<16 years	2.1E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	5E-09					
							16≤18 years	1.2E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E-01	$(mg/kg\text{-}day)^{-1}$	9E-10					
				Benzo(a)pyrene	1.7E-01	mg/kg	7<11 years	3.1E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	7E-08					
							11<16 years	3.2E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	2.2E+01	$(mg/kg\text{-}day)^{-1}$	7E-08					
							16≤18 years	1.8E-09	(mg/kg-day)	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1E-08					
				Benzo(b)fluoranthene	1.5E-01	mg/kg	7<11 years	2.7E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	6E-09					
							11<16 years	2.9E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	2.2E+00	$(mg/kg\text{-}day)^{-1}$	6E-09					
							16≤18 years	1.6E-09	(mg/kg-day)	7.3E-01	$(mg/kg\text{-}day)^{-1}$	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1E-09					
				Trichloroethene	4.5E-02	mg/kg													
				Vinyl chloride	6.8E-03	mg/kg													
				Dioxin-Like PCBs TEQ	9.7E-07	mg/kg	7-18 years	2.6E-14	(mg/kg-day)	1.6E+05	$(mg/kg\text{-}day)^{-1}$			4E-09	1.5E-13	(mg/kg-day)	7.0E-10	(mg/kg-day)	2E-04
			Exp. Route Total											2E-07					5E-03
			Inhalation	Aroclor-1254	5.7E-05	$(\mu g/m^3)$									1.5E-08	(mg/m^3)	5.0E-06	(mg/m^3)	3E-03
				Aroclor-1260	6.0E-05	$(\mu g/m^3)$									1.6E-08	(mg/m^3)	5.0E-06	(mg/m^3)	3E-03
				Total Aroclor	2.4E-04	$(\mu g/m^3)$	7-18 years	8.9E-07	$(\mu g/m^3)$	5.7E-04	$(ug/m^3)^{-1}$			5E-10					
				Benzene	1.9E-03	$(\mu g/m^3)$	7-18 years	7.2E-06	$(\mu g/m^3)$	7.8E-06	$(ug/m^3)^{-1}$			6E-11	5.1E-07	(mg/m^3)	3.0E-02	(mg/m^3)	2E-05
				Benzo(a)anthracene	2.5E-05	$(\mu g/m^3)$	7<11 years	2.3E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	1.1E-03	$(ug/m^3)^{-1}$	3E-09					
							11<16 years	2.8E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-2}$	1.1E-03	$(ug/m^3)^{-2}$	3E-09					
							16≤18 years	1.7E-06	$(\mu g/m^3)$	1.1E-04	$(ug/m^3)^{-1}$	3.3E-04	$(ug/m^3)^{-1}$	6E-10					
				Trichloroethene[1]	2.0E-02	$(\mu g/m^3)$	7<11 years	1.8E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3.0E-06	$(ug/m^3)^{-1}$	1E-08	5.3E-06	(mg/m^3)	2.0E-03	(mg/m^3)	3E-03
							11<16 years	2.3E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	3.0E-06	$(ug/m^3)^{-1}$	1E-08					
							16≤18 years	1.4E-03	$(\mu g/m^3)$	4.1E-06	$(ug/m^3)^{-1}$	1.0E-06	$(ug/m^3)^{-1}$	6E-09					
				Vinyl chloride	7.1E-03	$(\mu g/m^3)$	7-18 years	2.7E-05	$(\mu g/m^3)$	8.8E-06	$(ug/m^3)^{-1}$			2E-10	1.9E-06	(mg/m^3)	1.0E-01	(mg/m^3)	2E-05
				Dioxin-Like PCBs TEQ	5.0E-10	$(\mu g/m^3)$	7-18 years	1.9E-12	$(\mu g/m^3)$	3.8E+01	$(ug/m^3)^{-1}$			7E-11	1.3E-13	(mg/m^3)	4.0E-08	(mg/m^3)	3E-06
			Exp. Route Total											4E-08					9E-03
Medium Total														4E-07					2E-02

[1]Cancer risk from exposure to TCE is calculated in accordance with U.S. EPA (2011c) whereby the ADAF adjustment applies only to the kidney cancer component of the total cancer risk estimate.

Table 9.1.CT
Summary of Receptor Risks and Hazards for COPCs
Central Tendency
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	1E-03	2E-04	immune system	8E-03	9E-03
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	2E-03	3E-04	immune system	8E-03	1E-02
			Total Aroclor	2E-08	4E-09	1E-08	4E-08						
			Benzene	2E-11		1E-09	1E-09	blood	7E-07		blood	4E-05	5E-05
			Benzo(a)anthracene	5E-09	7E-10	2E-10	5E-09						
			Benzo(a)pyrene	7E-08	1E-08		8E-08						
			Benzo(b)fluoranthene	6E-09	1E-09		7E-09						
			Trichloroethene	1E-10		7E-09	8E-09	immune system/heart	4E-05		thymus/heart	7E-03	7E-03
			Vinyl chloride	3E-10		3E-09	3E-09	liver	1E-06		liver	5E-05	5E-05
			Dioxin-Like PCBs TEQ	9E-09	3E-10	2E-09	1E-08	Decrease sperm count	6E-04	2E-05	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	9E-06	6E-04
Receptor Total							2E-07				Receptor HI Total		3E-02

Circulatory HI Across All Media =	7E-03
Liver HI Across All Media =	6E-05
Immune System HI Across All Media =	3E-02
Eye HI Across All Media =	3E-03
Nails HI Across All Media =	3E-03
Endocrine System HI Across All Media =	9E-06
Kidney HI Across All Media =	6E-04
Hematopoietic System HI Across All Media =	9E-06
Reproductive HI Across All Media =	6E-04
Developmental HI Across All Media =	9E-06
Respiratory HI Across All Media =	9E-06

Table 9.1.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	3E-03	2E-03	immune system	1E-02	2E-02
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	5E-03	3E-03	immune system	1E-02	2E-02
			Total Aroclor	1E-07	8E-08	4E-08	3E-07						
			Benzene	1E-10		4E-09	4E-09	blood	2E-06		blood	6E-05	6E-05
			Benzo(a)anthracene	3E-08	2E-08	8E-10	4E-08						
			Benzo(a)pyrene	4E-07	2E-07		7E-07						
			Benzo(b)fluoranthene	4E-08	2E-08		6E-08						
			Trichloroethene	7E-10		2E-08	2E-08	immune system/heart	1E-04		thymus/heart	1E-02	1E-02
			Vinyl chloride	2E-09		9E-09	1E-08	liver	3E-06		liver	7E-05	7E-05
			Dioxin-Like PCBs TEQ	5E-08	7E-09	5E-09	6E-08	Decrease sperm count	2E-03	2E-04	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	1E-05	2E-03
Receptor Total							1E-06				Receptor HI Total		5E-02

Blood HI Across All Media =	1E-02
Liver HI Across All Media =	8E-05
Immune System HI Across All Media =	4E-02
Eye HI Across All Media =	1E-02
Nails HI Across All Media =	1E-02
Endocrine System HI Across All Media =	1E-05
Kidney HI Across All Media =	2E-03
Hematopoietic System HI Across All Media =	1E-05
Reproductive HI Across All Media =	2E-03
Developmental HI Across All Media =	1E-05
Respiratory HI Across All Media =	1E-05

Table 9.2.CT
Summary of Receptor Risks and Hazards for COPCs
Central Tendency
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	1E-02	2E-03	immune system	8E-03	2E-02
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	2E-02	2E-03	immune system	8E-03	3E-02
			Total Aroclor	8E-08	1E-08	4E-09	9E-08						
			Benzene	7E-11		5E-10	5E-10	blood	8E-06		blood	4E-05	5E-05
			Benzo(a)anthracene	2E-07	2E-08	1E-09	2E-07						
			Benzo(a)pyrene	3E-06	3E-07		3E-06						
			Benzo(b)fluoranthene	2E-07	3E-08		3E-07						
			Trichloroethene	9E-10		5E-09	6E-09	immune system/heart	4E-04		thymus/heart	7E-03	8E-03
			Vinyl chloride	2E-09		1E-09	3E-09	liver	1E-05		liver	5E-05	6E-05
			Dioxin-Like PCBs TEQ	3E-08	9E-10	2E-10	3E-08	Decrease sperm count	7E-03	2E-04	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	9E-06	7E-03
Receptor Total							4E-06				Receptor HI Total		6E-02

Circulatory HI Across All Media =	8E-03
Liver HI Across All Media =	7E-05
Immune System HI Across All Media =	6E-02
Eye HI Across All Media =	3E-02
Nails HI Across All Media =	3E-02
Endocrine System HI Across All Media =	9E-06
Kidney HI Across All Media =	7E-03
Hematopoietic System HI Across All Media =	9E-06
Reproductive HI Across All Media =	7E-03
Developmental HI Across All Media =	9E-06
Respiratory HI Across All Media =	9E-06

Table 9.2.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	3E-02	1E-02	immune system	1E-02	5E-02
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	5E-02	2E-02	immune system	1E-02	8E-02
			Total Aroclor	4E-07	1E-07	1E-08	6E-07						
			Benzene	4E-10		1E-09	2E-09	blood	2E-05		blood	6E-05	8E-05
			Benzo(a)anthracene	6E-07	2E-07	1E-09	8E-07						
			Benzo(a)pyrene	9E-06	3E-06		1E-05						
			Benzo(b)fluoranthene	8E-07	2E-07		1E-06						
			Trichloroethene	3E-09		1E-08	2E-08	immune system/heart	1E-03		thymus/heart	1E-02	1E-02
			Vinyl chloride	1E-08		5E-09	2E-08	liver	3E-05		liver	7E-05	1E-04
			Dioxin-Like PCBs TEC	2E-07	1E-08	2E-09	2E-07	Decrease sperm count	2E-02	1E-03	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	1E-05	2E-02
Receptor Total							1E-05				Receptor HI Total		2E-01

Circulatory HI Across All Media =	1E-02
Liver HI Across All Media =	1E-04
Immune System HI Across All Media =	1E-01
Eye HI Across All Media =	1E-01
Nails HI Across All Media =	1E-01
Endocrine System HI Across All Media =	1E-05
Kidney HI Across All Media =	2E-02
Hematopoietic System HI Across All Media =	1E-05
Reproductive HI Across All Media =	2E-02
Developmental HI Across All Media =	1E-05
Respiratory HI Across All Media =	1E-05

Table 9.3
Summary of Receptor Risks for COPCs
Reasonable Maximum Exposure
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe:	Future
Receptor Population:	Resident
Exposure:	0-26 years

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254				
			Aroclor-1260				
			Total Aroclor	6E-07	2E-07	5E-08	8E-07
			Benzene	5E-10		5E-09	6E-09
			Benzo(a)anthracene	6E-07	2E-07	2E-09	8E-07
			Benzo(a)pyrene	1E-05	3E-06		1E-05
			Benzo(b)fluoranthene	9E-07	3E-07		1E-06
			Trichloroethene	4E-09		4E-08	4E-08
			Vinyl chloride	1E-08		1E-08	3E-08
			Dioxin-Like PCBs TEQ	2E-07	2E-08	7E-09	2E-07
Receptor Total							2E-05

Table 9.4.CT
Summary of Receptor Risks and Hazards for COPCs
Central Tendency
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 10 feet.	Vestal Site	1,2,4-Trimethylbenzene								blood	5E-02	5E-02
			Aroclor-1016					Developmental	4E-03	1E-03	immune system	1E-02	2E-02
			Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	1E-03	2E-03	immune system	9E-04	4E-03
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	1E-01	2E-01	immune system	6E-02	4E-01
			Total Aroclor	6E-07	3E-06	3E-08	4E-06						
			Benzene	4E-10		2E-09	3E-09	blood	1E-04		blood	7E-04	8E-04
			Benzo(a)anthracene	8E-10	3E-08	4E-12	3E-08						
			Benzo(a)pyrene	8E-09	3E-09		1E-08						
			Benzo(b)fluoranthene	7E-10	3E-08		3E-08						
			Bromomethane					hyperplasia of forestomach	8E-05		lesions of olfactory epithelium and nasal cavity	2E-03	3E-03
			Naphthalene			1E-09	1E-09		3E-05	4E-05	Nasal effects: hyperplasia and metaplasia in respiratory and olfactory epithelium	7E-04	8E-04
			Trichloroethene	1E-10		9E-10	1E-09	immune system/heart	4E-04		thymus/heart	8E-03	8E-03
			Vinyl Chloride	8E-12		9E-12	2E-11	liver	3E-07		liver	1E-06	2E-06
			Dioxin-Like PCBs TEQ	2E-08	4E-18	4E-10	2E-08	Decrease sperm count	1E-02	4E-03	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	2E-05	2E-02
Receptor Total							4E-06					Receptor HI Total	5E-01

Circulatory HI Across All Media =	6E-02
Liver HI Across All Media =	2E-05
Immune System HI Across All Media =	4E-01
Eye HI Across All Media =	3E-01
Nails HI Across All Media =	3E-01
Endocrine System HI Across All Media =	2E-05
Kidney HI Across All Media =	2E-02
Hematopoietic System HI Across All Media =	2E-05
Nose HI Across All Media =	3E-03
Reproductive HI Across All Media =	2E-02
Devlopmental HI Across All Media =	5E-03
Respiratory HI Across All Media =	7E-04
GI HI Across All Media =	8E-05

Table 9.4.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 10 feet.	Vestal Site	1,2,4-Trimethylbenzene								blood	1E-01	1E-01
			Aroclor-1016					Developmental	1E-02	7E-03	immune system	3E-02	5E-02
			Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	5E-03	1E-02	immune system	2E-03	2E-02
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	5E-01	1E+00	immune system	1E-01	2E+00
			Total Aroclor	2E-06	2E-05	6E-08	2E-05						
			Benzene	1E-09		5E-09	6E-09	blood	4E-04		blood	1E-03	2E-03
			Benzo(a)anthracene	3E-09	2E-07		2E-07						
			Benzo(a)pyrene	3E-08	2E-08		5E-08						
			Benzo(b)fluoranthene	3E-09	2E-07		2E-07						
			Bromomethane					hyperplasia of forestomach	3E-04		lesions of olfactory epithelium and nasal cavity	5E-03	5E-03
			Naphthalene			2E-09	2E-09		1E-04	3E-04	Nasal effects: hyperplasia and metaplasia in respiratory and olfactory epithelium	1E-03	2E-03
			Trichloroethene	6E-10		2E-09	2E-09	immune system/heart	2E-03		thymus/heart	2E-02	2E-02
			Vinyl Chloride	3E-11		2E-11	5E-11	liver	1E-06		liver	3E-06	4E-06
			Dioxin-Like PCBs TEQ	8E-08	2E-17	8E-10	8E-08	Decrease sperm count	5E-02	3E-02	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	4E-05	8E-02
Receptor Total							2E-05				Receptor HI Total		2E+00

Blue highlight flags non-cancer HI values above a level of concern (HI>1E+00).

Circulatory HI Across All Media =	1E-01
Liver HI Across All Media =	4E-05
Immune System HI Across All Media =	2E+00
Eye HI Across All Media =	2E+00
Nails HI Across All Media =	2E+00
Endocrine System HI Across All Media =	4E-05
Kidney HI Across All Media =	8E-02
Hematopoietic System HI Across All Media =	4E-05
Nose HI Across All Media =	6E-03
Reproductive HI Across All Media =	8E-02
Devlopmental HI Across All Media =	2E-02
Respiratory HI Across All Media =	1E-03
GI HI Across All Media =	3E-04

Table 9.5.CT
Summary of Receptor Risks and Hazards for COPCs
Central Tendency
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe:	Current/Future
Receptor Population:	Outdoor Worker
Receptor Age:	Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	5E-04	5E-04	immune system	3E-02	3E-02
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	8E-04	8E-04	immune system	3E-02	3E-02
			Total Aroclor	3E-08	3E-08	5E-09	6E-08						
			Benzene	3E-11		2E-09	2E-09	blood	3E-07		blood	6E-05	6E-05
			Benzo(a)anthracene	6E-09	5E-09		1E-08						
			Benzo(a)pyrene	9E-08	8E-08		2E-07						
			Benzo(b)fluoranthene	8E-09	7E-09		1E-08						
			Trichloroethene	1E-10		3E-09	3E-09	immune system/heart	2E-05		thymus/heart	3E-02	3E-02
			Vinyl chloride	4E-10		1E-09	2E-09	liver	4E-07		liver	2E-04	2E-04
			Dioxin-Like PCBs TEQ	1E-08	2E-09	7E-10	1E-08	Decrease sperm count	3E-04	6E-05	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	3E-05	4E-04
Receptor Total							3E-07				Receptor HI Total		9E-02

Circulatory HI Across All Media =	3E-02
Liver HI Across All Media =	2E-04
Immune System HI Across All Media =	9E-02
Eye HI Across All Media =	2E-03
Nails HI Across All Media =	2E-03
Endocrine System HI Across All Media =	3E-05
Kidney HI Across All Media =	3E-04
Hematopoietic System HI Across All Media =	3E-05
Reproductive HI Across All Media =	4E-04
Devlopmental HI Across All Media =	3E-05
Respiratory HI Across All Media =	3E-05

Table 9.5.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Current/Future
Receptor Population: Outdoor Worker
Receptor Age: Adult (>18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	2E-03	1E-03	immune system	6E-02	6E-02
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	3E-03	2E-03	immune system	6E-02	7E-02
			Total Aroclor	1E-07	6E-08	1E-08	2E-07						
			Benzene	1E-10		1E-09	1E-09	blood	1E-06		blood	1E-04	1E-04
			Benzo(a)anthracene	2E-08	1E-08	2E-10	3E-08						
			Benzo(a)pyrene	3E-07	2E-07		5E-07						
			Benzo(b)fluoranthene	3E-08	2E-08		5E-08						
			Trichloroethene	6E-10		6E-09	7E-09	immune system/heart	7E-05		thymus/heart	5E-02	5E-02
			Vinyl chloride	1E-09		2E-09	4E-09	liver	2E-06		liver	4E-04	4E-04
			Dioxin-Like PCBs TEQ	4E-08	5E-09	1E-09	5E-08	Decrease sperm count	1E-03	1E-04	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	6E-05	1E-03
Receptor Total							9E-07					Receptor HI Total	2E-01

Circulatory HI Across All Media =	5E-02
Liver HI Across All Media =	4E-04
Immune System HI Across All Media =	2E-01
Eye HI Across All Media =	8E-03
Nails HI Across All Media =	8E-03
Endocrine System HI Across All Media =	6E-05
Kidney HI Across All Media =	1E-03
Hematopoietic System HI Across All Media =	6E-05
Reproductive HI Across All Media =	1E-03
Devlopmental HI Across All Media =	6E-05
Respiratory HI Across All Media =	6E-05

Table 9.6.CT
Summary of Receptor Risks and Hazards for COPCs
Central Tendency
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Current/Future
Receptor Population: Teenage Trespasser
Receptor Age: Adolescent (7-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	2E-04	9E-04	immune system	6E-04	2E-03
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	2E-04	1E-03	immune system	6E-04	2E-03
			Total Aroclor	3E-09	2E-08	9E-11	2E-08						
			Benzene	3E-12		1E-11	1E-11	blood	1E-07		blood	3E-06	3E-06
			Benzo(a)anthracene	1E-09	4E-09	4E-10	6E-09						
			Benzo(a)pyrene	2E-08	7E-08		8E-08						
			Benzo(b)fluoranthene	1E-09	6E-09		7E-09						
			Trichloroethene	1E-11		6E-09	6E-09	immune system/heart	6E-06		thymus/heart	5E-04	5E-04
			Vinyl chloride	8E-11		4E-11	1E-10	liver	1E-07		liver	4E-06	4E-06
			Dioxin-Like PCBs TEQ	1E-09	2E-09	1E-11	3E-09	Decrease sperm count	9E-05	1E-04	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	6E-07	2E-04
Receptor Total							1E-07				Receptor HI Total		5E-03

Circulatory HI Across All Media =	5E-04
Liver HI Across All Media =	4E-06
Immune System HI Across All Media =	4E-03
Eye HI Across All Media =	3E-03
Nails HI Across All Media =	3E-03
Endocrine System HI Across All Media =	6E-07
Kidney HI Across All Media =	2E-04
Hematopoietic System HI Across All Media =	6E-07
Reproductive HI Across All Media =	2E-04
Devlopmental HI Across All Media =	6E-07
Respiratory HI Across All Media =	6E-07

Table 9.6.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Scenario Timeframe: Current/Future
Receptor Population: Teenage Trespasser
Receptor Age: Adolescent (7-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Oral/Dermal Primary Target Organ(s)	Ingestion	Dermal	Inhalation Primary Target Organ(s)	Inhalation	Exposure Routes Total
Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	6E-04	2E-03	immune system	3E-03	5E-03
			Aroclor-1260					immune system/inflammation of the Meibomian gland/distorted growth of fingernails and toenails	1E-03	3E-03	immune system	3E-03	7E-03
			Total Aroclor	2E-08	5E-08	5E-10	7E-08						
			Benzene	2E-11		6E-11	7E-11	blood	4E-07		blood	2E-05	2E-05
			Benzo(a)anthracene	4E-09	1E-08	6E-09	2E-08						
			Benzo(a)pyrene	6E-08	2E-07		2E-07						
			Benzo(b)fluoranthene	6E-09	1E-08		2E-08						
			Trichloroethene	9E-11		3E-08	3E-08	immune system/heart	2E-05		thymus/heart	3E-03	3E-03
			Vinyl chloride	4E-10		2E-10	7E-10	liver	6E-07		liver	2E-05	2E-05
			Dioxin-Like PCBs TEQ	7E-09	4E-09	7E-11	1E-08	Decrease sperm count	4E-04	2E-04	alimentary system(liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system	3E-06	6E-04
Receptor Total							4E-07					Receptor HI Total	2E-02

Circulatory HI Across All Media =	3E-03
Liver HI Across All Media =	2E-05
Immune System HI Across All Media =	2E-02
Eye HI Across All Media =	6E-03
Nails HI Across All Media =	6E-03
Endocrine System HI Across All Media =	3E-06
Kidney HI Across All Media =	6E-04
Hematopoietic System HI Across All Media =	3E-06
Reproductive HI Across All Media =	6E-04
Devlopmental HI Across All Media =	3E-06
Respiratory HI Across All Media =	3E-06

Table 9.7
Summary of Receptor Risks and Hazards for COPCs
Vestal Chlorinated Solvent Site Human Health Risk Assessment

Receptor Population	Scenario Timeframe	Receptor Age	Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk		Non-Carcinogenic Hazard Quotient	
							CTE	RME	CTE	RME
Resident	Future	Adult	Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254			9E-03	2E-02
						Aroclor-1260			1E-02	2E-02
						Total Aroclor	4E-08	3E-07		
						Benzene	1E-09	4E-09	5E-05	6E-05
						Benzo(a)anthracene	5E-09	4E-08		
						Benzo(a)pyrene	8E-08	7E-07		
						Benzo(b)fluoranthene	7E-09	6E-08		
						Trichloroethene	8E-09	2E-08	7E-03	1E-02
						Vinyl chloride	3E-09	1E-08	5E-05	7E-05
						Dioxin-Like PCBs TEQ	1E-08	6E-08	6E-04	2E-03
Receptor Total							2E-07	1E-06	3E-02	5E-02
Resident	Future	Child (0-6 years)	Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254			2E-02	5E-02
						Aroclor-1260			3E-02	8E-02
						Total Aroclor	9E-08	6E-07		
						Benzene	5E-10	2E-09	5E-05	8E-05
						Benzo(a)anthracene	2E-07	8E-07		
						Benzo(a)pyrene	3E-06	1E-05		
						Benzo(b)fluoranthene	3E-07	1E-06		
						Trichloroethene	6E-09	2E-08	8E-03	1E-02
						Vinyl chloride	3E-09	2E-08	6E-05	1E-04
						Dioxin-Like PCBs TEQ	3E-08	2E-07	7E-03	2E-02
Receptor Total							4E-06	1E-05	6E-02	2E-01
Construction Worker	Current/ Future	Adult (>18 years)	Soil	Soils collected at a depth of 0 to 10 feet.	Vestal Site	1,2,4-Trimethylbenzene			5E-02	1E-01
						Aroclor-1016			2E-02	5E-02
						Aroclor-1254			4E-03	2E-02
						Aroclor-1260			4E-01	2E+00
						Total Aroclor	4E-06	2E-05		
						Benzene	3E-09	6E-09	8E-04	2E-03
						Benzo(a)anthracene	3E-08	2E-07		
						Benzo(a)pyrene	1E-08	5E-08		
						Benzo(b)fluoranthene	3E-08	2E-07		
						Bromomethane	0E+00	0E+00	3E-03	5E-03
						Naphthalene	1E-09	2E-09	8E-04	2E-03
						Trichloroethene	1E-09	2E-09	8E-03	2E-02
						Vinyl Chloride	2E-11	5E-11	2E-06	4E-06
						Dioxin-Like PCBs TEQ	2E-08	8E-08	2E-02	8E-02
Receptor Total							4E-06	2E-05	5E-01	2E+00
Outdoor Worker	Current/ Future	Adult (>18 years)	Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254			3E-02	6E-02
						Aroclor-1260			3E-02	7E-02
						Total Aroclor	6E-08	2E-07		
						Benzene	2E-09	1E-09	6E-05	1E-04
						Benzo(a)anthracene	1E-08	3E-08		
						Benzo(a)pyrene	2E-07	5E-07		
						Benzo(b)fluoranthene	1E-08	5E-08		
						Trichloroethene	3E-09	7E-09	3E-02	5E-02
						Vinyl chloride	2E-09	4E-09	2E-04	4E-04
						Dioxin-Like PCBs TEQ	1E-08	5E-08	4E-04	1E-03
Receptor Total							3E-07	9E-07	9E-02	2E-01
Teenage Trespasser	Current/ Future	Adolescent (7-18 years)	Soil	Soils collected at a depth of 0 to 12 inches	Vestal Site	Aroclor-1254			2E-03	5E-03
						Aroclor-1260			2E-03	7E-03
						Total Aroclor	2E-08	7E-08		
						Benzene	1E-11	7E-11	3E-06	2E-05
						Benzo(a)anthracene	6E-09	2E-08		
						Benzo(a)pyrene	8E-08	2E-07		
						Benzo(b)fluoranthene	7E-09	2E-08		
						Trichloroethene	6E-09	3E-08	5E-04	3E-03
						Vinyl chloride	1E-10	7E-10	4E-06	2E-05
						Dioxin-Like PCBs TEQ	3E-09	1E-08	2E-04	6E-04
Receptor Total							1E-07	4E-07	5E-03	2E-02

Blue highlight flags non-cancer HI values above a level of concern (HI>1E+00).