Risk-Based Remedies

RBR Consulting, Inc.

HEALTH RISK ASSESSMENT

FOR THE

HERCULES INCORPORATED FACILITY
HOPEWELL, VIRGINIA

Prepared for:

Groundwater & Environmental Services, Inc.

Prepared By:

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EXECUTIVE SUMMARY

This human health risk assessment report has been prepared by RBR Consulting Inc. (RBR), on behalf of Groundwater & Environmental Services, Inc. (GES) for the Hercules Incorporated (Hercules) Facility located in Hopewell, Virginia (site). Hercules is implementing Facility lead corrective action activities at the site under the United States Environmental Protection Agency's (USEPA) Resource Conservation and Recovery Act (RCRA). Therefore, this risk assessment has been prepared according to standard USEPA procedures and guidance documents.

Hercules operates the 390-acre chemical manufacturing facility, which reacts several different chemicals with purified cellulose and sodium hydroxide precursor to manufacture lines of chemicals known as cellulose derivatives. The site property was initially part of a DuPont guncotton manufacturing facility which operated from 1912 through the World War I era. Hercules first acquired part of the current site property in 1926 to manufacture purified cotton cellulose for use in the chemical and paper industry. Currently, Hercules operates four derivatives lines and provides its chemical products to a variety of end-users in the food, cosmetics, paint, and pharmaceutical industries.

Field investigations at the site were initiated in 2001 in accordance with a Facility Lead Corrective Action Agreement Workplan. The phased investigations (Phase I, II, and III) at the site focused on several Solid Waste Management Units (SWMUs) and other areas of concern, including onsite and offsite surface water bodies. Media which were sampled at the site include surface soil, groundwater, sludge, sediment and surface water. The majority of SWMUs were granted No Further Action designations as documented in the Final Remedial Investigation (RI) Report; the remaining areas were evaluated as discrete exposure areas in this risk assessment:

- SWMU #3 Eastern Whitewater Lagoon (Eastern WWL);
- SWMU #4 Western Whitewater Lagoon (Western WWL);
- SWMU #5 Old Landfill and Landfill #156 (Landfill Areas);
- SWMU #7 Natrosol Lagoon;
- SWMU #8 and #29: Reten/Aqualon Basin (RA Basin);
- SWMU #14 Sludge Drying Beds (SDBs);
- SWMU #15 Vacuum Filter Sludge Pile (VFSP);
- Main Holding Basin;
- East Bear Creek;
- West Bear Creek;
- Unnamed Tributary;
- Cattail Creek; and

- Bailey Creek.

The human health risk assessment consists of four main components: data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization. Soil, groundwater, sludge, sediment and surface water data from each exposure area were evaluated in order to identify constituents of interest (COI). The data, including both standard analytes and tentatively identified compounds (TICs), were compared to appropriate health-based screening values from USEPA which address the relevant pathways of human exposure in each area. In cases where specific screening values were not available (or in cases of TICs where probable identities were assumed), screening values were selected based on appropriate surrogate constituents.

The COI for direct contact with soil are inorganics (arsenic, chromium, iron and thallium) and two known TICs (28-norolean-17-en-3-one and 2,2-dimethoxy-propane). The COI for direct contact with groundwater include volatile organic compounds (VOCs) and volatile TICs; total and dissolved inorganics; and unknown TICs falling into three probable chemical class groups (glycol ether derivative, chlorinated VOC, and alcohol). A subset of the VOCs, known volatile TICs, and unknown TICs (with assumed volatile surrogates) were identified as COI for potential vapor intrusion from groundwater to indoor air. The COI for direct contact with sediment and surface water from onsite SWMUs consist of polynuclear aromatic hydrocarbons (PAHs) and inorganics, and one unknown TIC (probable chemical class: PAH). The main COI for direct contact with sediment and surface water from onsite and offsite streams are inorganics, with a few locations also identifying polychlorinated biphenyls (PCBs; in sediments of West Bear Creek and the Unnamed Tributary) and unknown TICs (probable chemical class: PAH; in sediments of West Bear Creek, the Unnamed Tributary and Cattail Creek).

Land use at the site is currently industrial, and land use restrictions will be implemented for the site that will prohibit future residential use. Furthermore, land use restrictions will prohibit the future use of groundwater for any purpose. Additional information regarding the facility's industrial land use designation was included in Section 2.3 of the USEPA-approved *Phase III Site Investigation Summary Report* (GES, 2007). Therefore, the potential current and future receptors quantitatively addressed in the assessment consist of outdoor industrial workers, indoor industrial workers (under a future use scenario only), construction workers, youth trespassers, and recreational visitors (adult and youth). These receptors were evaluated for the exposure routes identified below.

- Outdoor Industrial Worker – Surface soil from onsite SWMUs (Landfill Areas, SDBs and VFSP) via incidental ingestion, dermal contact, inhalation of particulates and inhalation of volatiles; sediment from onsite SWMUs (Eastern and Western WWLs, Natrosol Lagoon) via incidental ingestion and dermal contact; and surface water from onsite SWMUs (Eastern and Western WWLs, Natrosol Lagoon, SDBs and VFSP) via incidental ingestion and dermal contact.

- Indoor Worker – Indoor air (vapor intrusion from groundwater) from onsite groundwater (associated with Eastern and Western WWLs, Landfill Areas, Natrosol Lagoon, RA Basin, SDBs, VFSP and Main Holding Basin) via inhalation.

- Construction Worker – Surface soil from onsite SWMUs via incidental ingestion, dermal contact, inhalation of particulates and inhalation of volatiles; onsite groundwater via incidental ingestion, dermal contact, and inhalation of volatiles; and sediment and surface water from onsite SWMUs via incidental ingestion and dermal contact.

- Youth Trespasser – Sediment and surface water from onsite surface water bodies (East Bear Creek, West Bear Creek and the Unnamed Tributary) via incidental ingestion and dermal contact.

- Recreational Adult and Youth – Sediment and surface water from offsite surface water bodies (Cattail Creek and Bailey Creek) via incidental ingestion and dermal contact.

Exposure point concentrations for COI in each area and medium were either statistically calculated based on the analytical data, or were modeled using USEPA fate and transport equations. For the toxicity assessment, toxicity values for the COI were derived from the USEPA Integrated Risk Information System (IRIS) database and other relevant USEPA sources as needed. In cases where specific toxicity values were not available, and for unknown TICs where probable identities were assumed, toxicity values were selected based on appropriate surrogate constituents. Exposure to lead was addressed using a model specific to non-residential receptors developed by the USEPA Technical Review Workgroup for Lead.

The risk characterization was conducted for each potential receptor, exposure pathway, and constituent in each area of interest. Benchmarks selected for the assessment are those consistent with USEPA guidance, incorporating an upperbound target of 1×10^{-4} for potential cumulative cancer risks, a target noncancer hazard index (HI) of 1, and an upperbound fetal blood lead level of 10 micrograms per deciliter (µg/dL). A summary of the results and receptors for each area is provided below:

- **Eastern WWL**: For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI is 0.035 and the potential cancer risk is 4.16×10^{-5}. For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI is 0.16 and the potential cancer risk is 1.88×10^{-6}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater associated with both the Eastern and Western WWL) the potential cancer risk is 9.32×10^{-10}. None of the COI for this area and

pathway were associated with noncarcinogenic effects, therefore an HI was not calculated for the indoor worker.

- **Western WWL**: For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI is 0.027 and the potential cancer risk is 8.59 x 10^{-6}. For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI is 0.16 and the potential cancer risk is 1.56 x 10^{-7}.

- **Landfill Areas**: For the outdoor worker potentially exposed to COI in soil, the total noncancer HI is 0.11 and the potential cancer risk is 3.03 x 10^{-5}. For the construction worker potentially exposed to COI in soil and groundwater, the total noncancer HI is 0.056 and the potential cancer risk is 4.79 x 10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.000026 and the potential cancer risk is 1.49 x 10^{-8}. Finally, for the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.63 ug/dL.

- **Natrosol Lagoon**: For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI is 0.028 and the potential cancer risk is 8.34 x 10^{-6}. For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI is 0.087 and the potential cancer risk is 1.70 x 10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.0047 and the potential cancer risk is 9.92 x 10^{-10}. For the construction worker potentially exposed to lead in groundwater, the 95^{th} percentile adult blood lead level is 6.26 ug/dL and the 95^{th} percentile fetal blood lead level is 5.63 ug/dL.

- **RA Basin**: For the construction worker potentially exposed to COI in groundwater, the total noncancer HI is 0.13 and the potential cancer risk is 2.64 x 10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.00011. None of the COI for this area and pathway were associated with carcinogenic effects, therefore a potential cancer risk was not calculated for the indoor worker. For the construction worker potentially exposed to lead in groundwater, the 95^{th} percentile adult blood lead level is 6.26 ug/dL and the 95^{th} percentile fetal blood lead level is 5.64 ug/dL.

- **SDBs**: For the outdoor worker potentially exposed to COI in soil and surface water, the total noncancer HI is 0.023 and the potential cancer risk is 3.10 x 10^{-5}. For the

construction worker potentially exposed to COI in soil, groundwater and surface water, the total noncancer HI is 0.046 and the potential cancer risk is 3.56×10^{-6}. For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.64 ug/dL

- **VFSP**: For the outdoor worker potentially exposed to COI in soil and surface water, the total noncancer HI is 0.20 and the potential cancer risk is 7.53×10^{-5}. For the construction worker potentially exposed to COI in soil, groundwater and surface water, the total noncancer HI is 0.065 and the potential cancer risk is 6.63×10^{-6}. For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.63 ug/dL.

- **Main Holding Basin**: For the construction worker potentially exposed to COI in groundwater, the total noncancer HI is 0.16 and the cancer risk is 1.57×10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.00021and the potential cancer risk is 1.88×10^{-8}. For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.63 ug/dL.

- **East Bear Creek**: For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.13 and the potential cancer risk is 3.65×10^{-5}. For the youth trespasser potentially exposed to lead in surface water, the 95th percentile adult blood lead level is 6.27 ug/dL and the 95th percentile fetal blood lead level is 5.64 ug/dL.

- **West Bear Creek**: For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.074 and the potential cancer risk is 7.20×10^{-6}.

- **Unnamed Tributary**: For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.11 and the potential cancer risk is 5.40×10^{-6}. For the youth trespasser potentially exposed to lead in surface water, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.64 ug/dL.

- **Cattail Creek**: For the recreational adult potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.10 and the potential cancer risk is 1.64×10^{-5}. For the recreational youth potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.16 and the potential cancer risk is 1.53×10^{-5}.

- **Bailey Creek**: For the recreational adult potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.018 and the potential cancer risk is 2.04×10^{-6}. For the recreational youth potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.025 and the potential cancer risk is 2.52×10^{-6}.

The results of the risk assessment indicate that for all receptors and exposure areas, the total HIs, potential cumulative cancer risks, and predicted fetal blood lead levels meet the target benchmarks. As such, no further evaluation is warranted.

1.0 INTRODUCTION

This human health risk assessment report has been prepared by RBR Consulting Inc. (RBR), on behalf of Groundwater & Environmental Services, Inc. (GES) for the Hercules Incorporated (Hercules) Facility located in Hopewell, Virginia (site). The risk assessment consists of a quantitative analysis of the potential for adverse effects to human receptors that may be associated with constituents present in environmental media at the site.

1.1 PURPOSE OF THE RISK ASSESSMENT

Human health risk assessment is defined as the scientific evaluation of potential health effects posed by a particular substance or mixture of substances. The purpose of this risk assessment is to provide quantitative analyses, in a conservative and health-protective manner, of the likelihood that adverse health effects may be associated with potential exposures to constituents in environmental media associated with the site. In providing health-related information on potential human contact with site-associated constituents, this risk assessment is designed to provide a sound basis for risk management decisions.

This risk assessment presents an analysis of the site under current and expected future conditions. The risk assessment provides an understanding of the nature of constituent presence, the possible pathways of human exposure, and the degree to which such exposure may pose a potential for adverse effects. This report focuses on current and expected future non-residential use of the site and recreational use of the offsite surface water bodies.

1.2 REGULATORY FRAMEWORK AND APPROACH

In 2000, Hercules and the United States Environmental Protection Agency (USEPA) entered into a Facility Lead Agreement for the implementation of Corrective Action under the Resource Conservation and Recovery Act (RCRA). Therefore, this risk assessment has been prepared according to standard USEPA procedures and guidance documents (1989; 1991; 1992a; 2002a; 2002b; 2004a; 2004b; 2005a; 2005b; 2009a). The scientific basis and validity of values used in this assessment are considered and discussed in the context of primary research literature in order to provide a frame of reference for the conclusions. The actual levels of human exposure and the potential health risks associated with exposure to constituents at the site are likely to be significantly lower than the quantitative estimates described in this assessment, due to the conventional practice of using conservative assumptions in preparing risk assessments.

This risk assessment follows the guidelines published in the USEPA's *Risk Assessment Guidance for Superfund, Part A* (USEPA, 1989), which suggest that risk assessments should contain the following four major steps:

- **Data Collection and Evaluation**. Involves gathering and analyzing site investigation data and identifying constituents of interest (COI) with regard to potential health effects;

- **Exposure Assessment**. Identification of the human receptors likely to be exposed to site-originated COI and the likely extent of their exposure under defined exposure scenarios;

- **Toxicity Assessment**. A description of the relationship between the magnitude of exposure (dose) and the probability of occurrence of adverse health effects (response) associated with the COI; and

- **Risk Characterization**. Description of the nature and magnitude of potential human health risks, comparison to state and federal benchmarks regarding health risks, and a discussion of uncertainties in the analysis.

1.3 RISK ASSESSMENT ORGANIZATION

This report is organized in a manner consistent with the above-mentioned steps of a risk assessment. Following this introduction, the remaining sections of the report are as follows:

- Section 2 presents relevant site background information and summarizes the analytical data included in the risk assessment.

- Section 3 identifies appropriate screening benchmarks for constituents in each medium and identifies COI for each exposure area at the site.

- Section 4 identifies likely human receptors for the site and presents the exposure factors that are used to estimate the extent of exposure for each receptor.

- Section 5 describes the standard procedures for deriving toxicity values and presents the USEPA toxicity values for the COI.

- Section 6 quantifies and summarizes the potential risks associated with exposure to the COI.

- Section 7 describes the uncertainties associated with the calculated exposures and potential health risks.

- Section 8 presents the conclusions of the risk assessment.

- Section 9 presents the references cited in the report.

2.0 SITE BACKGROUND AND SUMMARY OF DATA

This section presents relevant site background information, including a physical description of the site and a summary of historical investigations. This section also identifies and describes the specific areas of the site that are included in the risk assessment and summarizes the analytical data collected from each area and medium as part of the characterization activities.

2.1 SITE DESCRIPTION AND HISTORY

Hercules operates the Aqualon Division chemical manufacturing facility located at 1111 Hercules Road in the city of Hopewell, Virginia (site). The 390-acre facility reacts several different chemicals with purified cellulose and sodium hydroxide precursor to manufacture lines of chemicals known as cellulose derivatives. The site property was initially part of a DuPont guncotton manufacturing facility which operated from 1912 through the World War I era. Hercules first acquired part of the current site property in 1926 to manufacture purified cotton cellulose for use in the chemical and paper industry. Today, Hercules operates four derivatives lines and provides its chemical products to a variety of end-users in the food, cosmetics, paint, and pharmaceutical industries (GES, 2007).

Future site use is expected to remain industrial based on the following: 1) the Aqualon plant remains operational, 2) the site property is zoned for industrial use, and 3) the December 2001 City of Hopewell Comprehensive Land Use Plan designates the eastern portion of the City (including the site property) for industrial development. In addition, the 1979 City of Hopewell Official Zoning Map depicts the site area and immediate surrounding properties as located in the M-2 zoning district. M-2 is described as “Intensive Industrial” (GES, 2007).

The northern 80-acre portion of the site is primarily industrial and includes paved/gravel roads, buildings, tanks, and structures. Areas without buildings, tanks, or other structures are gravel. The southern half of the site contains the Solid Waste Management Units (SWMUs) that are under investigation as part of the Facility Lead Corrective Action Agreement. This portion of the facility historically housed the treatment and waste storage facilities including the Sludge Drying Beds, the Vacuum Filter Sludge Pile, the Reten/Aqualon Basin, the Wastewater Lagoons, the Landfill Areas and the Natrosol Lagoon. Other than the Landfill Areas, the southern portion of the facility has little ground cover with the surface being comprised of sparse grass and gravel. Immediately bordering the ponds and lagoons, there are trees and wetland vegetation, and grassed areas. A fence borders the active part of the facility (including the Landfill Areas, and bordering the Sludge Pile Areas). Beyond the fence is predominantly wooded or wetland/marsh areas and two offsite creeks, Bailey Creek and Cattail Creek (ENTRIX, 2007).

Aqualon Road borders the northern side of the facility, with an active railroad immediately north of Aqualon Road and an active railroad yard beyond. The immediate surrounding properties to the west and

east are primarily industrial, including public (landfill) land use to the west with residential land use beyond that. Properties further to the north and east of the site consist of industrial properties with several vacant parcels located in the vicinity of the site as well. Bailey Creek flows to the south and southeast of the site. Hercules Road borders the site to the west. Adjacent to Hercules Road (west) is a small industrial facility to the northeast, and undeveloped wooded areas (ENTRIX, 2007). A general site map is provided as Figure 2-1.

2.1.1 Local Hydrogeology

Review of the various boring logs and related reports indicate that the surface stratigraphy is composed of a fairly thick sequence (10 to 30 feet) of silty clay / clay, which is underlain by a layer of gray silty sand. The silty sand layer ranges in thickness from 10 to 20 feet and forms the uppermost aquifer at the site. The aquifer is underlain by a second silty-clay to clay layer, which ranges in thickness from approximately 15 to 20 feet, and appears to be laterally continuous across the majority of the site property. Deeper borings that have penetrated this clay layer have encountered a second sand / gravel aquifer beneath the clay. In general, groundwater from the upper sand discharges to surface water where it overlies the upper clay formation (GES, 2007). Further information on the site-specific geology and hydrogeology is contained in the *Hydrogeologic Evaluation Report* (GES, 2002).

2.1.2 Local Watershed

Surface drainage generally flows to the south or east to one of a series of small channels which dissect the edge of the flat terrace of the site. The channels drain steeply towards Cattail Creek and Bailey Creek, which form the site's southern and eastern property boundaries. The confluence of the two creeks is located just south of the site. Bailey Creek continues to the northeast for approximately two miles until eventually emptying into the James River (GES, 2007).

2.2 INVESTIGATION HISTORY AND REGULATORY BACKGROUND

In 2000, Hercules and the USEPA entered into a Facility Lead Agreement for the implementation of Corrective Action under RCRA (GES, 2007). The October 2001 *Facility Lead Corrective Action Agreement Workplan* (GES, 2001) identified 34 SWMUs at the site. Upon completion of the review of the operational histories and current status of the units, 24 SWMUs were designated as needing No Further Action (NFA). The remaining ten SWMUs were designated as needing further investigative activities. Since the Reten/Aqualon Basin was identified under two separate SWMU numbers, there were only nine actual physical units for evaluation (GES, 2007):

- SWMU #3 Eastern Whitewater Lagoon;
- SWMU #4 Western Whitewater Lagoon;

- SWMU #5 Old Landfill and Landfill #156;
- SWMU #7 Natrosol Lagoon;
- SWMUs #8 and #29 Reten/Aqualon Basin;
- SWMU #14 Sludge Drying Beds;
- SWMU #15 Vacuum Filter Sludge Pile;
- SWMU #16 Solid Waste Incinerator; and,
- SWMU #34 Teepee Incinerator.

The *Facility Lead Corrective Action Agreement Workplan* (GES, 2001) was implemented as the first phase of field investigation (Phase I) in December 2001. This investigation included the evaluation of environmental samples from five areas (SWMUs #8/29, #14, #15, #16, and #34). A limited summary of the sampling results from the Phase I investigation was provided to USEPA in the February 2002 *SWMU Summary Information Report – Phase I Investigation*.

In 2002, Hercules prepared and submitted the *Phase II Sampling and Analysis Plan* (SAP) outlining a proposed second phase of field investigation. Phase II was conducted in November 2002, and included the installation and sampling of nine groundwater monitoring wells. The new monitoring wells were sited to evaluate groundwater quality downgradient of three SWMUs (#3, #4, and #5). A limited summary of the sampling results from Phase II was provided to USEPA in the April 2003 *SWMU Summary Information Report – Phase II Investigation*.

Based largely on the information obtained from the two phases of field investigation, the Facility's two Environmental Indicators (EIs), *Current Human Exposures Under Control* and *Migration of Contaminated Groundwater Under Control*, were prepared in September 2004. The evaluation of the two EIs resulted in "Yes" determinations, indicating USEPA's agreement that potential human exposures and contaminated groundwater were "under control" at the site.

In September 2005, a Phase I/II RCRA Facility Investigation (RFI) report was prepared and submitted to formally document the results of the first two phases of field investigation and evaluate the need for additional investigative and/or remedial actions (if any) at the subject SWMUs. Subsequently, a Phase III SAP was prepared with the objectives of further characterizing specific SWMUs (#3, #4, #7, #14, and #15) and to collect information in support of an ecological assessment of the site.

The Phase III SAP was implemented in May through July 2007, and included the following field activities:

- Installation and sampling of four groundwater monitoring wells downgradient of existing SWMUs, Sludge Drying Beds and Vacuum Filter Sludge Pile;

- Collection and analysis of groundwater samples and geochemical data from the site-wide monitoring well network (NAT-1, 2, 3, 4, RABMW-2, 3, 4, LF-1, 2, 3, 4, 5, WWL-1, 2, 3U, 3L, and MW-1, 2, 3, 4, 4U, 5, 5U, 6, 7U, 7L, 8U, 8L, 8D, 9, 10);

- Collection and analysis of soil, sludge, and/or sediment samples from the Eastern and Western Whitewater and Natrosol Lagoons, the Old Landfill and Landfill #156, Vacuum Filter Sludge Pile, and Sludge Drying Beds in support of further delineation efforts and/or source material evaluations;

- Collection and analysis of soil and sediment samples from East Bear Creek, West Bear Creek, Bailey Creek, Cattail Creek, and the Unnamed Tributary situated adjacent to and downgradient of the various SWMUs being evaluated as part of Corrective Action.

The results of the Phase III investigation were provided to USEPA in the November 2007 *Phase III Site Investigation Summary Report* (GES, 2007).

Finally, in 2009, a supplemental investigation was conducted at the site that included the collection of one surface water sample from the Vacuum Filter Sludge Pile, three surface water samples from the Sludge Drying Beds, and five surface soil samples from the Landfill Areas for lead analysis.

2.3 AREAS EVALUATED IN THE HUMAN HEALTH RISK ASSESSMENT

Based on the information collected during the phased investigations of the site, the Solid Waste Incinerator (SWMU #16) and the Teepee Incinerator (SWMU #34) have been granted a NFA (GES, 2007). Therefore, no further evaluation of these SWMUs is required, and these SWMUs are not discussed further in this report. The remaining eight SWMUs (seven areas) will be retained for quantitative evaluation in this human health risk assessment, including the following:

- **SWMU #3 Eastern Whitewater Lagoon (Eastern WWL) and SWMU #4 Western Whitewater Lagoon (Western WWL):** The WWLs consist of two unlined surface impoundments. The two lagoons lie adjacent to one another, and are joined by a pipe at their southern ends. The lagoons were used primarily for disposal of whitewater, a waste stream from the Chemical Cotton Process. Starting in approximately 1976, the Eastern WWL also received waste-activated sludge from the facility's Bioplant. The WWLs currently hold surface water and are bordered by wetlands and a wooded area. Sludge was identified in the lagoons ranging in thickness from three to seven feet in the Eastern WWL and from two to eleven feet in the Western WWL (GES,

2007). The Eastern WWL is approximately 1.9 acres in size. The Western WWL is approximately 2.1 acres in size (ENTRIX, 2007).

- **SWMU #5 Old Landfill and Landfill #156 (Landfill Areas):** Landfill #156 was a permitted solid waste landfill which was operational from 1972 to 1988. The Old Landfill is the adjacent area which was used for waste disposal dating back to the 1930s. The area is currently vegetated with grasses and small shrubs and is bordered by a wooded area. The landfill cover evaluation conducted during the Phase III investigation indicated that at least one-foot of cover material was present over approximately 76% of the landfill. The purpose of the soil cover is two-fold: to provide a substrate for vegetation to grow and prevent erosion and to prevent incidental exposure to waste via direct exposure. Based on observations during the Phase III assessment, it appears that the integrity of the existing cover is good and there are no significant signs of erosion (GES, 2007). The Landfill Areas are approximately 7.8 acres in size (ENTRIX, 2007).

- **SWMU #7 Natrosol Lagoon:** The Natrosol Lagoon was an unlined impoundment that received cellulose derivatives manufacturing waste from 1962 through 1988. Closure of the lagoon was conducted in 1995 and included dredging, excavation, and off-site disposal of lagoon sludge as solid waste. The Natrosol Lagoon was covered with a layer of topsoil and vegetated to stabilize the soil. The area is currently a groundwater and surface water fed pond. A wetland and wooded area immediately border the pond. The sludge/sediment samples collected as part of the Phase III investigation indicated that approximately 0 to 3 inches of sludge remains in the bottom of the lagoon (GES, 2007). The Natrosol Lagoon is approximately 0.95 acres in size (ENTRIX, 2007).

- **SWMUs #8 and #29: Reten/Aqualon Basin (RA Basin):** The RA Basin was originally constructed in 1976 to treat nonhazardous wastewaters from acrylamide polymer manufacturing and absorbent fiber areas. The original basin was constructed with a gunnite wall and an asphalt bottom. In early 1989, the RA Basin was enlarged vertically and laterally, and was fitted with a 40-mil plastic liner. The enhanced unit (called the Anoxic Basin) was used for treatment of all neutralized wastewater from June 1989 until late December 1989, when it was removed from service due to liner tears in the north end. The Natrosol Lagoon routinely discharged through an overflow pipe to the RA Basin, which then discharged to the Neutralization Basin. The RA Basin is no longer used for the management of wastewater (GES, 2007).

- **SWMU #14 Sludge Drying Beds (SDBs):** The SDBs consist of three unlined rectangular beds constructed in approximately the late 1970s to replace the Vacuum Filter Press. Sludge from the Bioplant was pumped to the beds to dry, and was then periodically removed and land-filled. In approximately 1976, the Facility began pumping the sludge to the Eastern WWL, and ceased use of the SDBs. This area currently contains wetland vegetation and surface water and is bordered by wooded areas. No visual evidence of sludge has been identified in any of the three beds. This SWMU is underlain by a 15-foot layer of low-permeability clay and silt (GES, 2007). The SDBs are approximately 1.6 acres in size (ENTRIX, 2007).

- **SWMU #15 Vacuum Filter Sludge Pile (VFSP):** The VFSP is a 50-foot wide surface impoundment used for temporary storage of sludge generated by a vacuum filter press during the 1960s and 1970s. This area currently contains wetland vegetation and is bordered by wooded areas. During the Phase III investigation, sludge materials were encountered at depths ranging from approximately 3 to 4 feet below the surface of the water (GES, 2007). The VFSP is approximately 0.6 acres in size (ENTRIX, 2007).

The location of each SWMU is illustrated in Figure 2-1. In addition to these SWMUs, groundwater associated with the Main Holding Basin and the following onsite and offsite surface water bodies will be retained for quantitative evaluation in the risk assessment:

- **Main Holding Basin:** The Main Holding Basin was constructed in 1961 for wastewater pretreatment. During operation, process waste streams entered the west end of the basin where they received anaerobic treatment and were subsequently discharged. In 1989 the Main Holding Basin was removed from service, and free water was removed. Sludge and soils removal was completed and, in February 1993, clean soil was satisfactorily certified to the Virginia Department of Environmental Quality. However, based on the groundwater samples collected as part of the Phase III SAP, the majority of the Main Holding Basin wells exhibited detections of t-butanol and diethyl ether at concentrations above the relevant screening values (GES, 2007). As such, groundwater associated with the Main Holding Basin is being retained for quantitative evaluation in the risk assessment.

- **East Bear Creek:** An onsite stream beginning at the Natrosol Lagoon and flowing south to Outfall 005. East Bear Creek joins with West Bear Creek approximately 500 feet downstream of Outfall 005. The combined Creeks flow offsite into Bailey Creek.

- **West Bear Creek:** Onsite stream that joins with East Bear Creek approximately 500 feet downstream of Outfall 005. The combined Creeks flow offsite into Bailey Creek.

- **Unnamed Tributary:** Unnamed onsite tributary to Cattail Creek that flows through the western portion of the site.

- **Cattail Creek:** Offsite stream that flows along the southern property boundary. Cattail Creek is located downgradient of the Landfill Areas and the Eastern and Western WWL. Cattail Creek becomes Bailey Creek at the midpoint of the southern site property boundary.

- **Bailey Creek:** Offsite stream that receives flow from East Bear and West Bear Creeks, runoff from VFSP, and potentially other areas of the site. Bailey Creek continues to flow beyond the site to the northeast for approximately two miles until eventually emptying into the James River (GES, 2007).

Figure 2-1 illustrates the locations of the Main Holding Basin and the onsite and offsite surface water bodies.

2.4 DATA INCLUDED IN THE RISK ASSESSMENT

All available soil, groundwater, sludge, sediment, and surface water, data collected during the phased investigations are included, as appropriate in this risk assessment. A summary of the analytical data available for each of the risk assessment areas is presented by medium in the following subsections.

Samples representative of background and/or upgradient locations were available for consideration in the risk assessment. USEPA Region 3 provided Hercules with excerpts from the RFI Report for the Honeywell Chesterfield Facility located in Chester, Virginia. USEPA indicated that the inorganic results for soil samples from the area around the Chesterfield site could be used as regional background concentrations for comparison to the Hercules site. The background soil data are not included quantitatively in this risk assessment but are discussed qualitatively in the Uncertainty Section (Section 7). Regarding sediment and surface water, one location from the most upstream point of Cattail Creek (samples CCSED-1 and CCSW-1) was upgradient of the confluence with the Unnamed Tributary and was considered to represent water quality entering the site (GES, 2007). Samples from this location are included in the risk assessment along with the sediment and surface water results from other creek locations. A qualitative discussion of these background results is provided in the Uncertainty Section (Section 7).

2.4.1 Soil Data Included in the Risk Assessment

Table 2-1 provides a list of the soil samples included in the risk assessment. Soil analytical data are available for the Landfill Areas, SDBs, and VFSP. Solid samples collected from the SDBs and VFSP are considered sludge/soil. For the purposes of the human health risk assessment, samples collected from these locations are conservatively evaluated as soil.

As presented in Table 2-1, a total of 13 samples (plus one duplicate sample) are available for the Landfill Areas; 18 samples (plus one duplicate sample) are available for the SDBs, and 18 samples (plus one duplicate sample) are available for the VFSP. All soil samples collected from these areas represent surface soil (i.e., all samples were collected from within 0 to 2 feet below ground surface [bgs]). Soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), acrylamide, alcohols and glycols, metals and other inorganic parameters (e.g., chlorides, nitrates, nitrites, sulfate, and total organic carbon). Complete analytical data for constituents in soil are provided in Table A-1 of Appendix A.

In addition to the standard analytical results, both known tentatively identified compounds (TICs) and unknown TICs were reported for soil samples collected at the site. Known TICs (i.e., TICs that were assigned an identity by the laboratory, as listed in the laboratory reports) have been included in Table A-1 of Appendix A under sub-category headings and are treated as standard analytical results. For example, a VOC TIC result for hexane via method 8260B-TIC is treated the same as a VOC result for hexane via method 8260B. Unknown TICs are treated separately, as discussed in Section 2.5.

2.4.2 Groundwater Data Included in the Risk Assessment

Table 2-2 provides a list of the groundwater samples included in the risk assessment. Groundwater samples were collected in the vicinity of the WWLs, Landfill Areas, Natrosol Lagoon, RA Basin, SDBs, VFSP, and Main Holding Basin.

As presented in Table 2-2, a total of 4 samples were collected from the vicinity of the WWLs; 5 samples were collected from the vicinity of the Landfill Areas; 4 samples (plus one duplicate sample) were collected from the vicinity of the Natrosol Lagoon; 3 samples were collected from the vicinity of the RA Basin; 3 samples were collected from the vicinity of the SDBs; 1 sample was collected from the vicinity of the VFSP; and 15 samples (plus one duplicate sample) were collected from the vicinity of the Main Holding Basin. Groundwater samples were analyzed for VOCs, SVOCs, acrylamide, alcohols and glycols, total and dissolved metals, and other inorganic parameters (e.g., chlorides, nitrates, nitrites, sulfate). Complete analytical data for constituents in groundwater are provided in Table A-2 of Appendix A.

As with the soil data, known and unknown TIC results were reported in addition to the standard analytical results for groundwater. Known TICs have been included in Table A-2 of Appendix A under sub-category

headings and are treated as though they are standard analytical results. Unknown TICs are treated separately, as discussed in Section 2.5.

2.4.3 Sediment Data Included in the Risk Assessment

Table 2-3 provides a list of the sediment samples included in the risk assessment. Sediment samples were collected from the Eastern WWL, Western WWL, Natrosol Lagoon, East Bear Creek, West Bear Creek, the Unnamed Tributary, Cattail Creek and Bailey Creek. Solid samples collected from the Lagoons are considered sludge/sediment. For the purposes of the human health risk assessment, samples collected from these locations are evaluated as sediment.

As presented in Table 2-3, a total of 10 samples were collected from the Eastern WWL; 11 samples (plus one duplicate sample) were collected from the Western WWL; 6 samples were collected from the Natrosol Lagoon; 4 samples were collected from East Bear Creek; 4 samples (plus one duplicate sample) were collected from West Bear Creek; 5 samples were collected from the Unnamed Tributary; 3 samples (plus one duplicate sample) were collected from Cattail Creek; and 1 sample was collected from Bailey Creek. Sediment samples were analyzed for VOCs, SVOCs, acrylamide, alcohols and glycols, polychlorinated biphenyls (PCBs), metals and other inorganic parameters. Complete analytical data for constituents in sediment are provided in Table A-3 of Appendix A.

As with the soil and groundwater data, known and unknown TIC results were reported in addition to the standard analytical results for sediment. Known TICs have been included in Table A-3 of Appendix A under sub-category headings and are treated as though they are standard analytical results. Unknown TICs are treated separately, as discussed in Section 2.5.

2.4.4 Surface Water Data Included in the Risk Assessment

Table 2-3 provides a list of the surface water samples included in the risk assessment. Surface water samples were collected from the Eastern WWL, Western WWL, Natrosol Lagoon, SDBs, VFSP, East Bear Creek, West Bear Creek, the Unnamed Tributary, Cattail Creek and Bailey Creek.

As presented in Table 2-3, a total of 3 samples were collected from the Eastern WWL; 3 samples were collected from the Western WWL; 2 samples were collected from the Natrosol Lagoon; 3 samples (plus one duplicate sample) were collected from the SDBs; 1 sample was collected from the VFSP; 3 samples were collected from East Bear Creek; 3 samples were collected from West Bear Creek; 3 samples were collected from the Unnamed Tributary; 3 samples (plus one duplicate sample) were collected from Cattail Creek; and 1 sample was collected from Bailey Creek. Surface water samples were analyzed for VOCs, SVOCs, acrylamide, alcohols and glycols, total metals, and other inorganic parameters. Complete analytical data for constituents in surface water are provided in Table A-4 of Appendix A.

As with the other media, known and unknown TIC results were reported in addition to the standard analytical results for surface water. Known TICs have been included in Table A-4 of Appendix A under sub-category headings and are treated as though they are standard analytical results. Unknown TICs are treated separately, as discussed in Section 2.5.

2.5 IDENTIFICATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS

As discussed above, unknown TICs were reported for samples of all media collected during the Phase III investigation in 2007. As part of the *Phase III Site Investigation Summary Report* (GES, 2007), an effort was made to further classify the nature of the TICs with the assistance of the analytical laboratory (Severn Trent Laboratories; now Test America Laboratories of Savannah, Georgia); however, little additional information was made available due to the intrinsic unknown nature of these substances. Based on these efforts, the Phase III Investigation report generally concluded that a detailed assessment of the unknown TICs was unnecessary due to the high level of uncertainty. USEPA provided comments on the Phase III report that requested further information as to the nature of the chemical classes represented by the unknown TICs. USEPA noted that several unknown TICs were reported at fairly high concentrations in several areas of the site.

In response to the USEPA's comments, a proposed TIC evaluation process was presented to USEPA and discussed during a teleconference on October 9, 2008 and a meeting on October 22, 2008. Based on the outcome of these discussions, an Interim TIC Submittal (GES, 2009) was submitted for USEPA's review. The Interim TIC Submittal presented the proposed chemical class selection for a subset of the unknown TICs detected in soil, sediment and groundwater at the site. The identification process included conducting a detailed review of the gas chromatography/mass spectrometry (GC/MS) chromatographs for the most prominent defining characteristics, such as number and location of peaks and magnitude of peaks. These prominent features were then matched to the extent possible with chromatographs of known library constituents that were also provided in the laboratory reports. Following review of the Interim TIC Submittal, USEPA provided several comments in an e-mail dated February 23, 2010.

On March 19, 2010, a series of draft responses to USEPA's comments on the Interim TIC Submittal were submitted. Following review of the draft responses, USEPA requested that a third-party chemist be selected to conduct an independent evaluation of the laboratory GC/MS chromatographs in relation to the chemical classes identified in the December 2009 Interim TIC Submittal. In response to USEPA's request, Environmental Data Quality (EDQ) was retained to further evaluate the unknown TICs. It should be noted that EDQ also conducted the third-party validation of the Phase III data collected in 2007 at the site.

Following review of the data, EDQ provided the following comments regarding unknown TICs:

- Test America library searches for unknown TICs were performed using accepted practices and in accordance with their internal standard operating procedures (SOPs); and

- Review of the unknown TICs during validation was performed in accordance with regional and national guidance. For those instances in which the data system generated a match, the quality of that match most times was less than 85%. Current national validation guidance (USEPA [2008] *Contract Laboratory Program, National Functional Guidelines for Superfund Organic Methods Data Review* and USEPA [1999] *Contract Laboratory Program, National Functional Guidelines for Organic Data Review*) requires that matches with qualities less than 85% be classified as unknown.

Based on EDQ's initial assessment, EDQ was retained to review all of the 2007 Phase III analytical data and propose probable TIC identities or probable TIC chemical classes for every unknown TIC. Following completion of EDQ's final assessment, probable TIC identities/chemical classes identified with reasonable certainty (i.e., match quality ≥ 85%) would be directly incorporated into the risk assessments. This final path forward was approved via an e-mail from USEPA on July 28, 2010. A detailed chronological documentation of the history of the approach for the management of unknown TICs is provided in the final Interim TIC Submittal dated July 6, 2010 (GES, 2010).

The results of the unknown TIC identification process are provided in tabular format in Appendices B-1 through B-4 for soil samples, groundwater samples, sediment samples and surface water samples, respectively. Specifically, for each unknown TIC result, these tables present the sample location, sample identification number, analytical method, unknown TIC concentration, retention time of the result, quality percentage of the library match (if available), notes related to the evaluation and/or identification of the TIC, and the probable TIC identity or probable TIC chemical class, if identified. As presented in Appendix B, the majority of the unknown TICs were not retained for further analysis, due to a variety of issues including the following:

- the library search did not produce a match; therefore, the TIC cannot have a valid tentative identification made and should remain reported as unknown;

- the result was "B" qualified (blank negated); therefore, it can be dropped from further analysis;

- the TIC result had low quality due to differing mass intensities; therefore, the TIC cannot have a valid tentative identification made and should remain reported as unknown; and

- the reported result was an “Aldol Condensate”, an artifact of the extraction process and should not have been reported originally.

The remaining unknown TIC results were assigned a probable identity or probable chemical class based on the library matches provided in the laboratory reports. TICs initially identified by the laboratory as an unknown chemical or unknown chemical classes (e.g., Unknown Alcohols, Unknown Alkanes, Unknown Acids, Unknown Silanes, Unknown Cycloalkanes, Unknown Ketones) have been assigned a probable TIC identity, despite a match quality <85%. This is because the match quality precluded the laboratory identification. Independent review of the mass spectra showed the presence of certain ions that allowed for a determination of the specific chemical or chemical class by the laboratory; therefore, these TICs were retained for evaluation in the risk assessment.

These are incorporated into the human health risk assessment. The final unknown TICs retained for quantitative assessment in the risk assessment are depicted as shaded in the Appendix B tables. A discussion of the uncertainty associated with the assessment of unknown TICs is provided in the Uncertainty Analysis (Section 7).

2.6 DATA USABILITY

USEPA (1992b) provides guidance for data usability in risk assessments. Data usability is the process of assuring or determining that the quality of the data generated meets the intended use. Site analytical data (standard analytes and known TICs) were evaluated with respect to data usability prior to inclusion in this risk assessment. The unknown TICs were evaluated separately, and data usability issues were addressed as part of the decision to retain the analyte for further analysis (see Section 2.5 above). The following data quality issues are addressed for standard analytes and for known TICs: (1) detection limits, (2) qualified data, and (3) quality control samples.

Selecting the analytical method for optimal detection limits is critical to the data usability in risk assessments. If detection limits are consistently greater than risk-based comparison values, this affects the confidence of the results of the risk assessment. There is a possibility that constituents are present at levels between the risk-based concentration and the detection limit. Therefore, as part of this risk assessment, the detection limits for constituents are compared to the appropriate risk-based concentrations (refer to Section 3).

Qualified data must be appropriately used in risk assessments. All validated, qualified data were considered usable for this assessment with the exception of unusable or rejected (“R” qualified) samples. Most notably, the alcohol/glycol results from soil samples collected in 2001 from the SDBs and VFSP were qualified as “R” and were therefore not used in the risk assessment. Although no detections of alcohols/glycols were identified in the 2001 samples, the analytical testing under method 8015B was

performed out of hold time, which resulted in the "R" qualifiers. Consequently, Hercules agreed to resample the previous locations in 2007 in order to reanalyze the sludge samples for the alcohols/glycols to confirm the non-detections. These results were included in the *Phase III Site Investigation Summary Report* (GES, 2007). The following qualifiers were included in the analytical results (refer to Appendix A); results with these qualifiers are included but may be discussed qualitatively:

- B - The analyte was not detected substantially above the level of the associated method blank.
- H - Sample prepped beyond holding time.
- J - The positive result reported for this analyte is a quantitative estimate.
- K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.
- L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.
- Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

Quality control samples (such as method blanks, trip blanks, and matrix spike samples) are generally not used in the risk assessment, with the exception of field duplicate samples. Results from duplicate samples were handled as follows: (1) if both results are detected, the mean of the two values is used to represent that sample; (2) if both results are non-detect, the higher detection limit is used to conservatively represent that sample; and (3) if one result is detected and the other is non-detect, the detected value is used to conservatively represent that sample.

3.0 IDENTIFICATION OF CONSTITUENTS OF INTEREST

An important step in the risk assessment is to identify the COI at a site. Although several constituents have been detected in samples of soil, groundwater, sediment, and surface water from the site, many of these are not present at concentrations considered to pose a concern by customary risk assessment standards and may be eliminated from further consideration in this preliminary step. In other words, many constituents may be detected at the site, but their presence does not contribute significantly to cumulative risks; therefore, they may be eliminated from further assessment. The comparison values, such as those used in this risk assessment, are constituent-specific, risk-based values that are derived using conservative exposure assumptions. If a constituent is detected below these values, it is not expected to pose a risk to human health and need not be evaluated further. This serves to make the risk assessment more meaningful by focusing attention on those constituents that may contribute significantly to the calculated risks. The constituents that cannot be eliminated are identified as COI and are carried through to the site-specific, quantitative risk assessment.

It is important to recognize that the selection of a constituent as a COI does not necessarily indicate that it poses a significant health risk. The selection of a COI only indicates that there is a need to further evaluate it quantitatively in the risk assessment to determine if that constituent could potentially result in human health risks.

3.1 IDENTIFICATION OF SURROGATES

Prior to conducting the COI identification process, a review of the detected analytes was completed to determine whether constituent-specific, risk-based values would be available. In general, the USEPA (2010a) Regional Screening Levels (RSLs) are used for comparison with the analytical data to identify COI. While the RSLs are available for a lengthy list of the most common target analytes and compounds, not all constituents are included in this list. Those constituents for which RSLs (or other standard and customary risk-based comparison values) are not available were assigned “surrogates;” in other words, constituents with structural or toxicological similarities whose screening values could conservatively be used in the absence of a constituent-specific value.

Surrogates were identified for many of the constituents not listed in the RSL table; however, not all constituents that lacked a specific screening value were assigned a surrogate. In some cases, constituents were determined to have low inherent toxicity, and were therefore excluded from consideration as COI. In other cases, an appropriate surrogate may not have been available, and the constituent was retained for quantitative evaluation. Table 3-1 summarizes the identified surrogates for constituents detected in soil, groundwater, sediment and surface water for the site. Constituents that were not detected in any medium were not assigned a surrogate because they are excluded from consideration as COI. The process for identification of surrogates for both TICs (known and unknown) and for standard

analytes is described in the following subsections. The assignment of surrogates was conducted by a doctoral level board certified toxicologist. In any exercise in which the toxicity of one substance must be inferred from that of another, there will be uncertainties. These uncertainties are discussed as part of the Uncertainty Analysis (Section 7).

3.1.1 Surrogates for Known and Unknown TICs

The majority of constituents lacking specific screening values were the known TICs and the probable identities determined for the unknown TICs. In addition, many of the unknown TICs were identified by chemical class, rather than a specific chemical. The surrogate process also included selecting a specific chemical to conservatively represent the unknown TIC chemical classes. The chemical structures and properties of the TICs and chemical classes were evaluated to determine appropriate surrogates. All surrogates are identified in Table 3-1. In addition, TICs that were determined to be non-toxic under environmental exposure conditions are identified in this table.

In all cases, professional judgment was required to select an appropriate surrogate for an identified TIC. Surrogate values for known and unknown TICs were selected based primarily on structural similarity or class similarity with known substances, and therefore expected to have similar toxicity. In all cases where information was available, the closest matching substance to a TIC was selected as the surrogate. In the case of probable chemical classes, the commonly considered most toxic substance in that class was selected to represent the probable chemical class. A summary of the information provided in Table 3-1, including the rationale for selection of surrogates is summarized below:

- alpha-amyrin; gamma-sitosterol; cholest-5-ene, 3-bromo-, (3.beta.)-; cholestane, 3-ethoxy-, (3.beta.,5.alpha); cholestanol; Chemical Class: sitosterol; and cholestan-3-ol, 6-methyl-, (3.beta.,5.alpha.,6.alpha)- were identified to be structurally similar to cholesterol, which has a low inherent toxicity in the environment. Cholesterol was also identified as a TIC. These were not considered further in the risk assessment due to a judgment of low inherent toxicity.

- 2,2',4,4',5-pentachloro-1,1'-biphenyl; 2,2',4,4',6-pentachloro-1,1'-biphenyl; 2,2',4,5,5'-pentachloro-1,1'-biphenyl; 2,3',4,4',6-pentachloro-1,1'-biphenyl; and pentachloro-1,1'-biphenyl were considered to be polychlorinated biphenyl (PCB) related. As such, the surrogate selected for this group was Aroclor 1260, commonly considered to be the PCB Aroclor with the highest toxicity.

- 17-pentatriacontene; 1-decene; 1-docosene; C10H16; eicosane; heptacosane, heptadecane; 2,6,10,15-tetramethyl-heptadecane; 9-octyl-heptadecane; hexacosane; hexadecane; nonadecane; pentacosane; pentatriacontane; Chemical Class: alkane,

Chemical Class: alkene; Chemical Class: alkyl chain; and 2-methyl-1-propene were considered to be alkyl carbon chain related. The chemical commonly considered to be the most toxic substance of this group is hexane. Hexane was used as a surrogate for all of these related substances.

- 1-docosanethiol is an alkyl chain with sulfur. Carbon disulfide was selected as a surrogate for this substance.

- 1-dotriacontanol is an alkene related alcohol. N-butanol was selected as a surrogate for this substance.

- 1-naphthalenepropanol,.alpha.-ethenylde and 1,2,3,5,6,8a-hexahydro-4,7-naphthalene are substituted naphthalene-related substances. Naphthalene was selected as a surrogate for these substances.

- 1,1,2-trichloro-1-propene and 1,2,3-trichloro-1-propene are short chain chlorinated alkenes. Tetrachloroethene was selected as a surrogate for these substances.

- 1,3-dichlorobenzene is structurally close to 1,4 dichlorobenzene. 1,4 Dichlorobenzene was selected as a surrogate for this substance.

- 28-Norolean-17-en-3-one is a terpene. Quinoline was selected as a surrogate for terpenes.

- 2,3-dimethyl-2-butanol; 1,1'-oxybis[2-ethoxy-]ethane; 2-[2-(2-ethoxyethoxy)ethoxy]-ethanol; and Chemical Class: glycol ether derivative are structurally similar to glycol ethers. Ethylene glycol monobutyl ether was selected as a surrogate for glycol ethers.

- 2-heptacosanone is a fatty acid pheremone. This substance is deemed to have low inherent toxicity and is not considered further.

- 4-hydroxy-4-methyl-2-pentanone; 4-methoxy-4-methyl-2-pentanone; and 4-methyl-3-penten-2-one are structurally similar to methyl isobutyl ketone, which was selected as a surrogate for these substances.

- 3-ethyltoluene; Chemical Class: alkyl aromatic; and Chemical Class: alkyl ring are considered to be represented by toluene.

- 4-Isopropyltoluene is structurally similar to isopropylbenzene which was selected as a surrogate for this substance.

- 4,5-Dimethylthiazole S-oxide is structurally similar to 4,5-Dimethylthiazole which was selected as a surrogate for this substance.

- 5(1H)-azulenone, 2,4,6,7,8,8a-hexahydro- and benzo[b]naphtho[2,3-d]furan are structurally similar to dibenzofuran which was selected as a surrogate for these substances.

- 9,12,15-octadecatrienal; hexadecanoic acid; and Oleic Acid are fatty acids considered to have a low inherent toxicity and are not considered further in this risk assessment.

- alpha-pinene; bacchotricuneatin c; d-Friedoolean-14-ene, 3-methoxy-, (3.bet; olean-12-ene; and stigmasterol are steroid substances, considered to have low inherent toxicity, and are not considered further in this risk assessment.

- 1-methyl-4-(1-methylethyl)-benzene is a fragrance and a substituted benzene. Benzene was selected as a surrogate for this substance.

- Benzyl cinnamate is a cosmetic ingredient with low inherent toxicity, and is not considered further.

- 3-methyl-butanal; butanal isomer; heptanal; hexanal; pentanal; Chemical Class: hexanal; and Chemical Class: propanal are structurally similar to propionaldehyde, which was used as a surrogate for these substances.

- Carbon dioxide has a low inherent toxicity and is not considered further in this assessment.

- Cyclodecane; cyclododecane; cyclooctacosane; cyclopropane, nonyl-; methylcyclohexane; Chemical Class: alkane ring; and Chemical Class: cycloalkane are alkane rings similar to cyclohexane. Cyclohexane was used as a surrogate for these substances.

- Ergost-5-en-3-ol, (3.beta.)- and ergostanol are structurally similar to Vitamin D, have a low inherent toxicity and are not considered further in this assessment.

- 2-(2-propenyl)-phenol is a substituted phenolic. Phenol was selected as a surrogate for this substance.

- 2,2-dimethoxy-propane is a substituted propane substance. 1,2-Dibromo-3-chloropropane was selected as a surrogate for this substance.

- Vitamin E has a low inherent toxicity and is not considered further in this assessment.

- Chemical Class: acid and organic acid are considered to be represented by acetic acid, which has a low inherent toxicity and is not considered further in this assessment.

- Chemical Class: alcohol is considered to be represented by n-butanol.

- Chemical Class: alkyl ether, 1, 2 diethoxyethane and methoxyethane are considered to be represented by ethyl ether.

- Chemical Class: alkyl silicon; Chemical Class: silane; Chemical Class: silanol and trimethylsilanol are considered to have a low inherent toxicity and are not considered further.

- Chemical Class: amide is considered to be represented by diphenylamine.

- Chemical Class: chlorinated VOC is considered to be represented by trichloroethene (the commonly considered most toxic substance of this group).

- Chemical Class: fluorinated VOC is considered to be represented by Freon 113.

- Chemical Class: ketone is considered to be represented by methyl ethyl ketone.

- Chemical Class: PAH is considered to be represented by benzo(a)pyrene (the commonly considered most toxic substance of this group).

For two of the known TICs, bromacil and diethyltoluamide (DEET), it was determined that surrogates were not necessary because USEPA-recommended toxicity values were available with which screening values could be calculated. For bromacil, USEPA's (2009b) *Drinking Water Standards and Health Advisories* provides an oral reference dose (RfD) of 0.1 mg/kg-day. For DEET, an oral RfD of 1.0 mg/kg-day is available from USEPA's (1998) Office of Pesticide Programs. These toxicity values were incorporated into the standard default equations used to calculate tapwater RSLs (USEPA, 2010a). Resulting calculated screening values for bromacil and DEET are 370 ug/L and 3,700 ug/L, respectively.

3.1.2 Surrogates for Standard Analytes

There are several standard analytes (i.e., common constituents included on target analyte/target compound lists) which lack specific screening values. In some cases this is because the constituent has low inherent toxicity in an environmental medium (e.g., essential nutrients). In these cases, the constituent is eliminated from consideration as a COI. In other cases, it may be that USEPA has not established toxicity values for the constituent. Table 3-1 lists the standard analytes that were detected at least once in site-associated media, and for which surrogate values have been assigned.

The following surrogates have been assigned on the basis of structural and toxicological similarity; these surrogates are used for all media in which the constituent was detected:

- Screening values for ethanol and t-butanol are based on the values for n-butanol;
- Screening values for 1,3-dichlorobenzene are based on the values for 1,4-dichlorobenzene;
- 9-Hexadecenoic acid (i.e., Oleic Acid) is a fatty acid considered to have a low inherent toxicity and is not considered further in this risk assessment.
- Screening values for benzo[g,h,i]perylene are based on the values for pyrene;
- Screening values for phenanthrene are based on the values for anthracene;
- Screening values for hexachloro-1,1'-biphenyl are based on the values for PCB-167;
- Screening values for pentachlorobiphenyl are based on the values for PCB-123;
- Screening values for tetrachlorobiphenyl are based on the values for PCB-77; and
- Screening values for diethylene glycol are based on the values for ethylene glycol.

Other standard analytes lacking specific screening values were not assigned surrogates. The COI identification process for these constituents is described in Sections 3.2 through 3.7 specifically for each medium and exposure route.

3.2 IDENTIFICATION OF COI IN SOIL – DIRECT CONTACT

For constituents in soil, the COI identification process consists of a comparison of the maximum detected concentration of each constituent with the USEPA (2010a) Regional Screening Levels (RSLs) for

Industrial Soil. Those constituents whose maximum detected concentrations were below the RSLs were eliminated as COI. The RSLs selected for use in this screening evaluation are applicable to non-residential direct contact exposure pathways, including incidental ingestion of soil, inhalation of particulates/vapors emitted from soil, and dermal contact with soil). The direct contact RSLs for non-carcinogenic constituents were adjusted to reflect a screening hazard quotient (HQ) of 0.1.

If RSLs were not available for a particular constituent (including known TICs), surrogate screening values were selected based on constituents with structural similarity, as described in Section 3.1. For some constituents, screening values were determined to be not applicable due to low inherent toxicity (e.g., essential nutrients such as calcium, magnesium, potassium, and sodium). Table 3-2 presents the complete list of soil screening values, including the basis of surrogate values and rationale for constituents for which screening values are not applicable.

The COI identification process for soil was completed separately for each exposure area; the results are presented in Tables 3-3 through 3-5. For each constituent, these tables present the detection frequency, the minimum and maximum detected concentrations, the sample with the maximum detect, the minimum and maximum detection limits, and the screening values. The maximum detected concentration of each constituent in soil is compared to the screening value. Constituents that exceed the screening values are identified as COI for soil.

- **Landfill Areas:** Table 3-3 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for soil of the Landfill Areas: 28-norolean-17-en-3-one, 2,2-dimethoxy-propane, arsenic, and chromium. In addition, thallium is retained as a COI because it lacks an industrial RSL, it does not have an appropriate surrogate, and it can not be eliminated on the basis of low toxicity.

- **Sludge Drying Beds:** Table 3-4 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for soil of the SDBs: arsenic and chromium.

- **Vacuum Filter Sludge Pile:** Table 3-5 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for soil of the VFSP: arsenic, chromium and iron.

Tables 3-3 through 3-5 indicate several SVOCs with maximum detection limits above the screening values. The elevated detection limits are frequently due to elevated detections of other constituents in select samples that resulted in dilution of the sample and thus, high detection limits. The elevated detection limits are unlikely to affect the usability of the data, because as indicated in Appendix A-1, most

constituents with elevated detection limits were not detected at all or in very few of the soil samples for a particular area. For example, in the Landfill Areas, benzo(a)pyrene was detected in only two of the eight samples collected from this area. Likewise, in the SDB, benzo(a)anthracene and benzo(a)pyrene are detected only twice in nine samples collected in this area. Based on this evaluation, the elevated detection limits are not considered an issue with respect to data usability.

3.3 IDENTIFICATION OF COI IN GROUNDWATER – DIRECT CONTACT

For constituents in groundwater, the COI identification process is similar to that for soil. The maximum detected concentration of each constituent is compared with the USEPA (2010a) RSLs for tap water. Although groundwater at the site is not used as a source of drinking water, the tap water RSLs were conservatively used to identify COI for the direct contact pathway. The tap water RSLs for non-carcinogenic constituents were adjusted to reflect a screening HQ of 0.1.

If RSLs were not available for a particular constituent, surrogate screening values were selected based on constituents with structural similarity, as described in Section 3.1. In addition, some screening values were obtained from the USEPA's (2009b) *Drinking Water Standards and Health Advisories*.

As with soil, screening values for essential nutrients were determined to be not applicable due to low inherent toxicity.

The results of the screening process for direct contact with groundwater are presented in Table 3-6. For screening purposes only, groundwater samples from all exposure areas were combined. For each constituent, this table presents the detection frequency, the minimum and maximum detected concentrations, the sample with the maximum detect, the minimum and maximum detection limits, and the screening values. The maximum detected concentration of each constituent in groundwater is compared to the screening value.

As indicated in Table 3-6, the following constituents were detected at concentrations exceeding the screening values and are identified as COI for direct contact with groundwater: 1,1,2,2-tetrachloroethane, 1,1-dichloroethane, chloroform, diethyl ether, t-butanol, tetrachloroethene, trichloroethene, 1,4-dioxane, 1,1,2-trichloro-1-propene, 1,2,3-trichloro-1-propene, 1,1'-oxybis[2-ethoxy-]ethane, ethanol, methanol, aluminum (total), arsenic (total & dissolved), barium (total), cadmium (total), chromium (total & dissolved), cobalt (total & dissolved), iron (total & dissolved), lead (total), manganese, (total & dissolved), mercury (total), nickel (total), and vanadium (total).

Table 3-6 also indicates several constituents with maximum detection limits above the screening values. The elevated detection limits are frequently due to elevated detections of other constituents in select samples (such as samples WWL-2, MW-1, MW-2 and MW-8L) that resulted in dilution of the sample and thus, high detection limits. The elevated detection limits are unlikely to affect the usability of the data,

because as indicated in Appendix A-2, for most constituents there are several samples with detection limits below the screening values, while only a few exhibit the elevated detection limits. Many of the constituents for which elevated detection limits were reported were not detected at all in any of the groundwater samples, or were detected at a very low frequency (e.g., 2 out of 35 samples). Furthermore, most of the infrequently detected constituents are already identified as COI (for example, 1,1,2,2-tetrachloroethene, 1,1-dichloroethane, chloroform, tetrachloroethene, 1,4-dioxane, arsenic, chromium and mercury) and are quantitatively evaluated in the risk assessment. Based on this information, the elevated detection limits are not considered an issue with respect to data usability.

3.4 IDENTIFICATION OF COI IN GROUNDWATER – VAPOR INTRUSION

In some cases, screening requirements in addition to those represented in the RSL table are necessary to evaluate the potential for unacceptable risk as a result of vapor intrusion of constituents from the subsurface into indoor structures. The vapor intrusion pathway is evaluated for a current or future hypothetical industrial scenario. To identify COI for the vapor intrusion pathway, groundwater concentrations are compared to USEPA (2002a) screening values appropriate for the vapor intrusion pathway. These values are generic screening values that are protective of indoor air for residential land uses (USEPA, 2002a). Because the site is a non-residential property, comparison of the groundwater data to these values is a conservative method to identify COI. The screening values are obtained from Table 2c of the guidance (USEPA, 2002a) and represent concentrations in groundwater based on a hazard index of 1 and/or a target risk level of 1E-6, to be as conservative as possible.

The results of the screening process for vapor intrusion from groundwater to indoor air are presented in Table 3-7. For screening purposes only, groundwater samples from all exposure areas were combined. This table lists only the detected organic constituents (as well as mercury) previously listed in Table 3-6; constituents that were not detected and constituents that are not organic are not retained for consideration of the vapor intrusion pathway. For each constituent, this table presents the detection frequency, the minimum and maximum detected concentrations, the sample with the maximum detect, the minimum and maximum detection limits, and the screening values. The maximum detected concentration of each constituent in groundwater is compared to the screening value. It should be noted that constituents not considered to be sufficiently volatile and/or toxic via the inhalation exposure route (indicated “NV”) are eliminated as COI for the vapor intrusion pathway.

As indicated in Table 3-7, the following constituents were detected at concentrations exceeding the screening values and are identified as COI for vapor intrusion from groundwater to indoor air: diethyl ether, tetrachloroethene, trichloroethene, 1,1,2-trichloro-1-propene, 1,2,3-trichloro-1-propene and mercury.

3.5 IDENTIFICATION OF COI IN SEDIMENT

The COI identification process for constituents in sediment is identical to that for soil. The screening values are based on USEPA (2010a) RSLs for Industrial Soil, and surrogate values are used when appropriate. Table 3-8 presents the complete list of sediment screening values, including the basis of surrogate values and rationale for constituents for which screening values are not applicable.

The COI identification process for sediment was completed separately for each exposure area, and the results are presented in Tables 3-9 through 3-15. For each constituent, these tables present the detection frequency, the minimum and maximum detected concentrations, the sample with the maximum detect, the minimum and maximum detection limits, and the screening values. The maximum detected concentration of each constituent in sediment is compared to the screening value. Constituents that exceed the screening values are identified as COI for sediment.

- **Eastern and Western Whitewater Lagoons:** Table 3-9 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for sediment of the WWLs: arsenic and chromium. In addition, thallium is retained as a COI because it lacks an appropriate screening value.

- **Natrosol Lagoon:** Table 3-10 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for sediment of the Natrosol Lagoon: arsenic and chromium. In addition, thallium is retained as a COI because it lacks an appropriate screening value.

- **East Bear Creek:** Table 3-11 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for sediment of East Bear Creek: arsenic and chromium. In addition, thallium is retained as a COI because it lacks an appropriate screening value.

- **West Bear Creek:** Table 3-12 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for sediment of West Bear Creek: 2,3,3',4,4',5-hexachloro-1,1'-biphenyl, PCB-1254, pentachlorobiphenyl, arsenic and chromium. In addition, thallium is retained as a COI because it lacks an appropriate screening value.

- **Unnamed Tributary:** Table 3-13 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for sediment of the Unnamed Tributary: PCB-1254, pentachlorobiphenyl, arsenic and

chromium. In addition, thallium is retained as a COI because it lacks an appropriate screening value.

- **Cattail Creek:** Table 3-14 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for sediment of Cattail Creek: hexadecane, arsenic and chromium. In addition, thallium is retained as a COI because it lacks an appropriate screening value.

- **Bailey Creek:** Table 3-15 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for sediment of Bailey Creek: arsenic and chromium. In addition, thallium is retained as a COI because it lacks an appropriate screening value.

Tables 3-9 through 3-15 indicate several constituents, mainly SVOCs, with maximum detection limits above the screening values. The elevated detection limits are unlikely to affect the usability of the data, because as indicated in Appendix A-3, most of these constituents were not detected in any sediment samples from any area, and are unlikely to be present at concentrations between the screening value and the detection limit. Based on this evaluation, the elevated detection limits are not considered an issue with respect to data usability.

3.6 IDENTIFICATION OF COI IN SURFACE WATER

For constituents in surface water, screening values were based primarily on the Virginia Water Quality Standards (WQS) for Human Health (Virginia State Water Control Board, 2010). In the absence of a Virginia WQS, the USEPA (2010a) RSLs for tap water were conservatively used to identify COI in surface water. Table 3-16 presents the complete list of surface water screening values, including the basis of each value (including assignment of surrogates) and rationale for constituents for which screening values are not applicable.

The COI identification process for surface water was completed separately for each exposure area, and the results are presented in Tables 3-17 through 3-25. For each constituent, these tables present the detection frequency, the minimum and maximum detected concentrations, the sample with the maximum detect, the minimum and maximum detection limits, and the screening values. The maximum detected concentration of each constituent in surface water is compared to the screening value. Constituents that exceed the screening values are identified as COI for surface water.

- **Eastern and Western Whitewater Lagoons:** Table 3-17 indicates that the following constituents were detected at concentrations exceeding the screening values and are

identified as COI for surface water of the WWLs: benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, arsenic and chromium.

- **Natrosol Lagoon:** Table 3-18 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of the Natrosol Lagoon: arsenic and chromium.

- **Sludge Drying Beds:** Table 3-19 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of the SDBs: benzo(a)pyrene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, chromium, cobalt, iron and manganese.

- **Vacuum Filter Sludge Pile:** Table 3-20 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of the VFSP: benzo(a)pyrene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, chromium, cobalt and iron.

- **East Bear Creek:** Table 3-21 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of East Bear Creek: aluminum, arsenic, chromium, cobalt, iron, lead, manganese, mercury, thallium and vanadium.

- **West Bear Creek:** Table 3-22 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of West Bear Creek: aluminum, arsenic, chromium, cobalt, iron, manganese and vanadium.

- **Unnamed Tributary:** Table 3-23 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of the Unnamed Tributary: aluminum, arsenic, chromium, cobalt, iron, lead, manganese and vanadium.

- **Cattail Creek:** Table 3-24 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of Cattail Creek: arsenic, chromium, cobalt, iron and manganese.

- **Bailey Creek:** Table 3-25 indicates that the following constituents were detected at concentrations exceeding the screening values and are identified as COI for surface water of Bailey Creek: arsenic, iron and manganese.

Tables 3-17 through 3-25 indicate several constituents in surface water with maximum detection limits above the screening values. The elevated detection limits are unlikely to affect the usability of the data, because as indicated in Appendix A-4, most of these constituents were not detected in any surface water samples from any area, and are unlikely to be present at concentrations between the screening value and the detection limit. For the detected constituents with elevated detection limits, the majority are already identified as COI and are further addressed in the risk assessment. Examples include benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and chromium in the WWLs and benzo(a)pyrene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene in the SDBs. Based on this evaluation, the elevated detection limits are not considered an issue with respect to data usability.

3.7 IDENTIFICATION OF COI FOR UNKNOWN TICS

The screening process to identify COI for unknown TICs is identical to the screening process presented above for standard analytes in each medium. The basis for the constituent-specific screening values used in the comparisons for unknown TICs is the probable TIC identity or probable TIC chemical class assigned to the unknown TICs, as described in Section 2.5. If RSLs were not available for an assigned identity, surrogate screening values were selected based on constituents with structural similarity, as described in Section 3.1. In addition, for unknown TICs assigned to a chemical class, a representative chemical was selected to conservatively represent that chemical class, as described in Section 3.1. Table 3-1 presents the complete list of surrogates for the unknown TIC probable identities and probable chemical classes, including the basis of surrogate values.

3.7.1 Unknown TICs in Soil – Direct Contact

The COI identification process for unknown TICs in soil is identical to the COI identification process for standard analytes detected in soil (see Section 3.2), and consists of a comparison of the results for each unknown TIC with the USEPA (2010a) RSLs for Industrial Soil. Those unknown TICs whose concentrations were below the RSLs were eliminated as COI.

Table 3-26 presents a summary of all the unknown TICs in soil for which a probable TIC identity or a probable chemical class was assigned. This includes unknown TICs from the Landfill Areas, SDB, and VFSP. For these unknown TICs, Table 3-26 presents the sample location, sample number, analytical method, analytical result, the probable TIC identity or probable TIC chemical class, and the USEPA Industrial Soil RSL. The concentration of each unknown TIC in soil is compared to the RSL and constituents that exceed the RSLs are identified as COI for direct contact with soil. As indicated in Table 3-26, there are no unknown TICs that were identified as COI for direct contact with soil at the site. No further evaluation of unknown TICs in soil is conducted in this risk assessment.

3.7.2 Unknown TICs in Groundwater – Direct Contact

The COI identification process for direct contact with unknown TICs in groundwater is identical to the COI identification process for standard analytes detected in groundwater (see Section 3.3), and consists of a comparison of the results for each unknown TIC with the USEPA (2010a) RSLs for Tapwater. Those unknown TICs whose concentrations were below the RSLs were eliminated as COI.

Table 3-27 presents a summary of all the unknown TICs in groundwater for which a probable TIC identity or a probable chemical class was assigned. This includes unknown TICs from the WW Lagoons, Natrosol Lagoon, and Main Holding Basin. For these unknown TICs, Table 3-27 presents the sample location, sample number, analytical method, analytical result, the probable TIC identity or probable TIC chemical class, and the USEPA (2010a) Tapwater RSL. The concentration of each unknown TIC in groundwater is compared to the RSL and constituents that exceed the RSLs are identified as COI for direct contact with groundwater. As indicated in Table 3-27, the following unknown TICs are identified as COI for direct contact with groundwater: chemical class: glycol ether derivative; chemical class: chlorinated VOC; and chemical class: alcohol.

3.7.3 Unknown TICs in Groundwater – Vapor Intrusion

The COI identification process for vapor intrusion to indoor air from unknown TICs in groundwater is identical to the COI identification process for standard analytes detected in groundwater (see Section 3.4), and consists of a comparison of the results for each unknown TIC with the USEPA (2002a) groundwater screening values for vapor intrusion to indoor air. Those unknown TICs whose concentrations were below the screening values were eliminated as COI. Unknown TICs not considered to be sufficiently volatile and/or toxic via the inhalation exposure route were also eliminated as COI.

Table 3-28 presents a summary of all the unknown TICs in groundwater for which a probable TIC identity or a probable chemical class was assigned. This includes unknown TICs from the WW Lagoons, Natrosol Lagoon, and Main Holding Basin. For these unknown TICs, Table 3-28 presents the sample location, sample number, analytical method, analytical result, the probable TIC identity or probable TIC chemical class, and the USEPA (2002a) vapor intrusion screening value. The concentration of each unknown TIC in groundwater is compared to the screening value and constituents that exceed the screening values are identified as COI for vapor intrusion from groundwater. As indicated in Table 3-28, the following unknown TICs are identified as COI for vapor intrusion from groundwater: chemical class: chlorinated VOC; chemical class: alkene; and unknown: 2-methyl-1-propene.

3.7.4 Unknown TICs in Sediment

The COI identification process for unknown TICs in sediment is identical to the COI identification process for standard analytes detected in sediment (see Section 3.5), and consists of a comparison of the results for each unknown TIC with the USEPA (2010a) RSLs for Industrial Soil. Those unknown TICs whose concentrations were below the RSLs were eliminated as COI.

Table 3-29 presents a summary of all the unknown TICs in sediment for which a probable TIC identity or a probable chemical class was assigned. This includes unknown TICs from the Eastern WWL, Western WWL, Natrosol Lagoon, East Bear Creek, West Bear Creek, Unnamed Tributary, Cattail Creek, and Bailey Creek. For these unknown TICs, Table 3-29 presents the sample location, sample number, analytical method, analytical result, the probable TIC identity or probable TIC chemical class, and the USEPA Industrial Soil RSL. The concentration of each unknown TIC in sediment is compared to the RSL and constituents that exceed the RSLs are identified as COI for direct contact with sediment. As indicated in Table 3-29, the following unknown TICs are identified as COI for direct contact with sediment of the Eastern WWL, West Bear Creek, the Unnamed Tributary, and Cattail Creek: chemical class: PAH.

3.7.5 Unknown TICs in Surface Water

The COI identification process for direct contact with unknown TICs in surface water is identical to the COI identification process for standard analytes detected in surface water (see Section 3.6), except that due to the limited number of surface water unknown TICs, only the USEPA (2010a) RSLs for Tapwater were used in the screening. Those unknown TICs whose concentrations were below the RSLs were eliminated as COI.

Table 3-30 presents a summary of all the unknown TICs in surface water for which a probable TIC identity or a probable chemical class was assigned. This includes one unknown TIC identified as “chemical class: alkane” from the Eastern WWL and one unknown TIC identified as “chemical class: organic acid” from the Western WWL. For these unknown TICs, Table 3-30 presents the sample location, sample number, analytical method, analytical result, the probable TIC identity or probable TIC chemical class, and the USEPA (2010a) Tapwater RSL. An RSL was not available (i.e., no surrogate was assigned) for chemical class: organic acid on the basis of low inherent toxicity, and this constituent was excluded as a COI. For chemical class: alkane, the concentration was below the RSL and therefore eliminated as a COI. Based on these results, there are no unknown TICs identified as COI, and no further evaluation of unknown TICs in surface water is conducted in this risk assessment.

3.8 SUMMARY OF CONSTITUENTS OF INTEREST

Comprehensive summaries of the human health COI (i.e., standard analytes, known and unknown TICs) identified for each exposure area are presented in Table 3-31 (soil), Table 3-32 (groundwater) and Table 3-33 (sediment and surface water). In the following subsections, exposure pathways are evaluated for completeness, and COI for all complete pathways are evaluated in the quantitative risk assessment.

4.0 EXPOSURE ASSESSMENT

Exposure assessment is the process of measuring or estimating the intensity, frequency, and duration of human exposure to a constituent in the environment. This section of the risk assessment discusses the mechanisms by which people might come in contact with COI and the approximate magnitude, frequency, and duration of contact between potential human receptors and such constituents. The quantitative assessment of exposure, based on constituent concentrations and the degree of absorption of each constituent, provides the basis for estimating constituent uptake (dose) and associated health risks. The exposure assessment in this risk assessment follows the recommendations for conducting an assessment according to USEPA risk assessment guidance (1989) and the *Guidelines for Exposure Assessment* (USEPA, 1992a).

4.1 PATHWAYS OF HUMAN EXPOSURE

An exposure pathway describes the course that a constituent takes from its environmental source to a human receptor. Each exposure pathway includes the following elements: (1) a source or constituent release from a source, (2) an exposure medium, (3) a point of potential contact for the receptor with the exposure medium, and (4) an exposure route at the contact point (e.g., ingestion, dermal contact or inhalation). An exposure pathway is considered complete when all of these elements are present.

Once constituents are released into an environmental medium, they may migrate from one medium to another. Complete exposure pathways are those that involve receptor contact with an environmental medium that contains elevated levels of site-associated constituents. The complete exposure pathways for the site are identified below. Only complete exposure pathways are evaluated quantitatively in the risk assessment.

4.1.1 Potential Exposure Media and Routes of Exposure

Soil - Direct Contact: COI for direct contact with soil have been selected based on the screening approach undertaken in Sections 3.2 and 3.7.1. For receptors with the potential to directly contact site soils, incidental ingestion of constituents in soil and dermal contact with constituents in soil are the standard exposure routes that are assessed.

Soil-to-Ambient and Indoor Air Volatile Emissions: Volatile constituents present in soil can be released to ambient air through volatilization. Of all the COI identified in soil, only 2,2-dimethoxy-propane is considered sufficiently volatile by USEPA. Receptors could be exposed to vapors in ambient air via inhalation. Therefore, inhalation of volatile constituents in ambient air is a complete exposure pathway for the site. Volatile constituents in the subsurface may also be transported via soil gas to indoor air through vapor intrusion. In this assessment, vapor intrusion to indoor air is evaluated using groundwater data.

Soil-to-Air Particulate Emissions: Constituent-containing soil particulates could be transported to ambient air by wind erosion or construction activities. Inhalation of particulate emissions is considered a potentially complete exposure route for all non-volatile COI.

Soil – Migration to Groundwater: Constituents in soil have the potential to migrate to groundwater. Because groundwater has been directly sampled at the site, the soil to groundwater migration pathway is evaluated as part of the groundwater direct contact pathway (see below). It should be noted that groundwater at the site is not used for potable or non-potable purpose; therefore, use of groundwater as a source of drinking water is an incomplete pathway for the site. In addition, groundwater use restrictions will be implemented for the site that will prohibit the future use of groundwater for any purpose; therefore, future use of groundwater as a source of drinking water is also an incomplete pathway for the site.

Groundwater – Direct Contact: As discussed previously, current and future use of groundwater as a source of drinking water is an incomplete pathway for the site. Groundwater at the site ranges from less than two feet bgs (e.g., in the VFSP) to over 30 feet bgs (e.g., in the Main Holding Basin), making incidental direct contact with groundwater possible for subsurface construction activities (e.g., utility trenching) in some areas of the site. Workers involved in intrusive activities may contact groundwater via incidental ingestion and dermal contact. COI for direct contact with groundwater have been identified based on the screening approach undertaken in Sections 3.3 and 3.7.2.

Groundwater-to-Ambient Air Volatile Emissions: Volatile constituents present in groundwater can be released to ambient air through volatilization. Several of the groundwater COI are considered volatile by USEPA. Receptors could be exposed to vapors in ambient air via inhalation. Therefore, inhalation of volatile constituents in ambient air is a complete exposure pathway for construction workers exposed to groundwater at the site.

Groundwater-to-Indoor Air Volatile Emissions: Volatile constituents in groundwater may potentially intrude into the indoor air of current or future buildings. Potential indoor receptors could be exposed to vapors via inhalation. Therefore, inhalation of volatile constituents in indoor air from groundwater is a complete exposure pathway for the site. COI for vapor intrusion from groundwater to indoor air have been identified based on the screening approach undertaken in Sections 3.4 and 3.7.3.

Groundwater Migration to Surface Water: Groundwater has the potential to migrate to onsite surface water features such as lagoons or streams, and has the potential to migrate offsite to Cattail and Bailey Creeks. In this assessment, this exposure pathway is evaluated using measured surface water data (see below).

Sediment – Direct Contact: COI for direct contact with sediment have been selected for onsite lagoons and onsite and offsite surface water bodies based on the screening approach undertaken in Sections 3.5 and 3.7.4. For receptors with the potential to directly contact sediment, incidental ingestion and dermal contact are the standard exposure routes that are assessed.

Surface Water – Direct Contact: COI for direct contact with surface water have been selected for onsite lagoons and onsite and offsite surface water bodies based on the screening approach undertaken in Sections 3.6 and 3.7.5. For receptors with the potential to directly contact surface water, incidental ingestion and dermal contact are the standard exposure routes that are assessed.

4.2 POTENTIAL RECEPTORS

The potential human receptors at a site must be characterized in order to evaluate potential exposure pathways. The site is an active industrial facility; therefore, potential receptors are identified based on the assumption that current and future land use is non-residential. In addition, recreational use of the offsite surface water bodies is also considered. The following potential receptors were evaluated for the site:

- Current/Future Onsite Outdoor Industrial Worker
- Current/Future Onsite Indoor Industrial Worker
- Current/Future Onsite Construction Worker
- Current/Future Onsite Youth Trespasser
- Current/Future Offsite Recreational Adult
- Current/Future Offsite Recreational Youth

The most common receptors for the site are outdoor and indoor industrial workers. The site workers are assumed to be full-time employees who would be present on a daily basis. The outdoor worker is assumed to spend the majority of the work day outdoors, and is not expected to be involved in any intrusive activities (e.g. excavation). Therefore, the outdoor worker is evaluated for direct exposure to surface soil (incidental ingestion, dermal contact, and inhalation of particulate and volatile emissions in ambient air). In addition, the outdoor industrial worker has the potential for exposure to onsite standing surface water features such as the WWLs, Natrosol Lagoon, SDB, and VFSP, although the potential for exposure to water in these areas is very limited. Therefore, the outdoor industrial worker is also evaluated for direct contact exposure to surface water (incidental ingestion and dermal contact) and sediment (incidental ingestion and dermal contact) of onsite standing water features. An indoor worker is assumed to spend the entire work day indoors, and could potentially be exposed via inhalation of volatile constituents in indoor air that migrate from groundwater. Both outdoor and indoor workers are evaluated for each SWMU (and for the Main Holding Basin) for which the relevant media have been sampled.

A construction worker may be involved in a short-term construction or excavation project at the site. This receptor could potentially be directly exposed to constituents in surface soil as well as shallow groundwater. Groundwater at the site is present at depths ranging from less than 2 feet bgs to over 30 feet bgs, and in some areas of the site (e.g., the WWLs where the average depth to groundwater is over 20 feet bgs), excavation to the depth of the groundwater table is unlikely. However, to be conservative, it was assumed that a construction worker could potentially contact groundwater in all relevant SWMUs/areas. Therefore, the construction worker is evaluated for direct exposure to surface soil via incidental ingestion, dermal contact, and inhalation of volatile emissions and airborne particulates in ambient air. The construction worker is also evaluated for exposure to groundwater via incidental ingestion, dermal contact, and inhalation of volatile emissions in ambient air. Similar to the outdoor industrial worker, the construction worker has the potential for exposure to onsite standing surface water features such as the WWLs, Natrosol Lagoon, SDB, and VFSP. Therefore, the construction worker is also evaluated for direct contact exposure to surface water (incidental ingestion and dermal contact) and sediment (incidental ingestion and dermal contact) of onsite standing water features.

It should be noted that while the outdoor industrial worker and the construction worker also have the potential to contact the onsite surface water streams (i.e., East Bear Creek, West Bear Creek, and the Unnamed Tributary), an onsite youth trespasser is considered to be a more likely receptor (see below). Thus, exposure to sediment and surface water from these areas is considered to be de minimis for workers. Also, as described above, when the appropriate data were available, all three of the worker receptors were evaluated for each of the onsite exposure areas (i.e., Eastern and Western WWL, Landfill Areas, Natrosol Lagoon, RA Basin, SDBs, VFSP, and Main Holding Basin), regardless of the current potential exposures at the site. This conservative approach was used in order to address any future exposure scenarios, which may not be currently defined or realized.

In addition to the worker receptors, trespassers may be present at the site. However, the magnitude of exposure of trespassers in each SWMU would be significantly less than workers, and in some cases, such as exposure to groundwater, would not occur at all. Therefore, exposure to media associated with the onsite SWMUs is considered to be de minimis for trespassers. A youth trespasser is considered the most likely receptor for the onsite streams (East Bear Creek, West Bear Creek, and the Unnamed Tributary). The trespasser is evaluated for exposure to surface water and sediment from the onsite streams via incidental ingestion and dermal contact while wading.

Recreational receptors, including adults and youths, may be present in the offsite streams (Cattail Creek and Bailey Creek). These water bodies are considered to be of sufficient depth that recreational visitors could be exposed to surface water and sediment while swimming. The potentially complete exposure pathways for the recreational visitors consist of incidental ingestion and dermal contact with surface water and sediment.

4.2.1 Complete Exposure Pathways

Complete exposure pathways require exposure media with elevated levels of site-associated constituents and receptors with the opportunity to contact these media. The previous sections described the potential exposure pathways at the site under current and expected future land use conditions, as well as the likely human receptors. Figure 4-1 presents a generalized conceptual site exposure model, which identifies the receptors and potential exposure pathways, and whether each pathway is complete. Additional details of the conceptual site exposure model are also presented in tabular format for the onsite SWMUs and other areas of concern (Table 4-1) and for the onsite and offsite streams (Table 4-2). Exposures resulting from all potentially complete pathways are quantitatively evaluated in this assessment.

4.3 QUANTIFICATION OF EXPOSURE POINT CONCENTRATIONS

Potential exposure to constituents in the environment is directly proportional to their concentrations in environmental media and characteristics of exposure (e.g., frequency and duration). The concentrations that a receptor may contact in an environmental medium generally are referred to as exposure point concentrations (EPCs). The analytical results for samples from a given medium were combined to derive a single EPC for each COI that conservatively represents the level of that COI to which potential receptors may be exposed. For COI in soil, groundwater, sediment, and surface water, EPCs were statistically calculated from sampling data. EPCs for volatile and particulate emissions from soil to ambient air are estimated using USEPA (2002b) methodologies. EPCs for volatile emissions from groundwater to ambient air are estimated using standard guidance for risk-based corrective action developed by the American Society for Testing and Materials (ASTM, 2002). EPCs for groundwater to indoor air were estimated using the Johnson and Ettinger (1991) vapor intrusion model and the USEPA's guidance for using this model (USEPA, 2004a).

4.3.1 Exposure Point Concentrations Based on Measured Data

EPCs generally are estimated using measured concentrations in environmental media, or estimated based on fate and transport models. Depending on the distribution of the data, the proportion of the samples reported as non-detect, and the total number of samples, there are several statistical parameters that may be used to estimate EPCs. USEPA supplemental risk assessment guidance (USEPA, 1992c) stipulates that EPC estimates should be based on the 95% upper confidence limit (95% UCL) of the arithmetic mean to estimate a Reasonable Maximum Exposure (RME) scenario. RME conditions are defined by USEPA as the "highest exposure that is reasonably expected to occur at the site." The 95% UCL is used to evaluate all COI, with a few exceptions as noted below.

In this assessment, the USEPA (2010b) software package, ProUCL Version 4.00.05, is used to calculate statistics. This program allows for statistical calculations on data sets with or without non-detect results. For data sets without non-detect results, statistics are simply calculated on the full data set. For data sets with non-detect results), regression on order statistics (ROS) are used to extrapolate non-detect observations based on the distribution of the data set. Prior to calculating any statistics, duplicate samples were appropriately averaged as discussed in Section 2.6.

The first step in the data evaluation process is to determine the best fit distribution of the data (USEPA, 2010b). Untransformed data are tested first to determine if the distribution is normal at α = 0.05. If they are normally distributed, the appropriate statistics for normal data are used. If the data are not normal, the data are log-transformed and retested for lognormality at α = 0.05. USEPA (2010b) also provides methods to test for Goodness of Fit to the Gamma distribution, and indicates that the Gamma distribution is prioritized over the lognormal distribution. A distribution which is neither normal, Gamma, nor lognormal is defined as a non-parametric distribution. The non-parametric Kaplan-Meier (KM) method is the preferred method for evaluating data sets with multiple detection limits.

ProUCL Version 4.00.05 was run on the data sets for COI from each medium and area, where sufficient data were available. The output is provided in Appendix C. The output files provide detailed information on statistics generated for each distribution type, and also identify the recommended UCL ("Potential UCL to Use"). The final EPC is identified as the lower of the UCL or the maximum detected concentration. It should be noted that for some data sets, too few distinct detected values were observed. In these cases, statistics for that data set were not generated, and the maximum detected concentration is selected as the final EPC. In addition, for areas where the dataset had too few samples to run ProUCL (e.g., five samples or less), the maximum detected concentration was selected as the final EPC.

4.3.1.1 Exposure Point Concentrations for Constituents in Soil

EPCs for COI in surface soil of each exposure area (Landfill Areas, SDBs and VFSP) are presented in Tables 4-3 through 4-5. These EPCs are used to evaluate both the outdoor worker and construction worker. Details of all statistical calculations are provided in Appendices C-1 through C-3, which contain the output sheets from ProUCL.

4.3.1.2 Exposure Point Concentrations for Constituents in Groundwater

EPCs for direct contact COI in groundwater of each exposure area (Eastern and Western WWL, Landfill Areas, Natrosol Lagoon, RA Basin, SDBs, VFSP and Main Holding Basin) are presented in Tables 4-6 through 4-12. Although the COI identification process was conducted for all groundwater samples on a

site-wide basis, the EPCs were determined by grouping the groundwater samples from each exposure area. These EPCs are used to evaluate incidental exposure by a construction worker.

For all areas with the exception of the Main Holding Basin, five samples or less were available to represent that area. For these areas, the EPCs were based on the maximum detected concentrations. For groundwater of the Main Holding Basin, EPCs were based on the lower of the UCL or the maximum detected concentration (details of the statistical calculations are provided in Appendix C-4).

For all areas in which lead was detected, regardless of the number of samples, the EPC is based on the arithmetic mean concentration. As will be discussed in Section 5.4, lead is evaluated using a separate type of model, and the EPC required for this model is the arithmetic mean concentration.

For groundwater associated with the RA Basin and SDBs, analytical results for selected inorganic COI are available for both total and dissolved phases. EPCs are determined for both phases, and the higher of the two EPCs is selected as the final EPC for the human health risk assessment.

EPCs for COI for the vapor intrusion from groundwater pathway for each area are the same EPCs used for direct contact with groundwater as presented in Tables 4-6 through 4-12. The specific COI identified for the vapor intrusion pathway are identified in these tables with an asterisk. These EPCs are used to evaluate inhalation exposure by an indoor worker.

4.3.1.3 Exposure Point Concentrations for Constituents in Sediment

EPCs for COI in sediment of each exposure area (Eastern and Western WWL, Natrosol Lagoon, East Bear Creek, West Bear Creek, Unnamed Tributary, Cattail Creek and Bailey Creek) are presented in Tables 4-13 through 4-20. These EPCs are used to evaluate exposure by workers, trespassers, and recreational visitors.

For all onsite and offsite creeks, five samples or less were available to represent each area. For these areas, the EPCs were based on the maximum detected concentrations. For sediment of the Eastern and Western WWLs and Natrosol Lagoon, EPCs were based on the lower of the UCL or the maximum detected concentration. Details of the statistical calculations are provided in Appendices C-5 through C-7, which contain the output sheets from ProUCL.

4.3.1.4 Exposure Point Concentrations for Constituents in Surface Water

EPCs for COI in surface water of each exposure area (Eastern and Western WWL, Natrosol Lagoon, SDBs, VFSP, East Bear Creek, West Bear Creek, Unnamed Tributary, Cattail Creek and Bailey Creek)

are presented in Tables 4-21 through 4-30. These EPCs are used to evaluate exposure by workers, trespassers, and recreational visitors.

Five samples or less were available to represent surface water from each exposure area. Therefore, the EPCs for all COI, with the exception of lead, were based on the maximum detected concentrations. For lead (a COI for surface water of East Bear Creek and the Unnamed Tributary), the EPC is based on the arithmetic mean concentration.

4.3.2 Exposure Point Concentrations for Particulates in Ambient Air

The concentrations of COI associated with particulate emissions were estimated using a particulate emission factor (PEF). The PEF relates the concentration of a constituent in soil to the estimated concentration in respirable airborne particulates. For this assessment, the PEF is based on the default value of 1.36×10^9 m^3/kg provided in USEPA's (2002b) soil screening guidance document.

The PEF is applied to soil concentrations for all non-volatile COI in each area to estimate particulate concentrations that might be inhaled by a potential receptor. Soil concentrations are converted to air concentrations by dividing the soil concentration (C_S) by the PEF to obtain an air concentration (C_A) in units of mg/m^3.

4.3.3 Exposure Point Concentrations for Volatiles in Ambient Air (Soil Source)

The concentrations of COI associated with volatilization from soil to outdoor air were estimated using a volatilization factor (VF). The VF relates the concentration of a constituent in soil to the estimated concentration in ambient air. This assessment calculates VFs for 2,2-dimethoxy-propane (the only volatile COI in soil) based on Equation 4-8 of USEPA's (2002b) soil screening guidance document. For this assessment, separate VFs were calculated to evaluate the different receptor scenarios.

The calculation of a VF incorporates default soil properties (porosity values, densities, and organic carbon) and constituent-specific properties (Henry's Law constants, diffusivity coefficients). The soil properties are based on USEPA (2004a) default values for a "silty clay" soil type. As discussed in the *Phase III Site Investigation Summary* Report (GES, 2007), review of the various boring logs and related reports indicate that the surface stratigraphy at the facility is composed of a fairly thick sequence (10 to 30 feet) of silty clay/clay (GES, 2007). This soil type was selected as representative of the Landfill Areas, the only SWMU in which 2,2-dimethoxy-propane was identified as a soil COI.

The equations and input factors for the VF calculations for the outdoor worker and the construction worker are presented in Table 4-31. The fraction organic carbon used in the model is the USEPA (2002b) default value of 0.006 g/g. The constituent-specific properties for 2,2-dimethoxy-propane were obtained

from USEPA (2004a) guidance and based on 1,2-dibromo-3-chloropropane as a surrogate. The value for the Henry's Law constant at the system temperature (H'_{TS}) were converted from Henry's Law constants at 25°C assuming a soil temperature of 13.9°C [average value for Virginia, based on Figure 8 of USEPA (2004a)] and using equations provided by USEPA (2004a).

The total time over which industrial work occurs (T) is based on the outdoor worker exposure duration, or 24 hrs/day for 25 years. The total time over which construction occurs is based on the construction worker exposure duration, or 24 hrs/day for 1 year. The value for Q/C_{vol} is based on the USEPA (2002b) default value of 68.18 g/m^2-s per kg/m^3.

The equation, input factors, and resulting calculated VFs are presented in Table 4-31. Soil concentrations are converted to air concentrations by dividing the C_S by the VF to obtain a C_A in units of mg/m^3.

4.3.4 Exposure Point Concentrations for Volatiles in Ambient Air (Groundwater Source)

Concentrations of COI that may volatilize from groundwater to ambient air are calculated using a volatilization factor (VF_{wamb}) based on standard guidance from the American Society for Testing and Materials (ASTM; 2002). The VF_{wamb} equation in this guidance accounts for diffusion of volatile constituents from groundwater and through the capillary and vadose zones.

Appendix D presents the details of the calculations for VF_{wamb}. The groundwater EPCs are multiplied by the constituent-specific VF_{wamb} to derive ambient air concentrations. The groundwater EPCs, constituent-specific VF_{wamb} values, and resulting concentrations of volatile COI in ambient air are presented in Table 4-32 for each exposure area.

4.3.5 Exposure Point Concentrations for Volatiles in Indoor Air

The concentrations of COI in indoor air associated with volatile emissions from groundwater were estimated using methodologies outlined in the *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004a). The first step in determining air concentrations from groundwater source concentrations is to convert the source concentration to a soil gas concentration. When groundwater is the source, assuming that the vapor and aqueous-phases are in local equilibrium, the soil gas concentrations (C_{SG}) are calculated according to Henry's Law in the following manner (USEPA, 2004a):

$$C_{SG} = C_{GW} \times 1000\ L/m^3 \times H'_{TS}$$

where C_{GW} is the exposure point concentration (in mg/L) and H'_{TS} is the unitless Henry's Law Constant at the system temperature (13.9°C for Virginia, as noted above). Table 4-33 presents the calculated soil gas source concentrations for volatile COI in groundwater of each exposure area.

The next step in calculating indoor air concentrations is to estimate a transport factor (TF_{ind}) that will relate the constituent concentration in soil gas to the concentration in air. The TF_{ind} is dependent on the diffusion coefficient and other properties that will affect the transfer of constituents into air, such as distance from the source to the breathing zone, soil properties, and building properties. For indoor air, the TF_{ind} is calculated in accordance with the conservative default values and equations presented in the USEPA (2004a) User's Guide. Separate sets of TF_{ind} values were calculated for the individual exposure areas because of differences in input factors (specifically, depth to groundwater). Details of the TF_{ind} calculations are provided in Appendix E.

Soil gas concentrations are converted to air concentration by applying the transfer factor as follows:

$$CA = C_{SG} \times TF_{ind}$$

The constituent-specific TF_{ind} for indoor air, along with the resulting estimated concentrations of volatile COI in indoor air, are presented in Table 4-33 for vapor intrusion from groundwater for each exposure area.

4.4 ESTIMATION OF CONSTITUENT EXPOSURE AND INTAKE

The USEPA's *Guidelines for Exposure Assessment* (USEPA, 1992a) define constituent exposure as "the condition of a constituent contacting the outer boundary of a human." The constituents are contained in an environmental medium such as water, soil, or air. Generally two steps are required for a constituent to enter a body; contact with the outer boundary of the body (exposure), then crossing this outside boundary to inside the body (intake). For most exposure routes, intake is evaluated in terms of how much of the carrier medium containing the constituents crosses the outer boundary (e.g., amount of soil ingested, volume of air inhaled).

Two types of doses, applied and internal, are defined for evaluating constituent exposure (USEPA, 1992a). The applied dose is the amount of a constituent present at an absorption barrier (e.g., lung) and available for absorption. This is analogous to the administered dose in a dose-response experiment. The internal dose is the amount of constituent actually absorbed across the barrier and available for internal biological interactions. It is the portion of the internal dose that actually reaches cells, sites, or membranes where adverse effects occur. Doses are generally presented as dose rates (dose per unit time) on a per-unit-body-weight basis (units of mg/kg-day).

Noncarcinogenic health effects are evaluated by calculating the average dose of a constituent over the course of the exposure period. This dose is termed the Average Daily Dose (ADD). Potential carcinogenic health effects are evaluated in terms of an individual's theoretical increased risk of developing cancer over a lifetime. Although the duration of exposure to a constituent release generally does not last for an

entire lifetime, constituent intake for carcinogens is estimated as the average dose over the average human lifetime (70 years). This lifetime dose applies specifically to the evaluation of carcinogenic effects and is termed the Lifetime Average Daily Dose (LADD). In a risk assessment, the calculated ADD or LADD are estimated quantitatively using assumptions about the duration, frequency, and magnitude of exposure experienced by each potential receptor, and assumptions about the constituent properties that influence absorption. Table 4-34 presents the general form of the equation used to evaluate intake of constituents.

4.5 ESTIMATE OF CONSTITUENT ABSORPTION

4.5.1 Gastrointestinal Bioavailability

As noted above, the amount of a constituent that actually penetrates the exchange boundaries of the organism is termed the internal dose (sometimes called absorbed dose). The studies that provide the basis for derived constituent toxicity values (e.g., references doses and cancer slope factors) generally report health effects as a function of applied doses rather than internal doses. These toxicity values are therefore most correctly compared to calculations of potential applied doses. However, toxicity studies often provide constituents to the study animals in food, in water, or in a matrix that readily allows absorption. The fraction of a constituent that is absorbed from soil is generally less than the fraction absorbed from food or drinking water. USEPA guidance indicates that reference doses (RfD) are usually based on or have been adjusted to reflect drinking water exposure (USEPA, 1989).

This risk assessment includes the evaluation of soil, groundwater, sediment, and surface water ingestion pathways. For these exposure routes, an absorption factor of 100 percent was used for all COI except lead. Lead absorption is discussed separately in Section 5.4.

4.5.2 Dermal Absorption of Constituents from Soil or Sediment

The administered dose in a dermal exposure pathway is the amount of constituent in the volume of soil (or sediment) contacting the skin. Only a small fraction of this amount will actually penetrate the skin and enter the body of a receptor. Dermal exposure calculations are, therefore, always calculated as an absorbed dose, and require the inclusion of a dermal absorption fraction (DAF). The DAF values are based on guidance from USEPA (2004b) and are summarized in Table 4-35.

For SVOCs (including semi-volatile TICs), a DAF of 0.10 (10%) is used, based on the default value from Exhibit 3-4 of USEPA (2004b). For PCBs (and PCB TICs), a DAF of 14% is used. For the unknown TIC chemical class: PAH (for which benzo(a)pyrene was identified as a surrogate) the default DAF for PAHs of 13% is used. For arsenic, the DAF is 3%. For other inorganics, USEPA (2004b) guidance indicates that

there are too little data to extrapolate a reasonable default value. Therefore, the DAF is set to zero for inorganics other than arsenic (chromium, iron and thallium).

4.5.3 Dermal Absorption of Constituents from Groundwater or Surface Water

Pathways that involve dermal contact with water require the calculation of the dermal absorbed dose per event (DA_{event}). This factor reflects the movement of the constituent from the water, across the skin, to the stratum corneum and into the bloodstream.

USEPA (2004b) guidance presents equations for calculating DA_{event} for both organic and inorganic constituents. For organic constituents, the DA_{event} values are calculated differently based on the exposure time for the site-specific scenario as it relates to a constant, t* (time to reach steady state). In this assessment, exposure time for dermal contact with water is assumed to be two hours per event for all scenarios. The equations and input factors used to calculate DA_{event} for all COI in groundwater and surface water (except for lead) are presented in Table 4-36; exposure to lead is discussed separately in Section 5.4. Constituent-specific factors were obtained from USEPA (2004b) guidance.

4.6 EXPOSURE ASSUMPTIONS

The quantitative estimation of constituent intake involves the incorporation of numerical assumptions for a variety of exposure parameters. Where guidance was available, exposure assumptions used in these intake calculations are based on USEPA (1989, 1997a, 2002b) recommended values. Some exposure values are not addressed in the available guidance, and, in these cases, values were derived based on site characteristics or best professional judgment. All exposure assumptions utilized in this risk assessment are described below.

4.6.1 All Pathways

The following factors are consistent across all of the exposure pathways considered in this assessment for each receptor.

4.6.1.1 Exposure Frequency and Duration

Each receptor in this assessment is assumed to have a particular frequency and duration of exposure.

Outdoor and Indoor Workers: USEPA (2002b) guidance recommends an exposure duration of 25 years and an exposure frequency of 225 days/year for an outdoor worker exposed via soil-related pathways. For the indoor worker, the recommended USEPA (2002b) exposure duration of 25 years and exposure frequency of 250 days/year are used. The potential for an outdoor worker to contact surface water (e.g., onsite lagoons and ponds) is very limited; therefore an exposure frequency of 20 days/year is used to

evaluate the surface water pathways. This value is based on professional judgment and accounts for the fact that many onsite surface water features are shallow pools of standing water, and work activities that might require workers to contact the surface water would be infrequent and of short duration.

Construction Worker: USEPA (2002b) guidance recommends that exposure frequency and duration for a construction worker should be determined on a site-specific basis. An exposure frequency of 20 days/year and exposure duration of 1 year were selected based on the Risk Assessment Information System (RAIS, 2010) values for an excavation/construction worker.

Youth Trespasser: USEPA does not provide default exposure factors for trespassers. On the basis of professional judgment, the youth trespasser was estimated to visit the onsite streams (East Bear Creek, West Bear Creek and the Unnamed Tributary) six times per month for four months of the year, for an exposure frequency of 24 days/year. The exposure duration for the youth trespasser (ages 7 through 16) is based on the number of years for this age range (10 years).

Recreational Visitors: USEPA does not provide default exposure factors for recreational receptors. Recreational receptors (adult and youth) are estimated to visit the offsite streams (Cattail Creek and Bailey Creek) 45 days/year. This exposure frequency is based on the RAIS (2010) value for recreational water exposure. The exposure duration for the recreational adult is based on the default value for a resident; therefore, a value of 30 years is used (USEPA, 2002b). The exposure duration for the recreational youth (ages 7 through 16) is based on the number of years for this age range (10 years).

4.6.1.2 Body Weight

The default value for average body weight of an adult is 70 kg based on USEPA (1989, 2002b). This value was used for the body weight of the outdoor and indoor workers, construction worker, and recreational adult. The body weight for a youth between ages 7 through 16 is approximately 43.4 kg (USEPA, 1997a).

4.6.1.3 Averaging Time

As described above, the doses for noncarcinogenic health effects are averaged over the specific period of exposure for a given receptor. Noncarcinogenic averaging times are, therefore, calculated by multiplying the exposure duration for the receptor by 365 days/year. Carcinogenic health effects are calculated over a lifetime exposure, so the USEPA (1989, 2002b) value for average lifetime, 70 years, was used for exposure duration. The resulting carcinogenic averaging time is 25,550 days.

4.6.2 Incidental Ingestion of Soil or Sediment

The factors incorporated into calculations of the soil and sediment ingestion pathways are discussed in this section. Exposure factors for the outdoor worker, construction worker, youth trespasser, and recreational visitors are presented in Table 4-37. The general calculation for this pathway is also presented in this table.

Soil/Sediment Ingestion Rate: The USEPA (2002b) recommended default value of 100 mg/day is used to estimate soil ingestion for the outdoor worker. For the construction worker, the default soil ingestion rate is 330 mg/day. In the absence of specific values for trespassers or recreational receptors exposed to sediments, the outdoor worker rate of 100 mg/day is also used to conservatively evaluate incidental sediment ingestion.

Gastrointestinal Bioavailability Factor: As described in Section 4.5.1, a relative gastrointestinal bioavailability factor is included in calculations of the soil or sediment ingestion pathway. A value of 100% was used in this assessment for all COI.

4.6.3 Dermal Contact with Soil or Sediment

The factors discussed below are incorporated into calculations of the dermal contact with soil or sediment pathway. Exposure factors for the outdoor worker, construction worker, youth trespasser, and recreational visitors are presented in Table 4-38. The intake equation for this pathway is also provided in this table.

Skin Surface Area: Potentially exposed workers are assumed to wear appropriate clothing during outdoor activities that may involve soil contact, such as long sleeve shirts and long pants. Skin surface area available for dermal contact with soil is assumed to be the hands, forearms, and head. The exposed skin surface area corresponding to these body parts is approximately 3,300 cm^2, based on guidance from USEPA (2002b). Trespassing and recreational youths are expected to wear shorts and short sleeves during the summer, exposing their head, hands, forearms, and lower legs. The average skin surface area for these body parts is 5,000 cm^2, based on values presented in USEPA (1997a). For the recreational adult, the skin surface area was set to 5,700 cm^2, based on the default value presented by USEPA (2002b) for a residential adult exposed to soil.

Soil Adherence Factor: The soil adherence factor describes the amount of soil or sediment that is assumed to be in contact with the exposed skin surface area. USEPA (2002b, 2004b) guidance provides values for a variety of receptors and soil contact activities. A value 0.2 mg/cm^2 is recommended for an outdoor worker, and a value 0.3 mg/cm^2 is recommended for a construction worker (USEPA, 2002b). In the absence of specific values for trespassing or recreational youths, a value of 0.2 mg/cm^2 is used. This is based on the USEPA (2004b) geometric mean adherence factor for children ages 8 to 12 playing in wet

soil (considered to be a high-end soil contact activity). For the recreational adult, a value of 0.07 mg/cm^2 is used, which is based on the default value for a residential adult exposed to soil.

Dermal Absorption Fraction: As described in Section 4.5.2, a DAF is included in calculations of exposure to constituents in soil or sediment through dermal contact. These values are based on guidance from USEPA (2004b) and were presented in Table 4-35.

4.6.4 Particulate and Volatile Inhalation

In accordance with USEPA's recent "Supplemental Guidance for Inhalation Risk Assessment" (USEPA, 2009a), an intake factor is not calculated for the inhalation pathway. USEPA recommends that when estimating risk via inhalation, the concentration of the constituent in air should be used as the exposure metric (e.g., mg/m^3), rather than inhalation intake of the constituent in air based on inhalation rate and body weight (e.g., mg/kg-day). Thus, instead of a dose calculation, an exposure concentration is calculated for each receptor.

The following factors are incorporated into calculations of inhalation exposure volatile emissions in ambient and indoor air. Exposure factors for all worker receptors are presented in Table 4-39. The general calculation for the exposure concentration is also presented in this table.

Exposure Time: The exposure time for all worker receptors exposed to soil is 8 hours per day. This is the recommended value for a typical workday (RAIS, 2010). The exposure time for the construction worker exposed to groundwater is 2 hours per day on the basis that exposure to groundwater is expected to be intermittent and infrequent.

Averaging Time: The averaging times for the worker receptors are the same as those discussed previously in Section 4.6.1.3. However, in the calculation of exposure concentration, the averaging time is expressed in units of hours (USEPA, 2009a).

4.6.5 Incidental Ingestion of Groundwater or Surface Water

The following factors are incorporated into calculations of the groundwater or surface water ingestion pathways. Exposure factors for the outdoor worker, construction worker, youth trespasser, and recreational visitors are presented in Table 4-40. The intake equation for this pathway is also provided in this table.

Incidental Water Ingestion Rate: Limited guidance is available on the estimated amount of water ingested during incidental exposure scenarios. USEPA (1989) guidance provides a value of 50 mL/hour for incidental ingestion of water while swimming, and RAIS (2010) provides a recreational water ingestion

rate which is also 50 mL/hour. Swimming is possible in Cattail and Bailey Creeks, but not in the other surface water bodies at the site. As a conservative estimate based on professional judgment of the amount of water that could accidentally be ingested in any of the surface water exposure areas (under recreational or occupational exposure scenarios), an ingestion rate of 50 mL/event (one event per day) is used in the risk assessment. This assumption is especially conservative for workers exposed to onsite surface water bodies (lagoons and ponds), where ingestion is unlikely to occur at all.

4.6.6 Dermal Contact with Groundwater or Surface Water

The following factors are incorporated into calculations of the dermal contact with groundwater or surface water pathway. Exposure factors for the outdoor worker, construction worker, youth trespasser, and recreational visitors are presented in Table 4-41. The intake equation for this pathway is also provided in this table.

Skin Surface Area: Exposure to onsite surface water by outdoor workers is considered unlikely. However, for this risk assessment it is assumed that a worker might contact water on their hands. Therefore, the skin surface area for hands (based on the average value for males) of 900 cm^2 is used to evaluate outdoor worker exposure to surface water in this risk assessment The construction worker was conservatively assumed to have the same exposed skin areas for groundwater and surface water contact as for soil and sediment. Therefore, the value of 3,300 cm^2 was included in the dose equations for the construction worker. Similarly, the youth trespasser was assumed to be exposed to surface water over the same body surface areas as they are for sediment (5,000 cm^2). For the recreational adult and youth exposed to Cattail and Bailey Creeks, where swimming is possible, the entire body surface area was used. These values are 18,000 cm^2 and 13,200 cm^2 for the adult and youth, respectively (USEPA, 2004b; 1997a).

Dermal Absorbed Dose per Event: As described in Section 4.5.3, constituent-specific values for DA_{event} are included in calculations describing dermal exposure to water. These values, calculated according to USEPA (2004b) guidance, were presented in Table 4-36 and reflect an exposure time of two hours per event (one event per day).

4.7 SUMMARY

Calculations of estimated doses for complete exposure pathways identified in this section are presented in Appendix F. These dose estimates were combined in the risk characterization (Section 6) with toxicity values presented in the Toxicity Assessment (Section 5) to estimate potential carcinogenic risks and noncarcinogenic effects.

5.0 TOXICITY ASSESSMENT

The toxicity assessment, also known as the dose-response assessment, provides a description of the relationship between a dose of a chemical and the anticipated incidence of an adverse health effect. The majority of existing knowledge about the dose-response relationship is based on data collected from studies of animals (usually rodents), studies of human occupational exposures, and theories about how humans respond to environmental doses of chemicals.

The USEPA has developed dose-response assessment techniques to set "acceptable" levels of human exposure to chemicals in the environment. These USEPA-derived toxicity values address both chronic and subchronic noncarcinogenic health effects and potential carcinogenic health risks.

5.1 EVALUATION OF NONCARCINOGENIC RESPONSES

The sections that follow discuss the mechanisms of noncarcinogenic response, the derivation of acceptable dose levels, the manner in which these levels are used in this risk assessment, and some of the limitations of these values. The limitations are addressed in greater detail in the Uncertainty Analysis section of this report (Section 7).

5.1.1 Background

It is widely accepted that noncarcinogenic biological effects of chemical substances occur only after a threshold dose is achieved (Klaassen, 2001). Typically, physiological mechanisms exist that will minimize the adverse effect, through pharmacokinetic means such as absorption, distribution, excretion, or metabolism (Klaassen, 2001). Therefore, a range of exposures and resulting doses exist that can be tolerated by a receptor with essentially no chance of developing adverse effects. The threshold dose for a constituent is usually estimated from the no observed adverse effect level (NOAEL) or the lowest observed adverse effect level (LOAEL), as determined from animal studies or human data. The NOAEL is the highest dose at which no adverse effects occur, while the LOAEL is the lowest dose at which adverse effects are discernable.

5.1.2 Noncarcinogenic Toxicity Values

USEPA uses the NOAEL or LOAEL estimates of threshold dose to establish reference doses (RfDs) and reference concentrations (RfCs) for human exposure. An RfD or RfC is an estimate of a daily exposure level (dose) that is unlikely to present an appreciable risk of deleterious effects during a lifetime. USEPA has derived RfDs and RfCs for both chronic (long-term) and subchronic (short-term) exposure periods. For this assessment, subchronic RfDs/RfCs have been used (when available) to evaluate the construction workers.

RfDs (used to evaluate the oral exposure route) are expressed in units of dose (mg/kg-day), while RfCs (used to evaluate the inhalation exposure route) are expressed as concentrations (mg/m^3). Both types of toxicity value incorporate uncertainty factors to account for limitations in the quality or quantity of available data. RfDs for the dermal route of exposure are developed through route-to-route extrapolation, as described by USEPA (2004b). An oral RfD is converted to an absorbed dose by multiplying the RfD by the fractional absorption value. As indicated in Exhibit 4-1 of USEPA (2004b), a fractional absorption value of 1 (100%) is recommended for all of the organic COI. For inorganics, the following absorption values are recommended: 0.07 for barium; 0.05 for cadmium; 0.025 for chromium; 0.04 for manganese; 0.04 for nickel; and 0.026 for vanadium. A value of 1 is used for all other inorganic COI.

5.1.3 Estimating the Likelihood of Adverse Noncarcinogenic Response

The likelihood of occurrence of adverse noncarcinogenic effects depends on the relationship between the RfD (or RfC) and the estimated average chemical dose (or exposure concentration) received by the receptor. Doses less than the RfD (and exposure concentrations less than the RfC) are not likely to be associated with any adverse health effects and are, generally, not of regulatory concern. Doses that exceed the RfD (and exposure concentrations that exceed the RfC) are considered to present the potential for adverse effects.

Noncarcinogenic responses are evaluated numerically using parameters known as the hazard quotient (HQ) and hazard index (HI). For oral and dermal exposure routes, the HQ is obtained by dividing the average daily dose (ADD) by the RfD as presented below. The ADD is the estimated daily dose of a chemical averaged over the specific duration of exposure, which may not necessarily be an entire lifetime.

$$ADD \div RfD = HQ$$

Similarly, for the inhalation exposure route, the HQ is calculated by dividing the exposure concentration by the RfC. The exposure concentration is calculated by applying the receptor-specific exposure time, frequency, and duration to the air concentration. Thus, HQ is calculated as follows:

$$[(CA \times ET \times EF \times ED) / AT] \div RfC = HQ$$

Each calculation with a specific combination of chemical, receptor, and exposure pathway, will have a distinct calculated HQ. HQs associated with all chemicals for a particular pathway are summed to yield the HI, as indicated:

$$HQi + HQii + HQiii + ... = HI$$

If a receptor is subject to exposure through more than one pathway, the HIs for all pathways are summed. A calculated HI of 1 or less indicates that an adverse effect would not be anticipated. HIs are most appropriately derived for chemicals that act on the same target organ or have similar critical effect. Therefore, if the total HI across all COI exceeds 1, it is appropriate to segregate the COI by effect and mechanism of action and to derive separate HIs for each group (USEPA, 1989).

5.2 EVALUATION OF POTENTIAL CARCINOGENIC RESPONSES

The subsections below discuss the assumed mechanisms of carcinogenic response, the derivation of carcinogenic toxicity values, the manner in which these values are used in this risk assessment, and some of the limitations of these values. The limitations are addressed in greater detail in the Uncertainty Analysis of this report (Section 7).

5.2.1 Background

USEPA typically has required that potentially carcinogenic chemicals be treated as if minimum threshold doses do not exist (USEPA, 2005a). The regulatory dose-response curve used for carcinogens only allows for zero risk at zero dose. Thus, for all environmental doses, some level of risk is assumed to be present.

To estimate the theoretical response at environmental doses, various mathematical dose-response models are used. USEPA uses the linearized multistage model for low dose extrapolation. This model assumes that the effect of the carcinogenic agent on tumor formation seen at high doses in animal data is basically the same at low doses (i.e., the slope of the dose-response curve can be extrapolated downward to the origin in a linear manner). USEPA's Guidelines for Carcinogen Risk Assessment (USEPA, 2005a) recommend that the linearized multistage model be employed in the absence of adequate information to the contrary.

5.2.2 Potential Carcinogenic Toxicity Values

USEPA evaluates all available scientific information, using a weight-of-evidence approach to determine whether a constituent poses a carcinogenic hazard in humans. USEPA groups constituents according to their potential for carcinogenic effects based on clinical evidence (USEPA, 1989):

- Group A - Human Carcinogen
- Group B - Probable Human Carcinogen
- Group C - Possible Human Carcinogen
- Group D - Insufficient Data to Classify as a Human Carcinogen
- Group E - Not a Human Carcinogen

In addition, constituents may have been assessed for carcinogenicity using USEPA's (2005a) Guidelines for Carcinogen Risk Assessment. Under the updated guidance, standard descriptors are used as part of the hazard narrative to express the conclusion regarding the weight-of-evidence for carcinogenic hazard potential. There are five recommended standard hazard descriptors: "Carcinogenic to Humans," "Likely to Be Carcinogenic to Humans," "Suggestive Evidence of Carcinogenic Potential," "Inadequate Information to Assess Carcinogenic Potential," and "Not Likely to Be Carcinogenic to Humans."

Cancer slope factors (CSFs) and inhalation unit risks (IURs) are the toxicity values used in quantitatively assessing potential carcinogenic effects from exposure. CSFs are defined as the plausible upper bound, approximating a 95% confidence limit, of the increased cancer risk from a lifetime exposure to a given level of a carcinogen. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg-day, is generally reserved for use in the low dose region of the dose-response relationship, that is, for exposure corresponding to risks less than 1 in 100 (USEPA, 2005a).

The CSF (used to evaluate the oral route of exposure) is expressed in units of reciprocal dose $(mg/kg\text{-}day)^{-1}$, while the IUR (used to evaluate the inhalation exposure route) is expressed as a reciprocal concentration $(mg/m^3)^{-1}$. CSFs for the dermal route of exposure are developed through route-to-route extrapolation, as described by USEPA (2004b). An oral CSF is converted to an absorbed dose by dividing the CSF by the fractional absorption value. The absorption values recommended in Exhibit 4-1 of USEPA (2002b) were identified in Section 5.1.2 above.

5.2.3 Estimating the Theoretical Excess Lifetime Cancer Risk

For potentially carcinogenic chemicals, a risk assessment evaluates the degree to which a receptor may have an increased likelihood of developing cancer over a lifetime due to exposure to site-associated chemicals. At environmental dosage levels, the CSF is assumed to be constant and potential carcinogenic risk to be directly related to intake. In order to estimate the theoretical excess lifetime cancer risk, the lifetime average daily dose (LADD) of a chemical is multiplied by the CSF as shown.

$$LADD \times CSF = Risk$$

Similarly, for the inhalation exposure route, the potential cancer risk is calculated by multiplying the exposure concentration by the IUR. Thus, the potential cancer risk is calculated as follows:

$$[(CA \times ET \times EF \times ED) / AT] \times IUR = Risk$$

For each pathway, these calculations are carried out for each applicable chemical, and the risks are summed to obtain the total risk due to that pathway. The total theoretical excess lifetime cancer risk for a particular receptor is then calculated as the sum of the risks from all exposure pathways for that receptor.

5.2.4 Assessing the Mutagenic Mode of Action for Potential Carcinogens

The Guidelines for Carcinogen Risk Assessment (USEPA, 2005a) and Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b) address a number of issues pertaining to cancer risks associated with early-life exposures. Specifically, USEPA (2005b) provides guidance on potency adjustment for carcinogens acting through a mutagenic mode of action. This guidance recommends for such substances, a default approach using estimates from chronic studies with appropriate modifications to address the potential for differential risk of early-lifestage exposure. Default adjustment factors are recommended for use in the absence of chemical-specific data to assess cancer susceptibility from early-life exposure to a carcinogen acting through a mutagenic mode of action.

The following COI have been identified as potential carcinogens with a mutagenic mode of action: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, 2,2-dimethoxy-propane (based on the surrogate 1,2-dibromo-3-chloropropane), chromium (assumed hexavalent), and unknown TIC chemical class: PAH (based on the surrogate of benzo(a)pyrene). For each of these COI, age-dependant adjustment factors (ADAFs) are applied to the CSFs and IURs for early-life age groups, as follows:

- A factor of 3 is applied to the CSFs and IURs for youth receptors (trespassers, recreational visitors) to evaluate exposures from age 7 through age 16.

- No adjustment is made to evaluate exposures for receptors from age 0 up to age 6, because none of the receptors evaluated for the site fall into this age range.

- No adjustment is made to evaluate exposures for receptors whose exposure occurs entirely within the adult age range.

In summary, the only receptors representing early-life age groups are the onsite youth trespasser and the offsite recreational youth receptors. The adjustments for mutagenic mode of action are applied to these receptors in all applicable areas.

5.3 TOXICITY VALUES FOR CONSTITUENTS OF INTEREST

The toxicity values for all COI are presented in Tables 5-1 and 5-2. The chronic and subchronic noncarcinogenic oral RfDs and inhalation RfCs are presented in Table 5-1. This table also lists the target organ or critical effect for each COI. For potentially carcinogenic constituents, the oral CSFs and inhalation IURs, along with the weight-of-evidence classification, are presented in Table 5-2. Fractional absorption factors and dermal toxicity values [estimated from the oral values in accordance with USEPA (2004b)] are also presented in these tables.

Toxicity values were obtained from the following hierarchy of sources:

1. The USEPA's Integrated Risk Information System (IRIS; USEPA, 2010c)

2. Sources used in the USEPA (2010a) RSL table, including:

    a. National Center for Environmental Assessment (NCEA) Provisional Peer-Reviewed Toxicity Values (PPRTV)

    b. Agency for Toxic Substances and Disease Registry's (ATSDR) Minimal Risk Levels (MRLs)

    c. California EPA Toxicity Criteria Database

    d. USEPA's (1997b) Health Effects Assessment Summary Tables (HEAST)

For constituents lacking specific toxicity values, surrogate values were assigned in a manner consistent with that described in Section 3.1. All toxicity values based on surrogates are footnoted in Tables 5-1 and 5-2.

For thallium, no toxicity values are currently posted by USEPA (2010c). On September 30, 2009 a new IRIS assessment was posted for thallium, in which no toxicity values were derived. According to IRIS (USEPA, 2010c), current studies on thallium have been reviewed and have been determined to be inadequate to establish values. IRIS also states that, "The available toxicity database for thallium contains studies that are generally of poor quality". Therefore, potential effects from thallium are not quantified in this risk assessment, but rather are discussed qualitatively in the Uncertainty Analysis (Section 7).

Where oral or inhalation toxicity values are unavailable, this risk assessment does not extrapolate from one route to another because there is significant uncertainty associated with the practice. USEPA (2005a) states "The differences in biological processes among routes of exposure (oral, inhalation, dermal) can be great because of, for example, first-pass effects and different results from different exposure patterns. There is no generally applicable method for accounting for these differences in uptake processes in a quantitative route-to-route extrapolation of dose-response data in the absence of good data on the agent of interest." Additional guidance can be found in USEPA (1994) Inhalation Dosimetry Methodology, which states that "unless th[e] first-pass effect and dosimetry are adequately understood, there can be substantial error introduced in route-to-route extrapolation that does not account for these parameters."

In addition, the use of generic route-to-route extrapolation to establish RSLs has been discontinued by USEPA. As stated on the USEPA (2010a) RSL website, "Previous versions of regional screening tables did contain some route-to-route extrapolation, because of the scarcity of inhalation toxicity factors.

However, this was not optimal due to the uncertainty associated with making such adjustments (e.g., point-of-entry, first-pass, and route-specific effects may not be adequately considered by simple extrapolations). With the increasing availability of Tier III toxicity values, generic route-to-route extrapolation has been discontinued. Chemical-specific route-to-route extrapolation may be used by Tier I, II, or III sources after thorough consideration of the chemical-specific issues."

As an example of this, diethyl ether is identified as a COI for the inhalation of indoor air pathway; however, inhalation toxicity values are not available. Therefore, potential effects from inhalation of diethyl ether are not quantified in this risk assessment, but rather are discussed qualitatively in the Uncertainty Analysis (Section 7).

Subchronic RfDs and RfCs are used to evaluate the construction worker. In the absence of a specific subchronic value for a constituent, the chronic value has been used.

5.4 EVALUATION OF LEAD

Lead was identified as a COI in groundwater from the Landfill Areas, Natrosol Lagoon, RA Basin, SDB, VFSP, and the Main Holding Basin. A construction worker could potentially be exposed to lead in groundwater while performing excavation activities. In addition, lead was identified as a COI in surface water of East Bear Creek and the Unnamed Tributary. A youth trespasser could potentially be exposed to lead in surface water from these onsite water bodies while wading.

The USEPA has not derived toxicity values for lead (USEPA, 2010c). For adult and youth receptors, the methodology proposed by the Technical Review Workgroup (TRW; USEPA, 2003) was selected to assess lead. The TRW adult lead model predicts a central tendency blood level ($PbB_{adult,central}$) by summing the baseline blood lead level ($PbB_{adult,0}$, which would occur in the absence of any recreational or occupational exposure to lead) with the increment in blood lead that is expected as a result of recreational or occupational exposure. The latter is estimated by multiplying the absorbed dose of lead from occupational/recreational exposures by a biokinetic slope factor (BKSF). The basic equation was established for soil and dust exposures. However, this equation can be modified to estimate blood lead levels resulting from exposure to water as well, by estimating the dose of lead to the receptor based on the concentration of lead measured in the water and the volume of water estimated to be ingested. The equation is modified as follows:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

where:

$PbB_{adult,central}$ = Central estimate of the blood lead concentration (µg/dL) in an adult (i.e., woman of child-bearing age) that has site exposure to lead via occupational or recreational activities

$PbB_{adult,0}$	=	Typical (i.e., baseline) blood lead concentration (µg/dL) in an adult not exposed to lead via occupational or recreational activities
PbW	=	Arithmetic mean concentration (ug/L) of lead in water at the location where exposure occurs
BKSF	=	Biokinetic slope factor relating (quasi-steady state) increase in typical adult blood lead concentration to average daily lead uptake (µg/dL increase in blood lead per µg/day lead absorbed)
IRw	=	Mean daily intake rate of water from areas of lead presence (L/day)
AFw	=	Absolute absorption fraction (bioavailability) of lead in water
EFw	=	Exposure frequency for contact with water (days/year)
AT	=	Averaging time; the total period during which exposure may occur; 365 days per year for continuing long term exposures.

The baseline blood lead concentration ($PbB_{adult,0}$) recommended by USEPA (2003) ranges from 1.7 to 2.2 ug/dL, depending on the ethnic and racial background of the population. Since workers or trespassers at the site could be individuals from any ethnic group with reasonably equal likelihood, a value of 2.0 is selected as a representor for all ethnic groups. The arithmetic mean concentrations for lead in groundwater and surface water (PbW) were calculated specifically for each exposure area. The groundwater values were previously presented in Tables 4-7 through 4-12 and range from 0.22 ug/L in the VFSP to 11.9 ug/L in the RA Basin. The surface water values were presented in Tables 4-26 and 4-28 and are 16.4 ug/L for East Bear Creek and 7.55 ug/L for the Unnamed Tributary.

The biokinetic slope factor (BKSF) proposed by the TRW (USEPA, 2003) is 0.4 µg/dL per mg/day absorbed. The incidental water ingestion rate (IRw) for both receptors is 50 mL/day. For the construction worker, the exposure frequency (EFw) is 20 days/year (RAIS, 2010), and for the youth trespasser, an EFw of 24 days/year is selected based on professional judgment. These are the same intake factors previously described in Section 4.6. The absolute absorption fraction of lead in water was reported to be 20% (USEPA, 2003).

An upperbound estimate of the concentration of lead in blood can be estimated using the approach adopted by the TRW (USEPA, 2003). In this approach, the geometric mean of the blood lead concentration is estimated, and the 95th percentile of the blood lead concentration ($PbB_{adult,0.95}$) is calculated with the following equation:

$$PbB_{adult,\ 0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

The GSDi is the estimated value of the geometric standard deviation and the exponent, 1.645, is the value of the standard normal derivative used to calculate the 95th percentile from a lognormal distribution of blood lead concentration. The TRW (USEPA, 2003) recommends a range of GSDi values between 1.8

and 2.2 depending on race and ethnic background; in this assessment the average GSDi value of 2.0 is selected.

The USEPA has not yet issued formal guidance on the blood lead level that is considered appropriate for the health of adults and older children. Therefore, USEPA (2003) recommends that for a non-residential scenario, a pregnant woman is the most sensitive receptor and that this receptor should be the subject of the risk assessment. The greater sensitivity is associated with exposure of the fetus to maternal blood lead, rather than the dose to the pregnant woman, herself. The health benchmark selected for use in this risk assessment is that there should be no calculated event that indicates that the fetus of a pregnant woman in the non-residential setting would have a blood lead concentration above 10 µg/dL. Both adult and fetal blood lead concentrations are presented and discussed as part of the risk characterization (Section 6).

6.0 RISK CHARACTERIZATION

Risk characterization is the final step of the human health risk assessment process. It includes a description of the nature and magnitude of the potential for occurrence of adverse health effects under reasonable maximal exposure conditions. In this step, the toxicity assessment and site-specific exposure assessment are integrated into quantitative and qualitative estimates of potential health risks. Potential noncarcinogenic and carcinogenic health risks are calculated and summarized individually for each receptor exposed to COI at the site. Estimated risks are combined across COI and exposure pathways as appropriate. Exposure to lead is evaluated separately.

Potential noncarcinogenic effects associated with exposure to COI from the site were estimated as described in Section 5.1.3. The total HIs are then calculated for each receptor by combining pathway-specific HIs. Table 6-1 presents the total HIs for each receptor exposed to COI within each exposure area at the site. An HI value equal to or less than 1 indicates that the likelihood of an adverse noncancer effect would be negligible (USEPA, 1989). An HI greater than 1 indicates that additional evaluation of the case is warranted.

Theoretical excess lifetime cancer risks associated with exposure to COI from the site were estimated as described in Section 5.2.3. Summed theoretical excess cancer risks are calculated for each receptor by combining pathway-specific risks. Table 6-1 presents the theoretical excess lifetime cancer risks for each receptor exposed to COI within each exposure area at the site. The results may be compared with target benchmarks for acceptable risk. Various demarcations of acceptable risk have been established by regulatory agencies. USEPA (1991) considers potential cancer risks less than 1×10^{-4} to be acceptable.

Fetal blood lead concentrations associated with exposure to lead in groundwater and surface water from the site were calculated as described in Section 5.4. The resulting blood lead concentrations are compared to the target fetal blood lead concentration of 10 µg/dL.

A summary of the noncancer HIs, potential cancer risks, and fetal blood lead concentrations for all areas, receptors, and exposure pathways is presented in Table 6-1. These results are described in detail in the following subsections.

6.1 EASTERN WHITEWATER LAGOON

The following results were calculated for receptors potentially exposed to COI in groundwater, sediment and surface water from the Eastern WWL.

- For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI of 0.035 is less than the benchmark of 1, and the potential cancer risk of 4.16×10^{-5} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI of 0.16 is less than the benchmark of 1, and the potential cancer risk of 1.88×10^{-6} is less than the benchmark of 1×10^{-4}.

- For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater associated with both the Eastern and Western WWL) the potential cancer risk of 9.32×10^{-10} is less than the benchmark of 1×10^{-4}. None of the COI for this area and pathway were associated with noncarcinogenic effects, therefore an HI was not calculated.

Constituent-specific results for each receptor are presented in Tables 6-2 through 6-4, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-1 through F-3. The results indicate that no further evaluation of the potential for exposure to COI in groundwater, sediment and surface water from the Eastern WWL is warranted.

6.2 WESTERN WHITEWATER LAGOON

The following results were calculated for receptors potentially exposed to COI in groundwater, sediment and surface water from the Western WWL.

- For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI of 0.027 is less than the benchmark of 1, and the potential cancer risk of 8.59×10^{-6} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI of 0.16 is less than the benchmark of 1, and the potential cancer risk of 1.56×10^{-7} is less than the benchmark of 1×10^{-4}.

- The results for the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater associated with both the Eastern and Western WWL) are presented above in Section 6.1.

Constituent-specific results for the outdoor worker and the construction worker are presented in Tables 6-5 and 6-6, respectively, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-4 and F-5. The results indicate that no further evaluation of the potential for exposure to COI in groundwater, sediment and surface water from the Western WWL is warranted.

6.3 LANDFILL AREAS

The following results were calculated for receptors potentially exposed to COI in soil and groundwater from the Landfill Areas.

- For the outdoor worker potentially exposed to COI in soil, the total noncancer HI of 0.11 is less than the benchmark of 1, and the potential cancer risk of 3.03×10^{-5} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to COI in soil and groundwater, the total noncancer HI of 0.056 is less than the benchmark of 1, and the potential cancer risk of 4.79×10^{-7} is less than the benchmark of 1×10^{-4}.

- For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI of 0.000026 is less than the benchmark of 1, and the potential cancer risk of 1.49×10^{-8} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level of 6.26 ug/dL and the 95th percentile fetal blood lead level of 5.63 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for each receptor are presented in Tables 6-7 through 6-9, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-6 through F-8. The results indicate that no further evaluation of the potential for exposure to COI in soil and groundwater from the Landfill Areas is warranted. In addition, the predicted fetal blood lead concentration for the construction worker (Table 6-10) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in groundwater associated with the Landfill Areas.

6.4 NATROSOL LAGOON

The following results were calculated for receptors potentially exposed to COI in groundwater, sediment and surface water from the Natrosol Lagoon.

- For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI of 0.028 is less than the benchmark of 1, and the potential cancer risk of 8.34×10^{-6} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI of 0.087 is less than the benchmark of 1, and the potential cancer risk of 1.70×10^{-7} is less than the benchmark of 1×10^{-4}.

- For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI of 0.0047 is less than the benchmark of 1, and the potential cancer risk of 9.92×10^{-10} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level of 6.26 ug/dL and the 95th percentile fetal blood lead level of 5.63 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for each receptor are presented in Tables 6-11 through 6-13, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-9 through F-11. The results indicate that no further evaluation of the potential for exposure to COI in groundwater, sediment and surface water from the Natrosol Lagoon is warranted. In addition, the predicted fetal blood lead concentration for the construction worker (Table 6-14) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in groundwater associated with the Natrosol Lagoon.

6.5 RETEN/AQUALON BASIN

The following results were calculated for receptors potentially exposed to COI in groundwater associated with the RA Basin.

- For the construction worker potentially exposed to COI in groundwater, the total noncancer HI of 0.13 is less than the benchmark of 1, and the potential cancer risk of 2.64×10^{-7} is less than the benchmark of 1×10^{-4}.

- For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI of 0.00011 is less than the benchmark of 1. None of the COI for this area and pathway were associated with carcinogenic effects, therefore a potential cancer risk was not calculated.

- For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level of 6.26 ug/dL and the 95th percentile fetal blood lead level of 5.64 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for the construction worker and the indoor worker are presented in Tables 6-15 and 6-16, respectively, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-12 and F-13. The results indicate that no further evaluation of the potential for exposure to COI in groundwater associated with the RA Basin is warranted. In addition, the predicted fetal blood lead concentration for the construction worker (Table 6-17) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in groundwater associated with the RA Basin.

6.6 SLUDGE DRYING BEDS

The following results were calculated for receptors potentially exposed to COI in soil, groundwater and surface water from the SDBs.

- For the outdoor worker potentially exposed to COI in soil and surface water, the total noncancer HI of 0.023 is less than the benchmark of 1, and the potential cancer risk of 3.10×10^{-5} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to COI in soil, groundwater and surface water, the total noncancer HI of 0.046 is less than the benchmark of 1, and the potential cancer risk of 3.56×10^{-6} is less than the benchmark of 1×10^{-4}.

- A total noncancer HI and a potential cancer risk were not calculated for the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater). The only COI identified in groundwater associated with the SDBs for vapor intrusion is diethyl ether. There are no inhalation toxicity values available for diethyl ether; therefore, a quantitative evaluation could not be conducted.

- For the construction worker potentially exposed to lead in groundwater, the 95^{th} percentile adult blood lead level of 6.26 ug/dL and the 95^{th} percentile fetal blood lead level of 5.64 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for each receptor are presented in Tables 6-18 through 6-20, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-14 through F-16. The results indicate that no further evaluation of the potential for exposure to COI in soil, groundwater and surface water from the SDBs is warranted. In addition, the predicted fetal blood lead concentration for the construction worker (Table 6-21) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in groundwater associated with the SDBs.

6.7 VACUUM FILTER SLUDGE PILE

The following results were calculated for receptors potentially exposed to COI in soil, groundwater and surface water from the VFSP.

- For the outdoor worker potentially exposed to COI in soil and surface water, the total noncancer HI of 0.20 is less than the benchmark of 1, and the potential cancer risk of 7.53×10^{-5} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to COI in soil, groundwater and surface water, the total noncancer HI of 0.065 is less than the benchmark of 1, and the potential cancer risk of 6.63×10^{-6} is less than the benchmark of 1×10^{-4}.

- A total noncancer HI and a potential cancer risk were not calculated for the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater). The only COI identified in groundwater associated with the VFSP for vapor intrusion is diethyl ether. There are no inhalation toxicity values available for diethyl ether; therefore, a quantitative evaluation could not be conducted.

- For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level of 6.26 ug/dL and the 95th percentile fetal blood lead level of 5.63 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for each receptor are presented in Tables 6-22 through 6-24, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-17 through F-19. The results indicate that no further evaluation of the potential for exposure to COI in soil, groundwater and surface water from the VFSP is warranted. In addition, the predicted fetal blood lead concentration for the construction worker (Table 6-25) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in groundwater associated with the VFSP.

6.8 MAIN HOLDING BASIN

The following results were calculated for receptors potentially exposed to COI in groundwater associated with the Main Holding Basin.

- For the construction worker potentially exposed to COI in groundwater, the total noncancer HI of 0.16 is less than the benchmark of 1, and the potential cancer risk of 1.57×10^{-7} is less than the benchmark of 1×10^{-4}.

- For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI of 0.00021 is less than the benchmark of 1, and the potential cancer risk of 1.88×10^{-8} is less than the benchmark of 1×10^{-4}.

- For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level of 6.26 ug/dL and the 95th percentile fetal blood lead level of 5.63 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for the construction worker and the indoor worker are presented in Tables 6-26 and 6-27, respectively, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-20 and F-21. The results indicate that no further evaluation of the potential for exposure to COI in groundwater associated with the Main Holding Basin is warranted. In addition, the predicted fetal blood lead concentration for the construction worker (Table 6-28) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in groundwater associated with the Main Holding Basin.

6.9 EAST BEAR CREEK

The following results were calculated for receptors potentially exposed to COI in surface water and sediment from East Bear Creek.

- For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI of 0.13 is less than the benchmark of 1, and the potential cancer risk of 3.65×10^{-5} is less than the benchmark of 1×10^{-4}.

- For the youth trespasser potentially exposed to lead in surface water, the 95th percentile adult blood lead level of 6.27 ug/dL and the 95th percentile fetal blood lead level of 5.64 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for the youth trespasser are presented in Table 6-29 and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendix F-22. The results indicate that no further evaluation of the potential for exposure to COI in surface water and sediment from East Bear Creek is warranted. In addition, the predicted fetal blood lead concentration for

the construction worker (Table 6-30) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in surface water of East Bear Creek.

6.10 WEST BEAR CREEK

The following results were calculated for receptors potentially exposed to COI in surface water and sediment from West Bear Creek.

- For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI of 0.074 is less than the benchmark of 1, and the potential cancer risk of 7.20×10^{-6} is less than the benchmark of 1×10^{-4}.

Constituent-specific results for the youth trespasser are presented in Table 6-31 and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendix F-23. The results indicate that no further evaluation of the potential for exposure to COI in surface water and sediment from West Bear Creek is warranted.

6.11 UNNAMED TRIBUTARY

The following results were calculated for receptors potentially exposed to COI in surface water and sediment from the Unnamed Tributary.

- For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI of 0.11 is less than the benchmark of 1, and the potential cancer risk of 5.40×10^{-6} is less than the benchmark of 1×10^{-4}.

- For the youth trespasser potentially exposed to lead in surface water, the 95^{th} percentile adult blood lead level of 6.26 ug/dL and the 95^{th} percentile fetal blood lead level of 5.64 ug/dL are less than the benchmark of 10 ug/dL.

Constituent-specific results for the youth trespasser are presented in Table 6-32 and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendix F-24. The results indicate that no further evaluation of the potential for exposure to COI in surface water and sediment from the Unnamed Tributary is warranted. In addition, the predicted fetal blood lead concentration for the construction worker (Table 6-33) is less than the benchmark of 10 ug/dL, indicating that no further evaluation is warranted for potential exposure to lead in surface water of the Unnamed Tributary.

6.12 CATTAIL CREEK

The following results were calculated for receptors potentially exposed to COI in surface water and sediment from the Cattail Creek.

- For the recreational adult potentially exposed to COI in the surface water and sediment, the total noncancer HI of 0.10 is less than the benchmark of 1, and the potential cancer risk of 1.64×10^{-5} is less than the benchmark of 1×10^{-4}.

- For the recreational youth potentially exposed to COI in the surface water and sediment, the total noncancer HI of 0.16 is less than the benchmark of 1, and the potential cancer risk of 1.53×10^{-5} is less than the benchmark of 1×10^{-4}.

Constituent-specific results for the recreational adult and recreational youth are presented in Tables 6-34 and 6-35, respectively, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-25 and F-26. The results indicate that no further evaluation of the potential for exposure to COI in surface water and sediment from Cattail Creek is warranted.

6.13 BAILEY CREEK

The following results were calculated for receptors potentially exposed to COI in surface water and sediment from the Bailey Creek.

- For the recreational adult potentially exposed to COI in the surface water and sediment, the total noncancer HI of 0.018 is less than the benchmark of 1, and the potential cancer risk of 2.04×10^{-6} is less than the benchmark of 1×10^{-4}.

- For the recreational youth potentially exposed to COI in the surface water and sediment, the total noncancer HI of 0.025 is less than the benchmark of 1, and the potential cancer risk of 2.52×10^{-6} is less than the benchmark of 1×10^{-4}.

Constituent-specific results for the recreational adult and recreational youth are presented in Tables 6-36 and 6-37, respectively, and the detailed calculations, including constituent- and pathway-specific results, are presented in Appendices F-27 and F-28. The results indicate that no further evaluation of the potential for exposure to COI in surface water and sediment from Bailey Creek is warranted.

7.0 UNCERTAINTY ANALYSIS

Uncertainties are inherent in a quantitative risk assessment. The inclusion of site-specific factors, which this assessment has incorporated, decreases uncertainty. An analysis of the areas of uncertainty in a risk assessment is a standard component of the risk assessment process. The uncertainty analysis provides a context for better understanding the assessment conclusions by identifying the uncertainties that have most significantly affected the assessment results.

USEPA (1992a) guidance stresses the importance of providing a complete analysis of uncertainties so that risk management decisions take these uncertainties into account when evaluating risk assessment conclusions. The major sources of uncertainty in the human health risk assessment are identified qualitatively below.

7.1 UNCERTAINTIES IN DATA EVALUATION

Uncertainties in the data evaluation step of the risk assessment are primarily associated with the available analytical data and the process for identification of COI. The following bullets list uncertainties associated with this step.

- **Focused vs. Random Sampling**. The environmental sampling conducted at the site was not random. Potential source areas within the SWMUs were targeted for sampling. Because the samples used in this assessment were collected in areas of the site where contamination was considered most likely to exist, the data sets are biased toward high concentrations, which can lead to an overestimation of the actual risks.

- **Background Data for Soil**: USEPA Region 3 provided Hercules with excerpts from the RFI Report for the Honeywell Chesterfield Facility located in Chester, Virginia. USEPA indicated that the inorganic results for soil samples from the area around the Chesterfield site could be used as regional background concentrations for comparison to the Hercules site. Thirteen background soil samples were collected for the Chersterfield site and analyzed for aluminum, arsenic, barium, beryllium, boron, calcium, chromium (total), cobalt, copper, iron, lean, magnesium, manganese, nickel, potassium, thallium, vanadium, and zinc. For the Hercules site, only arsenic, chromium, iron, and thallium were identified as inorganic direct contact COI for soil. The average concentrations from the 13 background samples were compared to the average Hercules site concentrations for each of these four constituents. For arsenic, the average background concentration is 5.06 mg/Kg and the average site concentration is 4.88 mg/Kg. For chromium, the average background concentration is

15.59 mg/Kg and the average site concentration is 68.2 mg/kg. For iron, the average background concentration is 20,186 mg/Kg and the average site concentration is 38,691 mg/Kg. For thallium, the average background concentration is 1.19 mg/Kg and the average site concentration is 0.34 mg/Kg. This analysis suggests that concentrations of arsenic and thallium at the site are consistent with background levels. Because these constituents been included in the quantitative risk calculations, the calculated risks attributable to site-related COI may be overestimated.

- **Upstream Data for Surface Water and Sediment of Cattail Creek**: One location from the most upstream point of Cattail Creek (samples CCSED-1 and CCSW-1) was upgradient of the confluence with the Unnamed Tributary and was considered to represent water quality entering the site (GES, 2007). Samples collected from this upstream location are included in this assessment along with the sediment and surface water results from other creek locations. The sediment COI identified for Cattail Creek and/or Bailey Creek include, hexadecane, arsenic, chromium, and thallium. Hexadecane was not analyzed in the upstream sample. For arsenic, upstream concentrations are slightly higher than some downstream locations. For chromium and thallium, upstream concentrations are consistent with downstream concentrations. These results suggest that, for inorganic COI identified for sediment, some portion of the detected downstream concentrations are likely attributable to background. The surface water COI identified for Cattail Creek and/or Bailey Creek include, arsenic, chromium, cobalt, iron, and manganese. All of these constituents were detected in the upstream sample at concentrations consistent with the downstream samples. These results suggest that, for inorganic COI identified for surface water, some portion of the detected downstream concentrations are likely attributable to background. Because these constituents have been included in the quantitative risk calculations, the calculated risks associated with site-related inorganic COI in Cattail Creek and Bailey Creek may be overestimated.

- **Inclusion of TIC Data and Surrogate Selection**. In addition to the standard analytical results, both known and unknown TICs were reported for samples collected from each medium at the site. Substantive effort has been made to identify these substances and evaluate them in the risk assessment. Most TICs have been identified individually and many others have been identified by chemical class. Even with identification of the substances, uncertainties are inherent throughout the risk assessment process. TICs were mostly incorporated into the quantitative risk assessment process through the use of surrogates. Surrogates are substances of known or recognized toxicity that are applied to represent a substance of unknown

toxicity in the risk assessment. For the surrogate process to be relevant, the original substance (i.e., the TIC) and the surrogate should be structurally similar with the assumption that the structural similarity occurs in conjunction with a toxicological similarity. While this is highly likely, it is conceivable that very small changes in the structure of a molecule can lead to significant differences in toxicity between it and a similar substance or a substance used as a surrogate. With respect to the screening step, this could have an effect on whether or not the TIC is retained as a COI. Due to the low concentrations of the individual substances that make up the TIC list, the likelihood that a substance of much greater toxicity would be present, would resist degradation and maintain toxic potency, and would cause a potential adverse effect in a receptor, is extremely small.

- **Evaluation of TICs in Groups and TIC Classes**: While many of the TICs were identified as individual substances, many of those substances fell into consistent groups. In addition, some TICs could not be identified individually and were identified as being within a larger class of substances. In both such cases, the individual toxicity of the TIC is represented by the toxicity of one substance in the same group or class. In these cases, the substance within the class with the highest level of toxicity was selected as the representative substance for that class (e.g., chemical class: alkene is represented by hexane). This was done in an effort to apply extreme conservatism to the incorporation of the TICs into the risk assessment process and to minimize the likelihood that a potentially toxic substance would not be included with sufficient representation in the risk assessment. Despite the effort to ensure that a highly conservative approach is taken, it is possible that a substance may be present as a TIC and represented by a probable chemical class, and that TIC may possess a higher magnitude of toxicity than the substance selected to represent the chemical class. This is highly unlikely since active research would have been likely to reveal such a substance already, and the substance identified to be representative of the TIC class (e.g., hexane) has been studied and identified as a higher inherent toxicity representative of the class.

- **Identification of COI**. Multiple uncertainties exist in the process of identifying COI. Constituents detected in site media were compared with screening values that are appropriate for human exposure scenarios. Of over one hundred constituents analyzed, less than half were detected and only a fraction of these were detected at concentrations that exceeded their screening values. The screening values used to identify COI were based on conservative assumptions (e.g., comparison with tapwater values when neither groundwater or surface water are used as a drinking

source, and RSLs were based on the lower-end of acceptable targets, including a cancer risk of 1 x 10^{-6} and an HQ of 0.1). This approach can result in the inclusion of a greater number of COI in the quantitative risk calculations, but is not likely to affect the overall conclusions of the risk assessment.

For site-related constituents that were "screened out" based on their detected concentrations, it is possible that cumulative risks and HIs could be underestimated. However, the purpose of the screening process is to make the risk assessment more meaningful by focusing attention on those constituents that contribute significantly to overall risk. In most cases, "screening out" of constituents will not affect the conclusions of the risk assessment.

- **Constituents Lacking Screening Values**. Thallium was detected in several exposure areas at the site, but lacked screening values or an appropriate surrogate with which to compare in the COI identification process. For purposes of this risk assessment, thallium has been retained as a COI, but for qualitative discussion only. It is likely that thallium is present at levels that will not contribute significantly to overall risk; however, because the risk-based values are not available with which to make this assessment, it can not be demonstrated herein.

- **Exclusion of Constituents Based on Low Inherent Toxicity**. Constituents such as calcium, magnesium, potassium and sodium were excluded as COI because they are essential nutrients, are naturally occurring, and/or they are of low inherent toxicity. These minerals have a recommended intake that is needed to support growth during infancy and childhood, to maintain body weight and health, and to facilitate pregnancy and lactation. Unless concentrations are in the high percentile range and exposure is expected to be very high (not documented and not expected at the site), these constituents will not pose unacceptable risk or hazard.

- **Samples with Elevated Detection Limits**. The screening for COI (presented in Section 4) identified detection limits for several constituents, including VOCs, SVOCs, and inorganics, that exceed RSLs. The elevated detection limits are frequently due to elevated detections of other constituents in select samples that resulted in dilution of the sample and thus, high detection limits. Elevated detection limits are not considered to be a concern with respect to the identification of COI for the site, because in general, these constituents were either (1) already retained as COI because the maximum detected concentrations exceeded the screening values, or (2) excluded as COI because they were not detected at all in samples from the

specific medium. However, some level of uncertainty remains in the data sets with elevated detection limits, because the true concentration of the sample is unknown. The statistical software used in this risk assessment assigns randomly generated concentrations within the distribution curve of the data set.

7.2 UNCERTAINTIES IN EXPOSURE ASSESSMENT

USEPA approaches to exposure assessments generally require standard default exposure scenarios rather than site-specific evaluations of exposure. Under this approach, if a constituent is identified as a COI for a particular area and medium, it is assumed that exposure to that substance will occur at levels consistent with the default scenario. The default scenarios used in the human health risk assessment evaluate current and future potential exposure pathways under RME conditions. The RME scenario is defined as the highest exposure that is reasonably expected to occur at a site (USEPA, 1989).

- **Inclusion of Unlikely Exposure Scenarios**. All sampled media associated with each of the onsite industrial exposure areas (i.e., WWLs, Landfill Areas, Natrosol Lagoon, RA Basin, SDBs, VFSP, and Main Holding Basin) were conservatively considered to be available for potential contact by all industrial receptors, including outdoor workers, construction workers, and indoor workers (via the vapor intrusion pathway). In actuality, repeated worker exposure in most of these areas is not likely to occur. For example, no occupied buildings are currently present in the vicinity of most SWMUs, and it is unlikely that buildings would be constructed in many of these areas (e.g., the lagoons). However, future indoor workers were evaluated for all areas where COI were identified for vapor intrusion from groundwater. As another example, groundwater at the site is present at depths ranging from less than 2 feet bgs to over 30 feet bgs, and in some areas of the site (e.g., the WWLs where the average depth to groundwater is over 20 feet bgs), excavation to the depth of the groundwater table (and subsequent construction worker exposure) is extremely unlikely.

- **Potentially Complete but De Minimis Exposure Pathways**. Two exposure pathways were determined to be potentially complete, but de minimis: worker exposure to onsite surface water streams, and trespasser exposure to onsite SWMUs. While site workers may have the opportunity to contact onsite surface water streams (i.e., East Bear Creek, West Bear Creek, and the Unnamed Tributary), a youth trespasser was considered to be a more likely receptor for these areas. In addition, work activities are expected to be focused within the active SWMUs, making worker exposure to the streams negligible by comparison. Similarly, it is possible for

a youth trespasser to contact media associated with the SWMUs; however the magnitude of exposure would be negligible compared to the daily exposure by an outdoor worker.

- **Modeling of Air Concentrations**. Because concentrations of outdoor and indoor air were not measured, fate and transport modeling was conducted to estimate these concentrations. Such models generally provide a conservative estimate of the actual air concentrations, especially since they assume a constant source concentration (as opposed to a continually degrading source). Another conservative assumption included in the vapor intrusion modeling is the low air exchange rate used for the buildings (commercial buildings are highly ventilated, and higher air exchange rates would result in lower indoor air concentrations). Additional assumptions used in the model may over- or underestimate the predicted air concentrations. Table 8 of the Vapor Intrusion User's Guide (USEPA, 2004a) identifies several input factors and how increasing or decreasing the value affects the estimated indoor air concentrations (e.g., as the building volume increases, the air concentration decreases; as the soil vapor permeability increases, the air concentrations increase).

- **Use of Default Exposure Factors.** The use of default exposure factors, rather than site-specific exposure factors, leads to a degree of uncertainty in the predicted risks. The scientific literature contains examples of studies that indicate that actual environmental exposure factors are lower than the default values recommended by USEPA (1989, 2002b). As an example, the factors incorporated for incidental ingestion of soil and sediment (primary exposure pathways for the site) for worker receptors are typically much higher than are realized in practice. For outdoor and construction workers, this risk assessment used default values of 100 mg/day and 330 mg/day, respectively, as the amount of soil ingested each day. In actuality, these values are probably much less. However, the default exposure factors represent an RME scenario, as recommended for a baseline risk assessment. There are also cases in the exposure assessment where potential low bias is introduced; for example, the youth trespasser is assumed to visit the site six times per month for four months of the year. While more frequent visits are difficult to envision (a fence borders the active part of the facility), it is highly unlikely but possible that trespassers may visit the site more often.

- **Dermal Absorption of Constituents from Water**. As noted in Section 4.5.3, pathways that involve dermal contact with water require the calculation of the dermal absorbed dose per event (DA_{event}). The equation incorporates Kp values which reflect

the movement of the constituent from the water, across the skin, to the stratum corneum and into the bloodstream. The Kp values are based on equilibrium partitioning equations, rather than empirical data. Therefore, the actual absorbed doses may be higher or lower than those presented in this risk assessment.

7.3 UNCERTAINTIES IN TOXICITY ASSESSMENT

- **Toxicity Assessment for Noncarcinogens**. Approaches typically utilized for designating reference doses are highly conservative. The USEPA (2010c) applies uncertainty factors (generally ranging from 1 to 10, with a maximum combined factor of 3,000) to the NOAEL for a chemical in a toxicity study to account for factors such as animal-to-human extrapolation, interindividual variation in the human population, limitations in data quality or incomplete studies. Some of this uncertainty may be reduced if the absorption, distribution, metabolic fate, and excretion parameters of a chemical are known. Because the fate and mechanism of action of a chemical may differ in animals and humans, effects observed in animals may not be observed in humans, and vice versa. Interspecies dose conversion may also be limited by differences in lifespan, body size, breathing rates, or the route of administration utilized in a study.

- **Use of Chronic RfDs/RfCs to Evaluate Subchronic Exposures.** In the absence of an oral RfD or inhalation RfC derived specifically for subchronic exposure durations, the chronic value was used in this risk assessment. Use of the chronic RfD or RfC to evaluate subchronic exposure durations may overestimate the potential for adverse effects to construction workers, because in general, the subchronic values are higher. In other words, subchronic durations of exposure generally require greater constituent concentrations before the adverse effect is observed.

- **Upper Bound CSFs and IURs.** The USEPA CSFs and IURs generally represent an upper bound on the average risk in a population or the risk for a randomly selected individual. They may not represent the risk for a highly susceptible individual or group. Some individuals face a higher risk and some face a lower risk. The use of upper bounds generally is considered to be a health-protective approach for covering the risk to susceptible individuals, although the calculation of upper bounds is not based on susceptibility data. Similarly, exposure during some lifestages can contribute more or less to the total lifetime risk than do similar exposures at other times.

- **Toxicity Values for TICs**. As indicated above with respect to the selection of screening values, TICs were mostly incorporated into the quantitative risk assessment process through the use of surrogates. For the surrogate process to be relevant, the original substance (i.e., the TIC) and the surrogate should be structurally similar with the assumption that the structural similarity occurs in conjunction with a toxicological similarity. While this is highly likely, it is conceivable that very small changes in the structure of a molecule can lead to significant differences in toxicity between it and a similar substance or a substance used as a surrogate. The difference could be manifested as a greater or lesser magnitude of toxicity. Due to the low concentrations of the individual substances that make up the TIC list, the likelihood that a substance of much greater toxicity would be present, would resist degradation and maintain toxic potency, and would cause a potential adverse effect in a receptor, is extremely small.

- **Constituents Lacking Toxicity Values**. A small number of COI did not have toxicity values for all exposure routes being assessed in the risk assessment. For example, toxicity values were not available from USEPA sources for t-butanol or ethanol; therefore the RfDs are based on the RfDs for n-butanol. Some known and unknown TICs also used toxicity values based on surrogate constituents. The use of surrogate toxicity values leads to some uncertainty in the calculated results. In the case of thallium, toxicity values are not currently posted by IRIS (USEPA, 2010c), an appropriate surrogate was not identified, and the COI is evaluated qualitatively. It is likely that thallium is present at levels that will not contribute significantly to overall risk; however, because toxicity values are not currently posted by USEPA with which to make this assessment, it has not been demonstrated herein.

- **Route-to-Route Extrapolation**. In a small number of cases, toxicity values were available for one route of exposure (e.g., oral) but not the other (e.g., inhalation). For example, diethyl ether, which was identified as a COI for vapor intrusion from groundwater, has an oral RfD but not an inhalation RfD. Therefore, exposure via the vapor intrusion pathway was not quantified due to the high degree of uncertainty associated with route-to-route extrapolation. Lack of pathway-specific toxicity values may contribute to an underestimation of potential risks from these constituents.

- **Toxicity Values for Total Chromium**. Total chromium was identified as a COI for all media sampled at the site. However, toxicity values are not available for total chromium, and none of the samples collected from the site were analyzed specifically for trivalent or hexavalent chromium. Therefore, the toxicity values for hexavalent

chromium were used to evaluate potential exposure to total chromium in all media. This is considered to be a very conservative approach since almost certainly the chromium present is in the trivalent form. It is highly unlikely that any detected chromium is in the hexavalent form.

7.4 UNCERTAINTIES IN RISK CHARACTERIZATION

The typical approach to risk assessment, and that used for the site, involves conservatively multiplying a combination of average and upper bound exposure assumptions together to evaluate exposure. USEPA risk assessment guidance (1989) specifies that numerous factors in the exposure equation should each be represented by the 95% UCL on the mean for that variable. These factors include the exposure point concentration, the contact rate with the environmental medium, and the exposure frequency and duration. While this approach may overestimate risk for exposure scenarios at the site, the approach is representative of an RME scenario, as recommended for a baseline risk assessment.

An additional uncertainty issue related to the risk characterization is the proportion of the total calculated risk due to the inclusion of unknown TICs. As discussed throughout this report, there is uncertainty associated with the identification and inclusion of TICs in this risk assessment. An evaluation was conducted to determine the overall proportion of the calculated risks that can be attributed to the unknown TICs. Of the 13 areas evaluated in the risk assessment, unknown TICs were included in the risk characterization for the following seven areas: Eastern WWL, Western WWL, Natrosol Lagoon, Main Holding Basin, West Bear Creek, Unnamed Tributary, and Cattail Creek. In general, the proportion of total calculated risks for these seven areas that can be attributed to the unknown TICs is 12% or less. There are outliers for four of the areas. For the Eastern WWL, the Unknown TIC; Chemical Class: PAH constitutes 46% of the calculated potential cancer risk of 4.16×10^{-5} for the outdoor worker. For the indoor worker evaluated for the Eastern and Western WWL, the Unknown TIC; Chemical Class: chlorinated VOC is the only COI for this area with potential carcinogenic endpoints; therefore, this constituent constitutes 100% of the calculated potential risk of 9.32×10^{-10}. Likewise, for the indoor worker evaluated for the Natrosol Lagoon area, the Unknown TIC; Chemical Class: alkene and Unknown TIC ; 2-methyl-1-propene are the only COI for this area with potential noncarcingenic endpoints; therefore, these constituents constitute 100% of the calculated HI of 0.0047. Finally, for West Bear Creek, the Unknown TIC: Chemical Class: PAH constitutes 41% of the calculated potential cancer risk of 7.20×10^{-6} for the youth trespasser.

The significance of these observations is that the TICs contribute a low and insignificant percentage of the overall potential site risk compared to the constituents that are recognized and evaluated quantitatively. Although there is some uncertainty with respect to the presence of the TICs, they are present in small quantities that do not pose a significant proportion of the potential risk and in no case do they approach concentrations or toxicities that would pose the potential for unacceptable potential risk anywhere on the site.

8.0 CONCLUSIONS

This risk assessment was conducted in a manner consistent with standard and customary approaches specified by the USEPA. Constituents associated with samples from surface soil, groundwater, sludge, sediment and surface water were evaluated and included as appropriate in the assessment. The following areas of the site were evaluated as discrete exposure areas in this risk assessment:

- SWMU #3 Eastern Whitewater Lagoon (Eastern WWL);
- SWMU #4 Western Whitewater Lagoon (Western WWL);
- SWMU #5 Old Landfill and Landfill #156 (Landfill Areas);
- SWMU #7 Natrosol Lagoon;
- SWMU #8 and #29: Reten/Aqualon Basin (RA Basin);
- SWMU #14 Sludge Drying Beds (SDBs);
- SWMU #15 Vacuum Filter Sludge Pile (VFSP);
- Main Holding Basin;
- East Bear Creek;
- West Bear Creek;
- Unnamed Tributary;
- Cattail Creek; and
- Bailey Creek.

Soil, groundwater, sludge, sediment and surface water data from each exposure area were evaluated in order to identify COI. The data, which included both standard analytes and TICs, were compared to appropriate health-based screening values from USEPA which address the relevant pathways of human exposure in each area. In cases where specific screening values were not available (or in cases of TICs where probable identities were assumed), screening values were selected based on appropriate surrogate constituents.

The COI for direct contact with soil are inorganics (arsenic, chromium, iron and thallium) and two known TICs (28-norolean-17-en-3-one and 2,2-dimethoxy-propane). The COI for direct contact with groundwater include VOCs and volatile TICs; total and dissolved inorganics; and unknown TICs falling into three probable chemical class groups (glycol ether derivative, chlorinated VOC, and alcohol). A subset of the VOCs, known volatile TICs, and unknown TICs (with assumed volatile surrogates) were identified as COI for potential vapor intrusion from groundwater to indoor air. The COI for direct contact with sediment and surface water from onsite SWMUs consist of PAHs and inorganics, and one unknown TIC (probable chemical class: PAH). The main COI for direct contact with sediment and surface water from onsite and offsite streams are inorganics, with a few locations also identifying PCBs (in sediments of West Bear

Creek and the Unnamed Tributary) and unknown TICs (probable chemical class: PAH; in sediments of West Bear Creek, the Unnamed Tributary and Cattail Creek).

The potential current and future receptors quantitatively addressed in the assessment consist of outdoor industrial workers, indoor industrial workers (under a future use scenario only), construction workers, youth trespassers, and recreational visitors (adult and youth). These receptors were evaluated for the exposure routes identified below.

- Outdoor Industrial Worker – Surface soil from onsite SWMUs (Landfill Areas, SDBs and VFSP) via incidental ingestion, dermal contact, inhalation of particulates and inhalation of volatiles; sediment from onsite SWMUs (Eastern and Western WWLs, Natrosol Lagoon) via incidental ingestion and dermal contact; and surface water from onsite SWMUs (Eastern and Western WWLs, Natrosol Lagoon, SDBs and VFSP) via incidental ingestion and dermal contact.

- Indoor Worker – Indoor air (vapor intrusion from groundwater) from onsite groundwater (associated with Eastern and Western WWLs, Landfill Areas, Natrosol Lagoon, RA Basin, SDBs, VFSP and Main Holding Basin) via inhalation.

- Construction Worker – Surface soil from onsite SWMUs via incidental ingestion, dermal contact, inhalation of particulates and inhalation of volatiles; onsite groundwater via incidental ingestion, dermal contact, and inhalation of volatiles; and sediment and surface water from onsite SWMUs via incidental ingestion and dermal contact.

- Youth Trespasser – Sediment and surface water from onsite surface water bodies (East Bear Creek, West Bear Creek and the Unnamed Tributary) via incidental ingestion and dermal contact.

- Recreational Adult and Youth – Sediment and surface water from offsite surface water bodies (Cattail Creek and Bailey Creek) via incidental ingestion and dermal contact.

For the toxicity assessment, toxicity values for the COI were derived from the USEPA IRIS database and other relevant USEPA sources as needed. In cases where specific toxicity values were not available, and for unknown TICs where probable identities were assumed, toxicity values were selected based on appropriate surrogate constituents. Exposure to lead was addressed using a model specific to non-residential receptors developed by the USEPA Technical Review Workgroup for Lead.

The risk characterization was conducted for each potential receptor, exposure pathway, and constituent in each area of interest. Benchmarks selected for the assessment are those consistent with USEPA guidance, incorporating an upperbound target of 1 x 10^{-4} for potential cumulative cancer risks, a target noncancer hazard index (HI) of 1, and an upperbound fetal blood lead level of 10 µg/dL. A summary of the results and receptors for each area is provided below:

- **Eastern WWL**: For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI is 0.035 and the potential cancer risk is 4.16 x 10^{-5}. For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI is 0.16 and the potential cancer risk is 1.88 x 10^{-6}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater associated with both the Eastern and Western WWL) the potential cancer risk is 9.32 x 10^{-10}. None of the COI for this area and pathway were associated with noncarcinogenic effects, therefore an HI was not calculated for the indoor worker.

- **Western WWL**: For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI is 0.027, and the potential cancer risk is 8.59 x 10^{-6}. For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI is 0.16 and the potential cancer risk is 1.56 x 10^{-7}.

- **Landfill Areas**: For the outdoor worker potentially exposed to COI in soil, the total noncancer HI is 0.11 and the potential cancer risk is 3.03 x 10^{-5}. For the construction worker potentially exposed to COI in soil and groundwater, the total noncancer HI is 0.056 and the potential cancer risk is 4.79 x 10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.000026 and the potential cancer risk is 1.49 x 10^{-8}. Finally, for the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.63 ug/dL.

- **Natrosol Lagoon**: For the outdoor worker potentially exposed to COI in sediment and surface water, the total noncancer HI is 0.028 and the potential cancer risk is 8.34 x 10^{-6}. For the construction worker potentially exposed to COI in groundwater, sediment and surface water, the total noncancer HI is 0.087 and the potential cancer risk is 1.70 x 10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.0047 and the potential cancer risk is 9.92 x 10^{-10}. For the construction worker potentially exposed to lead in

groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.63 ug/dL.

- **RA Basin**: For the construction worker potentially exposed to COI in groundwater, the total noncancer HI is 0.13 and the potential cancer risk is 2.64 x 10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.00011. None of the COI for this area and pathway were associated with carcinogenic effects, therefore a potential cancer risk was not calculated for the indoor worker. For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.64 ug/dL.

- **SDBs**: For the outdoor worker potentially exposed to COI in soil and surface water, the total noncancer HI is 0.023 and the potential cancer risk is 3.10 x 10^{-5}. For the construction worker potentially exposed to COI in soil, groundwater and surface water, the total noncancer HI is 0.046 and the potential cancer risk is 3.56 x 10^{-6}. For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.64 ug/dL.

- **VFSP**: For the outdoor worker potentially exposed to COI in soil and surface water, the total noncancer HI is 0.20 and the potential cancer risk is 7.53 x 10^{-5}. For the construction worker potentially exposed to COI in soil, groundwater and surface water, the total noncancer HI is 0.065 and the potential cancer risk is 6.63 x 10^{-6}. For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.63 ug/dL.

- **Main Holding Basin**: For the construction worker potentially exposed to COI in groundwater, the total noncancer HI is 0.16 and the cancer risk is 1.57 x 10^{-7}. For the indoor worker potentially exposed to COI in indoor air (vapor intrusion from groundwater), the total noncancer HI is 0.00021and the potential cancer risk is 1.88 x 10^{-8}. For the construction worker potentially exposed to lead in groundwater, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.63 ug/dL.

- **East Bear Creek**: For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.13 and the potential cancer risk is 3.65 x 10^{-5}. For the youth trespasser potentially exposed to lead in surface water, the

95th percentile adult blood lead level is 6.27 ug/dL and the 95th percentile fetal blood lead level is 5.64 ug/dL

- **West Bear Creek**: For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.074 and the potential cancer risk is 7.20 x 10^{-6}.

- **Unnamed Tributary**: For the youth trespasser potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.11 and the potential cancer risk is 5.40 x 10^{-6}. For the youth trespasser potentially exposed to lead in surface water, the 95th percentile adult blood lead level is 6.26 ug/dL and the 95th percentile fetal blood lead level is 5.64 ug/dL

- **Cattail Creek**: For the recreational adult potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.10 and the potential cancer risk is 1.64 x 10^{-5}. For the recreational youth potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.16 and the potential cancer risk is 1.53 x 10^{-5}.

- **Bailey Creek**: For the recreational adult potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.018 and the potential cancer risk is 2.04 x 10^{-6}. For the recreational youth potentially exposed to COI in the surface water and sediment, the total noncancer HI is 0.025 and the potential cancer risk is 2.52 x 10^{-6}.

The results of the risk assessment indicate that for all receptors and exposure areas, the total HIs, potential cumulative cancer risks, and predicted fetal blood lead levels meet the target benchmarks. As such, no further evaluation is warranted.

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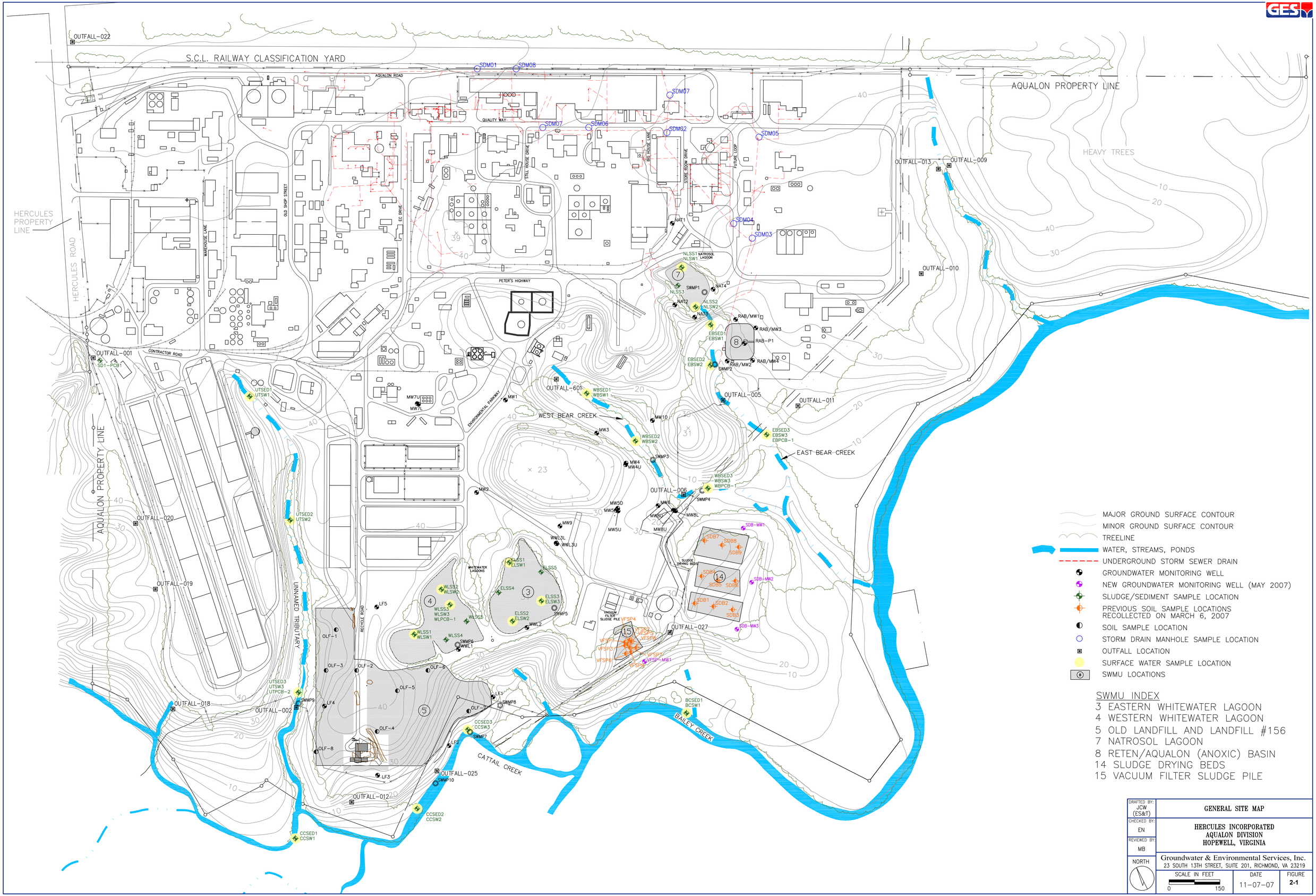
FIGURES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BIG HOUSE LANE
STORE ROOM DRIVE
FUTURE LOOP
OLD SHOP STREET
EC DRIVE
WAREHOUSE LANE
HERCULES ROAD
HERCULES PROPERTY LINE
PETER'S HIGHWAY
CONTRACTOR ROAD
ENVIRONMENTAL PARKWAY
RECYCLE ROAD
AQUALON PROPERTY LINE
UNNAMED TRIBUTARY
WEST BEAR CREEK
EAST BEAR CREEK
BAILEY CREEK
CATTAIL CREEK
HEAVY TREES
WHITEWATER LAGOONS
SLUDGE DRYING BEDS
VACUUM FILTER SLUDGE PILE
NATROSOL LAGOON
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WLSW3
WLPCB-1
WLSS4
WLSS5
ELSS1
ELSW1
ELSS2
ELSW2
ELSS3
ELSW3
ELSS4
ELSS5
VFSP1
VFSP2
VFSP3
VFSP4
VFSP5
VFSP6
VFSP7
VFSP8
VFSP9
VFSP-MW1
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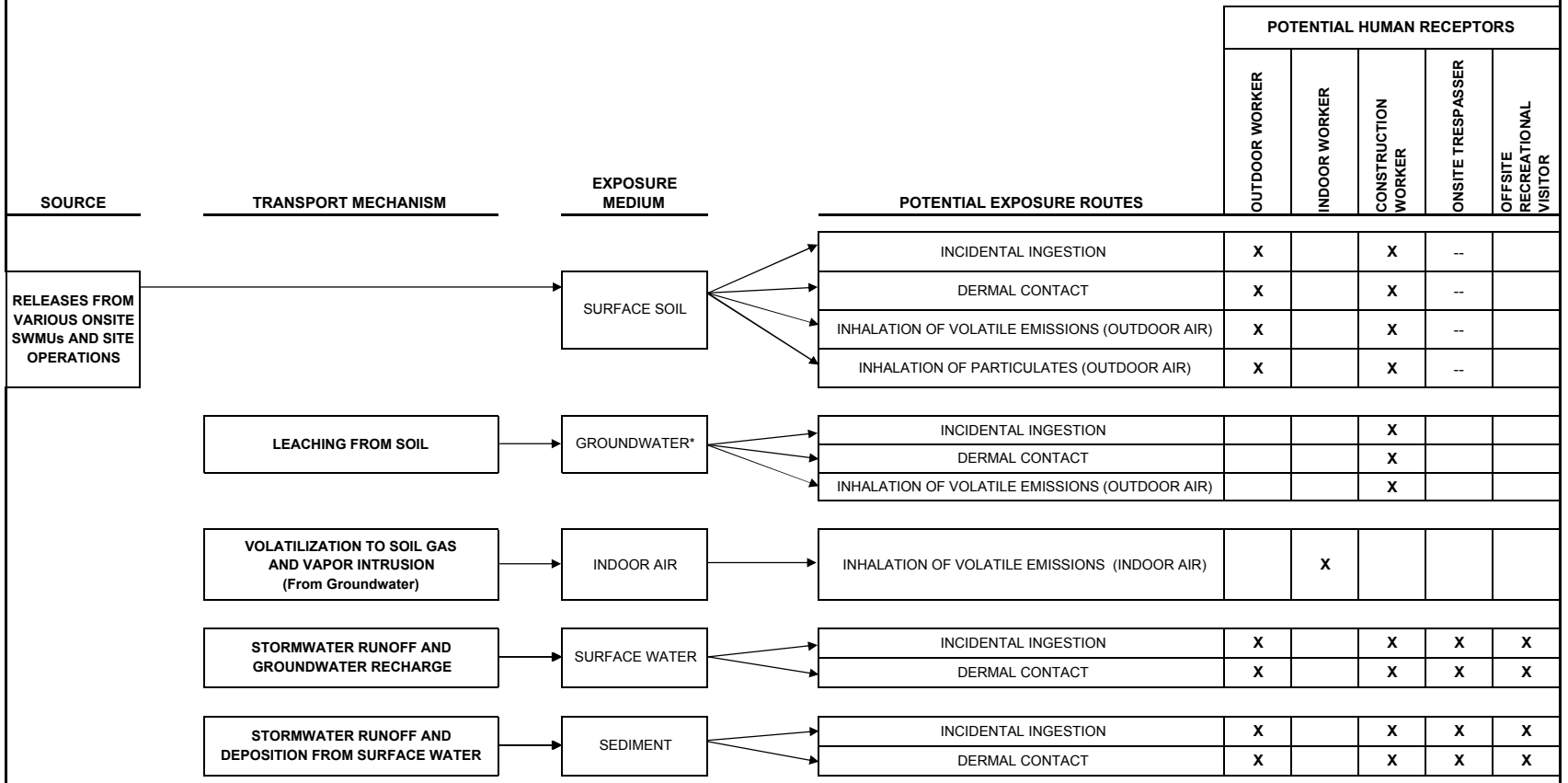
120
130
140
150
MAJOR GROUND SURFACE CONTOUR
MINOR GROUND SURFACE CONTOUR
TREELINE
WATER, STREAMS, PONDS
UNDERGROUND STORM SEWER DRAIN
GROUNDWATER MONITORING WELL
NEW GROUNDWATER MONITORING WELL (MAY 2007)
SLUDGE/SEDIMENT SAMPLE LOCATION
PREVIOUS SOIL SAMPLE LOCATIONS RECOLLECTED ON MARCH 6, 2007
SOIL SAMPLE LOCATION
STORM DRAIN MANHOLE SAMPLE LOCATION
OUTFALL LOCATION
SURFACE WATER SAMPLE LOCATION
SWMU LOCATIONS
SWMU INDEX
3 EASTERN WHITEWATER LAGOON
4 WESTERN WHITEWATER LAGOON
5 OLD LANDFILL AND LANDFILL #156
7 NATROSOL LAGOON
8 RETEN/AQUALON (ANOXIC) BASIN
14 SLUDGE DRYING BEDS
15 VACUUM FILTER SLUDGE PILE
DRAFTED BY: JCW (ES&T)
CHECKED BY: EN
REVIEWED BY: MB
NORTH
GENERAL SITE MAP
HERCULES INCORPORATED
AQUALON DIVISION
HOPEWELL, VIRGINIA
Groundwater & Environmental Services, Inc.
23 SOUTH 13TH STREET, SUITE 201, RICHMOND, VA 23219
SCALE IN FEET
0
150
DATE
11-07-07
FIGURE
2-1

FIGURE 4-1
GENERALIZED HUMAN HEALTH CONCEPTUAL SITE EXPOSURE MODEL
Hercules Incorporated Facility - Hopewell, Virginia



Notes:

X - Indicates a potentially complete exposure pathway that is evaluated in the quantitative risk assessment.

"--" Indicates a potentially complete, but insignificant, exposure pathway (e.g., exposure is de minimis and/or a more highly exposed receptor is evaluated).

* Land use controls such as deed restrictions and other institutional controls will be implemented at the site that will prohibit the use of groundwater for any (potable or non-potable) purposes.

TABLES

TABLE 2-1
SOIL SAMPLES INCLUDED IN THE RISK ASSESSMENT
Hercules Incorporated Facility - Hopewell, Virginia

Area	Medium	Sample Identification and Sample Dates			
Landfill Areas (SWMU 5)	Surface Soil	OLF-1*	7/5/2007	OLF-7	7/5/2007
		OLF-1 DUP*	7/5/2007	OLF-8	7/5/2007
		OLF-2	7/5/2007	LSS-1	3/18/2009
		OLF-3	7/5/2007	LSS-2	3/18/2009
		OLF-4	7/5/2007	LSS-3	3/18/2009
		OLF-5	7/5/2007	LSS-4	3/18/2009
		OLF-6	7/5/2007	LSS-5	3/18/2009
Sludge Drying Beds (SWMU 14)	Surface Soil	SDB-1	3/6/2007	SDB-1 B	12/2001
		SDB-2*	3/6/2007	SDB-2 B	12/2001
		SDB-2 DUP*	3/6/2007	SDB-3 B	12/2001
		SDB-3	3/6/2007	SDB-4 B	12/2001
		SDB-4	3/6/2007	SDB-5 B	12/2001
		SDB-5	3/6/2007	SDB-6 B	12/2001
		SDB-6	3/6/2007	SDB-7 B	12/2001
		SDB-7	3/6/2007	SDB-8 B	12/2001
		SDB-8	3/6/2007	SDB-9 B	12/2001
		SDB-9	3/6/2007		
Vacuum Filter Sludge Pile (SWMU 15)	Surface Soil	VFSP-1	3/6/2007	VFSP-1 B DUP*	12/18/2001
		VFSP-2	3/6/2007	VFSP-2 B	12/18/2001
		VFSP-3	3/6/2007	VFSP-3 B	12/18/2001
		VFSP-4	3/6/2007	VFSP-4 B	12/18/2001
		VFSP-5	3/6/2007	VFSP-5 B	12/18/2001
		VFSP-6	3/6/2007	VFSP-6 B	12/18/2001
		VFSP-7	3/6/2007	VFSP-7 B	12/18/2001
		VFSP-8	3/6/2007	VFSP-8 B	12/18/2001
		VFSP-9	3/6/2007	VFSP-9 B	12/18/2001
		VFSP-1 B*	12/18/2001		

Notes:
* Denotes samples of duplicate pair.

TABLE 2-2
GROUNDWATER SAMPLES INCLUDED IN THE RISK ASSESSMENT
Hercules Incorporated Facility - Hopewell, Virginia

Area	Sample Identification and Sample Dates			
Whitewater Lagoons (SWMUs 3 and 4)	WWL-1	6/4/2007	WWL-3L	6/4/2007
	WWL-2	6/4/2007	WWL-3U	6/4/2007
Landfill Areas (SWMU 5)	LF-1	6/5/2007	LF-4	6/5/2007
	LF-2	6/6/2007	LF-5	6/5/2007
	LF-3	6/5/2007		
Natrosol Lagoon (SWMU 7)	NAT-1	6/6/2007	NAT-3 DUP*	6/6/2007
	NAT-2	6/6/2007	NAT-4	6/6/2007
	NAT-3*	6/6/2007		
Reten/Aqualon Basin (SWMUs 8 and 29)	RABMW-2	5/31/2007	RABMW-4	5/31/2007
	RABMW-3	5/30/2007		
Sludge Drying Beds (SWMU 14)	SDB-MW1	6/5/2007	SDB-MW3	6/5/2007
	SDB-MW2	6/5/2007		
Vacuum Filter Sludge Pile (SWMU 15)	VFSP-MW1	6/6/2007		
Main Holding Basin	MW-1	5/31/2007	MW-7L	6/4/2007
	MW-2	5/31/2007	MW-7U	6/5/2007
	MW-3	6/1/2007	MW-8D	6/4/2007
	MW-4	6/1/2007	MW-8L	7/6/2007
	MW-4U	6/1/2007	MW-8U	6/4/2007
	MW-5	6/1/2007	MW-9*	6/4/2007
	MW-5U	6/1/2007	MW-9 DUP*	6/4/2007
	MW-6	6/1/2007	MW-10	5/31/2007

Notes:
* Denotes samples of duplicate pair.

TABLE 2-3
SEDIMENT AND SURFACE WATER SAMPLES INCLUDED IN THE RISK ASSESSMENT
Hercules Incorporated Facility - Hopewell, Virginia

Area	Medium	Sample Identification and Sample Dates			
Eastern Whitewater Lagoon (SWMU 3)	Sediment	ELSS-1A	5/9/2007	ELSS-3B	5/10/2007
		ELSS-1B	5/9/2007	ELSS-4A	5/9/2007
		ELSS-2A	5/9/2007	ELSS-4B	5/9/2007
		ELSS-2B	5/9/2007	ELSS-5A	5/9/2007
		ELSS-3A	5/10/2007	ELSS-5B	5/9/2007
	Surface Water	ELSW-1	5/9/2007	ELSW-3	5/10/2007
		ELSW-2	5/9/2007		
Western Whitewater Lagoon (SWMU 4)	Sediment	WLSS-1A	5/11/2007	WLSS-4A*	5/11/2007
		WLSS-1B	5/11/2007	WLSS-4A DUP*	5/11/2007
		WLSS-2A	5/11/2007	WLSS-4B	5/11/2007
		WLSS-2B	5/10/2007	WLSS-5A	5/10/2007
		WLSS-3A	5/11/2007	WLSS-5B	5/10/2007
		WLSS-3B	5/11/2007	WL PCB-1	5/11/2007
	Surface Water	WLSW-1	5/10/2007	WLSW-3	5/11/2007
		WLSW-2	5/10/2007		
Natrosol Lagoon (SWMU 7)	Sediment	NLSS-1A	5/8/2007	NLSS-2B	5/8/2007
		NLSS-1B	5/8/2007	NLSS-3A	5/8/2007
		NLSS-2A	5/8/2007	NLSS-3B	5/8/2007
	Surface Water	NLSW-1	5/8/2007	NLSW-2	5/8/2007
Sludge Drying Beds (SWMU 14)	Surface Water	SDB-SW-1	3/17/2009	SDB-SW-3*	3/18/2009
		SDB-SW-2	3/17/2009	SDB-SW-3 DUP*	3/18/2009
Vacuum Filter Sludge Pile (SWMU 15)	Surface Water	VFSP-SW-1	3/17/2009		

TABLE 2-3
SEDIMENT AND SURFACE WATER SAMPLES INCLUDED IN THE RISK ASSESSMENT
Hercules Incorporated Facility - Hopewell, Virginia

Area	Medium	Sample Identification and Sample Dates			
East Bear Creek	Sediment	EBSED-1	5/22/2007	EBSED-3	5/22/2007
		EBSED-2	5/23/2007	EB PCB-1	5/23/2007
	Surface Water	EBSW-1	5/23/2007	EBSW-3	5/23/2007
		EBSW-2	5/22/2007		
West Bear Creek	Sediment	WBSED-1	5/22/2007	WB PCB-1*	5/14/2007
		WBSED-2	5/22/2007	WB PCB-1 DUP*	5/14/2007
		WBSED-3	5/24/2007		
	Surface Water	WBSW-1	5/22/2007	WBSW-3	5/14/2007
		WBSW-2	5/22/2007		
Unnamed Tributary	Sediment	UTSED-1	5/25/2007	SD1 PCB-1	5/25/2007
		UTSED-2	5/24/2007	UT PCB-2	5/23/2007
		UTSED-3	5/23/2007		
	Surface Water	UTSW-1	5/25/2007	UTSW-3	5/23/2007
		UTSW-2	5/24/2007		
Cattail Creek	Sediment	CCSED-1	5/25/2007	CCSED-3*	5/21/2007
		CCSED-2	5/14/2007	CCSED-3 DUP*	5/21/2007
	Surface Water	CCSW-1	5/25/2007	CCSW-3*	5/21/2007
		CCSW-2	5/14/2007	CCSW-3 DUP*	5/21/2007
Bailey Creek	Sediment	BCSED-1	5/24/2007		
	Surface Water	BCSW-1	5/24/2007		

Notes:
* Denotes samples of duplicate pair.

TABLE 3-1
IDENTIFICATION OF SURROGATES FOR CONSTITUENTS LACKING RISK-BASED COMPARISON VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Surrogate
Known TICs		
.alpha.-Amyrin	638-95-9	Constituent structurally similar to cholesterol; low inherent toxicity.
.gamma.-Sitosterol	83-47-6	Constituent structurally similar to cholesterol; low inherent toxicity.
2,2',4,4',5-pentachloro-1,1'-Biphenyl	38380-01-7	PCB 1260
2,2',4,4',6-Pentachloro-1,1'-Biphenyl	39485-83-1	PCB 1260
2,2',4,5,5'-pentachloro-1,1'-Biphenyl	37680-73-2	PCB 1260
2,3',4,4',6-Pentachloro-1,1'-Biphenyl	56558-17-9	PCB 1260
pentachloro-1,1'-Biphenyl	25429-29-2	PCB 1260
17-Pentatriacontene	6971-40-0	alkane/alkene; assume hexane
1-Decene	872-05-9	alkane/alkene; assume hexane
1-Docosanethiol	7773-83-3	alkyl chain with sulfur; assume carbon disulfide
1-Docosene	1599-67-3	alkane/alkene; assume hexane
1-Dotriacontanol	6624-79-9	alkene alcohol; assume n-butanol
1-Naphthalenepropanol, .alpha.-ethenylde	596-85-0	substituted naphthalene; assume naphthalene
1,1,2-trichloro-1-Propene	21400-25-9	tetrachloroethene
1,2,3-trichloro-1-Propene	96-19-5	tetrachloroethene
1,3-Dichlorobenzene	541-73-1	1,4-dichlorobenzene
28-Norolean-17-en-3-one	5912-72-1	terpene; assume quinoline
2,3-dimethyl-2-Butanol	594-60-5	ethylene glycol monobutyl ether
2-Heptacosanone	NA	pheremone; fatty acid; low inherent toxicity.
4-hydroxy-4-methyl-2-Pentanone	123-42-2	methyl isobutyl ketone
4-methoxy-4-methyl-2-Pentanone	107-70-0	methyl isobutyl ketone
3-Ethyltoluene	620-14-4	toluene
4-methyl-3-Penten-2-one	141-79-7	methyl isobutyl ketone
4-Isopropyltoluene	99-87-6	isopropylbenzene
4,5-Dimethylthiazole S-oxide	NA	4,5-Dimethylthiazole
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	dibenzofuran
9,12,15-Octadecatrienal	26537-71-3	fatty acid; low inherent toxicity.
alpha-Pinene	NA	plant steroid; low inherent toxicity.
Bacchotricuneatin c	66563-30-2	natural steroid; low inherent toxicity.
1-methyl-4-(1-methylethyl)-Benzene	99-87-6	fragrance; assume benzene
Benzo[b]naphtho[2,3-d]furan	243-42-5	dibenzofuran
Benzyl cinnamate	103-41-3	cosmetic; low inherent toxicity.
Bromacil	314-40-9	no surrogate assigned; risk-based value calculated
3-methyl-Butanal	590-86-3	propionaldehyde
Butanal, isomer	NA	propionaldehyde
C10H16	NA	hexane
Carbon Dioxide	124-38-9	Low inherent toxicity.
Cholest-5-ene, 3-bromo-, (3.beta.)-	516-91-6	Constituent structurally similar to cholesterol; low inherent toxicity.
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2089-02-3	oxysterol; low inherent toxicity.

TABLE 3-1
IDENTIFICATION OF SURROGATES FOR CONSTITUENTS LACKING RISK-BASED COMPARISON VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Surrogate
Known TICs (continued)		
Cholestanol	80-97-7	Constituent structurally similar to cholesterol; low inherent toxicity.
Cholesterol	57-88-5	Low inherent toxicity.
Cyclodecane	293-96-9	cyclohexane
Cyclododecane	294-62-2	cyclohexane
Cyclooctacosane	297-24-5	cyclohexane
Cyclopropane, nonyl-	74663-85-7	cyclohexane
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	14021-23-9	plant steroid; low inherent toxicity.
Diethyltoluamide	134-62-3	no surrogate assigned; risk-based value calculated
Eicosane	112-95-8	hexane
Ergost-5-en-3-ol, (3.beta.)-	4651-51-8	Vitamin D2 precursor; low inherent toxicity.
Ergostanol	6538-02-9	Vitamin D2 precursor; low inherent toxicity.
1,1'-oxybis[2-ethoxy-]ethane	112-36-7	ethylene glycol monobutyl ether
2-[2-(2-ethoxyethoxy)ethoxy]-ethanol	112-50-5	ethylene glycol monobutyl ether
Heptacosane	593-49-7	alkane; assume hexane
Heptadecane	629-78-7	alkane; assume hexane
2,6,10,15-tetramethyl-Heptadecane	54833-48-6	alkane; assume hexane
9-octyl-heptadecane	7225-64-1	alkane; assume hexane
Heptanal	111-71-7	propionaldehyde
Hexacosane	630-01-3	alkane; assume hexane
Hexadecane	544-76-3	alkane; assume hexane
Hexadecanoic acid	57-10-3	fatty acid; low inherent toxicity.
Hexanal	66-25-1	propionaldehyde
Methylcyclohexane	108-87-2	cyclohexane
1,2,3,5,6,8a-hexahydro-4,7-naphthalene	483-76-1	naphthalene
Nonadecane	629-92-5	alkane; assume hexane
Olean-12-ene	471-68-1	plant steroid; low inherent toxicity.
Oleic Acid	112-80-1	fatty acid; low inherent toxicity.
Pentacosane	629-99-2	alkane; assume hexane
Pentanal	110-62-3	propionaldehyde
Pentatriacontane	630-07-9	alkane; assume hexane
2-(2-propenyl)-phenol	1745-81-9	phenol
2,2-dimethoxy-propane	77-76-9	1,2-Dibromo-3-chloropropane
Stigmasterol	83-48-7	plant steroid; low inherent toxicity.
Vitamin E	NA	Low inherent toxicity.

TABLE 3-1
IDENTIFICATION OF SURROGATES FOR CONSTITUENTS LACKING RISK-BASED COMPARISON VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Surrogate
Unknown TIC Identification		
Chemical Class: acid	NA	acetic acid; low inherent toxicity.
Chemical Class: alcohol	NA	n-butanol
Chemical Class: alkane	NA	hexane
Chemical Class: alkane ring	NA	cyclohexane
Chemical Class: alkene	NA	hexane
Chemical Class: alkyl aromatic	NA	toluene
Chemical Class: alkyl chain	NA	hexane
Chemical Class: alkyl ether	NA	ethyl ether
Chemical Class: alkyl ring	NA	toluene
Chemical Class: alkyl silicon	NA	silicon base; low inherent toxicity.
Chemical Class: amide	NA	diphenylamine
Chemical Class: chlorinated VOC	NA	trichloroethene
Chemical Class: cycloalkane	NA	cyclohexane
Chemical Class: fluorinated VOC	NA	Freon 113
Chemical Class: glycol ether derivative	NA	ethylene glycol monobutyl ether
Chemical Class: hexanal	NA	propionaldehyde
Chemical Class: ketone	NA	methyl ethyl ketone
Chemical Class: organic acid	NA	acetic acid; low inherent toxicity.
Chemical Class: PAH	NA	benzo(a)pyrene
Chemical Class: propanal	NA	propionaldehyde
Chemical Class: silane	NA	silicon base; low inherent toxicity.
Chemical Class: silanol	NA	silicon base; low inherent toxicity.
Chemical Class: sitosterol	NA	Constituent structurally similar to cholesterol; low inherent toxicity.
cholestan-3-ol, 6-methyl-, (3.beta.,5.alpha.,6.alpha)-	NA	Constituent structurally similar to cholesterol; low inherent toxicity.
1,2-diethoxyethane	629-14-1	ethyl ether
methoxyethane	NA	ethyl ether
trimethylsilanol	1066-40-6	silicon base; low inherent toxicity.
2-methyl-1-propene	9003-27-4	alkene; assume hexane

TABLE 3-1
IDENTIFICATION OF SURROGATES FOR CONSTITUENTS LACKING RISK-BASED COMPARISON VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Surrogate
Standard Analytes		
1,3-Dichlorobenzene	541-73-1	1,4-Dichlorobenzene
9-Hexadecenoic acid (i.e., Oleic Acid)	112-80-1	fatty acid; low inherent toxicity.
Benzo[g,h,i]perylene	191-24-2	Pyrene
Diethylene glycol	111-46-6	Ethylene glycol
Ethanol	64-17-5	n-Butanol
Hexachloro-1,1'-biphenyl	26601-64-9	PCB-167
Pentachlorobiphenyl	25429-29-2	PCB-123
Phenanthrene	85-01-8	Anthracene
t-Butanol	75-65-0	n-Butanol
Tetrachlorobiphenyl	26914-33-0	PCB-77

Notes:
NA - CAS number not available.

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Volatile Organics		
1,1,1,2-Tetrachloroethane	9.3	Industrial Soil RSL (USEPA, 2010a)
1,1,1-Trichloroethane	3800	Industrial Soil RSL (USEPA, 2010a)
1,1,2,2-Tetrachloroethane	2.8	Industrial Soil RSL (USEPA, 2010a)
1,1,2-Trichloroethane	5.3	Industrial Soil RSL (USEPA, 2010a)
1,1-Dichloroethane	17	Industrial Soil RSL (USEPA, 2010a)
1,1-Dichloroethene	110	Industrial Soil RSL (USEPA, 2010a)
1,2,3-Trichloropropane	0.095	Industrial Soil RSL (USEPA, 2010a)
1,2-Dibromo-3-Chloropropane	0.069	Industrial Soil RSL (USEPA, 2010a)
1,2-Dibromoethane	0.17	Industrial Soil RSL (USEPA, 2010a)
1,2-Dichloroethane	2.2	Industrial Soil RSL (USEPA, 2010a)
trans-1,2-Dichloroethene	69	Industrial Soil RSL (USEPA, 2010a)
1,2-Dichloropropane	4.5	Industrial Soil RSL (USEPA, 2010a)
cis-1,3-Dichloropropene	8.1	Based on the RSL for 1,3-dichloropropene.
trans-1,3-Dichloropropene	8.1	Based on the RSL for 1,3-dichloropropene.
1,4-Dioxane	160	Industrial Soil RSL (USEPA, 2010a)
2-Butanone (MEK)	20000	Industrial Soil RSL (USEPA, 2010a)
2-Hexanone	140	Industrial Soil RSL (USEPA, 2010a)
2-Methyl-1-propanol (Isobutyl Alcohol)	31000	Industrial Soil RSL (USEPA, 2010a)
4-Methyl-2-pentanone (MIBK)	5300	Industrial Soil RSL (USEPA, 2010a)
Acetone	63000	Industrial Soil RSL (USEPA, 2010a)
Acetonitrile	370	Industrial Soil RSL (USEPA, 2010a)
Acrylonitrile	1.2	Industrial Soil RSL (USEPA, 2010a)
Allyl alcohol	310	Industrial Soil RSL (USEPA, 2010a)
Allyl chloride	3.4	Industrial Soil RSL (USEPA, 2010a)
Benzene	5.4	Industrial Soil RSL (USEPA, 2010a)
Benzyl chloride	4.9	Industrial Soil RSL (USEPA, 2010a)
Bromodichloromethane	1.4	Industrial Soil RSL (USEPA, 2010a)
Bromoform	220	Industrial Soil RSL (USEPA, 2010a)
Bromomethane	3.2	Industrial Soil RSL (USEPA, 2010a)
Carbon disulfide	370	Industrial Soil RSL (USEPA, 2010a)
Carbon tetrachloride	3	Industrial Soil RSL (USEPA, 2010a)
Chlorobenzene	140	Industrial Soil RSL (USEPA, 2010a)
Chloroethane	6100	Industrial Soil RSL (USEPA, 2010a)
Chloroform	1.5	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Volatile Organics (continued)		
Chloromethane	50	Industrial Soil RSL (USEPA, 2010a)
Chloroprene	3.6	Industrial Soil RSL (USEPA, 2010a)
Dibromochloromethane	3.3	Industrial Soil RSL (USEPA, 2010a)
Dibromomethane	11	Industrial Soil RSL (USEPA, 2010a)
Dichlorodifluoromethane	78	Industrial Soil RSL (USEPA, 2010a)
Diethyl ether	20000	Industrial Soil RSL (USEPA, 2010a)
Ethanol	6200	Based on the RSL for n-butanol.
Ethyl methacrylate	9200	Industrial Soil RSL (USEPA, 2010a)
Ethylbenzene	27	Industrial Soil RSL (USEPA, 2010a)
Ethylene oxide	0.83	Industrial Soil RSL (USEPA, 2010a)
Methacrylonitrile	1.8	Industrial Soil RSL (USEPA, 2010a)
Methyl methacrylate	2100	Industrial Soil RSL (USEPA, 2010a)
Methylene Chloride	53	Industrial Soil RSL (USEPA, 2010a)
Pentachloroethane	19	Industrial Soil RSL (USEPA, 2010a)
Propylene oxide	8.8	Industrial Soil RSL (USEPA, 2010a)
Styrene	3600	Industrial Soil RSL (USEPA, 2010a)
t-Butanol	6200	Based on the RSL for n-butanol.
Tetrachloroethene	2.6	Industrial Soil RSL (USEPA, 2010a)
Toluene	4500	Industrial Soil RSL (USEPA, 2010a)
trans-1,4-Dichloro-2-butene	0.035	Industrial Soil RSL (USEPA, 2010a)
Trichloroethylene	14	Industrial Soil RSL (USEPA, 2010a)
Trichlorofluoromethane	340	Industrial Soil RSL (USEPA, 2010a)
Vinyl acetate	410	Industrial Soil RSL (USEPA, 2010a)
Vinyl chloride	1.7	Industrial Soil RSL (USEPA, 2010a)
Xylenes, Total	270	Industrial Soil RSL (USEPA, 2010a)
Volatile Organics (TICs)		
4-Isopropyltoluene	1100	Based on the RSL for isopropylbenzene (cumene).
Carbon Dioxide	NA	Low inherent toxicity in soil.
1,2,4-Trimethylbenzene	26	Industrial Soil RSL (USEPA, 2010a)
1,3,5-Trimethylbenzene	1000	Industrial Soil RSL (USEPA, 2010a)
1,3-Dichlorobenzene	12	Based on the RSL for 1,4-dichlorobenzene
1,4-Dichlorobenzene	12	Industrial Soil RSL (USEPA, 2010a)
3-Ethyltoluene	4500	Based on the RSL for toluene.
Acetaldehyde	52	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Volatile Organics (TICs) (continued)		
Butanal, 3-methyl-	34	Based on the RSL for propionaldehyde.
Butanal, isomer	34	Based on the RSL for propionaldehyde.
C10H16	260	Based on the RSL for hexane.
cis-1,2-Dichloroethene	1000	Industrial Soil RSL (USEPA, 2010a)
Heptanal	34	Based on the RSL for propionaldehyde.
Hexanal	34	Based on the RSL for propionaldehyde.
Hexane	260	Industrial Soil RSL (USEPA, 2010a)
Pentanal	34	Based on the RSL for propionaldehyde.
Semi-Volatile Organics		
1,2,4,5-Tetrachlorobenzene	18	Industrial Soil RSL (USEPA, 2010a)
1,2,4-Trichlorobenzene	99	Industrial Soil RSL (USEPA, 2010a)
1,2-Dichlorobenzene	980	Industrial Soil RSL (USEPA, 2010a)
1,3,5-Trinitrobenzene	2700	Industrial Soil RSL (USEPA, 2010a)
1,3-Dichlorobenzene	12	Based on the RSL for 1,4-dichlorobenzene.
1,4-Dichlorobenzene	12	Industrial Soil RSL (USEPA, 2010a)
1,4-Dioxane	160	Industrial Soil RSL (USEPA, 2010a)
2,2'-oxybis[1-chloropropane]	22	Industrial Soil RSL (USEPA, 2010a)
2,3,4,6-Tetrachlorophenol	1800	Industrial Soil RSL (USEPA, 2010a)
2,4,5-Trichlorophenol	6200	Industrial Soil RSL (USEPA, 2010a)
2,4,6-Trichlorophenol	160	Industrial Soil RSL (USEPA, 2010a)
2,4-Dichlorophenol	180	Industrial Soil RSL (USEPA, 2010a)
2,4-Dimethylphenol	1200	Industrial Soil RSL (USEPA, 2010a)
2,4-Dinitrophenol	120	Industrial Soil RSL (USEPA, 2010a)
2,4-Dinitrotoluene	5.5	Industrial Soil RSL (USEPA, 2010a)
2,6-Dinitrotoluene	62	Industrial Soil RSL (USEPA, 2010a)
2-Acetylaminofluorene	0.45	Industrial Soil RSL (USEPA, 2010a)
2-Chloronaphthalene	8200	Industrial Soil RSL (USEPA, 2010a)
2-Chlorophenol	510	Industrial Soil RSL (USEPA, 2010a)
2-Methylnaphthalene	410	Industrial Soil RSL (USEPA, 2010a)
2-Methylphenol	3100	Industrial Soil RSL (USEPA, 2010a)
2-Naphthalenamine	0.96	Industrial Soil RSL (USEPA, 2010a)
2-Nitroaniline	600	Industrial Soil RSL (USEPA, 2010a)
2-sec-Butyl-4,6-dinitrophenol	62	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Semi-Volatile Organics (continued)		
3,3'-Dichlorobenzidine	3.8	Industrial Soil RSL (USEPA, 2010a)
3,3'-Dimethylbenzidine	0.16	Industrial Soil RSL (USEPA, 2010a)
3-Methylcholanthrene	0.078	Industrial Soil RSL (USEPA, 2010a)
4,6-Dinitro-2-methylphenol	4.9	Industrial Soil RSL (USEPA, 2010a)
4-Aminobiphenyl	0.082	Industrial Soil RSL (USEPA, 2010a)
4-Chloro-3-methylphenol	6200	Industrial Soil RSL (USEPA, 2010a)
4-Chloroaniline	8.6	Industrial Soil RSL (USEPA, 2010a)
4-Nitroaniline	86	Industrial Soil RSL (USEPA, 2010a)
5-Nitro-o-toluidine	52	Industrial Soil RSL (USEPA, 2010a)
7,12-Dimethylbenz(a)anthracene	0.0062	Industrial Soil RSL (USEPA, 2010a)
Acenaphthene	3300	Industrial Soil RSL (USEPA, 2010a)
Acetophenone	10000	Industrial Soil RSL (USEPA, 2010a)
Aniline	300	Industrial Soil RSL (USEPA, 2010a)
Anthracene	17000	Industrial Soil RSL (USEPA, 2010a)
Aramite, Total	69	Industrial Soil RSL (USEPA, 2010a)
Benzo[a]anthracene	2.1	Industrial Soil RSL (USEPA, 2010a)
Benzo[a]pyrene	0.21	Industrial Soil RSL (USEPA, 2010a)
Benzo[b]fluoranthene	2.1	Industrial Soil RSL (USEPA, 2010a)
Benzo[g,h,i]perylene	1700	Based on the RSL for pyrene.
Benzo[k]fluoranthene	21	Industrial Soil RSL (USEPA, 2010a)
Benzyl alcohol	6200	Industrial Soil RSL (USEPA, 2010a)
Bis(2-chloroethoxy)methane	180	Industrial Soil RSL (USEPA, 2010a)
Bis(2-chloroethyl)ether	1	Industrial Soil RSL (USEPA, 2010a)
Bis(2-ethylhexyl) phthalate	120	Industrial Soil RSL (USEPA, 2010a)
Butyl benzyl phthalate	910	Industrial Soil RSL (USEPA, 2010a)
Chrysene	210	Industrial Soil RSL (USEPA, 2010a)
Diallate	28	Industrial Soil RSL (USEPA, 2010a)
Dibenz(a,h)anthracene	0.21	Industrial Soil RSL (USEPA, 2010a)
Dibenzofuran	100	Industrial Soil RSL (USEPA, 2010a)
Diethyl phthalate	49000	Industrial Soil RSL (USEPA, 2010a)
Dimethoate	12	Industrial Soil RSL (USEPA, 2010a)
Di-n-butyl phthalate	6200	Industrial Soil RSL (USEPA, 2010a)
Fluoranthene	2200	Industrial Soil RSL (USEPA, 2010a)
Fluorene	2200	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Semi-Volatile Organics (continued)		
Hexachlorobenzene	1.1	Industrial Soil RSL (USEPA, 2010a)
Hexachlorobutadiene	22	Industrial Soil RSL (USEPA, 2010a)
Hexachlorocyclopentadiene	370	Industrial Soil RSL (USEPA, 2010a)
Hexachloroethane	120	Industrial Soil RSL (USEPA, 2010a)
Hexachlorophene	18	Industrial Soil RSL (USEPA, 2010a)
Indeno[1,2,3-cd]pyrene	2.1	Industrial Soil RSL (USEPA, 2010a)
Isophorone	1800	Industrial Soil RSL (USEPA, 2010a)
m-Dinitrobenzene	6.2	Industrial Soil RSL (USEPA, 2010a)
Methyl methanesulfonate	17	Industrial Soil RSL (USEPA, 2010a)
Naphthalene	18	Industrial Soil RSL (USEPA, 2010a)
Nitrobenzene	24	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodiethylamine	0.011	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodimethylamine	0.034	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodi-n-butylamine	0.4	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodi-n-propylamine	0.25	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodiphenylamine	350	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosomethylethylamine	0.078	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosomorpholine	0.26	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosopiperidine	0.18	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosopyrrolidine	0.82	Industrial Soil RSL (USEPA, 2010a)
p-Dimethylamino azobenzene	0.37	Industrial Soil RSL (USEPA, 2010a)
Pentachlorobenzene	49	Industrial Soil RSL (USEPA, 2010a)
Pentachloronitrobenzene	6.6	Industrial Soil RSL (USEPA, 2010a)
Pentachlorophenol	9	Industrial Soil RSL (USEPA, 2010a)
Phenacetin	780	Industrial Soil RSL (USEPA, 2010a)
Phenanthrene	17000	Based on the RSL for anthracene.
Phenol	18000	Industrial Soil RSL (USEPA, 2010a)
p-Phenylene diamine	12000	Industrial Soil RSL (USEPA, 2010a)
Pronamide	4600	Industrial Soil RSL (USEPA, 2010a)
Pyrene	1700	Industrial Soil RSL (USEPA, 2010a)
Pyridine	100	Industrial Soil RSL (USEPA, 2010a)
Safrole, Total	7.8	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Semi-Volatile Organics (TICs)		
Ergostanol	NA	Constituent is a Vitamin D2 precursor; low inherent toxicity.
.gamma.-Sitosterol	NA	Constituent structurally similar to cholesterol; low inherent toxicity.
28-Norolean-17-en-3-one	0.57	Based on the RSL for quinoline
2-Pentanone, 4-hydroxy-4-methyl-	5300	Based on the RSL for methyl isobutyl ketone.
2-Pentanone, 4-methoxy-4-methyl-	5300	Based on the RSL for methyl isobutyl ketone
3-Penten-2-one, 4-methyl-	5300	Based on the RSL for methyl isobutyl ketone
4,5-Dimethylthiazole S-oxide	20	Safety in Use recommendation.
alpha-Pinene	NA	Constituent is a plant steroid, low inherent toxicity.
Benzene, 1-methyl-4-(1-methylethyl)-	5.4	Based on the RSL for benzene.
Benzyl cinnamate	NA	Constituent is a cosmetic; low inherent toxicity.
Cholest-5-ene, 3-bromo-, (3.beta.)-	NA	Constituent structurally similar to cholesterol; low inherent toxicity.
Cholesterol	NA	Low inherent toxicity.
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	NA	Constituent is a plant steroid, low inherent toxicity.
Methylene Chloride	53	Industrial Soil RSL (USEPA, 2010a)
Phenol, 2-(2-propenyl)-	18000	Based on the RSL for phenol.
Propane, 2,2-dimethoxy-	0.069	Based on the RSL for 1,2-dibromo-3-chloropropane.
.alpha.-Amyrin	NA	Constituent structurally similar to cholesterol; low inherent toxicity.
1-Docosanethiol	370	Based on the RSL for carbon disulfide.
1-Dotriacontanol	6200	Based on the RSL for n-butanol.
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	100	Based on the RSL for dibenzofuran.
Benzo[b]naphtho[2,3-d]furan	100	Based on the RSL for dibenzofuran.
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	NA	Constituent structurally similar to oxysterol; low inherent toxicity.
Cyclooctacosane	2900	Based on the RSL for cyclohexane.
Ergost-5-en-3-ol, (3.beta.)	NA	Constituent is a Vitamin D2 precursor; low inherent toxicity.
Nonadecane	260	Based on the RSL for hexane
Pentacosane	260	Based on the RSL for hexane
Pentatriacontane	260	Based on the RSL for hexane
Stigmasterol	NA	Constituent is a plant steroid, low inherent toxicity.
bis(2-Ethylhexyl) phthalate	120	Industrial Soil RSL (USEPA, 2010a)
4-Chloroaniline	8.6	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Acrylamide, Acrylonitrile and Acrolein		
Acrylamide	3.4	Industrial Soil RSL (USEPA, 2010a)
Alcohols and Glycols		
2-Butoxyethanol	6200	Industrial Soil RSL (USEPA, 2010a)
Allyl alcohol	310	Industrial Soil RSL (USEPA, 2010a)
Ethylene glycol	120000	Industrial Soil RSL (USEPA, 2010a)
Ethylene glycol monobutyl ether	6200	Industrial Soil RSL (USEPA, 2010a)
Isopropanol	4200000000	Industrial Soil RSL (USEPA, 2010a)
Methanol	31000	Industrial Soil RSL (USEPA, 2010a)
Propylene glycol	1200000	Industrial Soil RSL (USEPA, 2010a)
Inorganics		
Aluminum	99000	Industrial Soil RSL (USEPA, 2010a)
Antimony	41	Industrial Soil RSL (USEPA, 2010a)
Arsenic	1.6	Industrial Soil RSL (USEPA, 2010a)
Barium	19000	Industrial Soil RSL (USEPA, 2010a)
Beryllium	200	Industrial Soil RSL (USEPA, 2010a)
Cadmium	80	Industrial Soil RSL (USEPA, 2010a)
Calcium	NA	Essential nutrient.
Chromium	5.6	Based on the RSL for chromium VI.
Cobalt	30	Industrial Soil RSL (USEPA, 2010a)
Copper	4100	Industrial Soil RSL (USEPA, 2010a)
Iron	72000	Industrial Soil RSL (USEPA, 2010a)
Lead	800	Industrial Soil RSL (USEPA, 2010a)
Magnesium	NA	Essential nutrient.
Manganese	2300	Industrial Soil RSL (USEPA, 2010a)
Mercury	3.4	Industrial Soil RSL (USEPA, 2010a)
Nickel	2000	Industrial Soil RSL (USEPA, 2010a)
Potassium	NA	Essential nutrient.
Selenium	510	Industrial Soil RSL (USEPA, 2010a)
Silver	510	Industrial Soil RSL (USEPA, 2010a)
Sodium	NA	Essential nutrient.
Thallium	NA	Appropriate surrogate not available for this constituent.
Vanadium	520	Industrial Soil RSL (USEPA, 2010a)
Zinc	31000	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-2
SOIL SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Soil Screening Value (mg/kg)	Basis of Screening Values
Other Inorganics		
Chlorides	NA	Low inherent toxicity in soil.
Nitrates	160000	Industrial Soil RSL (USEPA, 2010a)
Nitrites	10000	Industrial Soil RSL (USEPA, 2010a)
Sulfate	NA	Low inherent toxicity in soil.
Nitrogen, Kjeldahl	NA	Physical soil property.
Total Organic Carbon	NA	Physical soil property.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 8	ND	ND	ND	0.0042	0.011	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 8	ND	ND	ND	0.0042	0.011	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 8	ND	ND	ND	0.0042	0.011	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 8	ND	ND	ND	0.0042	0.011	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 8	ND	ND	ND	0.0042	0.011	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 8	ND	ND	ND	0.0042	0.011	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 8	ND	ND	ND	0.0042	0.011	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 8	ND	ND	ND	0.0084	0.023	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 8	ND	ND	ND	0.0042	0.011	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 8	ND	ND	ND	0.0042	0.011	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 8	ND	ND	ND	0.0042	0.011	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 8	ND	ND	ND	0.0042	0.011	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 8	ND	ND	ND	0.0042	0.011	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 8	ND	ND	ND	0.0042	0.011	8.1	No	Constituent not detected.
2-Butanone (MEK)	1 / 8	0.025	0.025	OLF-6	0.021	0.031	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 8	ND	ND	ND	0.021	0.057	140	No	Constituent not detected.
2-Methyl-1-propanol (Isobutyl Alcohol)	0 / 8	ND	ND	ND	0.17	0.46	31000	No	Constituent not detected.
3-Methylhexane	0 / 8	ND	ND	ND	0.0042	0.011	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 8	ND	ND	ND	0.021	0.057	5300	No	Constituent not detected.
Acetone	4 / 8	0.0057	0.14	OLF-6	0.045	0.061	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 8	ND	ND	ND	0.17	0.46	370	No	Constituent not detected.
Acrolein	0 / 8	ND	ND	ND	0.084	0.23	NA	No	Constituent not detected.
Acrylonitrile	0 / 8	ND	ND	ND	0.084	0.23	1.2	No	Constituent not detected.
Allyl chloride	0 / 8	ND	ND	ND	0.0042	0.011	3.4	No	Constituent not detected.
Benzene	0 / 8	ND	ND	ND	0.0042	0.011	5.4	No	Constituent not detected.
Benzyl chloride	0 / 8	ND	ND	ND	0.0042	0.011	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 8	ND	ND	ND	0.0042	0.011	1.4	No	Constituent not detected.
Bromoform	0 / 8	ND	ND	ND	0.0042	0.011	220	No	Constituent not detected.
Bromomethane	0 / 8	ND	ND	ND	0.0042	0.011	3.2	No	Constituent not detected.
Carbon disulfide	0 / 8	ND	ND	ND	0.0042	0.011	370	No	Constituent not detected.
Carbon tetrachloride	0 / 8	ND	ND	ND	0.0042	0.011	3	No	Constituent not detected.
Chlorobenzene	0 / 8	ND	ND	ND	0.0042	0.011	140	No	Constituent not detected.
Chloroethane	0 / 8	ND	ND	ND	0.0042	0.011	6100	No	Constituent not detected.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chloroform	1 / 8	0.0022	0.0022	OLF-4	0.0042	0.011	1.5	No	Maximum detect below screening value.
Chloromethane	0 / 8	ND	ND	ND	0.0042	0.011	50	No	Constituent not detected.
Chloroprene	0 / 8	ND	ND	ND	0.0042	0.011	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 8	ND	ND	ND	0.0042	0.011	3.3	No	Constituent not detected.
Dibromomethane	0 / 8	ND	ND	ND	0.0042	0.011	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 8	ND	ND	ND	0.0042	0.011	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 8	ND	ND	ND	0.0042	0.011	NA	No	Constituent not detected.
Diethyl ether	0 / 8	ND	ND	ND	0.0084	0.023	20000	No	Constituent not detected.
Ethyl methacrylate	0 / 8	ND	ND	ND	0.0042	0.011	9200	No	Constituent not detected.
Ethylbenzene	0 / 8	ND	ND	ND	0.0042	0.011	27	No	Constituent not detected.
Ethylene oxide	0 / 8	ND	ND	ND	0.084	0.23	0.83	No	Constituent not detected.
Iodomethane	0 / 8	ND	ND	ND	0.0042	0.011	NA	No	Constituent not detected.
Methacrylonitrile	0 / 8	ND	ND	ND	0.084	0.23	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 8	ND	ND	ND	0.0042	0.011	2100	No	Constituent not detected.
Methylene Chloride	0 / 8	ND	ND	ND	0.0042	0.011	53	No	Constituent not detected.
n-Heptane	0 / 8	ND	ND	ND	0.0042	0.011	NA	No	Constituent not detected.
Pentachloroethane	0 / 8	ND	ND	ND	0.021	0.057	19	No	Constituent not detected.
Propionitrile	0 / 8	ND	ND	ND	0.084	0.23	NA	No	Constituent not detected.
Propylene oxide	0 / 8	ND	ND	ND	0.084	0.23	8.8	No	Constituent not detected.
Styrene	0 / 8	ND	ND	ND	0.0042	0.011	3600	No	Constituent not detected.
t-Butanol	0 / 8	ND	ND	ND	0.0042	0.011	6200	No	Constituent not detected.
Tetrachloroethene	0 / 8	ND	ND	ND	0.0042	0.011	2.6	No	Constituent not detected.
Toluene	0 / 8	ND	ND	ND	0.0042	0.011	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 8	ND	ND	ND	0.0084	0.023	0.035	No	Constituent not detected.
Trichloroethylene	0 / 8	ND	ND	ND	0.0042	0.011	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 8	ND	ND	ND	0.0042	0.011	340	No	Constituent not detected.
Vinyl acetate	0 / 8	ND	ND	ND	0.0084	0.023	410	No	Constituent not detected.
Vinyl chloride	0 / 8	ND	ND	ND	0.0042	0.011	1.7	No	Constituent not detected.
Xylenes, Total	0 / 8	ND	ND	ND	0.0084	0.023	270	No	Constituent not detected.
Volatile Organics (TICs)									
4-Isopropyltoluene	2 / 2	0.0014	0.0019	OLF-2	--	--	1100	No	Maximum detect below screening value.
Carbon Dioxide	8 / 8	0.93	2.8	OLF-8	--	--	NA	No	Screening value not available; see Table 3-2.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 8	ND	ND	ND	0.35	0.48	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 8	ND	ND	ND	0.35	0.48	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 8	ND	ND	ND	0.35	0.48	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 8	ND	ND	ND	0.35	0.48	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 8	ND	ND	ND	0.35	0.48	12	No	Constituent not detected.
1,4-Dioxane	0 / 8	ND	ND	ND	0.35	0.48	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 8	ND	ND	ND	0.35	0.48	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 8	ND	ND	ND	0.35	0.48	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 8	ND	ND	ND	0.35	0.48	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 8	ND	ND	ND	0.35	0.48	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 8	ND	ND	ND	0.35	0.48	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 8	ND	ND	ND	0.35	0.48	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 8	ND	ND	ND	1.8	2.5	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 8	ND	ND	ND	0.35	0.48	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 8	ND	ND	ND	0.35	0.48	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 8	ND	ND	ND	0.35	**0.48**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 8	ND	ND	ND	0.35	0.48	8200	No	Constituent not detected.
2-Chlorophenol	0 / 8	ND	ND	ND	0.35	0.48	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 8	ND	ND	ND	0.35	0.48	410	No	Constituent not detected.
2-Methylphenol	0 / 8	ND	ND	ND	0.35	0.48	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 8	ND	ND	ND	0.35	0.48	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 8	ND	ND	ND	1.8	2.5	600	No	Constituent not detected.
2-Nitrophenol	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
2-Picoline	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
2-sec-Butyl-4,6-dinitrophenol	0 / 8	ND	ND	ND	0.35	0.48	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 8	ND	ND	ND	0.69	0.97	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 8	ND	ND	ND	**1.8**	**2.5**	0.16	No	Constituent not detected.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
3-Methylcholanthrene	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 8	ND	ND	ND	1.8	2.5	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 8	ND	ND	ND	1.8	2.5	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 8	ND	ND	ND	0.35	0.48	6200	No	Constituent not detected.
4-Chloroaniline	0 / 8	ND	ND	ND	0.69	0.97	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
4-Nitroaniline	0 / 8	ND	ND	ND	1.8	2.5	86	No	Constituent not detected.
4-Nitrophenol	0 / 8	ND	ND	ND	1.8	2.5	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 8	ND	ND	ND	0.35	0.48	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 8	ND	ND	ND	0.35	0.48	3300	No	Constituent not detected.
Acenaphthylene	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
Acetophenone	0 / 8	ND	ND	ND	0.35	0.48	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 8	ND	ND	ND	71	98	NA	No	Constituent not detected.
Aniline	0 / 8	ND	ND	ND	0.69	0.97	300	No	Constituent not detected.
Anthracene	0 / 8	ND	ND	ND	0.35	0.48	17000	No	Constituent not detected.
Aramite, Total	0 / 8	ND	ND	ND	0.35	0.48	69	No	Constituent not detected.
Benzo[a]anthracene	2 / 8	0.04	0.043	OLF-5	0.36	0.48	2.1	No	Maximum detect below screening value.
Benzo[a]pyrene	2 / 8	0.034	0.045	OLF-5	**0.36**	**0.48**	0.21	No	Maximum detect below screening value.
Benzo[b]fluoranthene	2 / 8	0.067	0.069	OLF-5	0.36	0.48	2.1	No	Maximum detect below screening value.
Benzo[g,h,i]perylene	2 / 8	0.026	0.031	OLF-5	0.36	0.48	1700	No	Maximum detect below screening value.
Benzo[k]fluoranthene	2 / 8	0.029	0.032	OLF-8	0.36	0.48	21	No	Maximum detect below screening value.
Benzyl alcohol	0 / 8	ND	ND	ND	0.35	0.48	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 8	ND	ND	ND	0.35	0.48	180	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 8	ND	ND	ND	0.35	0.48	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 8	ND	ND	ND	0.35	0.48	120	No	Constituent not detected.
Butyl benzyl phthalate	0 / 8	ND	ND	ND	0.35	0.48	910	No	Constituent not detected.
Chrysene	3 / 8	0.024	0.071	OLF-8	0.37	0.48	210	No	Maximum detect below screening value.
Diallate	0 / 8	ND	ND	ND	0.35	0.48	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.21	No	Constituent not detected.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Dibenzofuran	0 / 8	ND	ND	ND	0.35	0.48	100	No	Constituent not detected.
Diethyl phthalate	0 / 8	ND	ND	ND	0.35	0.48	49000	No	Constituent not detected.
Dimethoate	0 / 8	ND	ND	ND	0.35	0.48	12	No	Constituent not detected.
Dimethyl phthalate	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 8	ND	ND	ND	0.35	0.48	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
Fluoranthene	3 / 8	0.024	0.17	OLF-5	0.37	0.48	2200	No	Maximum detect below screening value.
Fluorene	0 / 8	ND	ND	ND	0.35	0.48	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 8	ND	ND	ND	0.35	0.48	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 8	ND	ND	ND	0.35	0.48	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 8	ND	ND	ND	0.35	0.48	370	No	Constituent not detected.
Hexachloroethane	0 / 8	ND	ND	ND	0.35	0.48	120	No	Constituent not detected.
Hexachlorophene	0 / 8	ND	ND	ND	**180**	**250**	18	No	Constituent not detected.
Hexachloropropene	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 8	ND	ND	ND	0.35	0.48	2.1	No	Constituent not detected.
Isophorone	0 / 8	ND	ND	ND	0.35	0.48	1800	No	Constituent not detected.
Isosafrole	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 8	ND	ND	ND	0.35	0.48	6.2	No	Constituent not detected.
Methapyrilene	0 / 8	ND	ND	ND	71	98	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 8	ND	ND	ND	0.35	0.48	17	No	Constituent not detected.
Naphthalene	0 / 8	ND	ND	ND	0.35	0.48	18	No	Constituent not detected.
Nitrobenzene	0 / 8	ND	ND	ND	0.35	0.48	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.011	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 8	ND	ND	ND	0.35	**0.48**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 8	ND	ND	ND	0.35	0.48	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 8	ND	ND	ND	**0.35**	**0.48**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 8	ND	ND	ND	0.35	0.48	0.82	No	Constituent not detected.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
o,o',o''-Triethylphosphorothioate	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
o-Toluidine	0 / 8	ND	ND	ND	0.35	0.48	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 8	ND	ND	ND	0.35	**0.48**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 8	ND	ND	ND	0.35	0.48	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 8	ND	ND	ND	0.35	0.48	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 8	ND	ND	ND	1.8	2.5	9	No	Constituent not detected.
Phenacetin	0 / 8	ND	ND	ND	0.35	0.48	780	No	Constituent not detected.
Phenanthrene	2 / 8	0.025	0.13	OLF-5	0.36	0.48	17000	No	Maximum detect below screening value.
Phenol	0 / 8	ND	ND	ND	0.35	0.48	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 8	ND	ND	ND	1.8	2.5	12000	No	Constituent not detected.
Pronamide	0 / 8	ND	ND	ND	0.35	0.48	4600	No	Constituent not detected.
Pyrene	3 / 8	0.021	0.12	OLF-5	0.37	0.48	1700	No	Maximum detect below screening value.
Pyridine	0 / 8	ND	ND	ND	0.35	0.48	100	No	Constituent not detected.
Safrole, Total	0 / 8	ND	ND	ND	0.35	0.48	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
.gamma.-Sitosterol	1 / 1	0.37	0.37	OLF-6	--	--	NA	No	Screening value not available; see Table 3-2.
28-Norolean-17-en-3-one	1 / 1	1.5	1.5	OLF-1	**--**	**--**	0.57	**YES**	Maximum detect exceeds screening value.
2-Pentanone, 4-hydroxy-4-methyl-	2 / 2	15	19	OLF-1	**--**	**--**	5300	No	Maximum detect below screening value.
2-Pentanone, 4-methoxy-4-methyl-	8 / 8	0.26	0.4	OLF-6	**--**	**--**	5300	No	Maximum detect below screening value.
3-Penten-2-one, 4-methyl-	6 / 6	0.27	0.56	OLF-8	**--**	**--**	5300	No	Maximum detect below screening value.
4,5-Dimethylthiazole S-oxide	1 / 1	0.78	0.78	OLF-8	**--**	**--**	20	No	Maximum detect below screening value.
alpha-Pinene	1 / 1	0.74	0.74	OLF-1	--	--	NA	No	Screening value not available; see Table 3-2.
Benzene, 1-methyl-4-(1-methylethyl)-	1 / 1	0.21	0.21	OLF-1	**--**	**--**	5.4	No	Maximum detect below screening value.
Benzyl cinnamate	1 / 1	0.27	0.27	OLF-1	--	--	NA	No	Screening value not available; see Table 3-2.
Cholest-5-ene, 3-bromo-, (3.beta.)-	1 / 1	0.24	0.24	OLF-8	--	--	NA	No	Screening value not available; see Table 3-2.
Cholesterol	1 / 1	0.44	0.44	OLF-8	--	--	NA	No	Screening value not available; see Table 3-2.
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	1 / 1	0.19	0.19	OLF-3	--	--	NA	No	Screening value not available; see Table 3-2.
Methylene Chloride	2 / 2	0.21	0.29	OLF-8	**--**	**--**	53	No	Maximum detect below screening value.
Phenol, 2-(2-propenyl)-	1 / 1	0.7	0.7	OLF-1	**--**	**--**	18000	No	Maximum detect below screening value.
Propane, 2,2-dimethoxy-	2 / 2	1.2	1.8	OLF-1	**--**	**--**	0.069	**YES**	Maximum detect exceeds screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 8	ND	ND	ND	1	1.4	3.4	No	Constituent not detected.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 8	ND	ND	ND	1.1	1.5	310	No	Constituent not detected.
Diethylene glycol	0 / 8	ND	ND	ND	5.3	7.3	NA	No	Constituent not detected.
Dipropylene glycol	0 / 8	ND	ND	ND	5.3	7.3	NA	No	Constituent not detected.
Ethanol	0 / 8	ND	ND	ND	1.1	1.5	NA	No	Constituent not detected.
Ethylene glycol	0 / 8	ND	ND	ND	5.3	7.3	120000	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 8	ND	ND	ND	5.3	7.3	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 8	ND	ND	ND	5.3	7.3	NA	No	Constituent not detected.
Isopropanol	0 / 8	ND	ND	ND	1.1	1.5	4200000000	No	Constituent not detected.
Methanol	0 / 8	ND	ND	ND	1.1	1.5	31000	No	Constituent not detected.
Propylene glycol	0 / 8	ND	ND	ND	5.3	7.3	1200000	No	Constituent not detected.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics									
Aluminum	8 / 8	4100	17000	OLF-2	--	--	99000	No	Maximum detect below screening value.
Antimony	4 / 8	0.11	0.91	OLF-6	0.51	0.56	41	No	Maximum detect below screening value.
Arsenic	8 / 8	1.1	22	OLF-6	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	8 / 8	29	270	OLF-6	--	--	19000	No	Maximum detect below screening value.
Beryllium	8 / 8	0.26	4.1	OLF-6	--	--	200	No	Maximum detect below screening value.
Cadmium	5 / 8	0.036	0.25	OLF-6	0.1	0.11	80	No	Maximum detect below screening value.
Calcium	8 / 8	560	2700	OLF-6	--	--	NA	No	Screening value not available; see Table 3-2.
Chromium	8 / 8	9.7	31	OLF-2	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	8 / 8	2.2	14	OLF-6	--	--	30	No	Maximum detect below screening value.
Copper	8 / 8	7.2	110	OLF-6	--	--	4100	No	Maximum detect below screening value.
Iron	8 / 8	5600	32000	OLF-2	--	--	72000	No	Maximum detect below screening value.
Lead	13 / 13	13	99	OLF-4	--	--	800	No	Maximum detect below screening value.
Magnesium	8 / 8	350	1200	OLF-3	--	--	NA	No	Screening value not available; see Table 3-2.
Manganese	8 / 8	24	430	OLF-5	--	--	2300	No	Maximum detect below screening value.
Mercury	4 / 8	0.045	0.49	OLF-6	0.1	0.11	3.4	No	Maximum detect below screening value.
Nickel	8 / 8	4.5	28	OLF-6	--	--	2000	No	Maximum detect below screening value.
Potassium	8 / 8	240	630	OLF-6	--	--	NA	No	Screening value not available; see Table 3-2.
Selenium	8 / 8	0.13	1.8	OLF-6	--	--	510	No	Maximum detect below screening value.
Silver	8 / 8	0.035	0.25	OLF-6	--	--	510	No	Maximum detect below screening value.
Sodium	8 / 8	42	1200	OLF-3	--	--	NA	No	Screening value not available; see Table 3-2.
Thallium	5 / 8	0.16	0.89	OLF-6	0.19	0.21	NA	**YES**	Screening value not available; see Table 3-2.
Vanadium	8 / 8	13	69	OLF-2	--	--	520	No	Maximum detect below screening value.
Zinc	8 / 8	16	72	OLF-6	--	--	31000	No	Maximum detect below screening value.

TABLE 3-3
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Other Inorganics									
Chlorides	7 / 8	6.7	560	OLF-1	21	21	NA	No	Screening value not available; see Table 3-2.
Nitrates	2 / 8	5.6	16	OLF-6	5.1	6.1	160000	No	Maximum detect below screening value.
Nitrites	0 / 8	ND	ND	ND	1	1.5	10000	No	Constituent not detected.
Sulfate	7 / 8	11	800	OLF-4	100	100	NA	No	Screening value not available; see Table 3-2.
Nitrogen, Kjeldahl	8 / 8	260	3700	OLF-6	--	--	NA	No	Screening value not available; see Table 3-2.
Total Organic Carbon	8 / 8	2000	330000	OLF-6	--	--	NA	No	Screening value not available; see Table 3-2.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-4
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 9	ND	ND	ND	0.0054	0.058	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 9	ND	ND	ND	0.0054	0.058	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 9	ND	ND	ND	0.0054	0.058	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	2 / 9	0.001	0.001	SDB-1 B	0.0054	0.058	5.3	No	Maximum detect below screening value.
1,1-Dichloroethane	0 / 9	ND	ND	ND	0.0054	0.058	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 9	ND	ND	ND	0.0054	0.058	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 9	ND	ND	ND	0.0054	0.058	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 9	ND	ND	ND	0.011	**0.12**	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 9	ND	ND	ND	0.0054	0.058	0.17	No	Constituent not detected.
1,2-Dichloroethane	8 / 9	0.0047	0.014	SDB-6 B	0.0054	0.0054	2.2	No	Maximum detect below screening value.
trans-1,2-Dichloroethene	0 / 9	ND	ND	ND	0.0054	0.058	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 9	ND	ND	ND	0.0054	0.058	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 9	ND	ND	ND	0.0054	0.058	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 9	ND	ND	ND	0.0054	0.058	8.1	No	Constituent not detected.
2-Butanone (MEK)	7 / 9	0.0033	0.26	SDB-6 B	0.011	0.03	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 9	ND	ND	ND	0.011	0.12	140	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	3 / 9	0.006	0.068	SDB-6 B	0.011	0.03	5300	No	Maximum detect below screening value.
Acetone	9 / 9	0.029	2.3	SDB-6 B	--	--	63000	No	Maximum detect below screening value.
Acrylonitrile	0 / 9	ND	ND	ND	0.054	0.58	1.2	No	Constituent not detected.
Allyl chloride	0 / 9	ND	ND	ND	0.0054	0.058	3.4	No	Constituent not detected.
Benzene	0 / 9	ND	ND	ND	0.0054	0.058	5.4	No	Constituent not detected.
Bromodichloromethane	0 / 9	ND	ND	ND	0.0054	0.058	1.4	No	Constituent not detected.
Bromoform	0 / 9	ND	ND	ND	0.0054	0.058	220	No	Constituent not detected.
Bromomethane	0 / 9	ND	ND	ND	0.011	0.12	3.2	No	Constituent not detected.
Carbon disulfide	0 / 9	ND	ND	ND	0.0054	0.058	370	No	Constituent not detected.
Carbon tetrachloride	0 / 9	ND	ND	ND	0.0054	0.058	3	No	Constituent not detected.
Chlorobenzene	0 / 9	ND	ND	ND	0.0054	0.058	140	No	Constituent not detected.
Chloroethane	0 / 9	ND	ND	ND	0.011	0.12	6100	No	Constituent not detected.
Chloroform	0 / 9	ND	ND	ND	0.0054	0.058	1.5	No	Constituent not detected.
Chloromethane	0 / 9	ND	ND	ND	0.011	0.12	50	No	Constituent not detected.
Chloroprene	0 / 9	ND	ND	ND	0.0054	0.058	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 9	ND	ND	ND	0.0054	0.058	3.3	No	Constituent not detected.

TABLE 3-4
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Dibromomethane	0 / 9	ND	ND	ND	0.0054	0.058	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 9	ND	ND	ND	0.0054	0.058	78	No	Constituent not detected.
Ethyl methacrylate	0 / 9	ND	ND	ND	0.0054	0.058	9200	No	Constituent not detected.
Ethylbenzene	0 / 9	ND	ND	ND	0.0054	0.058	27	No	Constituent not detected.
Iodomethane	0 / 9	ND	ND	ND	0.0054	0.058	NA	No	Constituent not detected.
Methacrylonitrile	0 / 9	ND	ND	ND	0.022	0.23	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 9	ND	ND	ND	0.0054	0.058	2100	No	Constituent not detected.
Methylene Chloride	3 / 9	0.0011	0.01	SDB-6 B	0.0054	0.015	53	No	Maximum detect below screening value.
Styrene	0 / 9	ND	ND	ND	0.0054	0.058	3600	No	Constituent not detected.
Tetrachloroethene	0 / 9	ND	ND	ND	0.0054	0.058	2.6	No	Constituent not detected.
Toluene	3 / 9	0.007	0.017	SDB-6 B	0.0054	0.015	4500	No	Maximum detect below screening value.
trans-1,4-Dichloro-2-butene	0 / 9	ND	ND	ND	0.0054	**0.058**	0.035	No	Constituent not detected.
Trichloroethylene	0 / 9	ND	ND	ND	0.0054	0.3	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 9	ND	ND	ND	0.011	0.12	340	No	Constituent not detected.
Vinyl acetate	0 / 9	ND	ND	ND	0.011	0.12	410	No	Constituent not detected.
Vinyl chloride	0 / 9	ND	ND	ND	0.011	0.12	1.7	No	Constituent not detected.
Xylenes, Total	0 / 9	ND	ND	ND	0.0054	0.058	270	No	Constituent not detected.
Volatile Organics (TICs)									
4-Isopropyltoluene	1 / 1	0.021	0.021	SDB-8 B	--	--	1100	No	Maximum detect below screening value.
1,2,4-Trimethylbenzene	4 / 4	0.0018	0.025	SDB-6 B	--	--	26	No	Maximum detect below screening value.
3-Ethyltoluene	7 / 7	0.00055	0.0021	SDB-3 B	--	--	4500	No	Maximum detect below screening value.
Acetaldehyde	1 / 1	0.0073	0.0073	SDB-5 B	--	--	52	No	Maximum detect below screening value.
Butanal, 3-methyl-	1 / 1	0.0071	0.0071	SDB-1 B	--	--	34	No	Maximum detect below screening value.
Butanal, isomer	1 / 1	0.031	0.031	SDB-6 B	--	--	34	No	Maximum detect below screening value.
C10H16	1 / 1	0.071	0.071	SDB-8 B	--	--	260	No	Maximum detect below screening value.
Heptanal	4 / 4	0.0082	0.031	SDB-6 B	--	--	34	No	Maximum detect below screening value.
Hexanal	8 / 8	0.023	0.39	SDB-6 B	--	--	34	No	Maximum detect below screening value.
Hexane	6 / 6	0.001	0.041	SDB-6 B	--	--	260	No	Maximum detect below screening value.
Pentanal	5 / 5	0.016	0.12	SDB-6 B	--	--	34	No	Maximum detect below screening value.

TABLE 3-4
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 9	ND	ND	ND	0.39	4.2	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 9	ND	ND	ND	0.39	4.2	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 9	ND	ND	ND	0.39	4.2	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 9	ND	ND	ND	0.39	4.2	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 9	ND	ND	ND	0.39	4.2	12	No	Constituent not detected.
1,4-Naphthoquinone	0 / 9	ND	ND	ND	1.1	17	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 9	ND	ND	ND	0.39	4.2	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 9	ND	ND	ND	0.39	4.2	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 9	ND	ND	ND	0.39	4.2	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 9	ND	ND	ND	0.39	4.2	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 9	ND	ND	ND	0.39	4.2	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 9	ND	ND	ND	0.39	4.2	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 9	ND	ND	ND	1.1	16	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 9	ND	ND	ND	0.39	4.2	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 9	ND	ND	ND	0.39	4.2	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 9	ND	ND	ND	0.39	**4.2**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 9	ND	ND	ND	0.39	4.2	8200	No	Constituent not detected.
2-Chlorophenol	0 / 9	ND	ND	ND	0.39	4.2	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 9	ND	ND	ND	0.39	4.2	410	No	Constituent not detected.
2-Methylphenol	0 / 9	ND	ND	ND	0.39	4.2	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 9	ND	ND	ND	0.39	**4.2**	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 9	ND	ND	ND	1.1	16	600	No	Constituent not detected.
2-Nitrophenol	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
2-Picoline	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
2-sec-Butyl-4,6-dinitrophenol	0 / 9	ND	ND	ND	0.79	6.8	62	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 9	ND	ND	ND	1.1	**17**	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 9	ND	ND	ND	**1.1**	**17**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 9	ND	ND	ND	**0.39**	**4.2**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 9	ND	ND	ND	1.1	16	NA	No	Constituent not detected.

TABLE 3-4
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
4,6-Dinitro-2-methylphenol	0 / 9	ND	ND	ND	1.1	**16**	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 9	ND	ND	ND	**2**	**17**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 9	ND	ND	ND	0.39	4.2	6200	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
4-Nitroaniline	0 / 9	ND	ND	ND	1.1	16	86	No	Constituent not detected.
4-Nitrophenol	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
4-Nitroquinoline-1-oxide	0 / 9	ND	ND	ND	1.1	17	NF	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 9	ND	ND	ND	0.39	4.2	52	No	Constituent not detected.
Acenaphthene	0 / 9	ND	ND	ND	0.39	4.2	3300	No	Constituent not detected.
Acenaphthylene	0 / 9	ND	ND	ND	0.39	4.2	NA	No	Constituent not detected.
Acetophenone	0 / 9	ND	ND	ND	0.39	4.2	10000	No	Constituent not detected.
Aniline	0 / 9	ND	ND	ND	0.39	4.2	300	No	Constituent not detected.
Anthracene	0 / 9	ND	ND	ND	0.39	4.2	17000	No	Constituent not detected.
Aramite, Total	0 / 9	ND	ND	ND	0.39	4.2	69	No	Constituent not detected.
Benzo[a]anthracene	1 / 9	0.17	0.17	SDB-1 B	0.39	**3.4**	2.1	No	Maximum detect below screening value.
Benzo[a]pyrene	2 / 9	0.044	0.14	SDB-1 B	**0.39**	**3.4**	0.21	No	Maximum detect below screening value.
Benzo[b]fluoranthene	2 / 9	0.053	0.21	SDB-1 B	0.39	**3.4**	2.1	No	Maximum detect below screening value.
Benzo[g,h,i]perylene	0 / 9	ND	ND	ND	0.39	4.2	1700	No	Constituent not detected.
Benzo[k]fluoranthene	2 / 9	0.055	0.18	SDB-1 B	0.39	3.4	21	No	Maximum detect below screening value.
Benzyl alcohol	0 / 9	ND	ND	ND	0.39	3.4	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 9	ND	ND	ND	0.39	3.4	180	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 9	ND	ND	ND	0.39	**3.4**	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	1 / 9	0.2	0.2	SDB-7 B	0.39	3.4	120	No	Maximum detect below screening value.
Butyl benzyl phthalate	0 / 9	ND	ND	ND	0.39	3.4	910	No	Constituent not detected.
Chrysene	2 / 9	0.064	0.4	SDB-1 B	0.39	3.4	210	No	Maximum detect below screening value.
Dibenz(a,h)anthracene	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 9	ND	ND	ND	0.39	3.4	100	No	Constituent not detected.
Diethyl phthalate	0 / 9	ND	ND	ND	0.39	3.4	49000	No	Constituent not detected.
Dimethyl phthalate	0 / 9	ND	ND	ND	0.39	3.4	NA	No	Constituent not detected.
Di-n-octyl phthalate	0 / 9	ND	ND	ND	0.39	3.4	NA	No	Constituent not detected.
Fluoranthene	2 / 9	0.067	0.12	SDB-1 B	0.39	3.4	2200	No	Maximum detect below screening value.

TABLE 3-4
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Fluorene	0 / 9	ND	ND	ND	0.39	3.4	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 9	ND	ND	ND	0.39	**3.4**	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 9	ND	ND	ND	0.39	3.4	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 9	ND	ND	ND	0.39	3.4	370	No	Constituent not detected.
Hexachloroethane	0 / 9	ND	ND	ND	0.39	3.4	120	No	Constituent not detected.
Hexachloropropene	0 / 9	ND	ND	ND	0.39	3.4	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 9	ND	ND	ND	0.39	**3.4**	2.1	No	Constituent not detected.
Isophorone	0 / 9	ND	ND	ND	0.39	3.4	1800	No	Constituent not detected.
Isosafrole	0 / 9	ND	ND	ND	0.39	3.4	NA	No	Constituent not detected.
Methapyrilene	0 / 9	ND	ND	ND	1.1	17	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 9	ND	ND	ND	0.39	3.4	17	No	Constituent not detected.
Naphthalene	0 / 9	ND	ND	ND	0.39	3.4	18	No	Constituent not detected.
Nitrobenzene	0 / 9	ND	ND	ND	0.39	3.4	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.011	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 9	ND	ND	ND	0.39	**3.4**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 9	ND	ND	ND	0.39	3.4	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 9	ND	ND	ND	0.39	**3.4**	0.82	No	Constituent not detected.
o-Toluidine	0 / 9	ND	ND	ND	0.39	3.4	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 9	ND	ND	ND	**0.39**	**3.4**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 9	ND	ND	ND	0.39	3.4	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 9	ND	ND	ND	0.39	3.4	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 9	ND	ND	ND	1.1	**16**	9	No	Constituent not detected.
Phenacetin	0 / 9	ND	ND	ND	0.39	3.4	780	No	Constituent not detected.
Phenanthrene	0 / 9	ND	ND	ND	0.39	3.4	17000	No	Constituent not detected.
Phenol	0 / 9	ND	ND	ND	0.39	3.4	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 9	ND	ND	ND	1.1	34	12000	No	Constituent not detected.
Pronamide	0 / 9	ND	ND	ND	0.39	3.4	4600	No	Constituent not detected.
Pyrene	1 / 9	0.059	0.059	SDB-5 B	0.39	3.4	1700	No	Maximum detect below screening value.

TABLE 3-4
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Pyridine	0 / 9	ND	ND	ND	0.39	3.4	100	No	Constituent not detected.
Safrole, Total	0 / 9	ND	ND	ND	0.39	3.4	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
.gamma.-Sitosterol	1 / 1	0.34	0.34	SDB-4	--	--	NA	No	Screening value not available; see Table 3-2.
Nonadecane	1 / 1	0.2	0.2	SDB-4	**--**	**--**	260	No	Maximum detect below screening value.
Alcohols and Glycols									
2-Butoxyethanol	0 / 9	ND	ND	ND	5.8	6.9	6200	No	Constituent not detected.
Allyl alcohol	0 / 9	ND	ND	ND	1.2	1.4	310	No	Constituent not detected.
Diethylene glycol	0 / 9	ND	ND	ND	5.8	6.9	NA	No	Constituent not detected.
Dipropylene glycol	0 / 9	ND	ND	ND	5.8	6.9	NA	No	Constituent not detected.
Ethanol	0 / 9	ND	ND	ND	1.2	1.4	NA	No	Constituent not detected.
Ethylene glycol	0 / 9	ND	ND	ND	5.8	6.9	120000	No	Constituent not detected.
Isopropanol	0 / 9	ND	ND	ND	1.2	1.4	4200000000	No	Constituent not detected.
Methanol	0 / 9	ND	ND	ND	1.2	1.4	31000	No	Constituent not detected.
Propyl cellosolve	0 / 9	ND	ND	ND	5.8	6.9	NA	No	Constituent not detected.
Propylene glycol	0 / 9	ND	ND	ND	5.8	6.9	1200000	No	Constituent not detected.
tert-Butyl alcohol	0 / 9	ND	ND	ND	1.2	1.4	NA	No	Constituent not detected.

TABLE 3-4
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics									
Aluminum	9 / 9	10200	37700	SDB-3 B	--	--	99000	No	Maximum detect below screening value.
Antimony	0 / 9	ND	ND	ND	1.2	5.1	41	No	Constituent not detected.
Arsenic	9 / 9	1.1	3.8	SDB-4 B	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	9 / 9	31.5	62.8	SDB-3 B	--	--	19000	No	Maximum detect below screening value.
Beryllium	9 / 9	0.36	0.91	SDB-3 B	--	--	200	No	Maximum detect below screening value.
Cadmium	2 / 9	0.14	0.14	SDB-3 B	0.59	2.6	80	No	Maximum detect below screening value.
Calcium	9 / 9	727	2570	SDB-4 B	--	--	NA	No	Screening value not available; see Table 3-2.
Chromium	9 / 9	10.5	52.2	SDB-3 B	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	9 / 9	2.6	7.1	SDB-3 B	--	--	30	No	Maximum detect below screening value.
Copper	9 / 9	7.8	23.3	SDB-6 B	--	--	4100	No	Maximum detect below screening value.
Iron	9 / 9	7640	28600	SDB-3 B	--	--	72000	No	Maximum detect below screening value.
Lead	9 / 9	13.5	48.7	SDB-5 B	--	--	800	No	Maximum detect below screening value.
Magnesium	9 / 9	721	1570	SDB-4 B	--	--	NA	No	Screening value not available; see Table 3-2.
Manganese	9 / 9	26.3	299	SDB-5 B	--	--	2300	No	Maximum detect below screening value.
Mercury	9 / 9	0.025	0.14	SDB-3 B	--	--	3.4	No	Maximum detect below screening value.
Nickel	9 / 9	4.8	15	SDB-3 B	--	--	2000	No	Maximum detect below screening value.
Potassium	9 / 9	385	912	SDB-6 B	--	--	NA	No	Screening value not available; see Table 3-2.
Selenium	1 / 9	0.81	0.81	SDB-8 B	0.59	2.6	510	No	Maximum detect below screening value.
Silver	0 / 9	ND	ND	ND	1.2	5.1	510	No	Constituent not detected.
Sodium	2 / 9	58.3	58.6	SDB-7 B	591	2560	NA	No	Screening value not available; see Table 3-2.
Thallium	0 / 9	ND	ND	ND	1.2	5.1	NA	No	Constituent not detected.
Vanadium	9 / 9	18.3	76.4	SDB-3 B	--	--	520	No	Maximum detect below screening value.
Zinc	9 / 9	29.4	141	SDB-3 B	--	--	31000	No	Maximum detect below screening value.
Other Inorganics									
Chlorides	9 / 9	6.2	104	SDB-6 B	--	--	NA	No	Screening value not available; see Table 3-2.
Nitrates	9 / 9	2.6	40.3	SDB-2 B	--	--	160000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 9	ND	ND	ND	0.024	0.054	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 9	ND	ND	ND	0.024	0.054	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 9	ND	ND	ND	0.024	0.054	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 9	ND	ND	ND	0.024	0.054	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 9	ND	ND	ND	0.024	0.054	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 9	ND	ND	ND	0.024	0.054	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 8	ND	ND	ND	0.024	0.054	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 9	ND	ND	ND	0.049	**0.11**	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 9	ND	ND	ND	0.024	0.054	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 9	ND	ND	ND	0.024	0.054	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 9	ND	ND	ND	0.024	0.054	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 9	ND	ND	ND	0.024	0.054	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 9	ND	ND	ND	0.024	0.054	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 9	ND	ND	ND	0.024	0.054	8.1	No	Constituent not detected.
2-Butanone (MEK)	9 / 9	0.27	0.91	VFSP-8 B	--	--	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 9	ND	ND	ND	0.049	0.11	140	No	Constituent not detected.
2-Methyl-1-propanol (Isobutyl Alcohol)	0 / 1	ND	ND	ND	1.5	1.5	31000	No	Constituent not detected.
3-Methylhexane	0 / 9	ND	ND	ND	0.024	0.054	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 9	ND	ND	ND	0.049	0.11	5300	No	Constituent not detected.
Acetone	9 / 9	0.93	2.85	VFSP-1 B	--	--	63000	No	Maximum detect below screening value.
Acrylonitrile	0 / 9	ND	ND	ND	0.24	0.54	1.2	No	Constituent not detected.
Allyl chloride	0 / 9	ND	ND	ND	0.024	0.054	3.4	No	Constituent not detected.
Benzene	0 / 9	ND	ND	ND	0.024	0.054	5.4	No	Constituent not detected.
Benzyl chloride	0 / 9	ND	ND	ND	0.024	0.054	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 9	ND	ND	ND	0.024	0.054	1.4	No	Constituent not detected.
Bromoform	0 / 9	ND	ND	ND	0.024	0.054	220	No	Constituent not detected.
Bromomethane	0 / 9	ND	ND	ND	0.049	0.11	3.2	No	Constituent not detected.
Carbon disulfide	5 / 9	0.01	0.031	VFSP-8 B	0.032	0.054	370	No	Maximum detect below screening value.
Carbon tetrachloride	0 / 9	ND	ND	ND	0.024	0.054	3	No	Constituent not detected.
Chlorobenzene	0 / 9	ND	ND	ND	0.024	0.054	140	No	Constituent not detected.
Chloroethane	0 / 9	ND	ND	ND	0.049	0.11	6100	No	Constituent not detected.
Chloroform	0 / 9	ND	ND	ND	0.024	0.054	1.5	No	Constituent not detected.
Chloromethane	0 / 9	ND	ND	ND	0.049	0.11	50	No	Constituent not detected.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Dibromochloromethane	0 / 9	ND	ND	ND	0.024	0.054	3.3	No	Constituent not detected.
Dibromomethane	0 / 9	ND	ND	ND	0.024	0.054	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 9	ND	ND	ND	0.024	0.054	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 9	ND	ND	ND	0.024	0.054	NA	No	Constituent not detected.
Ethyl methacrylate	0 / 9	ND	ND	ND	0.024	0.054	9200	No	Constituent not detected.
Ethylbenzene	0 / 9	ND	ND	ND	0.024	0.054	27	No	Constituent not detected.
Iodomethane	0 / 9	ND	ND	ND	0.024	0.054	NA	No	Constituent not detected.
Methacrylonitrile	0 / 9	ND	ND	ND	0.098	0.22	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 9	ND	ND	ND	0.024	0.054	2100	No	Constituent not detected.
Methylene Chloride	0 / 9	ND	ND	ND	0.024	0.054	53	No	Constituent not detected.
n-Heptane	0 / 9	ND	ND	ND	0.024	0.054	NA	No	Constituent not detected.
Styrene	0 / 9	ND	ND	ND	0.024	0.054	3600	No	Constituent not detected.
Tetrachloroethene	0 / 9	ND	ND	ND	0.024	0.054	2.6	No	Constituent not detected.
Toluene	0 / 9	ND	ND	ND	0.024	0.054	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 9	ND	ND	ND	0.024	**0.054**	0.035	No	Constituent not detected.
Trichloroethylene	0 / 9	ND	ND	ND	0.024	0.054	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 9	ND	ND	ND	0.032	0.11	340	No	Constituent not detected.
Vinyl acetate	0 / 9	ND	ND	ND	0.049	0.11	410	No	Constituent not detected.
Vinyl chloride	0 / 9	ND	ND	ND	0.049	0.11	1.7	No	Constituent not detected.
Xylenes, Total	0 / 9	ND	ND	ND	0.024	0.054	270	No	Constituent not detected.
Volatile Organics (TICs)									
1,3,5-Trimethylbenzene	9 / 9	0.014	0.033	VFSP-8 B	--	--	1000	No	Maximum detect below screening value.
1,3-Dichlorobenzene	6 / 6	0.013	0.1	VFSP-8 B	--	--	12	No	Maximum detect below screening value.
1,4-Dichlorobenzene	3 / 3	0.0067	0.016	VFSP-7 B	--	--	12	No	Maximum detect below screening value.
Hexane	5 / 5	0.0028	0.0081	VFSP-8 B	--	--	260	No	Maximum detect below screening value.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 9	ND	ND	ND	3.6	**90**	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 9	ND	ND	ND	3.6	90	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 9	ND	ND	ND	3.6	90	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 9	ND	ND	ND	3.6	90	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 9	ND	ND	ND	3.6	**90**	12	No	Constituent not detected.
1,4-Naphthoquinone	0 / 9	ND	ND	ND	18	460	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 9	ND	ND	ND	3.6	**90**	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 9	ND	ND	ND	3.6	90	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 9	ND	ND	ND	3.6	90	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 9	ND	ND	ND	3.6	90	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 9	ND	ND	ND	3.6	90	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 9	ND	ND	ND	3.6	90	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 9	ND	ND	ND	18	**440**	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 9	ND	ND	ND	3.6	**90**	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 9	ND	ND	ND	3.6	**90**	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 9	ND	ND	ND	**3.6**	**90**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 9	ND	ND	ND	3.6	90	8200	No	Constituent not detected.
2-Chlorophenol	0 / 9	ND	ND	ND	3.6	90	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 9	ND	ND	ND	3.6	90	410	No	Constituent not detected.
2-Methylphenol	0 / 9	ND	ND	ND	3.6	90	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 9	ND	ND	ND	**3.6**	**90**	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 9	ND	ND	ND	18	440	600	No	Constituent not detected.
2-Nitrophenol	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
2-Picoline	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
2-sec-Butyl-4,6-dinitrophenol	0 / 9	ND	ND	ND	7.4	**180**	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 9	ND	ND	ND	**18**	**460**	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 9	ND	ND	ND	**18**	**460**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 9	ND	ND	ND	**3.6**	**90**	0.078	No	Constituent not detected.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
3-Nitroaniline	0 / 9	ND	ND	ND	18	440	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 9	ND	ND	ND	**18**	**440**	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 9	ND	ND	ND	**18**	**460**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 9	ND	ND	ND	3.6	90	6200	No	Constituent not detected.
4-Chloroaniline	0 / 5	ND	ND	ND	**22**	**90**	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
4-Nitroaniline	0 / 9	ND	ND	ND	18	**440**	86	No	Constituent not detected.
4-Nitrophenol	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
4-Nitroquinoline-1-oxide	0 / 9	ND	ND	ND	18	460	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 9	ND	ND	ND	3.6	**90**	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 9	ND	ND	ND	**3.6**	**90**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 9	ND	ND	ND	3.6	90	3300	No	Constituent not detected.
Acenaphthylene	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
Acetophenone	0 / 9	ND	ND	ND	3.6	90	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 9	ND	ND	ND	36	900	NA	No	Constituent not detected.
Aniline	0 / 9	ND	ND	ND	3.6	90	300	No	Constituent not detected.
Anthracene	0 / 9	ND	ND	ND	3.6	90	17000	No	Constituent not detected.
Aramite, Total	0 / 9	ND	ND	ND	3.6	**90**	69	No	Constituent not detected.
Benzo[a]anthracene	0 / 9	ND	ND	ND	**3.6**	**90**	2.1	No	Constituent not detected.
Benzo[a]pyrene	0 / 9	ND	ND	ND	**3.6**	**90**	0.21	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 9	ND	ND	ND	**3.6**	**90**	2.1	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 9	ND	ND	ND	3.6	90	1700	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 9	ND	ND	ND	3.6	**90**	21	No	Constituent not detected.
Benzyl alcohol	0 / 9	ND	ND	ND	3.6	90	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 9	ND	ND	ND	3.6	90	180	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 9	ND	ND	ND	**3.6**	**90**	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	1 / 9	4.4	4.4	VFSP-9 B	3.6	90	120	No	Maximum detect below screening value.
Butyl benzyl phthalate	0 / 9	ND	ND	ND	3.6	90	910	No	Constituent not detected.
Chrysene	0 / 9	ND	ND	ND	3.6	90	210	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 9	ND	ND	ND	**3.6**	**90**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 9	ND	ND	ND	3.6	90	100	No	Constituent not detected.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Diethyl phthalate	0 / 9	ND	ND	ND	3.6	90	49000	No	Constituent not detected.
Dimethyl phthalate	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 9	ND	ND	ND	3.6	90	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
Fluoranthene	0 / 9	ND	ND	ND	3.6	90	2200	No	Constituent not detected.
Fluorene	0 / 9	ND	ND	ND	3.6	90	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 9	ND	ND	ND	**3.6**	**90**	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 9	ND	ND	ND	3.6	**90**	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 9	ND	ND	ND	3.6	90	370	No	Constituent not detected.
Hexachloroethane	0 / 9	ND	ND	ND	3.6	90	120	No	Constituent not detected.
Hexachloropropene	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 9	ND	ND	ND	**3.6**	**90**	2.1	No	Constituent not detected.
Isophorone	0 / 9	ND	ND	ND	3.6	90	1800	No	Constituent not detected.
Isosafrole	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 9	ND	ND	ND	3.6	**90**	6.2	No	Constituent not detected.
Methapyrilene	0 / 9	ND	ND	ND	18	460	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 9	ND	ND	ND	3.6	**90**	17	No	Constituent not detected.
Naphthalene	0 / 9	ND	ND	ND	3.6	**90**	18	No	Constituent not detected.
Nitrobenzene	0 / 9	ND	ND	ND	3.6	**90**	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 9	ND	ND	ND	**3.6**	**90**	0.011	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 9	ND	ND	ND	**3.6**	**90**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 9	ND	ND	ND	**3.6**	**90**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 9	ND	ND	ND	**3.6**	**90**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 9	ND	ND	ND	3.6	90	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 9	ND	ND	ND	**3.6**	**90**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 9	ND	ND	ND	**3.6**	**90**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 9	ND	ND	ND	**3.6**	**90**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 9	ND	ND	ND	**3.6**	**90**	0.82	No	Constituent not detected.
o-Toluidine	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 9	ND	ND	ND	**3.6**	**90**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 8	ND	ND	ND	3.6	40	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 9	ND	ND	ND	3.6	**90**	6.6	No	Constituent not detected.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Pentachlorophenol	0 / 9	ND	ND	ND	**18**	**440**	9	No	Constituent not detected.
Phenacetin	0 / 9	ND	ND	ND	3.6	90	780	No	Constituent not detected.
Phenanthrene	0 / 9	ND	ND	ND	3.6	90	NA	No	Constituent not detected.
Phenol	0 / 9	ND	ND	ND	3.6	90	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 9	ND	ND	ND	36	900	12000	No	Constituent not detected.
Pronamide	0 / 9	ND	ND	ND	3.6	90	4600	No	Constituent not detected.
Pyrene	0 / 9	ND	ND	ND	3.6	90	1700	No	Constituent not detected.
Pyridine	0 / 9	ND	ND	ND	3.6	90	100	No	Constituent not detected.
Safrole, Total	0 / 9	ND	ND	ND	3.6	**90**	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
Ergostanol	5 / 5	7.2	36	VFSP-7	--	--	NA	No	Screening value not available; see Table 3-2.
.gamma.-Sitosterol	7 / 7	6.4	32	VFSP-3	--	--	NA	No	Screening value not available; see Table 3-2.
.alpha.-Amyrin	6 / 6	5.8	26	VFSP-7	--	--	NA	No	Screening value not available; see Table 3-2.
1-Docosanethiol	1 / 1	11	11	VFSP-3	**--**	**--**	370	No	Maximum detect below screening value.
1-Dotriacontanol	1 / 1	9.5	9.5	VFSP-4	**--**	**--**	6200	No	Maximum detect below screening value.
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	4 / 4	3	31	VFSP-8	**--**	**--**	100	No	Maximum detect below screening value.
Benzo[b]naphtho[2,3-d]furan	1 / 1	13	13	VFSP-3	**--**	**--**	100	No	Maximum detect below screening value.
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2 / 2	9.5	12	VFSP-7	--	--	NA	No	Screening value not available; see Table 3-2.
Cyclooctacosane	1 / 1	1.9	1.9	VFSP-9	**--**	**--**	2900	No	Maximum detect below screening value.
Ergost-5-en-3-ol, (3.beta.)-	1 / 1	4.2	4.2	VFSP-4	--	--	NA	No	Screening value not available; see Table 3-2.
Pentacosane	1 / 1	6.4	6.4	VFSP-8	**--**	**--**	260	No	Maximum detect below screening value.
Pentatriacontane	1 / 1	5.3	5.3	VFSP-8	**--**	**--**	260	No	Maximum detect below screening value.
Stigmasterol	1 / 1	8.1	8.1	VFSP-3	--	--	NA	No	Screening value not available; see Table 3-2.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Alcohols and Glycols									
2-Butoxyethanol	0 / 9	ND	ND	ND	7.7	67	6200	No	Constituent not detected.
Allyl alcohol	0 / 9	ND	ND	ND	1.5	13	310	No	Constituent not detected.
Diethylene glycol	0 / 9	ND	ND	ND	7.7	67	NA	No	Constituent not detected.
Dipropylene glycol	0 / 9	ND	ND	ND	7.7	67	NA	No	Constituent not detected.
Ethanol	0 / 9	ND	ND	ND	1.5	13	NA	No	Constituent not detected.
Ethylene glycol	0 / 9	ND	ND	ND	7.7	67	120000	No	Constituent not detected.
Isopropanol	0 / 9	ND	ND	ND	1.5	13	4200000000	No	Constituent not detected.
Methanol	0 / 9	ND	ND	ND	1.5	13	31000	No	Constituent not detected.
Propyl cellosolve	0 / 9	ND	ND	ND	7.7	67	NA	No	Constituent not detected.
Propylene glycol	0 / 9	ND	ND	ND	7.7	67	1200000	No	Constituent not detected.
tert-Butyl alcohol	0 / 9	ND	ND	ND	1.5	13	NA	No	Constituent not detected.
Inorganics									
Aluminum	9 / 9	3070	21100	VFSP-4 B	--	--	99000	No	Maximum detect below screening value.
Antimony	1 / 9	3.2	3.2	VFSP-1 B	4.9	11	41	No	Maximum detect below screening value.
Arsenic	9 / 9	3.3	9.1	VFSP-5 B	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	9 / 9	20.6	196	VFSP-3 B	--	--	19000	No	Maximum detect below screening value.
Beryllium	6 / 9	0.52	2	VFSP-3 B	2.8	4.5	200	No	Maximum detect below screening value.
Cadmium	9 / 9	2.7	5.9	VFSP-3 B	--	--	80	No	Maximum detect below screening value.
Calcium	9 / 9	3680	8570	VFSP-3 B	--	--	NA	No	Screening value not available; see Table 3-2.
Chromium	9 / 9	86.7	205	VFSP-4 B	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	9 / 9	3.3	25.6	VFSP-4 B	--	--	30	No	Maximum detect below screening value.
Copper	9 / 9	139	292	VFSP-4 B	--	--	4100	No	Maximum detect below screening value.
Iron	9 / 9	38200	112650	VFSP-1 B	--	--	72000	**YES**	Maximum detect exceeds screening value.
Lead	9 / 9	77.7	163	VFSP-1 B	--	--	800	No	Maximum detect below screening value.
Magnesium	9 / 9	1200	1870	VFSP-3 B	--	--	NA	No	Screening value not available; see Table 3-2.
Manganese	9 / 9	211	539	VFSP-8 B	--	--	2300	No	Maximum detect below screening value.
Mercury	9 / 9	0.25	0.65	VFSP-8 B	--	--	3.4	No	Maximum detect below screening value.

TABLE 3-5
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Soil Concentration (mg/kg)	Maximum Detected Soil Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Soil Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics (continued)									
Nickel	9 / 9	35	111	VFSP-4 B	**--**	**--**	2000	No	Maximum detect below screening value.
Potassium	9 / 9	152	1060	VFSP-3 B	--	--	NA	No	Screening value not available; see Table 3-2.
Selenium	4 / 9	2.1	3.05	VFSP-1 B	3.3	5.5	510	No	Maximum detect below screening value.
Silver	0 / 9	ND	ND	ND	4.9	11	510	No	Constituent not detected.
Sodium	0 / 9	ND	ND	ND	2440	5480	NA	No	Constituent not detected.
Thallium	0 / 9	ND	ND	ND	4.9	11	NA	No	Constituent not detected.
Vanadium	9 / 9	19.5	104	VFSP-3 B	**--**	**--**	520	No	Maximum detect below screening value.
Zinc	9 / 9	2510	11200	VFSP-4 B	**--**	**--**	31000	No	Maximum detect below screening value.
Other Inorganics									
Chlorides	9 / 9	32.4	105	VFSP-3 B	--	--	NA	No	Screening value not available; see Table 3-2.
Nitrates	7 / 9	8.7	15.8	VFSP-8 B	32.7	54.8	160000	No	Maximum detect below screening value.
Sulfate	9 / 9	4420	12300	VFSP-3 B	--	--	NA	No	Screening value not available; see Table 3-2.
Nitrogen, Kjeldahl	9 / 9	18500	38200	VFSP-5 B	--	--	NA	No	Screening value not available; see Table 3-2.
Total Organic Carbon	9 / 9	32900	387000	VFSP-3 B	--	--	NA	No	Screening value not available; see Table 3-2.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 35	ND	ND	ND	**1**	**100**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 35	ND	ND	ND	1	100	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	1 / 35	0.96	0.96	MW-10	**1**	**100**	0.067	**YES**	Maximum detect exceeds screening value.
1,1,2-Trichloroethane	0 / 35	ND	ND	ND	**1**	**100**	0.24	No	Constituent not detected.
1,1-Dichloroethane	2 / 35	1.1	2.5	MW-10	1	**100**	2.4	**YES**	Maximum detect exceeds screening value.
1,1-Dichloroethene	2 / 35	0.99	2.5	MW-10	1	**100**	34	No	Maximum detect below screening value.
1,2,3-Trichloropropane	0 / 35	ND	ND	ND	**1**	**100**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 35	ND	ND	ND	**1**	**100**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 35	ND	ND	ND	**1**	**100**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 35	ND	ND	ND	**1**	**100**	0.15	No	Constituent not detected.
trans-1,2-Dichloroethene	1 / 35	2.8	2.8	MW-10	1	**100**	11	No	Maximum detect below screening value.
1,2-Dichloropropane	0 / 35	ND	ND	ND	**1**	**100**	0.39	No	Constituent not detected.
cis-1,3-Dichloropropene [2]	0 / 35	ND	ND	ND	**1**	**100**	0.43	No	Constituent not detected.
trans-1,3-Dichloropropene [2]	0 / 35	ND	ND	ND	**1**	**100**	0.43	No	Constituent not detected.
2-Butanone (MEK)	0 / 35	ND	ND	ND	10	**1000**	710	No	Constituent not detected.
2-Hexanone	0 / 35	ND	ND	ND	**10**	**1000**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 35	ND	ND	ND	1	100	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 35	ND	ND	ND	10	**1000**	200	No	Constituent not detected.
Acetone	4 / 35	5.9	57.5	NAT-3	25	**2500**	2200	No	Maximum detect below screening value.
Acetonitrile	0 / 35	ND	ND	ND	**40**	**4000**	13	No	Constituent not detected.
Acrolein	0 / 35	ND	ND	ND	**20**	**2000**	0.0042	No	Constituent not detected.
Acrylonitrile	0 / 35	ND	ND	ND	**20**	**2000**	0.045	No	Constituent not detected.
Allyl chloride	0 / 35	ND	ND	ND	**1**	**100**	0.65	No	Constituent not detected.
Benzene	0 / 35	ND	ND	ND	**1**	**100**	0.41	No	Constituent not detected.
Benzyl chloride	0 / 35	ND	ND	ND	**1**	**100**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 35	ND	ND	ND	**1**	**100**	0.12	No	Constituent not detected.
Bromoform	0 / 35	ND	ND	ND	1	**100**	8.5	No	Constituent not detected.
Bromomethane	0 / 35	ND	ND	ND	**1**	**100**	0.87	No	Constituent not detected.
Carbon disulfide	1 / 35	0.54	0.54	VFSP-MW1	2	**200**	100	No	Maximum detect below screening value.
Carbon tetrachloride	0 / 35	ND	ND	ND	**1**	**100**	0.44	No	Constituent not detected.
Chlorobenzene	0 / 35	ND	ND	ND	1	**100**	9.1	No	Constituent not detected.
Chloroethane	0 / 35	ND	ND	ND	1	100	2100	No	Constituent not detected.
Chloroform	1 / 35	0.65	0.65	MW-10	**1**	**100**	0.19	**YES**	Maximum detect exceeds screening value.
Chloromethane	0 / 35	ND	ND	ND	1	**100**	19	No	Constituent not detected.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chloroprene	0 / 35	ND	ND	ND	1	**100**	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 35	ND	ND	ND	**1**	**100**	0.15	No	Constituent not detected.
Dibromomethane	0 / 35	ND	ND	ND	**1**	**100**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 35	ND	ND	ND	1	**100**	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 35	ND	ND	ND	1	100	NA	No	Constituent not detected.
Diethyl ether	27 / 35	0.495	11000	MW-2	10	10	730	**YES**	Maximum detect exceeds screening value.
Ethyl methacrylate	0 / 35	ND	ND	ND	1	100	330	No	Constituent not detected.
Ethylbenzene	0 / 35	ND	ND	ND	1	**100**	1.5	No	Constituent not detected.
Ethylene oxide	0 / 23	ND	ND	ND	**200**	**20000**	0.044	No	Constituent not detected.
Iodomethane	0 / 35	ND	ND	ND	5	500	NA	No	Constituent not detected.
Methacrylonitrile	0 / 35	ND	ND	ND	**20**	**2000**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 35	ND	ND	ND	1	100	140	No	Constituent not detected.
Methylene Chloride	0 / 35	ND	ND	ND	**5**	**500**	4.8	No	Constituent not detected.
n-Heptane	0 / 35	ND	ND	ND	1	100	NA	No	Constituent not detected.
Pentachloroethane	0 / 35	ND	ND	ND	**5**	**500**	0.75	No	Constituent not detected.
Propionitrile	0 / 35	ND	ND	ND	20	2000	NA	No	Constituent not detected.
Propylene oxide	0 / 35	ND	ND	ND	**200**	**20000**	0.23	No	Constituent not detected.
Styrene	0 / 35	ND	ND	ND	1	100	160	No	Constituent not detected.
t-Butanol [3]	24 / 35	3	92000	NAT-3	5	250	370	**YES**	Maximum detect exceeds screening value.
Tetrachloroethene	1 / 35	22	22	MW-10	**1**	**100**	0.11	**YES**	Maximum detect exceeds screening value.
Toluene	0 / 35	ND	ND	ND	1	100	230	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 35	ND	ND	ND	**2**	**200**	0.0012	No	Constituent not detected.
Trichloroethylene	3 / 35	0.6	8.4	NAT-1	1	**100**	2	**YES**	Maximum detect exceeds screening value.
Trichlorofluoromethane	0 / 35	ND	ND	ND	1	100	130	No	Constituent not detected.
Vinyl acetate	0 / 35	ND	ND	ND	2	**200**	41	No	Constituent not detected.
Vinyl chloride	0 / 35	ND	ND	ND	**1**	**100**	0.016	No	Constituent not detected.
Xylenes, Total	0 / 35	ND	ND	ND	2	**200**	20	No	Constituent not detected.
Volatile Organics (TICs)									
1,2-Dichloroethene, Total	1 / 1	3.5	3.5	MW-10	**--**	**--**	33	No	Maximum detect below screening value.
Carbon Dioxide [4]	35 / 35	58	3200	MW-8L	--	--	NA	No	Low inherent toxicity in groundwater.
Methyl tert-butyl ether	1 / 1	0.87	0.87	RABMW-2	**--**	**--**	12	No	Maximum detect below screening value.
Sulfur Dioxide [10]	1 / 1	610	610	MW-8L	**--**	**--**	250000	No	Maximum detect below screening value.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	2.3	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 35	ND	ND	ND	9.4	10	37	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 35	ND	ND	ND	9.4	10	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	0.43	No	Constituent not detected.
1,4-Dioxane	14 / 35	2.4	33	WWL-3L	**9.4**	**10**	6.1	**YES**	Maximum detect exceeds screening value.
1,4-Naphthoquinone	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 35	ND	ND	ND	**9.4**	**10**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 35	ND	ND	ND	9.4	10	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 35	ND	ND	ND	9.4	10	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 35	ND	ND	ND	**9.4**	**10**	6.1	No	Constituent not detected.
2,4-Dichlorophenol	0 / 35	ND	ND	ND	9.4	10	11	No	Constituent not detected.
2,4-Dimethylphenol	0 / 35	ND	ND	ND	9.4	10	73	No	Constituent not detected.
2,4-Dinitrophenol	0 / 35	ND	ND	ND	**47**	**50**	7.3	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 35	ND	ND	ND	**9.4**	**10**	0.22	No	Constituent not detected.
2,6-Dichlorophenol	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 35	ND	ND	ND	**9.4**	**10**	3.7	No	Constituent not detected.
2-Acetylaminofluorene	0 / 35	ND	ND	ND	**9.4**	**10**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 35	ND	ND	ND	9.4	10	290	No	Constituent not detected.
2-Chlorophenol	0 / 35	ND	ND	ND	9.4	10	18	No	Constituent not detected.
2-Methylnaphthalene	0 / 35	ND	ND	ND	9.4	10	15	No	Constituent not detected.
2-Methylphenol	0 / 35	ND	ND	ND	9.4	10	180	No	Constituent not detected.
2-Naphthalenamine	0 / 35	ND	ND	ND	**9.4**	**10**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 35	ND	ND	ND	**47**	**50**	37	No	Constituent not detected.
2-Nitrophenol	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
2-Picoline	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
2-sec-Butyl-4,6-dinitrophenol	0 / 35	ND	ND	ND	**9.4**	**10**	3.7	No	Constituent not detected.
3 & 4 Methylphenol	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
3,3'-Dichlorobenzidine	0 / 35	ND	ND	ND	**19**	**20**	0.15	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 35	ND	ND	ND	**19**	**20**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 35	ND	ND	ND	**9.4**	**10**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 35	ND	ND	ND	47	50	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 35	ND	ND	ND	**47**	**50**	0.29	No	Constituent not detected.
4-Aminobiphenyl	0 / 35	ND	ND	ND	**9.4**	**10**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 35	ND	ND	ND	9.4	10	370	No	Constituent not detected.
4-Chloroaniline	0 / 35	ND	ND	ND	**19**	**20**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
4-Nitroaniline	0 / 35	ND	ND	ND	**47**	**50**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 35	ND	ND	ND	47	50	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 35	ND	ND	ND	**9.4**	**10**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 35	ND	ND	ND	**9.4**	**10**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 35	ND	ND	ND	9.4	10	220	No	Constituent not detected.
Acenaphthylene	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
Acetophenone	0 / 35	ND	ND	ND	9.4	10	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 35	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Aniline	0 / 35	ND	ND	ND	**19**	**20**	12	No	Constituent not detected.
Anthracene	0 / 35	ND	ND	ND	9.4	10	1100	No	Constituent not detected.
Aramite, Total	0 / 35	ND	ND	ND	**9.4**	**10**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 35	ND	ND	ND	**9.4**	**10**	0.029	No	Constituent not detected.
Benzo[a]pyrene	0 / 35	ND	ND	ND	**9.4**	**10**	0.0029	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 35	ND	ND	ND	**9.4**	**10**	0.029	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 35	ND	ND	ND	**9.4**	**10**	0.29	No	Constituent not detected.
Benzyl alcohol	0 / 35	ND	ND	ND	9.4	10	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 35	ND	ND	ND	9.4	10	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 35	ND	ND	ND	**9.4**	**10**	0.012	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 35	ND	ND	ND	**9.4**	**10**	4.8	No	Constituent not detected.
Butyl benzyl phthalate	0 / 35	ND	ND	ND	9.4	10	35	No	Constituent not detected.
Chrysene	0 / 35	ND	ND	ND	**9.4**	**10**	2.9	No	Constituent not detected.
Diallate	0 / 35	ND	ND	ND	**9.4**	**10**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 35	ND	ND	ND	**9.4**	**10**	0.0029	No	Constituent not detected.
Dibenzofuran	0 / 35	ND	ND	ND	**9.4**	**10**	3.7	No	Constituent not detected.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Diethyl phthalate	0 / 35	ND	ND	ND	9.4	10	2900	No	Constituent not detected.
Dimethoate	0 / 35	ND	ND	ND	**9.4**	**10**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 35	ND	ND	ND	9.4	10	370	No	Constituent not detected.
Di-n-octyl phthalate	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
Fluoranthene	0 / 35	ND	ND	ND	9.4	10	150	No	Constituent not detected.
Fluorene	0 / 35	ND	ND	ND	9.4	10	150	No	Constituent not detected.
Hexachlorobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	0.042	No	Constituent not detected.
Hexachlorobutadiene	0 / 35	ND	ND	ND	**9.4**	**10**	0.86	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 35	ND	ND	ND	9.4	10	22	No	Constituent not detected.
Hexachloroethane	0 / 35	ND	ND	ND	**9.4**	**10**	4.8	No	Constituent not detected.
Hexachlorophene	0 / 29	ND	ND	ND	**4700**	**5000**	1.1	No	Constituent not detected.
Hexachloropropene	0 / 29	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 35	ND	ND	ND	**9.4**	**10**	0.029	No	Constituent not detected.
Isophorone	0 / 35	ND	ND	ND	9.4	10	71	No	Constituent not detected.
Isosafrole	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	0.37	No	Constituent not detected.
Methapyrilene	0 / 27	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 35	ND	ND	ND	**9.4**	**10**	0.68	No	Constituent not detected.
Naphthalene	0 / 35	ND	ND	ND	**9.4**	**10**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	0.12	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 35	ND	ND	ND	**9.4**	**10**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 35	ND	ND	ND	**9.4**	**10**	0.00042	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 35	ND	ND	ND	**9.4**	**10**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 35	ND	ND	ND	**9.4**	**10**	0.0096	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 35	ND	ND	ND	9.4	10	14	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 35	ND	ND	ND	**9.4**	**10**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 35	ND	ND	ND	**9.4**	**10**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 35	ND	ND	ND	**9.4**	**10**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 35	ND	ND	ND	**9.4**	**10**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
o-Toluidine	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
p-Dimethylamino azobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 35	ND	ND	ND	**9.4**	**10**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 35	ND	ND	ND	**47**	**50**	0.56	No	Constituent not detected.
Phenacetin	0 / 35	ND	ND	ND	9.4	10	31	No	Constituent not detected.
Phenanthrene	0 / 35	ND	ND	ND	9.4	10	NA	No	Constituent not detected.
Phenol	0 / 35	ND	ND	ND	9.4	10	1100	No	Constituent not detected.
p-Phenylene diamine	0 / 27	ND	ND	ND	**1900**	**2000**	690	No	Constituent not detected.
Pronamide	0 / 35	ND	ND	ND	9.4	10	270	No	Constituent not detected.
Pyrene	0 / 35	ND	ND	ND	9.4	10	110	No	Constituent not detected.
Pyridine	0 / 35	ND	ND	ND	**47**	**50**	3.7	No	Constituent not detected.
Safrole, Total	0 / 35	ND	ND	ND	**9.4**	**10**	0.31	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
1-Propene, 1,1,2-trichloro- [5]	4 / 4	4.9	7.4	LF-5	--	--	0.11	**YES**	Maximum detect exceeds screening value.
1-Propene, 1,2,3-trichloro- [5]	2 / 2	5.4	6.7	LF-4	--	--	0.11	**YES**	Maximum detect exceeds screening value.
2-Butanol, 2,3-dimethyl- [6]	1 / 1	5.4	5.4	WWL-3U	--	--	370	No	Maximum detect below screening value.
Diethyltoluamide [7]	2 / 2	11	13	SDB-MW1	--	--	3700	No	Maximum detect below screening value.
Ethane, 1,1'-oxybis[2-ethoxy-] [6]	13 / 13	150	875	MW-9	--	--	370	**YES**	Maximum detect exceeds screening value.
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]- [6]	1 / 1	54	54	WWL-3U	--	--	370	No	Maximum detect below screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 35	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 35	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 35	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Dipropylene glycol	0 / 35	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol [3]	14 / 35	450	11000	MW-2	1000	1000	6200	**YES**	Maximum detect exceeds screening value.
Ethylene glycol	0 / 35	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 35	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 35	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 35	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	19 / 35	490	3000	MW-5U	1000	1000	1800	**YES**	Maximum detect exceeds screening value.
Propylene glycol	0 / 35	ND	ND	ND	5000	5000	73000	No	Constituent not detected.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Total Inorganics									
Aluminum	35 / 35	23	24000	RABMW-4	--	--	3700	**YES**	Maximum detect exceeds screening value.
Antimony	2 / 35	0.56	1.1	LF-4	**2.5**	**2.5**	1.5	No	Maximum detect below screening value.
Arsenic	29 / 35	0.58	46	MW-8L	**2.5**	**2.5**	0.045	**YES**	Maximum detect exceeds screening value.
Barium	35 / 35	16	1600	WWL-2	--	--	730	**YES**	Maximum detect exceeds screening value.
Beryllium	12 / 35	0.09	1.9	MW-7U	0.5	2	7.3	No	Maximum detect below screening value.
Cadmium	12 / 35	0.14	9.6	MW-7U	0.5	0.5	1.8	**YES**	Maximum detect exceeds screening value.
Calcium	35 / 35	5400	830000	WWL-2	--	--	NA	No	Essential Nutrient
Chromium [8]	34 / 35	0.63	79	RABMW-4	**5**	**5**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	35 / 35	0.26	330	MW-7U	--	--	1.1	**YES**	Maximum detect exceeds screening value.
Copper	34 / 35	0.5	100	MW-7U	2.5	2.5	150	No	Maximum detect below screening value.
Iron	35 / 35	170	190000	SDB-MW1	--	--	2600	**YES**	Maximum detect exceeds screening value.
Lead [9]	17 / 35	0.22	26	SDB-MW1	1.5	1.5	15	**YES**	Maximum detect exceeds screening value.
Magnesium	35 / 35	3000	300000	WWL-2	--	--	NA	No	Essential Nutrient
Manganese	35 / 35	120	32000	MW-7U	--	--	88	**YES**	Maximum detect exceeds screening value.
Mercury	5 / 35	0.21	1.3	MW-7U	**0.5**	**0.5**	0.057	**YES**	Maximum detect exceeds screening value.
Nickel	35 / 35	0.72	100	MW-7U	--	--	73	**YES**	Maximum detect exceeds screening value.
Potassium	35 / 35	600	38000	MW-8U	--	--	NA	No	Essential Nutrient
Selenium	10 / 35	0.51	9.2	SDB-MW3	2.5	2.5	18	No	Maximum detect below screening value.
Silver	1 / 35	3.8	3.8	MW-7U	1	1	18	No	Maximum detect below screening value.
Sodium	35 / 35	10000	1450000	NDT-3	--	--	NA	No	Essential Nutrient
Thallium [9]	5 / 35	0.31	0.46	RABMW-3	1	1	2	No	Maximum detect below screening value.
Vanadium	18 / 35	1.5	1700	MW-5U	5	5	18	**YES**	Maximum detect exceeds screening value.
Zinc	33 / 35	7.4	110	RABMW-2	20	20	1100	No	Maximum detect below screening value.
Dissolved Inorganics									
Aluminum	3 / 3	27	890	SDB-MW1	--	--	3700	No	Maximum detect below screening value.
Antimony	0 / 3	ND	ND	ND	**2.5**	**2.5**	1.5	No	Constituent not detected.
Arsenic	2 / 3	3.5	6.3	SDB-MW1	**2.5**	**2.5**	0.045	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	17	380	SDB-MW1	--	--	730	No	Maximum detect below screening value.
Beryllium	0 / 3	ND	ND	ND	0.5	2	7.3	No	Constituent not detected.
Cadmium	1 / 3	0.35	0.35	RABMW-4	0.5	0.5	1.8	No	Maximum detect below screening value.
Calcium	3 / 3	71000	160000	RABMW-4	--	--	NA	No	Essential Nutrient
Chromium [8]	2 / 3	2.4	4.1	SDB-MW1	**5**	**5**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	1.4	120	RABMW-2	--	--	1.1	**YES**	Maximum detect exceeds screening value.
Copper	3 / 3	1.2	1.6	SDB-MW1	--	--	150	No	Maximum detect below screening value.
Iron	3 / 3	73	170000	SDB-MW1	--	--	2600	**YES**	Maximum detect exceeds screening value.

TABLE 3-6
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Tapwater Regional Screening Level [1] (ug/L)	Constituent of Interest	Comment
Dissolved Inorganics (continued)									
Lead [9]	1 / 3	1.3	1.3	SDB-MW1	1.5	1.5	15	No	Maximum detect below screening value.
Magnesium	3 / 3	22000	150000	RABMW-2	--	--	NA	No	Essential Nutrient
Manganese	3 / 3	260	11000	RABMW-2	**--**	**--**	88	**YES**	Maximum detect exceeds screening value.
Mercury	0 / 3	ND	ND	ND	**0.5**	**0.5**	0.057	No	Constituent not detected.
Nickel	3 / 3	3	67	RABMW-2	**--**	**--**	73	No	Maximum detect below screening value.
Potassium	3 / 3	2000	11000	SDB-MW1	--	--	NA	No	Essential Nutrient
Selenium	2 / 3	0.63	0.94	SDB-MW1	2.5	2.5	18	No	Maximum detect below screening value.
Silver	0 / 3	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	3 / 3	64000	500000	RABMW-2	--	--	NA	No	Essential Nutrient
Thallium [9]	0 / 3	ND	ND	ND	1	1	2	No	Constituent not detected.
Vanadium	3 / 3	2.6	5.2	SDB-MW1	**--**	**--**	18	No	Maximum detect below screening value.
Zinc	3 / 3	12	28	RABMW-2	**--**	**--**	1100	No	Maximum detect below screening value.
Other Inorganics									
Chloride [10]	35 / 35	3700	2600000	WWL-2	**--**	**--**	250000	No	Common inorganic/low inherent toxicity.
Nitrate as N	8 / 35	32	10000	NDT-1	50	250	5800	No	Common inorganic/low inherent toxicity.
Nitrite as N	2 / 35	10	16	NDT-1	50	250	370	No	Maximum detect below screening value.
Nitrogen, Kjeldahl	35 / 35	170	31000	MW-8L	--	--	NA	No	Physical property.
Total Organic Carbon	28 / 35	910	260000	WWL-1	1000	1000	NA	No	Physical property.
Sulfate [10]	30 / 35	5800	1400000	SDB-MW2	5000	50000	250000	No	Common inorganic/low inherent toxicity.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
[1] Screening levels are the USEPA Tapwater Regional Screening Levels (RSLs; USEPA, 2010a). Non-cancer based screening levels are adjusted to reflect a hazard quotient of 0.1
[2] The RSLs for cis- and trans-1,3-dichloropropene are based on the RSL for 1,3-dichloropropene.
[3] The RSLs for t-butanol and ethanol are based on the RSL for n-butanol.
[4] Groundwater screening value not available; constituent has low inherent toxicity
[5] The RSLs for 1,1,2-trichloro-1-propene and 1,2,3-trichloro-1-propene are based on the RSL for tetrachloroethene
[6] The RSL for 2-butanol,2,3-dimethyl, ethane, 1,1'-oxybis[2-ethoxy-] and ethanol,2-[2-(2-ethoxyethoxy)ethoxy]- is based on the RSL for ethylene glycol monobutyl ethe
[7] The RSL for diethyltoluamide (DEET) is calculated based on an oral reference dose of 1 mg/kg-day (USEPA, 1998)
[8] The RSL for chromium is based on the RSL for chromium VI.
[9] The screening values for lead and thallium are based on the Federal Maximum Contaminant Level (MCL; USEPA, 2009) due to the lack of an RSL.
[10] The direct contact groundwater screening values for chloride and sulfate are based on Secondary Drinking Water Regulations (USEPA, 2009); the value for sulfur dioxide is based on sulfate.
The SDWR values are aesthetic thresholds, not risk-based concentrations; thus the constituents have low toxicity.

TABLE 3-7
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SITE-WIDE GROUNDWATER - VAPOR INTRUSION
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Groundwater Concentration (ug/L)	Maximum Detected Groundwater Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	USEPA Vapor Intrusion Screening Value [1] (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,2,2-Tetrachloroethane	1 / 35	0.96	0.96	MW-10	1	**100**	3.0	No	Maximum detect below screening value.
1,1-Dichloroethane	2 / 35	1.1	2.5	MW-10	1	100	2200	No	Maximum detect below screening value.
1,1-Dichloroethene	2 / 35	0.99	2.5	MW-10	1	100	190	No	Maximum detect below screening value.
trans-1,2-Dichloroethene	1 / 35	2.8	2.8	MW-10	1	100	180	No	Maximum detect below screening value.
Acetone	4 / 35	5.9	57.5	NAT-3	25	2500	220000	No	Maximum detect below screening value.
Carbon disulfide	1 / 35	0.54	0.54	VFSP-MW1	2	200	560	No	Maximum detect below screening value.
Chloroform	1 / 35	0.65	0.65	MW-10	1	**100**	80	No	Maximum detect below screening value.
Diethyl ether	27 / 35	0.495	11000	MW-2	10	10	520	**YES**	Maximum detect exceeds screening value.
t-Butanol	24 / 35	3	92000	NAT-3	5	250	NV	No	Constituent not sufficiently volatile.
Tetrachloroethene	1 / 35	22	22	MW-10	1	**100**	5.0	**YES**	Maximum detect exceeds screening value.
Trichloroethylene	3 / 35	0.6	8.4	NAT-1	1	**100**	5.0	**YES**	Maximum detect exceeds screening value.
Volatile Organics (TICs)									
1,2-Dichloroethene, Total [2]	1 / 1	3.5	3.5	MW-10	**--**	**--**	180	No	Maximum detect below screening value.
Carbon Dioxide	35 / 35	58	3200	MW-8L	--	--	NA	No	Low inherent toxicity.
Methyl tert-butyl ether	1 / 1	0.87	0.87	RABMW-2	**--**	**--**	120000	No	Maximum detect below screening value.
Sulfur Dioxide	1 / 1	610	610	MW-8L	--	--	NA	No	Low inherent toxicity.
Semi-Volatile Organics									
1,4-Dioxane	14 / 35	2.4	33	WWL-3L	9.4	10	NV	No	Constituent not sufficiently volatile.
Semi-Volatile Organics (TICs)									
1-Propene, 1,1,2-trichloro- [3]	4 / 4	4.9	7.4	LF-5	**--**	**--**	5.0	**YES**	Maximum detect exceeds screening value.
1-Propene, 1,2,3-trichloro- [3]	2 / 2	5.4	6.7	LF-4	**--**	**--**	5.0	**YES**	Maximum detect exceeds screening value.
2-Butanol, 2,3-dimethyl-	1 / 1	5.4	5.4	WWL-3U	--	--	NV	No	Constituent not sufficiently volatile.
Diethyltoluamide	2 / 2	11	13	SDB-MW1	--	--	NV	No	Constituent not sufficiently volatile.
Ethane, 1,1'-oxybis[2-ethoxy-]	13 / 13	150	875	MW-9	--	--	NV	No	Constituent not sufficiently volatile.
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]-	1 / 1	54	54	WWL-3U	--	--	NV	No	Constituent not sufficiently volatile.
Alcohols and Glycols									
Ethanol	14 / 35	450	11000	MW-2	1000	1000	NV	No	Constituent not sufficiently volatile.
Methanol	19 / 35	490	3000	MW-5U	1000	1000	NV	No	Constituent not sufficiently volatile.
Total Inorganics									
Mercury	5 / 35	0.21	1.3	MW-7U	**0.5**	**0.5**	0.28	**YES**	Maximum detect exceeds screening value.

Notes:
NA - Not Available
NV - Constituent is not sufficiently volatile and/or toxic via the inhalation route.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds the comparison benchmark.
[1] Vapor intrusion from groundwater screening values are from Table 2c of the USEPA (2002a) Vapor Guidance and are based on a target risk of 10^{-6}.
[2] The vapor intrusion screening value for total 1,2-dichloroethene is based on the value for trans-1,2-dichloroethene.
[3] The vapor intrusion screening values for 1,1,2-trichloro-1-propene and 1,2,3-trichloro-1-propene are based on the value for tetrachloroethene.

TABLE 3-8
SEDIMENT SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Sediment Screening Value (mg/kg)	Basis of Screening Values
Volatile Organics		
1,1,1,2-Tetrachloroethane	9.3	Industrial Soil RSL (USEPA, 2010a)
1,1,1-Trichloroethane	3800	Industrial Soil RSL (USEPA, 2010a)
1,1,2,2-Tetrachloroethane	2.8	Industrial Soil RSL (USEPA, 2010a)
1,1,2-Trichloroethane	5.3	Industrial Soil RSL (USEPA, 2010a)
1,1-Dichloroethane	17	Industrial Soil RSL (USEPA, 2010a)
1,1-Dichloroethene	110	Industrial Soil RSL (USEPA, 2010a)
1,2,3-Trichloropropane	0.095	Industrial Soil RSL (USEPA, 2010a)
1,2-Dibromo-3-Chloropropane	0.069	Industrial Soil RSL (USEPA, 2010a)
1,2-Dibromoethane	0.17	Industrial Soil RSL (USEPA, 2010a)
1,2-Dichloroethane	2.2	Industrial Soil RSL (USEPA, 2010a)
trans-1,2-Dichloroethene	69	Industrial Soil RSL (USEPA, 2010a)
1,2-Dichloropropane	4.5	Industrial Soil RSL (USEPA, 2010a)
cis-1,3-Dichloropropene	8.1	Based on the RSL for 1,3-dichloropropene.
trans-1,3-Dichloropropene	8.1	Based on the RSL for 1,3-dichloropropene.
2-Butanone (MEK)	20000	Industrial Soil RSL (USEPA, 2010a)
2-Hexanone	140	Industrial Soil RSL (USEPA, 2010a)
2-Methyl-1-propanol	31000	Industrial Soil RSL (USEPA, 2010a)
4-Methyl-2-pentanone (MIBK)	5300	Industrial Soil RSL (USEPA, 2010a)
Acetone	63000	Industrial Soil RSL (USEPA, 2010a)
Acetonitrile	370	Industrial Soil RSL (USEPA, 2010a)
Acrolein	0.065	Industrial Soil RSL (USEPA, 2010a)
Acrylonitrile	1.2	Industrial Soil RSL (USEPA, 2010a)
Allyl chloride	3.4	Industrial Soil RSL (USEPA, 2010a)
Benzene	5.4	Industrial Soil RSL (USEPA, 2010a)
Benzyl chloride	4.9	Industrial Soil RSL (USEPA, 2010a)
Bromodichloromethane	1.4	Industrial Soil RSL (USEPA, 2010a)
Bromoform	220	Industrial Soil RSL (USEPA, 2010a)
Bromomethane	3.2	Industrial Soil RSL (USEPA, 2010a)
Carbon dioxide	NA	Low inherent toxicity in sediment.
Carbon disulfide	370	Industrial Soil RSL (USEPA, 2010a)
Carbon tetrachloride	3	Industrial Soil RSL (USEPA, 2010a)
Chlorobenzene	140	Industrial Soil RSL (USEPA, 2010a)
Chloroethane	6100	Industrial Soil RSL (USEPA, 2010a)
Chloroform	1.5	Industrial Soil RSL (USEPA, 2010a)
Chloromethane	50	Industrial Soil RSL (USEPA, 2010a)
Chloroprene	3.6	Industrial Soil RSL (USEPA, 2010a)
Dibromochloromethane	3.3	Industrial Soil RSL (USEPA, 2010a)
Dibromomethane	11	Industrial Soil RSL (USEPA, 2010a)
Dichlorodifluoromethane	78	Industrial Soil RSL (USEPA, 2010a)
Diethyl ether	20000	Industrial Soil RSL (USEPA, 2010a)
Ethyl methacrylate	9200	Industrial Soil RSL (USEPA, 2010a)
Ethylbenzene	27	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-8
SEDIMENT SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Sediment Screening Value (mg/kg)	Basis of Screening Values
Volatile Organics (continued)		
Ethylene oxide	0.83	Industrial Soil RSL (USEPA, 2010a)
Methacrylonitrile	1.8	Industrial Soil RSL (USEPA, 2010a)
Methyl methacrylate	2100	Industrial Soil RSL (USEPA, 2010a)
Methylene Chloride	53	Industrial Soil RSL (USEPA, 2010a)
Pentachloroethane	19	Industrial Soil RSL (USEPA, 2010a)
Propylene oxide	8.8	Industrial Soil RSL (USEPA, 2010a)
Styrene	3600	Industrial Soil RSL (USEPA, 2010a)
t-Butanol	6200	Based on the RSL for n-butanol.
Tetrachloroethene	2.6	Industrial Soil RSL (USEPA, 2010a)
Toluene	4500	Industrial Soil RSL (USEPA, 2010a)
trans-1,4-Dichloro-2-butene	0.035	Industrial Soil RSL (USEPA, 2010a)
Trichloroethylene	14	Industrial Soil RSL (USEPA, 2010a)
Trichlorofluoromethane	340	Industrial Soil RSL (USEPA, 2010a)
Vinyl acetate	410	Industrial Soil RSL (USEPA, 2010a)
Vinyl chloride	1.7	Industrial Soil RSL (USEPA, 2010a)
Xylenes, Total	270	Industrial Soil RSL (USEPA, 2010a)
Volatile Organics (TICs)		
Carbon Dioxide	NA	Low inherent toxicity in sediment.
Methylcyclohexane	2900	Based on the RSL for cyclohexane.
Semi-Volatile Organics		
1,2,4,5-Tetrachlorobenzene	18	Industrial Soil RSL (USEPA, 2010a)
1,2,4-Trichlorobenzene	99	Industrial Soil RSL (USEPA, 2010a)
1,2-Dichlorobenzene	980	Industrial Soil RSL (USEPA, 2010a)
1,3,5-Trinitrobenzene	2700	Industrial Soil RSL (USEPA, 2010a)
1,4-Dichlorobenzene	12	Industrial Soil RSL (USEPA, 2010a)
1,4-Dioxane	160	Industrial Soil RSL (USEPA, 2010a)
1,4-Naphthoquinone	8.1	Industrial Soil RSL (USEPA, 2010a)
1-Naphthalenamine	8.1	Industrial Soil RSL (USEPA, 2010a)
2,2'-oxybis[1-chloropropane]	22	Industrial Soil RSL (USEPA, 2010a)
2,3,4,6-Tetrachlorophenol	1800	Industrial Soil RSL (USEPA, 2010a)
2,4,5-Trichlorophenol	6200	Industrial Soil RSL (USEPA, 2010a)
2,4,6-Trichlorophenol	160	Industrial Soil RSL (USEPA, 2010a)
2,4-Dichlorophenol	180	Industrial Soil RSL (USEPA, 2010a)
2,4-Dimethylphenol	1200	Industrial Soil RSL (USEPA, 2010a)
2,4-Dinitrophenol	120	Industrial Soil RSL (USEPA, 2010a)
2,4-Dinitrotoluene	5.5	Industrial Soil RSL (USEPA, 2010a)
2,6-Dinitrotoluene	62	Industrial Soil RSL (USEPA, 2010a)
2-Acetylaminofluorene	0.45	Industrial Soil RSL (USEPA, 2010a)
2-Chloronaphthalene	8200	Industrial Soil RSL (USEPA, 2010a)
2-Chlorophenol	510	Industrial Soil RSL (USEPA, 2010a)
2-Methylnaphthalene	410	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-8
SEDIMENT SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Sediment Screening Value (mg/kg)	Basis of Screening Values
Semi-Volatile Organics (continued)		
2-Methylphenol	3100	Industrial Soil RSL (USEPA, 2010a)
2-Naphthalenamine	0.96	Industrial Soil RSL (USEPA, 2010a)
2-Nitroaniline	600	Industrial Soil RSL (USEPA, 2010a)
2-sec-Butyl-4,6-dinitrophenol	62	Industrial Soil RSL (USEPA, 2010a)
3 & 4 Methylphenol	310	Based on the RSL for 4-methylphenol.
3,3'-Dichlorobenzidine	3.8	Industrial Soil RSL (USEPA, 2010a)
3,3'-Dimethylbenzidine	0.16	Industrial Soil RSL (USEPA, 2010a)
3-Methylcholanthrene	0.078	Industrial Soil RSL (USEPA, 2010a)
4,6-Dinitro-2-methylphenol	4.9	Industrial Soil RSL (USEPA, 2010a)
4-Aminobiphenyl	0.082	Industrial Soil RSL (USEPA, 2010a)
4-Chloro-3-methylphenol	6200	Industrial Soil RSL (USEPA, 2010a)
4-Chloroaniline	8.6	Industrial Soil RSL (USEPA, 2010a)
4-Nitroaniline	86	Industrial Soil RSL (USEPA, 2010a)
5-Nitro-o-toluidine	52	Industrial Soil RSL (USEPA, 2010a)
7,12-Dimethylbenz(a)anthracene	0.0062	Industrial Soil RSL (USEPA, 2010a)
Acenaphthene	3300	Industrial Soil RSL (USEPA, 2010a)
Acetophenone	10000	Industrial Soil RSL (USEPA, 2010a)
Aniline	300	Industrial Soil RSL (USEPA, 2010a)
Anthracene	17000	Industrial Soil RSL (USEPA, 2010a)
Aramite, Total	69	Industrial Soil RSL (USEPA, 2010a)
Benzo[a]anthracene	2.1	Industrial Soil RSL (USEPA, 2010a)
Benzo[a]pyrene	0.21	Industrial Soil RSL (USEPA, 2010a)
Benzo[b]fluoranthene	2.1	Industrial Soil RSL (USEPA, 2010a)
Benzo[g,h,i]perylene	1700	Based on the RSL for pyrene.
Benzo[k]fluoranthene	21	Industrial Soil RSL (USEPA, 2010a)
Benzyl alcohol	6200	Industrial Soil RSL (USEPA, 2010a)
Bis(2-chloroethoxy)methane	180	Industrial Soil RSL (USEPA, 2010a)
Bis(2-chloroethyl)ether	1	Industrial Soil RSL (USEPA, 2010a)
Bis(2-ethylhexyl) phthalate	120	Industrial Soil RSL (USEPA, 2010a)
Butyl benzyl phthalate	910	Industrial Soil RSL (USEPA, 2010a)
Chrysene	210	Industrial Soil RSL (USEPA, 2010a)
Diallate	28	Industrial Soil RSL (USEPA, 2010a)
Dibenz(a,h)anthracene	0.21	Industrial Soil RSL (USEPA, 2010a)
Dibenzofuran	100	Industrial Soil RSL (USEPA, 2010a)
Diethyl phthalate	49000	Industrial Soil RSL (USEPA, 2010a)
Dimethoate	12	Industrial Soil RSL (USEPA, 2010a)
Di-n-butyl phthalate	6200	Industrial Soil RSL (USEPA, 2010a)
Fluoranthene	2200	Industrial Soil RSL (USEPA, 2010a)
Fluorene	2200	Industrial Soil RSL (USEPA, 2010a)
Hexachlorobenzene	1.1	Industrial Soil RSL (USEPA, 2010a)
Hexachlorobutadiene	22	Industrial Soil RSL (USEPA, 2010a)

TABLE 3-8
SEDIMENT SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Sediment Screening Value (mg/kg)	Basis of Screening Values
Semi-Volatile Organics (continued)		
Hexachlorocyclopentadiene	370	Industrial Soil RSL (USEPA, 2010a)
Hexachloroethane	120	Industrial Soil RSL (USEPA, 2010a)
Hexachlorophene	18	Industrial Soil RSL (USEPA, 2010a)
Indeno[1,2,3-cd]pyrene	2.1	Industrial Soil RSL (USEPA, 2010a)
Isophorone	1800	Industrial Soil RSL (USEPA, 2010a)
m-Dinitrobenzene	6.2	Industrial Soil RSL (USEPA, 2010a)
Methyl methanesulfonate	17	Industrial Soil RSL (USEPA, 2010a)
Methyl phenols, Total	9100	Industrial Soil RSL (USEPA, 2010a)
Naphthalene	18	Industrial Soil RSL (USEPA, 2010a)
Nitrobenzene	24	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodiethylamine	0.011	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodimethylamine	0.034	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodi-n-butylamine	0.4	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodi-n-propylamine	0.25	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosodiphenylamine	350	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosomethylethylamine	0.078	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosomorpholine	0.26	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosopiperidine	0.18	Industrial Soil RSL (USEPA, 2010a)
N-Nitrosopyrrolidine	0.82	Industrial Soil RSL (USEPA, 2010a)
p-Dimethylamino azobenzene	0.37	Industrial Soil RSL (USEPA, 2010a)
Pentachlorobenzene	49	Industrial Soil RSL (USEPA, 2010a)
Pentachloronitrobenzene	6.6	Industrial Soil RSL (USEPA, 2010a)
Pentachlorophenol	9	Industrial Soil RSL (USEPA, 2010a)
Phenacetin	780	Industrial Soil RSL (USEPA, 2010a)
Phenanthrene	17000	Based on the RSL for anthracene
Phenol	18000	Industrial Soil RSL (USEPA, 2010a)
p-Phenylene diamine	12000	Industrial Soil RSL (USEPA, 2010a)
Pronamide	4600	Industrial Soil RSL (USEPA, 2010a)
Pyrene	1700	Industrial Soil RSL (USEPA, 2010a)
Pyridine	100	Industrial Soil RSL (USEPA, 2010a)
Safrole, Total	7.8	Industrial Soil RSL (USEPA, 2010a)
Semi-Volatile Organics (TICs)		
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	0.74	Based on the RSL for PCB 1260.
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	0.74	Based on the RSL for PCB 1260.
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	0.74	Based on the RSL for PCB 1260.
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	0.023	Industrial Soil RSL (USEPA, 2010a)
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	0.74	Based on the RSL for PCB 1260.
1,1'-Biphenyl, pentachloro-	0.74	Based on the RSL for PCB 1260.
17-Pentatriacontene	260	Based on the RSL for hexane.
1-Decene	260	Based on the RSL for hexane.
1-Docosene	260	Based on the RSL for hexane.
1-Dotriacontanol	6200	Based on the RSL for n-butanol.

TABLE 3-8
SEDIMENT SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Sediment Screening Value (mg/kg)	Basis of Screening Values
Semi-Volatile Organics (TICs) (continued)		
1-Naphthalenepropanol, .alpha.-ethenylde	18	Based on the RSL for naphthalene.
2-Heptacosanone	NA	Constituent is a pheremone, fatty acid; low inherent toxicity.
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	100	Based on the RSL for dibenzofuran.
Bacchotricuneatin c	NA	Constituent is a natural steroid; low inherent toxicity.
Cholestanol	NA	Constituent structurally similar to cholesterol; low inherent toxicity.
Cyclodecane	2900	Based on the RSL for cyclohexane.
Cyclododecane	2900	Based on the RSL for cyclohexane.
Cyclopropane, nonyl-	2900	Based on the RSL for cyclohexane.
Eicosane	260	Based on the RSL for hexane.
Ergostanol	NA	Constituent is a Vitamin D2 precursor; low inherent toxicity.
Ethane, 1,1,2,2-tetrachloro-	2.8	Industrial Soil RSL (USEPA, 2010a)
gamma.-Sitosterol	NA	Constituent structurally similar to cholesterol; low inherent toxicity.
Heptacosane	260	Based on the RSL for hexane.
Heptadecane	260	Based on the RSL for hexane.
Heptadecane, 2,6,10,15-tetramethyl-	260	Based on the RSL for hexane.
Heptadecane, 9-octyl-	260	Based on the RSL for hexane.
Hexacosane	260	Based on the RSL for hexane.
Hexadecane	260	Based on the RSL for hexane.
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	18	Based on the RSL for naphthalene.
Olean-12-ene	NA	Constituent is a plant steroid; low inherent toxicity.
Pentacosane	260	Based on the RSL for hexane.
Vitamin E	NA	Low inherent toxicity.
Acrylamide, Acrylonitrile and Acrolein		
Acrylamide	3.4	Industrial Soil RSL (USEPA, 2010a)
Alcohols and Glycols		
Allyl alcohol	310	Industrial Soil RSL (USEPA, 2010a)
Ethylene glycol	120000	Industrial Soil RSL (USEPA, 2010a)
Ethylene glycol monobutyl ether	6200	Industrial Soil RSL (USEPA, 2010a)
Isopropanol	4200000000	Industrial Soil RSL (USEPA, 2010a)
Methanol	31000	Industrial Soil RSL (USEPA, 2010a)
Propylene glycol	1200000	Industrial Soil RSL (USEPA, 2010a)
Polychlorinated Biphenyls (PCBs)		
PCB-1016	21	Industrial Soil RSL (USEPA, 2010a)
PCB-1221	0.54	Industrial Soil RSL (USEPA, 2010a)
PCB-1232	0.54	Industrial Soil RSL (USEPA, 2010a)
PCB-1242	0.74	Industrial Soil RSL (USEPA, 2010a)
PCB-1248	0.74	Industrial Soil RSL (USEPA, 2010a)
PCB-1254	0.74	Industrial Soil RSL (USEPA, 2010a)
PCB-1260	0.74	Industrial Soil RSL (USEPA, 2010a)
Pesticides and PCBs		
1,1'-Biphenyl, hexachloro-	1.1	Based on the RSL for PCB 167.
Pentachlorobiphenyl	0.11	Based on the RSL for PCB 123.
Tetrachlorobiphenyl	0.11	Based on the RSL for PCB 77.

TABLE 3-8
SEDIMENT SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Direct Contact Sediment Screening Value (mg/kg)	Basis of Screening Values
Inorganics		
Aluminum	99000	Industrial Soil RSL (USEPA, 2010a)
Antimony	41	Industrial Soil RSL (USEPA, 2010a)
Arsenic	1.6	Industrial Soil RSL (USEPA, 2010a)
Barium	19000	Industrial Soil RSL (USEPA, 2010a)
Beryllium	200	Industrial Soil RSL (USEPA, 2010a)
Cadmium	80	Industrial Soil RSL (USEPA, 2010a)
Calcium	NA	Essential Nutrient.
Chromium	5.6	Based on the RSL for chromium VI.
Cobalt	30	Industrial Soil RSL (USEPA, 2010a)
Copper	4100	Industrial Soil RSL (USEPA, 2010a)
Iron	72000	Industrial Soil RSL (USEPA, 2010a)
Lead	800	Industrial Soil RSL (USEPA, 2010a)
Magnesium	NA	Essential Nutrient.
Manganese	2300	Industrial Soil RSL (USEPA, 2010a)
Mercury	3.4	Industrial Soil RSL (USEPA, 2010a)
Nickel	2000	Industrial Soil RSL (USEPA, 2010a)
Potassium	NA	Essential Nutrient.
Selenium	510	Industrial Soil RSL (USEPA, 2010a)
Silver	510	Industrial Soil RSL (USEPA, 2010a)
Sodium	NA	Essential Nutrient.
Thallium	NA	Appropriate surrogate not available for this constituent.
Vanadium	520	Industrial Soil RSL (USEPA, 2010a)
Zinc	31000	Industrial Soil RSL (USEPA, 2010a)
Other Inorganics		
Chloride	NA	Low inherent toxicity in sediment.
Nitrate as N	160000	Industrial Soil RSL (USEPA, 2010a)
Nitrite as N	10000	Industrial Soil RSL (USEPA, 2010a)
Total Kjeldhal Nitrogen (TKN)	NA	Physical soil property.
Total Organic Carbon (TOC)	NA	Physical soil property.
Sulfate	NA	Low inherent toxicity in sediment.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 20	ND	ND	ND	0.0049	0.081	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 20	ND	ND	ND	0.0049	0.081	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 20	ND	ND	ND	0.0049	0.081	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 20	ND	ND	ND	0.0049	0.081	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 20	ND	ND	ND	0.0049	0.081	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 20	ND	ND	ND	0.0049	0.081	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 20	ND	ND	ND	0.0049	0.081	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 20	ND	ND	ND	0.0097	**0.16**	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 20	ND	ND	ND	0.0049	0.081	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 20	ND	ND	ND	0.0049	0.081	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 20	ND	ND	ND	0.0049	0.081	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 20	ND	ND	ND	0.0049	0.081	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 20	ND	ND	ND	0.0049	0.081	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 20	ND	ND	ND	0.0049	0.081	8.1	No	Constituent not detected.
2-Butanone (MEK)	3 / 20	0.033	0.11	ELSS-2A	0.024	0.4	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 20	ND	ND	ND	0.024	0.4	140	No	Constituent not detected.
2-Methyl-1-propanol	0 / 8	ND	ND	ND	0.19	3.2	31000	No	Constituent not detected.
3-Methylhexane	0 / 20	ND	ND	ND	0.0049	0.081	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 20	ND	ND	ND	0.024	0.4	5300	No	Constituent not detected.
Acetone	20 / 20	0.026	0.71	ELSS-5A	--	--	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 20	ND	ND	ND	0.19	3.2	370	No	Constituent not detected.
Acrolein	0 / 20	ND	ND	ND	**0.097**	**1.6**	0.065	No	Constituent not detected.
Acrylonitrile	0 / 20	ND	ND	ND	0.097	**1.6**	1.2	No	Constituent not detected.
Allyl chloride	0 / 20	ND	ND	ND	0.0049	0.081	3.4	No	Constituent not detected.
Benzene	0 / 20	ND	ND	ND	0.0049	0.081	5.4	No	Constituent not detected.
Benzyl chloride	0 / 20	ND	ND	ND	0.0049	0.081	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 20	ND	ND	ND	0.0049	0.081	1.4	No	Constituent not detected.
Bromoform	0 / 20	ND	ND	ND	0.0049	0.081	220	No	Constituent not detected.
Bromomethane	0 / 20	ND	ND	ND	0.0049	0.081	3.2	No	Constituent not detected.
Carbon disulfide	1 / 20	0.033	0.033	WLSS-4B	0.0049	0.081	370	No	Maximum detect below screening value.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Carbon tetrachloride	0 / 20	ND	ND	ND	0.0049	0.081	3	No	Constituent not detected.
Chlorobenzene	0 / 20	ND	ND	ND	0.0049	0.081	140	No	Constituent not detected.
Chloroethane	0 / 20	ND	ND	ND	0.0049	0.081	6100	No	Constituent not detected.
Chloroform	0 / 20	ND	ND	ND	0.0049	0.081	1.5	No	Constituent not detected.
Chloromethane	0 / 20	ND	ND	ND	0.0049	0.081	50	No	Constituent not detected.
Chloroprene	0 / 20	ND	ND	ND	0.0049	0.081	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 20	ND	ND	ND	0.0049	0.081	3.3	No	Constituent not detected.
Dibromomethane	0 / 20	ND	ND	ND	0.0049	0.081	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 20	ND	ND	ND	0.0049	0.081	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 20	ND	ND	ND	0.0049	0.081	NA	No	Constituent not detected.
Diethyl ether	2 / 20	0.17	0.28	WLSS-2A	0.0097	0.14	20000	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 20	ND	ND	ND	0.0049	0.081	9200	No	Constituent not detected.
Ethylbenzene	0 / 20	ND	ND	ND	0.0049	0.081	27	No	Constituent not detected.
Ethylene oxide	0 / 20	ND	ND	ND	0.097	**1.6**	0.83	No	Constituent not detected.
Iodomethane	0 / 20	ND	ND	ND	0.0049	0.081	NA	No	Constituent not detected.
Methacrylonitrile	0 / 20	ND	ND	ND	0.097	1.6	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 20	ND	ND	ND	0.0049	0.081	2100	No	Constituent not detected.
Methylene Chloride	0 / 20	ND	ND	ND	0.0049	0.081	53	No	Constituent not detected.
n-Heptane	0 / 20	ND	ND	ND	0.0049	0.081	NA	No	Constituent not detected.
Pentachloroethane	0 / 20	ND	ND	ND	0.024	0.4	19	No	Constituent not detected.
Propionitrile	0 / 20	ND	ND	ND	0.097	1.6	NA	No	Constituent not detected.
Propylene oxide	0 / 20	ND	ND	ND	0.097	1.6	8.8	No	Constituent not detected.
Styrene	0 / 20	ND	ND	ND	0.0049	0.081	3600	No	Constituent not detected.
t-Butanol[2]	16 / 20	0.0059	4.8	WLSS-2B	0.0056	0.069	6200	No	Maximum detect below screening value.
Tetrachloroethene	0 / 20	ND	ND	ND	0.0049	0.081	2.6	No	Constituent not detected.
Toluene	0 / 20	ND	ND	ND	0.0049	0.081	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 20	ND	ND	ND	0.0097	**0.16**	0.035	No	Constituent not detected.
Trichloroethylene	0 / 20	ND	ND	ND	0.0049	0.081	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 20	ND	ND	ND	0.0049	0.081	340	No	Constituent not detected.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Vinyl acetate	0 / 20	ND	ND	ND	0.0097	0.16	410	No	Constituent not detected.
Vinyl chloride	0 / 20	ND	ND	ND	0.0049	0.081	1.7	No	Constituent not detected.
Xylenes, Total	0 / 20	ND	ND	ND	0.0097	0.16	270	No	Constituent not detected.
Volatile Organics (TICs)									
Carbon Dioxide	20 / 20	0.37	61	WLSS-2A	--	--	NA	No	Screening value not available; see Table 3-8.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 20	ND	ND	ND	0.39	5.3	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 20	ND	ND	ND	0.39	5.3	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 20	ND	ND	ND	0.39	5.3	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 20	ND	ND	ND	0.39	5.3	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 20	ND	ND	ND	0.39	5.3	12	No	Constituent not detected.
1,4-Dioxane	0 / 20	ND	ND	ND	0.39	5.3	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 20	ND	ND	ND	0.39	5.3	8.1	No	Constituent not detected.
1-Naphthalenamine	0 / 20	ND	ND	ND	0.39	5.3	8.1	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 20	ND	ND	ND	0.39	5.3	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 20	ND	ND	ND	0.39	5.3	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 20	ND	ND	ND	0.39	5.3	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 20	ND	ND	ND	0.39	5.3	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 20	ND	ND	ND	0.39	5.3	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 20	ND	ND	ND	0.39	5.3	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 20	ND	ND	ND	2	27	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 20	ND	ND	ND	0.39	5.3	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 20	ND	ND	ND	0.39	5.3	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 20	ND	ND	ND	0.39	**5.3**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 20	ND	ND	ND	0.39	5.3	8200	No	Constituent not detected.
2-Chlorophenol	0 / 20	ND	ND	ND	0.39	5.3	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 20	ND	ND	ND	0.39	5.3	410	No	Constituent not detected.
2-Methylphenol	0 / 20	ND	ND	ND	0.39	5.3	3100	No	Constituent not detected.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Naphthalenamine	0 / 20	ND	ND	ND	0.39	**5.3**	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 20	ND	ND	ND	2	27	600	No	Constituent not detected.
2-Nitrophenol	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
2-Picoline	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
2-sec-Butyl-4,6-dinitrophenol	0 / 20	ND	ND	ND	0.39	5.3	62	No	Constituent not detected.
3 & 4 Methylphenol[3]	1 / 20	0.063	0.063	ELSS-1B	0.43	5.3	310	No	Maximum detect below screening value.
3,3'-Dichlorobenzidine	0 / 20	ND	ND	ND	0.78	**11**	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 20	ND	ND	ND	**2**	**27**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 20	ND	ND	ND	2	27	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 20	ND	ND	ND	2	**27**	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 20	ND	ND	ND	0.39	5.3	6200	No	Constituent not detected.
4-Chloroaniline	0 / 20	ND	ND	ND	0.78	**11**	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
4-Nitroaniline	0 / 20	ND	ND	ND	2	27	86	No	Constituent not detected.
4-Nitrophenol	0 / 20	ND	ND	ND	2	27	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 20	ND	ND	ND	0.39	5.3	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 20	ND	ND	ND	0.39	5.3	3300	No	Constituent not detected.
Acenaphthylene	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
Acetophenone	0 / 20	ND	ND	ND	0.39	5.3	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 20	ND	ND	ND	80	1100	NA	No	Constituent not detected.
Aniline	0 / 20	ND	ND	ND	0.78	11	300	No	Constituent not detected.
Anthracene	0 / 20	ND	ND	ND	0.39	5.3	17000	No	Constituent not detected.
Aramite, Total	0 / 20	ND	ND	ND	0.39	5.3	69	No	Constituent not detected.
Benzo[a]anthracene	0 / 20	ND	ND	ND	0.39	**5.3**	2.1	No	Constituent not detected.
Benzo[a]pyrene	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.21	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 20	ND	ND	ND	0.39	**5.3**	2.1	No	Constituent not detected.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Benzo[g,h,i]perylene	0 / 20	ND	ND	ND	0.39	5.3	1700	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 20	ND	ND	ND	0.39	5.3	21	No	Constituent not detected.
Benzyl alcohol	0 / 20	ND	ND	ND	0.39	5.3	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 20	ND	ND	ND	0.39	5.3	180	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 20	ND	ND	ND	0.39	**5.3**	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 20	ND	ND	ND	0.39	5.3	120	No	Constituent not detected.
Butyl benzyl phthalate	0 / 20	ND	ND	ND	0.39	5.3	910	No	Constituent not detected.
Chrysene	0 / 20	ND	ND	ND	0.39	5.3	210	No	Constituent not detected.
Diallate	0 / 20	ND	ND	ND	0.39	5.3	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 20	ND	ND	ND	0.39	5.3	100	No	Constituent not detected.
Diethyl phthalate	0 / 20	ND	ND	ND	0.39	5.3	49000	No	Constituent not detected.
Dimethoate	0 / 20	ND	ND	ND	0.39	5.3	12	No	Constituent not detected.
Dimethyl phthalate	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 20	ND	ND	ND	0.39	5.3	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
Fluoranthene	0 / 20	ND	ND	ND	0.39	5.3	2200	No	Constituent not detected.
Fluorene	0 / 20	ND	ND	ND	0.39	5.3	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 20	ND	ND	ND	0.39	**5.3**	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 20	ND	ND	ND	0.39	5.3	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 20	ND	ND	ND	0.39	5.3	370	No	Constituent not detected.
Hexachloroethane	0 / 20	ND	ND	ND	0.39	5.3	120	No	Constituent not detected.
Hexachlorophene	0 / 17	ND	ND	ND	**200**	**2300**	18	No	Constituent not detected.
Hexachloropropene	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 20	ND	ND	ND	0.39	**5.3**	2.1	No	Constituent not detected.
Isophorone	0 / 20	ND	ND	ND	0.39	5.3	1800	No	Constituent not detected.
Isosafrole	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 20	ND	ND	ND	0.39	5.3	6.2	No	Constituent not detected.
Methapyrilene	0 / 16	ND	ND	ND	80	1100	NA	No	Constituent not detected.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Methyl methanesulfonate	0 / 20	ND	ND	ND	0.39	5.3	17	No	Constituent not detected.
Naphthalene	0 / 20	ND	ND	ND	0.39	5.3	18	No	Constituent not detected.
Nitrobenzene	0 / 20	ND	ND	ND	0.39	5.3	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.011	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 20	ND	ND	ND	0.39	**5.3**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 20	ND	ND	ND	0.39	5.3	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 20	ND	ND	ND	0.39	**5.3**	0.82	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
o-Toluidine	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 20	ND	ND	ND	**0.39**	**5.3**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 20	ND	ND	ND	0.39	5.3	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 20	ND	ND	ND	0.39	5.3	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 20	ND	ND	ND	2	**27**	9	No	Constituent not detected.
Phenacetin	0 / 20	ND	ND	ND	0.39	5.3	780	No	Constituent not detected.
Phenanthrene	0 / 20	ND	ND	ND	0.39	5.3	NA	No	Constituent not detected.
Phenol	0 / 20	ND	ND	ND	0.39	5.3	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 20	ND	ND	ND	2	27	12000	No	Constituent not detected.
Pronamide	0 / 20	ND	ND	ND	0.39	5.3	4600	No	Constituent not detected.
Pyrene	0 / 20	ND	ND	ND	0.39	5.3	1700	No	Constituent not detected.
Pyridine	0 / 20	ND	ND	ND	0.39	5.3	100	No	Constituent not detected.
Safrole, Total	0 / 20	ND	ND	ND	0.39	5.3	7.8	No	Constituent not detected.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (TICs)									
1-Decene	1 / 1	3.2	3.2	WLSS-4A	--	--	260	No	Maximum detect below screening value.
Cyclododecane	2 / 2	1.8	1.9	WLSS-3A	--	--	2900	No	Maximum detect below screening value.
Cyclopropane, nonyl-	1 / 1	3.9	3.9	WLSS-3A	--	--	2900	No	Maximum detect below screening value.
Ethane, 1,1,2,2-tetrachloro-	1 / 1	0.26	0.26	ELSS-3B	--	--	2.8	No	Maximum detect below screening value.
.gamma.-Sitosterol	1 / 1	2.8	2.8	WLSS-1A	--	--	NA	No	Screening value not available; see Table 3-8.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 20	ND	ND	ND	1.1	**15**	3.4	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 20	ND	ND	ND	1.2	16	310	No	Constituent not detected.
Diethylene glycol	0 / 20	ND	ND	ND	6	81	NA	No	Constituent not detected.
Dipropylene glycol	0 / 20	ND	ND	ND	6	81	NA	No	Constituent not detected.
Ethanol	0 / 20	ND	ND	ND	1.2	16	NA	No	Constituent not detected.
Ethylene glycol	0 / 20	ND	ND	ND	6	81	120000	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 20	ND	ND	ND	6	81	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 20	ND	ND	ND	6	81	NA	No	Constituent not detected.
Isopropanol	0 / 20	ND	ND	ND	1.2	16	4200000000	No	Constituent not detected.
Methanol	2 / 20	1.6	14	WLSS-5A	1.3	16	31000	No	Maximum detect below screening value.
Propylene glycol	0 / 20	ND	ND	ND	6	81	1200000	No	Constituent not detected.
Polychlorinated Biphenyls (PCBs)									
PCB-1016	0 / 1	ND	ND	ND	0.042	0.042	21	No	Constituent not detected.
PCB-1221	0 / 1	ND	ND	ND	0.086	0.086	0.54	No	Constituent not detected.
PCB-1232	0 / 1	ND	ND	ND	0.042	0.042	0.54	No	Constituent not detected.
PCB-1242	0 / 1	ND	ND	ND	0.042	0.042	0.74	No	Constituent not detected.
PCB-1248	0 / 1	ND	ND	ND	0.042	0.042	0.74	No	Constituent not detected.
PCB-1254	0 / 1	ND	ND	ND	0.042	0.042	0.74	No	Constituent not detected.
PCB-1260	0 / 1	ND	ND	ND	0.042	0.042	0.74	No	Constituent not detected.
Pesticides and PCBs									
1,1'-Biphenyl, heptachloro-	0 / 1	ND	ND	ND	0.013	0.013	NA	No	Constituent not detected.
1,1'-Biphenyl, hexachloro-	0 / 1	ND	ND	ND	0.0086	0.0086	1.1	No	Constituent not detected.
1,1'-Biphenyl, nonachloro-	0 / 1	ND	ND	ND	0.022	0.022	NA	No	Constituent not detected.
1,1'-Biphenyl, octachloro-	0 / 1	ND	ND	ND	0.013	0.013	NA	No	Constituent not detected.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Pesticides and PCBs (continued)									
Chlorobiphenyl	0 / 1	ND	ND	ND	0.0043	0.0043	NA	No	Constituent not detected.
Decachlorobiphenyl	0 / 1	ND	ND	ND	0.022	0.022	NA	No	Constituent not detected.
Dichlorobiphenyl	0 / 1	ND	ND	ND	0.0043	0.0043	NA	No	Constituent not detected.
Pentachlorobiphenyl	0 / 1	ND	ND	ND	0.0086	0.0086	0.11	No	Constituent not detected.
Tetrachlorobiphenyl	0 / 1	ND	ND	ND	0.0086	0.0086	NA	No	Constituent not detected.
Trichlorobiphenyl	0 / 1	ND	ND	ND	0.0043	0.0043	NA	No	Constituent not detected.
Inorganics									
Aluminum	20 / 20	3000	32000	ELSS-3A	--	--	99000	No	Maximum detect below screening value.
Antimony	9 / 20	1.4	3.4	WLSS-2A	0.55	6.2	41	No	Maximum detect below screening value.
Arsenic	20 / 20	0.44	6.5	WLSS-2A	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	20 / 20	16	400	ELSS-3B	--	--	19000	No	Maximum detect below screening value.
Beryllium	18 / 20	0.16	1.8	ELSS-3B	1.1	1.2	200	No	Maximum detect below screening value.
Cadmium	14 / 20	0.028	1.9	ELSS-5A	0.11	0.17	80	No	Maximum detect below screening value.
Calcium	20 / 20	410	14000	ELSS-4A	--	--	NA	No	Screening value not available; see Table 3-8.
Chromium	20 / 20	7.3	78	ELSS-5A	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	20 / 20	1.7	18	ELSS-3B	--	--	30	No	Maximum detect below screening value.
Copper	20 / 20	2.3	300	WLSS-3A	--	--	4100	No	Maximum detect below screening value.
Iron	20 / 20	2800	25000	WLSS-4B	--	--	72000	No	Maximum detect below screening value.
Lead	20 / 20	3.3	76	ELSS-5A	--	--	800	No	Maximum detect below screening value.
Magnesium	20 / 20	350	2300	WLSS-1A	--	--	NA	No	Screening value not available; see Table 3-8.
Manganese	20 / 20	29	380	ELSS-3B	--	--	2300	No	Maximum detect below screening value.
Mercury	1 / 20	0.062	0.062	ELSS-4B	0.11	1.4	3.4	No	Maximum detect below screening value.
Nickel	20 / 20	1.9	72	ELSS-5A	--	--	2000	No	Maximum detect below screening value.
Potassium	20 / 20	320	2400	ELSS-3B	--	--	NA	No	Screening value not available; see Table 3-8.
Selenium	17 / 20	0.18	1.4	ELSS-3A	0.61	7	510	No	Maximum detect below screening value.
Silver	11 / 20	0.072	1.6	ELSS-5A	0.22	0.33	510	No	Maximum detect below screening value.
Sodium	20 / 20	200	8500	ELSS-3B	--	--	NA	No	Screening value not available; see Table 3-8.
Thallium	12 / 20	0.12	0.5	ELSS-3A	0.24	2.8	NA	**YES**	Screening value not available; see Table 3-8.
Vanadium	20 / 20	11	100	ELSS-3B	--	--	520	No	Maximum detect below screening value.
Zinc	20 / 20	6.3	3700	ELSS-5A	--	--	31000	No	Maximum detect below screening value.

TABLE 3-9
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Other Inorganics									
Chloride	20 / 20	110	9400	ELSS-3B	--	--	NA	No	Screening value not available; see Table 3-8.
Nitrate as N	11 / 20	4.1	280	WLSS-2A	6	56	160000	No	Maximum detect below screening value.
Nitrite as N	3 / 20	0.88	22	ELSS-5A	1.2	16	10000	No	Maximum detect below screening value.
Total Kjeldhal Nitrogen (TKN)	20 / 20	250	30000	WLSS-3A	--	--	NA	No	Screening value not available; see Table 3-8.
Total Organic Carbon (TOC)	20 / 20	1100	410000	WLSS-5A	--	--	NA	No	Screening value not available; see Table 3-8.
Sulfate	13 / 20	210	2500	ELSS-3B	990	1600	NA	No	Screening value not available; see Table 3-8.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 6	ND	ND	ND	0.0071	0.0079	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 6	ND	ND	ND	0.0071	0.0079	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 6	ND	ND	ND	0.0071	0.0079	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 6	ND	ND	ND	0.0071	0.0079	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 6	ND	ND	ND	0.0071	0.0079	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 6	ND	ND	ND	0.0071	0.0079	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 6	ND	ND	ND	0.0071	0.0079	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 6	ND	ND	ND	0.014	0.016	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 6	ND	ND	ND	0.0071	0.0079	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 6	ND	ND	ND	0.0071	0.0079	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 6	ND	ND	ND	0.0071	0.0079	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 6	ND	ND	ND	0.0071	0.0079	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 6	ND	ND	ND	0.0071	0.0079	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 6	ND	ND	ND	0.0071	0.0079	8.1	No	Constituent not detected.
2-Butanone (MEK)	0 / 6	ND	ND	ND	0.035	0.04	20000	No	Constituent not detected.
2-Hexanone	0 / 6	ND	ND	ND	0.035	0.04	140	No	Constituent not detected.
3-Methylhexane	0 / 6	ND	ND	ND	0.0071	0.0079	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 6	ND	ND	ND	0.035	0.04	5300	No	Constituent not detected.
Acetone	6 / 6	0.053	0.17	NLSS-3A	--	--	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 6	ND	ND	ND	0.28	0.32	370	No	Constituent not detected.
Acrolein	0 / 6	ND	ND	ND	**0.14**	**0.16**	0.065	No	Constituent not detected.
Acrylonitrile	0 / 6	ND	ND	ND	0.14	0.16	1.2	No	Constituent not detected.
Allyl chloride	0 / 6	ND	ND	ND	0.0071	0.0079	3.4	No	Constituent not detected.
Benzene	0 / 6	ND	ND	ND	0.0071	0.0079	5.4	No	Constituent not detected.
Benzyl chloride	0 / 6	ND	ND	ND	0.0071	0.0079	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 6	ND	ND	ND	0.0071	0.0079	1.4	No	Constituent not detected.
Bromoform	0 / 6	ND	ND	ND	0.0071	0.0079	220	No	Constituent not detected.
Bromomethane	0 / 6	ND	ND	ND	0.0071	0.0079	3.2	No	Constituent not detected.
Carbon disulfide	0 / 6	ND	ND	ND	0.0071	0.0079	370	No	Constituent not detected.
Carbon tetrachloride	0 / 6	ND	ND	ND	0.0071	0.0079	3	No	Constituent not detected.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chlorobenzene	0 / 6	ND	ND	ND	0.0071	0.0079	140	No	Constituent not detected.
Chloroethane	0 / 6	ND	ND	ND	0.0071	0.0079	6100	No	Constituent not detected.
Chloroform	0 / 6	ND	ND	ND	0.0071	0.0079	1.5	No	Constituent not detected.
Chloromethane	0 / 6	ND	ND	ND	0.0071	0.0079	50	No	Constituent not detected.
Chloroprene	0 / 6	ND	ND	ND	0.0071	0.0079	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 6	ND	ND	ND	0.0071	0.0079	3.3	No	Constituent not detected.
Dibromomethane	0 / 6	ND	ND	ND	0.0071	0.0079	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 6	ND	ND	ND	0.0071	0.0079	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 6	ND	ND	ND	0.0071	0.0079	NA	No	Constituent not detected.
Diethyl ether	0 / 6	ND	ND	ND	0.014	0.016	20000	No	Constituent not detected.
Ethyl methacrylate	0 / 6	ND	ND	ND	0.0071	0.0079	9200	No	Constituent not detected.
Ethylbenzene	0 / 6	ND	ND	ND	0.0071	0.0079	27	No	Constituent not detected.
Ethylene oxide	0 / 6	ND	ND	ND	0.14	0.16	0.83	No	Constituent not detected.
Iodomethane	0 / 6	ND	ND	ND	0.0071	0.0079	NA	No	Constituent not detected.
Methacrylonitrile	0 / 6	ND	ND	ND	0.14	0.16	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 6	ND	ND	ND	0.0071	0.0079	2100	No	Constituent not detected.
Methylene Chloride	0 / 6	ND	ND	ND	0.0071	0.0079	53	No	Constituent not detected.
n-Heptane	0 / 6	ND	ND	ND	0.0071	0.0079	NA	No	Constituent not detected.
Pentachloroethane	0 / 6	ND	ND	ND	0.035	0.04	19	No	Constituent not detected.
Propionitrile	0 / 6	ND	ND	ND	0.14	0.16	NA	No	Constituent not detected.
Propylene oxide	0 / 6	ND	ND	ND	0.14	0.16	8.8	No	Constituent not detected.
Styrene	0 / 6	ND	ND	ND	0.0071	0.0079	3600	No	Constituent not detected.
t-Butanol[3]	6 / 6	0.26	13	NLSS-3B	--	--	6200	No	Maximum detect below screening value.
Tetrachloroethene	0 / 6	ND	ND	ND	0.0071	0.0079	2.6	No	Constituent not detected.
Toluene	0 / 6	ND	ND	ND	0.0071	0.0079	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 6	ND	ND	ND	0.014	0.016	0.035	No	Constituent not detected.
Trichloroethylene	0 / 6	ND	ND	ND	0.0071	0.0079	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 6	ND	ND	ND	0.0071	0.0079	340	No	Constituent not detected.
Vinyl acetate	0 / 6	ND	ND	ND	0.014	0.016	410	No	Constituent not detected.
Vinyl chloride	0 / 6	ND	ND	ND	0.0071	0.0079	1.7	No	Constituent not detected.
Xylenes, Total	0 / 6	ND	ND	ND	0.014	0.016	270	No	Constituent not detected.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	6 / 6	0.55	3	NLSS-3A	--	--	NA	No	Screening value not available; see Table 3-8.
Methylcyclohexane	1 / 1	0.0041	0.0041	NLSS-1B	--	--	2900	No	Maximum detect below screening value.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 6	ND	ND	ND	0.4	0.46	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 6	ND	ND	ND	0.4	0.46	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 6	ND	ND	ND	0.4	0.46	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 6	ND	ND	ND	0.4	0.46	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 6	ND	ND	ND	0.4	0.46	12	No	Constituent not detected.
1,4-Dioxane	0 / 6	ND	ND	ND	0.4	0.46	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 6	ND	ND	ND	0.4	0.46	8.1	No	Constituent not detected.
1-Naphthalenamine	0 / 6	ND	ND	ND	0.4	0.46	8.1	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 6	ND	ND	ND	0.4	0.46	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 6	ND	ND	ND	0.4	0.46	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 6	ND	ND	ND	0.4	0.46	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 6	ND	ND	ND	0.4	0.46	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 6	ND	ND	ND	0.4	0.46	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 6	ND	ND	ND	0.4	0.46	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 6	ND	ND	ND	2.1	2.4	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 6	ND	ND	ND	0.4	0.46	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 6	ND	ND	ND	0.4	0.46	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 6	ND	ND	ND	0.4	**0.46**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 6	ND	ND	ND	0.4	0.46	8200	No	Constituent not detected.
2-Chlorophenol	0 / 6	ND	ND	ND	0.4	0.46	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 6	ND	ND	ND	0.4	0.46	410	No	Constituent not detected.
2-Methylphenol	0 / 6	ND	ND	ND	0.4	0.46	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 6	ND	ND	ND	0.4	0.46	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 6	ND	ND	ND	2.1	2.4	600	No	Constituent not detected.
2-Nitrophenol	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Picoline	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
2-sec-Butyl-4,6-dinitrophenol	0 / 6	ND	ND	ND	0.4	0.46	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 6	ND	ND	ND	0.4	0.46	310	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 6	ND	ND	ND	0.8	0.92	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 6	ND	ND	ND	**2.1**	**2.4**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 6	ND	ND	ND	2.1	2.4	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 6	ND	ND	ND	2.1	2.4	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 6	ND	ND	ND	0.4	0.46	6200	No	Constituent not detected.
4-Chloroaniline	0 / 6	ND	ND	ND	0.8	0.92	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
4-Nitroaniline	0 / 6	ND	ND	ND	2.1	2.4	86	No	Constituent not detected.
4-Nitrophenol	0 / 6	ND	ND	ND	2.1	2.4	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 6	ND	ND	ND	0.4	0.46	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 6	ND	ND	ND	0.4	0.46	3300	No	Constituent not detected.
Acenaphthylene	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
Acetophenone	0 / 6	ND	ND	ND	0.4	0.46	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 6	ND	ND	ND	81	93	NA	No	Constituent not detected.
Aniline	0 / 6	ND	ND	ND	0.8	0.92	300	No	Constituent not detected.
Anthracene	0 / 6	ND	ND	ND	0.4	0.46	17000	No	Constituent not detected.
Aramite, Total	0 / 6	ND	ND	ND	0.4	0.46	69	No	Constituent not detected.
Benzo[a]anthracene	0 / 6	ND	ND	ND	0.4	0.46	2.1	No	Constituent not detected.
Benzo[a]pyrene	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.21	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 6	ND	ND	ND	0.4	0.46	2.1	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 6	ND	ND	ND	0.4	0.46	1700	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 6	ND	ND	ND	0.4	0.46	21	No	Constituent not detected.
Benzyl alcohol	0 / 6	ND	ND	ND	0.4	0.46	6200	No	Constituent not detected.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Bis(2-chloroethoxy)methane	0 / 6	ND	ND	ND	0.4	0.46	180	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 6	ND	ND	ND	0.4	0.46	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	1 / 6	0.13	0.13	NLSS-3B	0.4	0.46	120	No	Maximum detect below screening value.
Butyl benzyl phthalate	0 / 6	ND	ND	ND	0.4	0.46	910	No	Constituent not detected.
Chrysene	0 / 6	ND	ND	ND	0.4	0.46	210	No	Constituent not detected.
Diallate	0 / 6	ND	ND	ND	0.4	0.46	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 6	ND	ND	ND	0.4	0.46	100	No	Constituent not detected.
Diethyl phthalate	0 / 6	ND	ND	ND	0.4	0.46	49000	No	Constituent not detected.
Dimethoate	0 / 6	ND	ND	ND	0.4	0.46	12	No	Constituent not detected.
Dimethyl phthalate	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 6	ND	ND	ND	0.4	0.46	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
Fluoranthene	0 / 6	ND	ND	ND	0.4	0.46	2200	No	Constituent not detected.
Fluorene	0 / 6	ND	ND	ND	0.4	0.46	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 6	ND	ND	ND	0.4	0.46	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 6	ND	ND	ND	0.4	0.46	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 6	ND	ND	ND	0.4	0.46	370	No	Constituent not detected.
Hexachloroethane	0 / 6	ND	ND	ND	0.4	0.46	120	No	Constituent not detected.
Hexachlorophene	0 / 6	ND	ND	ND	**210**	**240**	18	No	Constituent not detected.
Hexachloropropene	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 6	ND	ND	ND	0.4	0.46	2.1	No	Constituent not detected.
Isophorone	0 / 6	ND	ND	ND	0.4	0.46	1800	No	Constituent not detected.
Isosafrole	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 6	ND	ND	ND	0.4	0.46	6.2	No	Constituent not detected.
Methapyrilene	0 / 6	ND	ND	ND	81	93	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 6	ND	ND	ND	0.4	0.46	17	No	Constituent not detected.
Naphthalene	0 / 6	ND	ND	ND	0.4	0.46	18	No	Constituent not detected.
Nitrobenzene	0 / 6	ND	ND	ND	0.4	0.46	24	No	Constituent not detected.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
N-Nitrosodiethylamine	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.011	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 6	ND	ND	ND	0.4	**0.46**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 6	ND	ND	ND	0.4	0.46	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 6	ND	ND	ND	0.4	0.46	0.82	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
o-Toluidine	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 6	ND	ND	ND	**0.4**	**0.46**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 6	ND	ND	ND	0.4	0.46	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 6	ND	ND	ND	0.4	0.46	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 6	ND	ND	ND	2.1	2.4	9	No	Constituent not detected.
Phenacetin	0 / 6	ND	ND	ND	0.4	0.46	780	No	Constituent not detected.
Phenanthrene	0 / 6	ND	ND	ND	0.4	0.46	NA	No	Constituent not detected.
Phenol	0 / 6	ND	ND	ND	0.4	0.46	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 6	ND	ND	ND	2.1	2.4	12000	No	Constituent not detected.
Pronamide	0 / 6	ND	ND	ND	0.4	0.46	4600	No	Constituent not detected.
Pyrene	0 / 6	ND	ND	ND	0.4	0.46	1700	No	Constituent not detected.
Pyridine	0 / 6	ND	ND	ND	0.4	0.46	100	No	Constituent not detected.
Safrole, Total	0 / 6	ND	ND	ND	0.4	0.46	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
Ergostanol	1 / 1	0.35	0.35	NLSS-1B	--	--	NA	No	Screening value not available; see Table 3-8.
Ethane, 1,1,2,2-tetrachloro-	1 / 1	0.17	0.17	NLSS-3B	**--**	**--**	2.8	No	Maximum detect below screening value.
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	1 / 1	0.17	0.17	NLSS-3B	**--**	**--**	18	No	Maximum detect below screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 6	ND	ND	ND	1.1	1.3	3.4	No	Constituent not detected.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 6	ND	ND	ND	1.2	1.4	310	No	Constituent not detected.
Diethylene glycol	0 / 6	ND	ND	ND	6.1	7	NA	No	Constituent not detected.
Dipropylene glycol	0 / 6	ND	ND	ND	6.1	7	NA	No	Constituent not detected.
Ethanol	0 / 6	ND	ND	ND	1.2	1.4	NA	No	Constituent not detected.
Ethylene glycol	0 / 6	ND	ND	ND	6.1	7	120000	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 6	ND	ND	ND	6.1	7	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 6	ND	ND	ND	6.1	7	NA	No	Constituent not detected.
Isopropanol	0 / 6	ND	ND	ND	1.2	1.4	4200000000	No	Constituent not detected.
Methanol	5 / 6	0.52	1.3	NLSS-2B	1.2	1.2	31000	No	Maximum detect below screening value.
Propylene glycol	0 / 6	ND	ND	ND	6.1	7	1200000	No	Constituent not detected.
Inorganics									
Aluminum	6 / 6	5600	20000	NLSS-2B	--	--	99000	No	Maximum detect below screening value.
Antimony	1 / 6	0.25	0.25	NLSS-2A	0.54	0.64	41	No	Maximum detect below screening value.
Arsenic	6 / 6	1.4	5	NLSS-2A	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	6 / 6	34	78	NLSS-2B	--	--	19000	No	Maximum detect below screening value.
Beryllium	6 / 6	0.32	0.67	NLSS-3A	--	--	200	No	Maximum detect below screening value.
Cadmium	3 / 6	0.03	0.088	NLSS-2A	0.12	0.13	80	No	Maximum detect below screening value.
Calcium	6 / 6	420	1400	NLSS-1B	--	--	NA	No	Screening value not available; see Table 3-8.
Chromium	6 / 6	18	39	NLSS-3A	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	6 / 6	2.7	5.8	NLSS-2B	--	--	30	No	Maximum detect below screening value.
Copper	6 / 6	8	17	NLSS-1B	--	--	4100	No	Maximum detect below screening value.
Iron	6 / 6	6700	24000	NLSS-3A	--	--	72000	No	Maximum detect below screening value.
Lead	6 / 6	7.7	31	NLSS-2A	--	--	800	No	Maximum detect below screening value.
Magnesium	6 / 6	590	1300	NLSS-3A	--	--	NA	No	Screening value not available; see Table 3-8.
Manganese	6 / 6	30	61	NLSS-1B	--	--	2300	No	Maximum detect below screening value.
Mercury	1 / 6	0.051	0.051	NLSS-2A	0.11	0.13	3.4	No	Maximum detect below screening value.
Nickel	6 / 6	4.7	10	NLSS-2A	--	--	2000	No	Maximum detect below screening value.
Potassium	6 / 6	520	920	NLSS-3A	--	--	NA	No	Screening value not available; see Table 3-8.
Selenium	5 / 6	0.14	0.45	NLSS-2A	0.59	0.59	510	No	Maximum detect below screening value.
Silver	1 / 6	0.069	0.069	NLSS-2A	0.22	0.26	510	No	Maximum detect below screening value.

TABLE 3-10
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics (continued)									
Sodium	6 / 6	150	3400	NLSS-3A	--	--	NA	No	Screening value not available; see Table 3-8.
Thallium	6 / 6	0.077	0.32	NLSS-2B	--	--	NA	**YES**	Screening value not available; see Table 3-8.
Vanadium	6 / 6	19	66	NLSS-3A	**--**	**--**	520	No	Maximum detect below screening value.
Zinc	6 / 6	18	35	NLSS-3A	**--**	**--**	31000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	6 / 6	56	1700	NLSS-3A	--	--	NA	No	Screening value not available; see Table 3-8.
Nitrate as N	0 / 6	ND	ND	ND	6.1	7	160000	No	Constituent not detected.
Nitrite as N	2 / 6	0.8	1	NLSS-3A	1.2	1.4	10000	No	Maximum detect below screening value.
Total Kjeldhal Nitrogen (TKN)	6 / 6	40	390	NLSS-2B	--	--	NA	No	Screening value not available; see Table 3-8.
Total Organic Carbon (TOC)	5 / 6	1700	4700	NLSS-1B	1000	1000	NA	No	Screening value not available; see Table 3-8.
Sulfate	6 / 6	720	2800000	NLSS-1A	--	--	NA	No	Screening value not available; see Table 3-8.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-11
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.0049	0.017	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	0.0049	0.017	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.0049	0.017	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	0.0049	0.017	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	0.0049	0.017	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	0.0049	0.017	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	0.0049	0.017	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	0.0099	0.034	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	0.0049	0.017	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	0.0049	0.017	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	0.0049	0.017	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	0.0049	0.017	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.0049	0.017	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.0049	0.017	8.1	No	Constituent not detected.
2-Butanone (MEK)	3 / 3	0.0052	0.03	EBSED-3	--	--	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 3	ND	ND	ND	0.025	0.085	140	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	0.0049	0.017	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	0.025	0.085	5300	No	Constituent not detected.
Acetone	3 / 3	0.04	0.26	EBSED-2	--	--	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 3	ND	ND	ND	0.2	0.68	370	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**0.099**	**0.34**	0.065	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	0.099	0.34	1.2	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	0.0049	0.017	3.4	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	0.0049	0.017	5.4	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	0.0049	0.017	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	0.0049	0.017	1.4	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	0.0049	0.017	220	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	0.0049	0.017	3.2	No	Constituent not detected.
Carbon disulfide	2 / 3	0.013	0.023	EBSED-2	0.0049	0.0049	370	No	Maximum detect below screening value.
Carbon tetrachloride	0 / 3	ND	ND	ND	0.0049	0.017	3	No	Constituent not detected.

TABLE 3-11
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chlorobenzene	0 / 3	ND	ND	ND	0.0049	0.017	140	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	0.0049	0.017	6100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	0.0049	0.017	1.5	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	0.0049	0.017	50	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	0.0049	0.017	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	0.0049	0.017	3.3	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	0.0049	0.017	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	0.0049	0.017	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	0.0049	0.017	NA	No	Constituent not detected.
Diethyl ether	2 / 3	0.0028	0.031	EBSED-3	0.0099	0.0099	20000	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 3	ND	ND	ND	0.0049	0.017	9200	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	0.0049	0.017	27	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	0.099	0.34	0.83	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	0.0049	0.017	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	0.099	0.34	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	0.0049	0.017	2100	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	0.0049	0.017	53	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	0.0049	0.017	NA	No	Constituent not detected.
Pentachloroethane	0 / 3	ND	ND	ND	0.025	0.085	19	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	0.099	0.34	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	0.099	0.34	8.8	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	0.0049	0.017	3600	No	Constituent not detected.
t-Butanol	3 / 3	0.021	1.6	EBSED-2	--	--	6200	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	0.0049	0.017	2.6	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	0.0049	0.017	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 3	ND	ND	ND	0.0099	0.034	0.035	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	0.0049	0.017	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 3	ND	ND	ND	0.0049	0.017	340	No	Constituent not detected.
Vinyl acetate	0 / 3	ND	ND	ND	0.0099	0.034	410	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	0.0049	0.017	1.7	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	0.0099	0.034	270	No	Constituent not detected.

TABLE 3-11
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	3 / 3	0.67	3.8	EBSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	0.54	0.62	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	0.54	0.62	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	0.54	0.62	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	0.54	0.62	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	0.54	0.62	12	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	0.54	0.62	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 3	ND	ND	ND	0.54	0.62	8.1	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	0.54	0.62	8.1	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	0.54	0.62	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	0.54	0.62	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	0.54	0.62	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	0.54	0.62	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	0.54	0.62	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 3	ND	ND	ND	0.54	0.62	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	2.8	3.2	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	0.54	0.62	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	0.54	0.62	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	0.54	0.62	8200	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	0.54	0.62	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	0.54	0.62	410	No	Constituent not detected.
2-Methylphenol	0 / 3	ND	ND	ND	0.54	0.62	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	0.54	0.62	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	2.8	3.2	600	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.

TABLE 3-11
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
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Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-sec-Butyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	0.54	0.62	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	0.54	0.62	310	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 3	ND	ND	ND	1.1	1.2	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**2.8**	**3.2**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	2.8	3.2	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	2.8	3.2	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	0.54	0.62	6200	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	1.1	1.2	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	2.8	3.2	86	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	2.8	3.2	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 3	ND	ND	ND	0.54	0.62	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	0.54	0.62	3300	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	0.54	0.62	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 3	ND	ND	ND	110	130	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	1.1	1.2	300	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	0.54	0.62	17000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	0.54	0.62	69	No	Constituent not detected.
Benzo[a]anthracene	0 / 3	ND	ND	ND	0.54	0.62	2.1	No	Constituent not detected.
Benzo[a]pyrene	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.21	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	0.54	0.62	2.1	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 3	ND	ND	ND	0.54	0.62	1700	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 3	ND	ND	ND	0.54	0.62	21	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	0.54	0.62	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	0.54	0.62	180	No	Constituent not detected.

TABLE 3-11
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Semi-Volatile Organics (continued)									
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	0.54	0.62	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 3	ND	ND	ND	0.54	0.62	120	No	Constituent not detected.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	0.54	0.62	910	No	Constituent not detected.
Chrysene	0 / 3	ND	ND	ND	0.54	0.62	210	No	Constituent not detected.
Diallate	0 / 3	ND	ND	ND	0.54	0.62	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 3	ND	ND	ND	0.54	0.62	100	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	0.54	0.62	49000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	0.54	0.62	12	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	0.54	0.62	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
Fluoranthene	0 / 3	ND	ND	ND	0.54	0.62	2200	No	Constituent not detected.
Fluorene	0 / 3	ND	ND	ND	0.54	0.62	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	0.54	0.62	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	0.54	0.62	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	0.54	0.62	370	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	0.54	0.62	120	No	Constituent not detected.
Hexachlorophene	0 / 3	ND	ND	ND	**280**	**320**	18	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 3	ND	ND	ND	0.54	0.62	2.1	No	Constituent not detected.
Isophorone	0 / 3	ND	ND	ND	0.54	0.62	1800	No	Constituent not detected.
Isosafrole	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	0.54	0.62	6.2	No	Constituent not detected.
Methapyrilene	0 / 3	ND	ND	ND	110	130	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 3	ND	ND	ND	0.54	0.62	17	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	0.54	0.62	18	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	0.54	0.62	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.011	No	Constituent not detected.

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Semi-Volatile Organics (continued)									
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	0.54	0.62	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	0.54	0.62	0.82	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	0.54	0.62	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**0.54**	**0.62**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	0.54	0.62	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	0.54	0.62	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	2.8	3.2	9	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	0.54	0.62	780	No	Constituent not detected.
Phenanthrene	1 / 3	0.065	0.065	EBSED-3	0.54	0.62	17000	No	Maximum detect below screening value.
Phenol	0 / 3	ND	ND	ND	0.54	0.62	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	2.8	3.2	12000	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	0.54	0.62	4600	No	Constituent not detected.
Pyrene	0 / 3	ND	ND	ND	0.54	0.62	1700	No	Constituent not detected.
Pyridine	0 / 3	ND	ND	ND	0.54	0.62	100	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	0.54	0.62	7.8	No	Constituent not detected.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	1.5	1.7	3.4	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	1.6	1.9	310	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	8.1	9.4	NA	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	8.1	9.4	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1.6	1.9	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	8.1	9.4	120000	No	Constituent not detected.

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Alcohols and Glycols (continued)									
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	8.1	9.4	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	8.1	9.4	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1.6	1.9	4200000000	No	Constituent not detected.
Methanol	2 / 3	2	4	EBSED-3	1.9	1.9	31000	No	Maximum detect below screening value.
Propylene glycol	0 / 3	ND	ND	ND	8.1	9.4	1200000	No	Constituent not detected.
Polychlorinated Biphenyls (PCBs)									
PCB-1016	0 / 1	ND	ND	ND	0.074	0.074	21	No	Constituent not detected.
PCB-1221	0 / 1	ND	ND	ND	0.15	0.15	0.54	No	Constituent not detected.
PCB-1232	0 / 1	ND	ND	ND	0.074	0.074	0.54	No	Constituent not detected.
PCB-1242	0 / 1	ND	ND	ND	0.074	0.074	0.74	No	Constituent not detected.
PCB-1248	0 / 1	ND	ND	ND	0.074	0.074	0.74	No	Constituent not detected.
PCB-1254	1 / 1	0.48	0.48	EB PCB-1	--	--	0.74	No	Maximum detect below screening value.
PCB-1260	1 / 1	0.17	0.17	EB PCB-1	--	--	0.74	No	Maximum detect below screening value.
Pesticides and PCBs									
1,1'-Biphenyl, heptachloro-	0 / 1	ND	ND	ND	0.22	0.22	NA	No	Constituent not detected.
1,1'-Biphenyl, hexachloro-	0 / 1	ND	ND	ND	0.15	0.15	1.1	No	Constituent not detected.
1,1'-Biphenyl, nonachloro-	0 / 1	ND	ND	ND	0.38	0.38	NA	No	Constituent not detected.
1,1'-Biphenyl, octachloro-	0 / 1	ND	ND	ND	0.22	0.22	NA	No	Constituent not detected.
Chlorobiphenyl	0 / 1	ND	ND	ND	0.073	0.073	NA	No	Constituent not detected.
Decachlorobiphenyl	0 / 1	ND	ND	ND	0.38	0.38	NA	No	Constituent not detected.
Dichlorobiphenyl	0 / 1	ND	ND	ND	0.073	0.073	NA	No	Constituent not detected.
Pentachlorobiphenyl	0 / 1	ND	ND	ND	**0.15**	**0.15**	0.11	No	Constituent not detected.
Tetrachlorobiphenyl	0 / 1	ND	ND	ND	0.15	0.15	NA	No	Constituent not detected.
Trichlorobiphenyl	0 / 1	ND	ND	ND	0.073	0.073	NA	No	Constituent not detected.
Inorganics									
Aluminum	3 / 3	21000	38000	EBSED-3	--	--	99000	No	Maximum detect below screening value.
Antimony	2 / 3	0.9	1.7	EBSED-2	0.75	0.75	41	No	Maximum detect below screening value.
Arsenic	3 / 3	3.3	12	EBSED-3	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	110	150	EBSED-3	--	--	19000	No	Maximum detect below screening value.
Beryllium	3 / 3	1.3	1.7	EBSED-2	--	--	200	No	Maximum detect below screening value.

TABLE 3-11
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics (continued)									
Cadmium	3 / 3	0.05	1	EBSED-2	**--**	**--**	80	No	Maximum detect below screening value.
Calcium	3 / 3	2000	4200	EBSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Chromium	3 / 3	33	71	EBSED-3	**--**	**--**	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	7.9	9.9	EBSED-3	**--**	**--**	30	No	Maximum detect below screening value.
Copper	3 / 3	21	56	EBSED-2	**--**	**--**	4100	No	Maximum detect below screening value.
Iron	3 / 3	20000	24000	EBSED-3	**--**	**--**	72000	No	Maximum detect below screening value.
Lead	3 / 3	22	110	EBSED-3	**--**	**--**	800	No	Maximum detect below screening value.
Magnesium	3 / 3	1700	2200	EBSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Manganese	3 / 3	97	330	EBSED-2	**--**	**--**	2300	No	Maximum detect below screening value.
Mercury	1 / 3	0.24	0.24	EBSED-3	0.15	0.17	3.4	No	Maximum detect below screening value.
Nickel	3 / 3	13	21	EBSED-3	**--**	**--**	2000	No	Maximum detect below screening value.
Potassium	3 / 3	1100	1400	EBSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Selenium	3 / 3	0.35	0.79	EBSED-3	**--**	**--**	510	No	Maximum detect below screening value.
Silver	2 / 3	0.18	0.27	EBSED-3	0.3	0.3	510	No	Maximum detect below screening value.
Sodium	3 / 3	110	740	EBSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Thallium	3 / 3	0.31	0.72	EBSED-3	--	--	NA	**YES**	Screening value not available; see Table 3-8.
Vanadium	3 / 3	72	340	EBSED-2	**--**	**--**	520	No	Maximum detect below screening value.
Zinc	3 / 3	56	360	EBSED-2	**--**	**--**	31000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	3 / 3	110	360	EBSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Nitrate as N	2 / 3	5.9	7.4	EBSED-3	16	16	160000	No	Maximum detect below screening value.
Nitrite as N	0 / 3	ND	ND	ND	1.6	1.9	10000	No	Constituent not detected.
Total Kjeldhal Nitrogen (TKN)	3 / 3	810	2500	EBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Total Organic Carbon (TOC)	3 / 3	6500	100000	EBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Sulfate	3 / 3	180	2300	EBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.0064	0.038	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	0.0064	0.038	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.0064	0.038	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	0.0064	0.038	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	0.0064	0.038	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	0.0064	0.038	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	0.0064	0.038	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	0.013	**0.077**	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	0.0064	0.038	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	0.0064	0.038	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	0.0064	0.038	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	0.0064	0.038	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.0064	0.038	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.0064	0.038	8.1	No	Constituent not detected.
2-Butanone (MEK)	3 / 3	0.0066	0.2	WBSED-3	--	--	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 3	ND	ND	ND	0.032	0.19	140	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	0.0064	0.038	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	0.032	0.19	5300	No	Constituent not detected.
Acetone	3 / 3	0.2	0.99	WBSED-3	--	--	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 3	ND	ND	ND	0.25	1.5	370	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**0.13**	**0.77**	0.065	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	0.13	0.77	1.2	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	0.0064	0.038	3.4	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	0.0064	0.038	5.4	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	0.0064	0.038	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	0.0064	0.038	1.4	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	0.0064	0.038	220	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	0.0064	0.038	3.2	No	Constituent not detected.
Carbon disulfide	1 / 3	0.024	0.024	WBSED-1	0.0064	0.038	370	No	Maximum detect below screening value.
Carbon tetrachloride	0 / 3	ND	ND	ND	0.0064	0.038	3	No	Constituent not detected.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chlorobenzene	0 / 3	ND	ND	ND	0.0064	0.038	140	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	0.0064	0.038	6100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	0.0064	0.038	1.5	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	0.0064	0.038	50	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	0.0064	0.038	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	0.0064	0.038	3.3	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	0.0064	0.038	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	0.0064	0.038	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	0.0064	0.038	NA	No	Constituent not detected.
Diethyl ether	3 / 3	0.038	0.3	WBSED-3	--	--	20000	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 3	ND	ND	ND	0.0064	0.038	9200	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	0.0064	0.038	27	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	0.13	0.77	0.83	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	0.0064	0.038	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	0.13	0.77	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	0.0064	0.038	2100	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	0.0064	0.038	53	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	0.0064	0.038	NA	No	Constituent not detected.
Pentachloroethane	0 / 3	ND	ND	ND	0.032	0.19	19	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	0.13	0.77	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	0.13	0.77	8.8	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	0.0064	0.038	3600	No	Constituent not detected.
t-Butanol	3 / 3	0.19	0.7	WBSED-3	--	--	6200	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	0.0064	0.038	2.6	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	0.0064	0.038	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 3	ND	ND	ND	0.013	**0.077**	0.035	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	0.0064	0.038	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 3	ND	ND	ND	0.0064	0.038	340	No	Constituent not detected.
Vinyl acetate	0 / 3	ND	ND	ND	0.013	0.077	410	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	0.0064	0.038	1.7	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	0.013	0.077	270	No	Constituent not detected.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	3 / 3	0.65	12	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	0.46	0.86	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	0.46	0.86	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	0.46	0.86	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	0.46	0.86	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	0.46	0.86	12	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	0.46	0.86	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 3	ND	ND	ND	0.46	0.86	8.1	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	0.46	0.86	8.1	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	0.46	0.86	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	0.46	0.86	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	0.46	0.86	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	0.46	0.86	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	0.46	0.86	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 3	ND	ND	ND	0.46	0.86	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	2.3	4.4	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	0.46	0.86	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	0.46	0.86	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	0.46	0.86	8200	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	0.46	0.86	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	0.46	0.86	410	No	Constituent not detected.
2-Methylphenol	0 / 3	ND	ND	ND	0.46	0.86	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	0.46	0.86	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	2.3	4.4	600	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-sec-Butyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	0.46	0.86	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	0.46	0.86	310	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 3	ND	ND	ND	0.91	1.7	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**2.3**	**4.4**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	2.3	4.4	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	2.3	4.4	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	0.46	0.86	6200	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	0.91	1.7	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	2.3	4.4	86	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	2.3	4.4	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 3	ND	ND	ND	0.46	0.86	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	0.46	0.86	3300	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	0.46	0.86	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 3	ND	ND	ND	93	170	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	0.91	1.7	300	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	0.46	0.86	17000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	0.46	0.86	69	No	Constituent not detected.
Benzo[a]anthracene	0 / 3	ND	ND	ND	0.46	0.86	2.1	No	Constituent not detected.
Benzo[a]pyrene	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.21	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	0.46	0.86	2.1	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 3	ND	ND	ND	0.46	0.86	1700	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 3	ND	ND	ND	0.46	0.86	21	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	0.46	0.86	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	0.46	0.86	180	No	Constituent not detected.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	0.46	0.86	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 3	ND	ND	ND	0.46	0.86	120	No	Constituent not detected.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	0.46	0.86	910	No	Constituent not detected.
Chrysene	1 / 3	0.076	0.076	WBSED-3	0.46	0.55	210	No	Maximum detect below screening value.
Diallate	0 / 3	ND	ND	ND	0.46	0.86	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 3	ND	ND	ND	0.46	0.86	100	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	0.46	0.86	49000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	0.46	0.86	12	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	0.46	0.86	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
Fluoranthene	1 / 3	0.097	0.097	WBSED-3	0.46	0.55	2200	No	Maximum detect below screening value.
Fluorene	0 / 3	ND	ND	ND	0.46	0.86	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	0.46	0.86	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	0.46	0.86	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	0.46	0.86	370	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	0.46	0.86	120	No	Constituent not detected.
Hexachlorophene	0 / 3	ND	ND	ND	**230**	**440**	18	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 3	ND	ND	ND	0.46	0.86	2.1	No	Constituent not detected.
Isophorone	0 / 3	ND	ND	ND	0.46	0.86	1800	No	Constituent not detected.
Isosafrole	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	0.46	0.86	6.2	No	Constituent not detected.
Methapyrilene	0 / 2	ND	ND	ND	93	110	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 3	ND	ND	ND	0.46	0.86	17	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	0.46	0.86	18	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	0.46	0.86	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.011	No	Constituent not detected.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	0.46	0.86	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	0.46	**0.86**	0.82	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	0.46	0.86	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**0.46**	**0.86**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	0.46	0.86	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	0.46	0.86	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	2.3	4.4	9	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	0.46	0.86	780	No	Constituent not detected.
Phenanthrene	0 / 3	ND	ND	ND	0.46	0.86	17000	No	Constituent not detected.
Phenol	0 / 3	ND	ND	ND	0.46	0.86	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	2.3	4.4	12000	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	0.46	0.86	4600	No	Constituent not detected.
Pyrene	2 / 3	0.031	0.076	WBSED-3	0.55	0.55	1700	No	Maximum detect below screening value.
Pyridine	0 / 3	ND	ND	ND	0.46	0.86	100	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	0.46	0.86	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	1 / 1	0.25	0.25	WBSED-2	--	--	0.74	No	Maximum detect below screening value.
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	1 / 1	0.26	0.26	WBSED-2	--	--	0.74	No	Maximum detect below screening value.
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	1 / 1	0.22	0.22	WBSED-2	--	--	0.023	**YES**	Maximum detect exceeds screening value.
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	1 / 1	0.25	0.25	WBSED-2	--	--	0.74	No	Maximum detect below screening value.
Eicosane	1 / 1	1.1	1.1	WBSED-3	--	--	260	No	Maximum detect below screening value.
.gamma.-Sitosterol	1 / 1	3.1	3.1	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (TICs) (continued)									
Hexacosane	1 / 1	2.3	2.3	WBSED-3	--	--	260	No	Maximum detect below screening value.
Olean-12-ene	1 / 1	1.2	1.2	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Vitamin E	1 / 1	2.1	2.1	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	1.2	2.5	3.4	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	1.4	2.6	310	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	7	13	NA	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	7	13	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1.4	2.6	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	7	13	120000	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	7	13	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	7	13	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1.4	2.6	4200000000	No	Constituent not detected.
Methanol	0 / 3	ND	ND	ND	1.4	2.6	31000	No	Constituent not detected.
Propylene glycol	0 / 3	ND	ND	ND	7	13	1200000	No	Constituent not detected.
Polychlorinated Biphenyls (PCBs)									
PCB-1016	0 / 1	ND	ND	ND	0.083	0.083	21	No	Constituent not detected.
PCB-1221	0 / 1	ND	ND	ND	0.17	0.17	0.54	No	Constituent not detected.
PCB-1232	0 / 1	ND	ND	ND	0.083	0.083	0.54	No	Constituent not detected.
PCB-1242	0 / 1	ND	ND	ND	0.083	0.083	0.74	No	Constituent not detected.
PCB-1248	0 / 1	ND	ND	ND	0.083	0.083	0.74	No	Constituent not detected.
PCB-1254	1 / 1	1.315	1.315	WB PCB-1	--	--	0.74	**YES**	Maximum detect exceeds screening value.
PCB-1260	1 / 1	0.415	0.415	WB PCB-1	--	--	0.74	No	Maximum detect below screening value.
Pesticides and PCBs									
1,1'-Biphenyl, heptachloro-	0 / 1	ND	ND	ND	0.25	0.25	NA	No	Constituent not detected.
1,1'-Biphenyl, hexachloro-	1 / 1	0.097	0.097	WB PCB-1	--	--	1.1	No	Maximum detect below screening value.
1,1'-Biphenyl, nonachloro-	0 / 1	ND	ND	ND	0.43	0.43	NA	No	Constituent not detected.
1,1'-Biphenyl, octachloro-	0 / 1	ND	ND	ND	0.25	0.25	NA	No	Constituent not detected.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Pesticides and PCBs (continued)									
Chlorobiphenyl	0 / 1	ND	ND	ND	0.083	0.083	NA	No	Constituent not detected.
Decachlorobiphenyl	0 / 1	ND	ND	ND	0.43	0.43	NA	No	Constituent not detected.
Dichlorobiphenyl	0 / 1	ND	ND	ND	0.083	0.083	NA	No	Constituent not detected.
Pentachlorobiphenyl	1 / 1	0.12	0.12	WB PCB-1	--	--	0.11	**YES**	Maximum detect exceeds screening value.
Tetrachlorobiphenyl	0 / 1	ND	ND	ND	0.17	0.17	NA	No	Constituent not detected.
Trichlorobiphenyl	0 / 1	ND	ND	ND	0.083	0.083	NA	No	Constituent not detected.
Inorganics									
Aluminum	3 / 3	12000	20000	WBSED-1	--	--	99000	No	Maximum detect below screening value.
Antimony	3 / 3	0.46	1.2	WBSED-2	--	--	41	No	Maximum detect below screening value.
Arsenic	3 / 3	4.3	7.3	WBSED-3	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	100	170	WBSED-3	--	--	19000	No	Maximum detect below screening value.
Beryllium	3 / 3	0.62	1.1	WBSED-1	--	--	200	No	Maximum detect below screening value.
Cadmium	3 / 3	0.24	1.3	WBSED-3	--	--	80	No	Maximum detect below screening value.
Calcium	3 / 3	1500	6700	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Chromium	3 / 3	27	35	WBSED-3	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	4.4	17	WBSED-3	--	--	30	No	Maximum detect below screening value.
Copper	3 / 3	25	53	WBSED-3	--	--	4100	No	Maximum detect below screening value.
Iron	3 / 3	13000	26000	WBSED-1	--	--	72000	No	Maximum detect below screening value.
Lead	3 / 3	54	68	WBSED-3	--	--	800	No	Maximum detect below screening value.
Magnesium	3 / 3	920	2000	WBSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Manganese	3 / 3	210	600	WBSED-3	--	--	2300	No	Maximum detect below screening value.
Mercury	3 / 3	0.086	0.66	WBSED-2	--	--	3.4	No	Maximum detect below screening value.
Nickel	3 / 3	15	31	WBSED-3	--	--	2000	No	Maximum detect below screening value.
Potassium	3 / 3	820	1500	WBSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Selenium	3 / 3	0.31	0.61	WBSED-3	--	--	510	No	Maximum detect below screening value.
Silver	2 / 3	0.32	0.35	WBSED-2	0.3	0.3	510	No	Maximum detect below screening value.
Sodium	3 / 3	170	380	WBSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Thallium	3 / 3	0.19	0.32	WBSED-3	--	--	NA	**YES**	Screening value not available; see Table 3-8.
Vanadium	3 / 3	58	120	WBSED-3	--	--	520	No	Maximum detect below screening value.
Zinc	3 / 3	120	420	WBSED-3	--	--	31000	No	Maximum detect below screening value.

TABLE 3-12
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Other Inorganics									
Chloride	3 / 3	130	380	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Nitrate as N	2 / 3	4	8.9	WBSED-3	8.3	8.3	160000	No	Maximum detect below screening value.
Nitrite as N	0 / 3	ND	ND	ND	1.4	2.6	10000	No	Constituent not detected.
Total Kjeldhal Nitrogen (TKN)	3 / 3	850	2900	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Total Organic Carbon (TOC)	3 / 3	11000	78000	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Sulfate	3 / 3	240	1600	WBSED-3	--	--	NA	No	Screening value not available; see Table 3-8.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.006	0.013	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	0.006	0.013	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.006	0.013	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	0.006	0.013	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	0.006	0.013	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	0.006	0.013	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	0.006	0.013	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	0.012	0.026	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	0.006	0.013	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	0.006	0.013	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	0.006	0.013	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	0.006	0.013	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.006	0.013	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.006	0.013	8.1	No	Constituent not detected.
2-Butanone (MEK)	2 / 3	0.03	0.031	UTSED-1	0.03	0.03	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 3	ND	ND	ND	0.03	0.065	140	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	0.006	0.013	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	0.03	0.065	5300	No	Constituent not detected.
Acetone	3 / 3	0.042	0.24	UTSED-1	--	--	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 3	ND	ND	ND	0.24	0.52	370	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**0.12**	**0.26**	0.065	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	0.12	0.26	1.2	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	0.006	0.013	3.4	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	0.006	0.013	5.4	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	0.006	0.013	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	0.006	0.013	1.4	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	0.006	0.013	220	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	0.006	0.013	3.2	No	Constituent not detected.
Carbon disulfide	1 / 3	0.0069	0.0069	UTSED-1	0.006	0.013	370	No	Maximum detect below screening value.
Carbon tetrachloride	0 / 3	ND	ND	ND	0.006	0.013	3	No	Constituent not detected.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chlorobenzene	0 / 3	ND	ND	ND	0.006	0.013	140	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	0.006	0.013	6100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	0.006	0.013	1.5	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	0.006	0.013	50	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	0.006	0.013	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	0.006	0.013	3.3	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	0.006	0.013	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	0.006	0.013	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	0.006	0.013	NA	No	Constituent not detected.
Diethyl ether	0 / 3	ND	ND	ND	0.012	0.026	20000	No	Constituent not detected.
Ethyl methacrylate	0 / 3	ND	ND	ND	0.006	0.013	9200	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	0.006	0.013	27	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	0.12	0.26	0.83	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	0.006	0.013	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	0.12	0.26	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	0.006	0.013	2100	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	0.006	0.013	53	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	0.006	0.013	NA	No	Constituent not detected.
Pentachloroethane	0 / 3	ND	ND	ND	0.03	0.065	19	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	0.12	0.26	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	0.12	0.26	8.8	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	0.006	0.013	3600	No	Constituent not detected.
t-Butanol	2 / 3	0.053	0.19	UTSED-3	0.012	0.012	6200	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	0.006	0.013	2.6	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	0.006	0.013	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 3	ND	ND	ND	0.012	0.026	0.035	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	0.006	0.013	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 3	ND	ND	ND	0.006	0.013	340	No	Constituent not detected.
Vinyl acetate	0 / 3	ND	ND	ND	0.012	0.026	410	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	0.006	0.013	1.7	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	0.012	0.026	270	No	Constituent not detected.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	3 / 3	1.5	9.6	UTSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	0.4	0.72	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	0.4	0.72	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	0.4	0.72	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	0.4	0.72	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	0.4	0.72	12	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	0.4	0.72	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 3	ND	ND	ND	0.4	0.72	8.1	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	0.4	0.72	8.1	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	0.4	0.72	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	0.4	0.72	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	0.4	0.72	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	0.4	0.72	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	0.4	0.72	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 3	ND	ND	ND	0.4	0.72	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	2.1	3.7	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	0.4	0.72	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	0.4	0.72	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 3	ND	ND	ND	0.4	**0.72**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	0.4	0.72	8200	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	0.4	0.72	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	0.4	0.72	410	No	Constituent not detected.
2-Methylphenol	0 / 3	ND	ND	ND	0.4	0.72	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	0.4	0.72	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	2.1	3.7	600	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-sec-Butyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	0.4	0.72	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	0.4	0.72	310	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 3	ND	ND	ND	0.81	1.4	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**2.1**	**3.7**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	2.1	3.7	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	2.1	3.7	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	0.4	0.72	6200	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	0.81	1.4	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	2.1	3.7	86	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	2.1	3.7	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 3	ND	ND	ND	0.4	0.72	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	0.4	0.72	3300	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	0.4	0.72	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 3	ND	ND	ND	82	150	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	0.81	1.4	300	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	0.4	0.72	17000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	0.4	0.72	69	No	Constituent not detected.
Benzo[a]anthracene	1 / 3	0.09	0.09	UTSED-2	0.4	0.72	2.1	No	Maximum detect below screening value.
Benzo[a]pyrene	1 / 3	0.087	0.087	UTSED-2	**0.4**	**0.72**	0.21	No	Maximum detect below screening value.
Benzo[b]fluoranthene	1 / 3	0.15	0.15	UTSED-2	0.4	0.72	2.1	No	Maximum detect below screening value.
Benzo[g,h,i]perylene	1 / 3	0.072	0.072	UTSED-2	0.4	0.72	1700	No	Maximum detect below screening value.
Benzo[k]fluoranthene	1 / 3	0.074	0.074	UTSED-2	0.4	0.72	21	No	Maximum detect below screening value.
Benzyl alcohol	0 / 3	ND	ND	ND	0.4	0.72	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	0.4	0.72	180	No	Constituent not detected.

TABLE 3-13
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UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	0.4	0.72	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	1 / 3	0.15	0.15	UTSED-2	0.4	0.72	120	No	Maximum detect below screening value.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	0.4	0.72	910	No	Constituent not detected.
Chrysene	1 / 3	0.16	0.16	UTSED-2	0.4	0.72	210	No	Maximum detect below screening value.
Diallate	0 / 3	ND	ND	ND	0.4	0.72	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 3	ND	ND	ND	0.4	0.72	100	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	0.4	0.72	49000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	0.4	0.72	12	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	0.4	0.72	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
Fluoranthene	1 / 3	0.2	0.2	UTSED-2	0.4	0.72	2200	No	Maximum detect below screening value.
Fluorene	0 / 3	ND	ND	ND	0.4	0.72	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	0.4	0.72	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	0.4	0.72	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	0.4	0.72	370	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	0.4	0.72	120	No	Constituent not detected.
Hexachlorophene	0 / 3	ND	ND	ND	**210**	**370**	18	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	1 / 3	0.057	0.057	UTSED-2	0.4	0.72	2.1	No	Maximum detect below screening value.
Isophorone	0 / 3	ND	ND	ND	0.4	0.72	1800	No	Constituent not detected.
Isosafrole	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	0.4	0.72	6.2	No	Constituent not detected.
Methapyrilene	0 / 3	ND	ND	ND	82	150	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 3	ND	ND	ND	0.4	0.72	17	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	0.4	0.72	18	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	0.4	0.72	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.011	No	Constituent not detected.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	0.4	**0.72**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	0.4	0.72	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	0.4	0.72	0.82	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	0.4	0.72	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**0.4**	**0.72**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	0.4	0.72	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	0.4	0.72	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	2.1	3.7	9	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	0.4	0.72	780	No	Constituent not detected.
Phenanthrene	1 / 3	0.12	0.12	UTSED-2	0.4	0.72	17000	No	Maximum detect below screening value.
Phenol	0 / 3	ND	ND	ND	0.4	0.72	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	2.1	3.7	12000	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	0.4	0.72	4600	No	Constituent not detected.
Pyrene	1 / 3	0.18	0.18	UTSED-2	0.4	0.72	1700	No	Maximum detect below screening value.
Pyridine	0 / 3	ND	ND	ND	0.4	0.72	100	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	0.4	0.72	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	1 / 1	0.4	0.4	UTSED-2	**--**	**--**	0.74	No	Maximum detect below screening value.
1,1'-Biphenyl, pentachloro-	1 / 1	0.68	0.68	UTSED-2	**--**	**--**	0.74	No	Maximum detect below screening value.
17-Pentatriacontene	1 / 1	0.39	0.39	UTSED-2	**--**	**--**	260	No	Maximum detect below screening value.
.gamma.-Sitosterol	1 / 1	0.21	0.21	UTSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	1.2	2.1	3.4	No	Constituent not detected.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	1.2	2.2	310	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	6.2	11	NA	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	6.2	11	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1.2	2.2	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	6.2	11	120000	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	6.2	11	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	6.2	11	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1.2	2.2	4200000000	No	Constituent not detected.
Methanol	2 / 3	1.8	5	UTSED-2	1.2	1.2	31000	No	Maximum detect below screening value.
Propylene glycol	0 / 3	ND	ND	ND	6.2	11	1200000	No	Constituent not detected.
Polychlorinated Biphenyls (PCBs)									
PCB-1016	0 / 2	ND	ND	ND	0.037	0.042	21	No	Constituent not detected.
PCB-1221	0 / 2	ND	ND	ND	0.075	0.086	0.54	No	Constituent not detected.
PCB-1232	0 / 2	ND	ND	ND	0.037	0.042	0.54	No	Constituent not detected.
PCB-1242	0 / 2	ND	ND	ND	0.037	0.042	0.74	No	Constituent not detected.
PCB-1248	0 / 2	ND	ND	ND	0.037	0.042	0.74	No	Constituent not detected.
PCB-1254	2 / 2	0.2	3.6	SD1 PCB-1	--	--	0.74	**YES**	Maximum detect exceeds screening value.
PCB-1260	1 / 2	0.12	0.12	UT PCB-2	0.037	0.037	0.74	No	Maximum detect below screening value.
Pesticides and PCBs									
1,1'-Biphenyl, heptachloro-	0 / 2	ND	ND	ND	0.11	0.13	NA	No	Constituent not detected.
1,1'-Biphenyl, hexachloro-	1 / 2	0.08	0.08	SD1 PCB-1	0.085	0.085	1.1	No	Maximum detect below screening value.
1,1'-Biphenyl, nonachloro-	0 / 2	ND	ND	ND	0.19	0.22	NA	No	Constituent not detected.
1,1'-Biphenyl, octachloro-	0 / 2	ND	ND	ND	0.11	0.13	NA	No	Constituent not detected.
Chlorobiphenyl	0 / 2	ND	ND	ND	0.037	0.042	NA	No	Constituent not detected.
Decachlorobiphenyl	0 / 2	ND	ND	ND	0.19	0.22	NA	No	Constituent not detected.
Dichlorobiphenyl	0 / 2	ND	ND	ND	0.037	0.042	NA	No	Constituent not detected.
Pentachlorobiphenyl	2 / 2	0.013	0.23	SD1 PCB-1	--	--	0.11	**YES**	Maximum detect exceeds screening value.
Tetrachlorobiphenyl	1 / 2	0.037	0.037	SD1 PCB-1	0.085	0.085	0.11	No	Maximum detect below screening value.
Trichlorobiphenyl	0 / 2	ND	ND	ND	0.037	0.042	NA	No	Constituent not detected.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics									
Antimony	2 / 3	1.5	3.6	UTSED-1	0.54	0.54	41	No	Maximum detect below screening value.
Arsenic	3 / 3	1.3	12	UTSED-1	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	25	270	UTSED-1	--	--	19000	No	Maximum detect below screening value.
Beryllium	3 / 3	0.3	0.93	UTSED-1	--	--	200	No	Maximum detect below screening value.
Cadmium	3 / 3	0.052	1.5	UTSED-1	--	--	80	No	Maximum detect below screening value.
Calcium	3 / 3	1900	19000	UTSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Chromium	3 / 3	4.4	46	UTSED-1	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	2.2	9.3	UTSED-1	--	--	30	No	Maximum detect below screening value.
Copper	3 / 3	4.5	220	UTSED-1	--	--	4100	No	Maximum detect below screening value.
Iron	3 / 3	7200	29000	UTSED-1	--	--	72000	No	Maximum detect below screening value.
Lead	3 / 3	4.4	130	UTSED-2	--	--	800	No	Maximum detect below screening value.
Magnesium	3 / 3	1400	11000	UTSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Manganese	3 / 3	190	520	UTSED-1	--	--	2300	No	Maximum detect below screening value.
Mercury	2 / 3	0.44	0.47	UTSED-1	0.11	0.11	3.4	No	Maximum detect below screening value.
Nickel	3 / 3	2.7	62	UTSED-1	--	--	2000	No	Maximum detect below screening value.
Potassium	3 / 3	700	2800	UTSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Selenium	2 / 3	0.66	1.2	UTSED-1	0.54	0.54	510	No	Maximum detect below screening value.
Silver	2 / 3	0.41	0.58	UTSED-1	0.22	0.22	510	No	Maximum detect below screening value.
Sodium	3 / 3	84	380	UTSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Thallium	3 / 3	0.12	0.33	UTSED-1	--	--	NA	**YES**	Screening value not available; see Table 3-8.
Vanadium	3 / 3	14	160	UTSED-1	--	--	520	No	Maximum detect below screening value.
Zinc	3 / 3	55	930	UTSED-1	--	--	31000	No	Maximum detect below screening value.

TABLE 3-13
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Other Inorganics									
Chloride	3 / 3	17	93	UTSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Nitrate as N	2 / 3	3.9	7.4	UTSED-1	6	6	160000	No	Maximum detect below screening value.
Nitrite as N	0 / 3	ND	ND	ND	1.2	2.2	10000	No	Constituent not detected.
Total Kjeldhal Nitrogen (TKN)	3 / 3	230	2300	UTSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Total Organic Carbon (TOC)	3 / 3	2400	54000	UTSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Sulfate	3 / 3	140	1100	UTSED-1	--	--	NA	No	Screening value not available; see Table 3-8.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-14
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.01	0.015	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	0.01	0.015	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	0.01	0.015	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	0.01	0.015	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	0.01	0.015	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	0.01	0.015	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	0.01	0.015	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	0.02	0.03	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	0.01	0.015	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	0.01	0.015	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	0.01	0.015	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	0.01	0.015	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.01	0.015	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	0.01	0.015	8.1	No	Constituent not detected.
2-Butanone (MEK)	3 / 3	0.021	0.077	CCSED-1	--	--	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 3	ND	ND	ND	0.05	0.075	140	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	0.01	0.015	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	0.05	0.075	5300	No	Constituent not detected.
Acetone	3 / 3	0.28	0.555	CCSED-3	--	--	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 3	ND	ND	ND	0.4	0.6	370	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**0.2**	**0.3**	0.065	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	0.2	0.3	1.2	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	0.01	0.015	3.4	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	0.01	0.015	5.4	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	0.01	0.015	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	0.01	0.015	1.4	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	0.01	0.015	220	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	0.01	0.015	3.2	No	Constituent not detected.
Carbon disulfide	1 / 3	0.009	0.009	CCSED-3	0.015	0.015	370	No	Maximum detect below screening value.
Carbon tetrachloride	0 / 3	ND	ND	ND	0.01	0.015	3	No	Constituent not detected.

TABLE 3-14
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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chlorobenzene	0 / 3	ND	ND	ND	0.01	0.015	140	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	0.01	0.015	6100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	0.01	0.015	1.5	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	0.01	0.015	50	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	0.01	0.015	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	0.01	0.015	3.3	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	0.01	0.015	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	0.01	0.015	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	0.01	0.015	NA	No	Constituent not detected.
Diethyl ether	1 / 3	0.0132	0.0132	CCSED-3	0.03	0.03	20000	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 3	ND	ND	ND	0.01	0.015	9200	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	0.01	0.015	27	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	0.2	0.3	0.83	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	0.01	0.015	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	0.2	0.3	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	0.01	0.015	2100	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	0.01	0.015	53	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	0.01	0.015	NA	No	Constituent not detected.
Pentachloroethane	0 / 3	ND	ND	ND	0.05	0.075	19	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	0.2	0.3	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	0.2	0.3	8.8	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	0.01	0.015	3600	No	Constituent not detected.
t-Butanol	1 / 3	0.073	0.073	CCSED-3	0.015	0.015	6200	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	0.01	0.015	2.6	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	0.01	0.015	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 3	ND	ND	ND	0.02	0.03	0.035	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	0.01	0.015	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 3	ND	ND	ND	0.01	0.015	340	No	Constituent not detected.
Vinyl acetate	0 / 3	ND	ND	ND	0.02	0.03	410	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	0.01	0.015	1.7	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	0.02	0.03	270	No	Constituent not detected.

TABLE 3-14
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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	3 / 3	1.7	1.8	CCSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	0.64	0.9	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	0.64	0.9	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	0.64	0.9	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	0.64	0.9	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	0.64	0.9	12	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	0.64	0.9	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 3	ND	ND	ND	0.64	0.9	8.1	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	0.64	0.9	8.1	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	0.64	0.9	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	0.64	0.9	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	0.64	0.9	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	0.64	0.9	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	0.64	0.9	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 3	ND	ND	ND	0.64	0.9	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	3.3	4.7	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	0.64	0.9	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	0.64	0.9	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	0.64	0.9	8200	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	0.64	0.9	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	0.64	0.9	410	No	Constituent not detected.
2-Methylphenol	0 / 3	ND	ND	ND	0.64	0.9	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	0.64	0.9	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	3.3	4.7	600	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.

TABLE 3-14
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-sec-Butyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	0.64	0.9	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	0.64	0.9	310	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 3	ND	ND	ND	1.3	1.8	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**3.3**	**4.7**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	3.3	4.7	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	3.3	4.7	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	0.64	0.9	6200	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	1.3	1.8	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	3.3	4.7	86	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	3.3	4.7	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 3	ND	ND	ND	0.64	0.9	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	0.64	0.9	3300	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	0.64	0.9	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 3	ND	ND	ND	130	180	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	1.3	1.8	300	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	0.64	0.9	17000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	0.64	0.9	69	No	Constituent not detected.
Benzo[a]anthracene	0 / 3	ND	ND	ND	0.64	0.9	2.1	No	Constituent not detected.
Benzo[a]pyrene	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.21	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	0.64	0.9	2.1	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 3	ND	ND	ND	0.64	0.9	1700	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 3	ND	ND	ND	0.64	0.9	21	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	0.64	0.9	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	0.64	0.9	180	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	0.64	0.9	1	No	Constituent not detected.

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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Bis(2-ethylhexyl) phthalate	1 / 3	0.125	0.125	CCSED-3	0.68	0.9	120	No	Maximum detect below screening value.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	0.64	0.9	910	No	Constituent not detected.
Chrysene	1 / 3	0.05	0.05	CCSED-3	0.68	0.9	210	No	Maximum detect below screening value.
Diallate	0 / 3	ND	ND	ND	0.64	0.9	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 3	ND	ND	ND	0.64	0.9	100	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	0.64	0.9	49000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	0.64	0.9	12	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	0.64	0.9	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
Fluoranthene	1 / 3	0.0535	0.0535	CCSED-3	0.68	0.9	2200	No	Maximum detect below screening value.
Fluorene	0 / 3	ND	ND	ND	0.64	0.9	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	0.64	0.9	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	0.64	0.9	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	0.64	0.9	370	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	0.64	0.9	120	No	Constituent not detected.
Hexachlorophene	0 / 2	ND	ND	ND	**350**	**470**	18	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 3	ND	ND	ND	0.64	0.9	2.1	No	Constituent not detected.
Isophorone	0 / 3	ND	ND	ND	0.64	0.9	1800	No	Constituent not detected.
Isosafrole	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	0.64	0.9	6.2	No	Constituent not detected.
Methapyrilene	0 / 2	ND	ND	ND	130	180	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 3	ND	ND	ND	0.64	0.9	17	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	0.64	0.9	18	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	0.64	0.9	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.011	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.034	No	Constituent not detected.

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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	0.64	0.9	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	0.64	**0.9**	0.82	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	0.64	0.9	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**0.64**	**0.9**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	0.64	0.9	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	0.64	0.9	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	3.3	4.7	9	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	0.64	0.9	780	No	Constituent not detected.
Phenanthrene	0 / 3	ND	ND	ND	0.64	0.9	17000	No	Constituent not detected.
Phenol	0 / 3	ND	ND	ND	0.64	0.9	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	3.3	4.7	12000	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	0.64	0.9	4600	No	Constituent not detected.
Pyrene	1 / 3	0.047	0.047	CCSED-3	0.68	0.9	1700	No	Maximum detect below screening value.
Pyridine	0 / 3	ND	ND	ND	0.64	0.9	100	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	0.64	0.9	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
1-Naphthalenepropanol, .alpha.-ethenylde	1 / 1	0.41	0.41	CCSED-3	**--**	**--**	18.0	No	Maximum detect below screening value.
2-Heptacosanone	1 / 1	0.48	0.48	CCSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Bacchotricuneatin c	1 / 1	0.39	0.39	CCSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Cholestanol	1 / 1	0.66	1	CCSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Cyclopropane, nonyl-	1 / 1	0.98	0.98	CCSED-3	**--**	**--**	2900	No	Maximum detect below screening value.
Eicosane	1 / 1	0.48	0.48	CCSED-3	**--**	**--**	260	No	Maximum detect below screening value.
.gamma.-Sitosterol	1 / 1	2.1	2.1	CCSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Heptacosane	1 / 1	0.59	0.59	CCSED-2	**--**	**--**	260	No	Maximum detect below screening value.

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Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (TICs)									
Heptadecane, 2,6,10,15-tetramethyl-	1 / 1	0.4	0.4	CCSED-3	--	--	260	No	Maximum detect below screening value.
Hexadecane	1 / 1	480	480	CCSED-3	--	--	260	**YES**	Maximum detect exceeds screening value.
Pentacosane	1 / 1	0.86	0.86	CCSED-2	--	--	260	No	Maximum detect below screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	1.9	2.6	3.4	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	2	2.7	310	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	9.8	14	NA	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	9.8	14	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	2	2.7	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	9.8	14	120000	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	9.8	14	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	9.8	14	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	2	2.7	4200000000	No	Constituent not detected.
Methanol	0 / 3	ND	ND	ND	2	2.7	31000	No	Constituent not detected.
Propylene glycol	0 / 3	ND	ND	ND	9.8	14	1200000	No	Constituent not detected.
Inorganics									
Aluminum	3 / 3	18000	20000	CCSED-1	--	--	99000	No	Maximum detect below screening value.
Antimony	3 / 3	0.56	2.4	CCSED-2	--	--	41	No	Maximum detect below screening value.
Arsenic	3 / 3	12.5	75	CCSED-2	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	115	180	CCSED-2	--	--	19000	No	Maximum detect below screening value.
Beryllium	3 / 3	0.59	1.5	CCSED-1	--	--	200	No	Maximum detect below screening value.
Cadmium	3 / 3	0.26	0.95	CCSED-3	--	--	80	No	Maximum detect below screening value.
Calcium	3 / 3	2300	3400	CCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Chromium	3 / 3	31	39.5	CCSED-3	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	6.8	9.8	CCSED-3	--	--	30	No	Maximum detect below screening value.
Copper	3 / 3	11	43.5	CCSED-3	--	--	4100	No	Maximum detect below screening value.
Iron	3 / 3	13000	35000	CCSED-2	--	--	72000	No	Maximum detect below screening value.
Lead	3 / 3	20	93.5	CCSED-3	--	--	800	No	Maximum detect below screening value.
Magnesium	3 / 3	1100	1500	CCSED-3	--	--	NA	No	Screening value not available; see Table 3-8.

TABLE 3-14
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics (continued)									
Manganese	3 / 3	190	230	CCSED-3	**--**	**--**	2300	No	Maximum detect below screening value.
Mercury	2 / 3	0.365	0.69	CCSED-2	0.25	0.25	3.4	No	Maximum detect below screening value.
Nickel	3 / 3	10	17.5	CCSED-3	**--**	**--**	2000	No	Maximum detect below screening value.
Potassium	3 / 3	1030	1400	CCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Selenium	3 / 3	0.74	2	CCSED-2	**--**	**--**	510	No	Maximum detect below screening value.
Silver	2 / 3	0.11	0.42	CCSED-3	0.5	0.5	510	No	Maximum detect below screening value.
Sodium	3 / 3	180	1400	CCSED-3	--	--	NA	No	Screening value not available; see Table 3-8.
Thallium	3 / 3	0.37	0.51	CCSED-2	--	--	NA	**YES**	Screening value not available; see Table 3-8.
Vanadium	3 / 3	40	65	CCSED-3	**--**	**--**	520	No	Maximum detect below screening value.
Zinc	3 / 3	43	235	CCSED-3	**--**	**--**	31000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	3 / 3	44	410	CCSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Nitrate as N	2 / 3	5.1	8.6	CCSED-2	13	13	160000	No	Maximum detect below screening value.
Nitrite as N	1 / 3	2	2	CCSED-3	2	2.7	10000	No	Maximum detect below screening value.
Total Kjeldhal Nitrogen (TKN)	3 / 3	1500	3000	CCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Total Organic Carbon (TOC)	3 / 3	18000	23000	CCSED-2	--	--	NA	No	Screening value not available; see Table 3-8.
Sulfate	3 / 3	880	2000	CCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 1	ND	ND	ND	0.016	0.016	9.3	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 1	ND	ND	ND	0.016	0.016	3800	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 1	ND	ND	ND	0.016	0.016	2.8	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 1	ND	ND	ND	0.016	0.016	5.3	No	Constituent not detected.
1,1-Dichloroethane	0 / 1	ND	ND	ND	0.016	0.016	17	No	Constituent not detected.
1,1-Dichloroethene	0 / 1	ND	ND	ND	0.016	0.016	110	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 1	ND	ND	ND	0.016	0.016	0.095	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 1	ND	ND	ND	0.031	0.031	0.069	No	Constituent not detected.
1,2-Dibromoethane	0 / 1	ND	ND	ND	0.016	0.016	0.17	No	Constituent not detected.
1,2-Dichloroethane	0 / 1	ND	ND	ND	0.016	0.016	2.2	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 1	ND	ND	ND	0.016	0.016	69	No	Constituent not detected.
1,2-Dichloropropane	0 / 1	ND	ND	ND	0.016	0.016	4.5	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 1	ND	ND	ND	0.016	0.016	8.1	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 1	ND	ND	ND	0.016	0.016	8.1	No	Constituent not detected.
2-Butanone (MEK)	1 / 1	0.068	0.068	BCSED-1	--	--	20000	No	Maximum detect below screening value.
2-Hexanone	0 / 1	ND	ND	ND	0.078	0.078	140	No	Constituent not detected.
3-Methylhexane	0 / 1	ND	ND	ND	0.016	0.016	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 1	ND	ND	ND	0.078	0.078	5300	No	Constituent not detected.
Acetone	1 / 1	0.4	0.4	BCSED-1	--	--	63000	No	Maximum detect below screening value.
Acetonitrile	0 / 1	ND	ND	ND	0.63	0.63	370	No	Constituent not detected.
Acrolein	0 / 1	ND	ND	ND	**0.31**	**0.31**	0.065	No	Constituent not detected.
Acrylonitrile	0 / 1	ND	ND	ND	0.31	0.31	1.2	No	Constituent not detected.
Allyl chloride	0 / 1	ND	ND	ND	0.016	0.016	3.4	No	Constituent not detected.
Benzene	0 / 1	ND	ND	ND	0.016	0.016	5.4	No	Constituent not detected.
Benzyl chloride	0 / 1	ND	ND	ND	0.016	0.016	4.9	No	Constituent not detected.
Bromodichloromethane	0 / 1	ND	ND	ND	0.016	0.016	1.4	No	Constituent not detected.
Bromoform	0 / 1	ND	ND	ND	0.016	0.016	220	No	Constituent not detected.
Bromomethane	0 / 1	ND	ND	ND	0.016	0.016	3.2	No	Constituent not detected.
Carbon disulfide	1 / 1	0.0098	0.0098	BCSED-1	--	--	370	No	Maximum detect below screening value.
Carbon tetrachloride	0 / 1	ND	ND	ND	0.016	0.016	3	No	Constituent not detected.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chlorobenzene	0 / 1	ND	ND	ND	0.016	0.016	140	No	Constituent not detected.
Chloroethane	0 / 1	ND	ND	ND	0.016	0.016	6100	No	Constituent not detected.
Chloroform	0 / 1	ND	ND	ND	0.016	0.016	1.5	No	Constituent not detected.
Chloromethane	0 / 1	ND	ND	ND	0.016	0.016	50	No	Constituent not detected.
Chloroprene	0 / 1	ND	ND	ND	0.016	0.016	3.6	No	Constituent not detected.
Dibromochloromethane	0 / 1	ND	ND	ND	0.016	0.016	3.3	No	Constituent not detected.
Dibromomethane	0 / 1	ND	ND	ND	0.016	0.016	11	No	Constituent not detected.
Dichlorodifluoromethane	0 / 1	ND	ND	ND	0.016	0.016	78	No	Constituent not detected.
Dichlorofluoromethane	0 / 1	ND	ND	ND	0.016	0.016	NA	No	Constituent not detected.
Diethyl ether	0 / 1	ND	ND	ND	0.031	0.031	20000	No	Constituent not detected.
Ethyl methacrylate	0 / 1	ND	ND	ND	0.016	0.016	9200	No	Constituent not detected.
Ethylbenzene	0 / 1	ND	ND	ND	0.016	0.016	27	No	Constituent not detected.
Ethylene oxide	0 / 1	ND	ND	ND	0.31	0.31	0.83	No	Constituent not detected.
Iodomethane	0 / 1	ND	ND	ND	0.016	0.016	NA	No	Constituent not detected.
Methacrylonitrile	0 / 1	ND	ND	ND	0.31	0.31	1.8	No	Constituent not detected.
Methyl methacrylate	0 / 1	ND	ND	ND	0.016	0.016	2100	No	Constituent not detected.
Methylene Chloride	0 / 1	ND	ND	ND	0.016	0.016	53	No	Constituent not detected.
n-Heptane	0 / 1	ND	ND	ND	0.016	0.016	NA	No	Constituent not detected.
Pentachloroethane	0 / 1	ND	ND	ND	0.078	0.078	19	No	Constituent not detected.
Propionitrile	0 / 1	ND	ND	ND	0.31	0.31	NA	No	Constituent not detected.
Propylene oxide	0 / 1	ND	ND	ND	0.31	0.31	8.8	No	Constituent not detected.
Styrene	0 / 1	ND	ND	ND	0.016	0.016	3600	No	Constituent not detected.
t-Butanol	0 / 1	ND	ND	ND	0.016	0.016	6200	No	Constituent not detected.
Tetrachloroethene	0 / 1	ND	ND	ND	0.016	0.016	2.6	No	Constituent not detected.
Toluene	0 / 1	ND	ND	ND	0.016	0.016	4500	No	Constituent not detected.
trans-1,4-Dichloro-2-butene	0 / 1	ND	ND	ND	0.031	0.031	0.035	No	Constituent not detected.
Trichloroethylene	0 / 1	ND	ND	ND	0.016	0.016	14	No	Constituent not detected.
Trichlorofluoromethane	0 / 1	ND	ND	ND	0.016	0.016	340	No	Constituent not detected.
Vinyl acetate	0 / 1	ND	ND	ND	0.031	0.031	410	No	Constituent not detected.
Vinyl chloride	0 / 1	ND	ND	ND	0.016	0.016	1.7	No	Constituent not detected.
Xylenes, Total	0 / 1	ND	ND	ND	0.031	0.031	270	No	Constituent not detected.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	1 / 1	5.3	5.3	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 1	ND	ND	ND	0.55	0.55	18	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 1	ND	ND	ND	0.55	0.55	99	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 1	ND	ND	ND	0.55	0.55	980	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 1	ND	ND	ND	0.55	0.55	2700	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 1	ND	ND	ND	0.55	0.55	12	No	Constituent not detected.
1,4-Dioxane	0 / 1	ND	ND	ND	0.55	0.55	160	No	Constituent not detected.
1,4-Naphthoquinone	0 / 1	ND	ND	ND	0.55	0.55	8.1	No	Constituent not detected.
1-Naphthalenamine	0 / 1	ND	ND	ND	0.55	0.55	8.1	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 1	ND	ND	ND	0.55	0.55	22	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 1	ND	ND	ND	0.55	0.55	1800	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 1	ND	ND	ND	0.55	0.55	6200	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 1	ND	ND	ND	0.55	0.55	160	No	Constituent not detected.
2,4-Dichlorophenol	0 / 1	ND	ND	ND	0.55	0.55	180	No	Constituent not detected.
2,4-Dimethylphenol	0 / 1	ND	ND	ND	0.55	0.55	1200	No	Constituent not detected.
2,4-Dinitrophenol	0 / 1	ND	ND	ND	2.9	2.9	120	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 1	ND	ND	ND	0.55	0.55	5.5	No	Constituent not detected.
2,6-Dichlorophenol	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 1	ND	ND	ND	0.55	0.55	62	No	Constituent not detected.
2-Acetylaminofluorene	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.45	No	Constituent not detected.
2-Chloronaphthalene	0 / 1	ND	ND	ND	0.55	0.55	8200	No	Constituent not detected.
2-Chlorophenol	0 / 1	ND	ND	ND	0.55	0.55	510	No	Constituent not detected.
2-Methylnaphthalene	0 / 1	ND	ND	ND	0.55	0.55	410	No	Constituent not detected.
2-Methylphenol	0 / 1	ND	ND	ND	0.55	0.55	3100	No	Constituent not detected.
2-Naphthalenamine	0 / 1	ND	ND	ND	0.55	0.55	0.96	No	Constituent not detected.
2-Nitroaniline	0 / 1	ND	ND	ND	2.9	2.9	600	No	Constituent not detected.
2-Nitrophenol	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
2-Picoline	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-sec-Butyl-4,6-dinitrophenol	0 / 1	ND	ND	ND	0.55	0.55	62	No	Constituent not detected.
3 & 4 Methylphenol	0 / 1	ND	ND	ND	0.55	0.55	310	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 1	ND	ND	ND	1.1	1.1	3.8	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 1	ND	ND	ND	**2.9**	**2.9**	0.16	No	Constituent not detected.
3-Methylcholanthrene	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.078	No	Constituent not detected.
3-Nitroaniline	0 / 1	ND	ND	ND	2.9	2.9	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 1	ND	ND	ND	2.9	2.9	4.9	No	Constituent not detected.
4-Aminobiphenyl	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.082	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 1	ND	ND	ND	0.55	0.55	6200	No	Constituent not detected.
4-Chloroaniline	0 / 1	ND	ND	ND	1.1	1.1	8.6	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
4-Nitroaniline	0 / 1	ND	ND	ND	2.9	2.9	86	No	Constituent not detected.
4-Nitrophenol	0 / 1	ND	ND	ND	2.9	2.9	NA	No	Constituent not detected.
5-Nitro-o-toluidine	0 / 1	ND	ND	ND	0.55	0.55	52	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.0062	No	Constituent not detected.
Acenaphthene	0 / 1	ND	ND	ND	0.55	0.55	3300	No	Constituent not detected.
Acenaphthylene	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
Acetophenone	0 / 1	ND	ND	ND	0.55	0.55	10000	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 1	ND	ND	ND	110	110	NA	No	Constituent not detected.
Aniline	0 / 1	ND	ND	ND	1.1	1.1	300	No	Constituent not detected.
Anthracene	0 / 1	ND	ND	ND	0.55	0.55	17000	No	Constituent not detected.
Aramite, Total	0 / 1	ND	ND	ND	0.55	0.55	69	No	Constituent not detected.
Benzo[a]anthracene	0 / 1	ND	ND	ND	0.55	0.55	2.1	No	Constituent not detected.
Benzo[a]pyrene	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.21	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 1	ND	ND	ND	0.55	0.55	2.1	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 1	ND	ND	ND	0.55	0.55	1700	No	Constituent not detected.
Benzo[k]fluoranthene	0 / 1	ND	ND	ND	0.55	0.55	21	No	Constituent not detected.
Benzyl alcohol	0 / 1	ND	ND	ND	0.55	0.55	6200	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 1	ND	ND	ND	0.55	0.55	180	No	Constituent not detected.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Bis(2-chloroethyl)ether	0 / 1	ND	ND	ND	0.55	0.55	1	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 1	ND	ND	ND	0.55	0.55	120	No	Constituent not detected.
Butyl benzyl phthalate	0 / 1	ND	ND	ND	0.55	0.55	910	No	Constituent not detected.
Chrysene	0 / 1	ND	ND	ND	0.55	0.55	210	No	Constituent not detected.
Diallate	0 / 1	ND	ND	ND	0.55	0.55	28	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.21	No	Constituent not detected.
Dibenzofuran	0 / 1	ND	ND	ND	0.55	0.55	100	No	Constituent not detected.
Diethyl phthalate	0 / 1	ND	ND	ND	0.55	0.55	49000	No	Constituent not detected.
Dimethoate	0 / 1	ND	ND	ND	0.55	0.55	12	No	Constituent not detected.
Dimethyl phthalate	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
Di-n-butyl phthalate	0 / 1	ND	ND	ND	0.55	0.55	6200	No	Constituent not detected.
Di-n-octyl phthalate	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
Ethyl methanesulfonate	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
Fluoranthene	0 / 1	ND	ND	ND	0.55	0.55	2200	No	Constituent not detected.
Fluorene	0 / 1	ND	ND	ND	0.55	0.55	2200	No	Constituent not detected.
Hexachlorobenzene	0 / 1	ND	ND	ND	0.55	0.55	1.1	No	Constituent not detected.
Hexachlorobutadiene	0 / 1	ND	ND	ND	0.55	0.55	22	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 1	ND	ND	ND	0.55	0.55	370	No	Constituent not detected.
Hexachloroethane	0 / 1	ND	ND	ND	0.55	0.55	120	No	Constituent not detected.
Hexachlorophene	0 / 1	ND	ND	ND	**290**	**290**	18	No	Constituent not detected.
Hexachloropropene	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 1	ND	ND	ND	0.55	0.55	2.1	No	Constituent not detected.
Isophorone	0 / 1	ND	ND	ND	0.55	0.55	1800	No	Constituent not detected.
Isosafrole	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 1	ND	ND	ND	0.55	0.55	6.2	No	Constituent not detected.
Methapyrilene	0 / 1	ND	ND	ND	110	110	NA	No	Constituent not detected.
Methyl methanesulfonate	0 / 1	ND	ND	ND	0.55	0.55	17	No	Constituent not detected.
Naphthalene	0 / 1	ND	ND	ND	0.55	0.55	18	No	Constituent not detected.
Nitrobenzene	0 / 1	ND	ND	ND	0.55	0.55	24	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.011	No	Constituent not detected.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
N-Nitrosodimethylamine	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.034	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.4	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.25	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 1	ND	ND	ND	0.55	0.55	350	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.078	No	Constituent not detected.
N-Nitrosomorpholine	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.26	No	Constituent not detected.
N-Nitrosopiperidine	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.18	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 1	ND	ND	ND	0.55	0.55	0.82	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
o-Toluidine	0 / 1	ND	ND	ND	0.55	0.55	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 1	ND	ND	ND	**0.55**	**0.55**	0.37	No	Constituent not detected.
Pentachlorobenzene	0 / 1	ND	ND	ND	0.55	0.55	49	No	Constituent not detected.
Pentachloronitrobenzene	0 / 1	ND	ND	ND	0.55	0.55	6.6	No	Constituent not detected.
Pentachlorophenol	0 / 1	ND	ND	ND	2.9	2.9	9	No	Constituent not detected.
Phenacetin	0 / 1	ND	ND	ND	0.55	0.55	780	No	Constituent not detected.
Phenanthrene	0 / 1	ND	ND	ND	0.55	0.55	17000	No	Constituent not detected.
Phenol	0 / 1	ND	ND	ND	0.55	0.55	18000	No	Constituent not detected.
p-Phenylene diamine	0 / 1	ND	ND	ND	2.9	2.9	12000	No	Constituent not detected.
Pronamide	0 / 1	ND	ND	ND	0.55	0.55	4600	No	Constituent not detected.
Pyrene	0 / 1	ND	ND	ND	0.55	0.55	1700	No	Constituent not detected.
Pyridine	0 / 1	ND	ND	ND	0.55	0.55	100	No	Constituent not detected.
Safrole, Total	0 / 1	ND	ND	ND	0.55	0.55	7.8	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
1-Dotriacontanol	1 / 1	1.3	1.3	BCSED-1	--	--	6200	No	Maximum detect below screening value.
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	1 / 1	0.94	0.94	BCSED-1	--	--	100	No	Maximum detect below screening value.
Heptadecane	1 / 1	1.2	1.2	BCSED-1	--	--	260	No	Maximum detect below screening value.
Heptadecane, 9-octyl-	1 / 1	1.1	1.1	BCSED-1	--	--	260	No	Maximum detect below screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 1	ND	ND	ND	1.5	1.5	3.4	No	Constituent not detected.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 1	ND	ND	ND	1.7	1.7	310	No	Constituent not detected.
Diethylene glycol	0 / 1	ND	ND	ND	8.4	8.4	NA	No	Constituent not detected.
Dipropylene glycol	0 / 1	ND	ND	ND	8.4	8.4	NA	No	Constituent not detected.
Ethanol	0 / 1	ND	ND	ND	1.7	1.7	NA	No	Constituent not detected.
Ethylene glycol	0 / 1	ND	ND	ND	8.4	8.4	120000	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 1	ND	ND	ND	8.4	8.4	6200	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 1	ND	ND	ND	8.4	8.4	NA	No	Constituent not detected.
Isopropanol	0 / 1	ND	ND	ND	1.7	1.7	4200000000	No	Constituent not detected.
Methanol	0 / 1	ND	ND	ND	1.7	1.7	31000	No	Constituent not detected.
Propylene glycol	0 / 1	ND	ND	ND	8.4	8.4	1200000	No	Constituent not detected.
Inorganics									
Aluminum	1 / 1	22000	22000	BCSED-1	--	--	99000	No	Maximum detect below screening value.
Antimony	0 / 1	ND	ND	ND	0.75	0.75	41	No	Constituent not detected.
Arsenic	1 / 1	4.8	4.8	BCSED-1	--	--	1.6	**YES**	Maximum detect exceeds screening value.
Barium	1 / 1	170	170	BCSED-1	--	--	19000	No	Maximum detect below screening value.
Beryllium	1 / 1	1.3	1.3	BCSED-1	--	--	200	No	Maximum detect below screening value.
Cadmium	1 / 1	0.19	0.19	BCSED-1	--	--	80	No	Maximum detect below screening value.
Calcium	1 / 1	1400	1400	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Chromium	1 / 1	34	34	BCSED-1	--	--	5.6	**YES**	Maximum detect exceeds screening value.
Cobalt	1 / 1	12	12	BCSED-1	--	--	30	No	Maximum detect below screening value.
Copper	1 / 1	12	12	BCSED-1	--	--	4100	No	Maximum detect below screening value.
Iron	1 / 1	16000	16000	BCSED-1	--	--	72000	No	Maximum detect below screening value.
Lead	1 / 1	21	21	BCSED-1	--	--	800	No	Maximum detect below screening value.
Magnesium	1 / 1	1800	1800	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Manganese	1 / 1	190	190	BCSED-1	--	--	2300	No	Maximum detect below screening value.
Mercury	0 / 1	ND	ND	ND	0.15	0.15	3.4	No	Constituent not detected.
Nickel	1 / 1	13	13	BCSED-1	--	--	2000	No	Maximum detect below screening value.
Potassium	1 / 1	1800	1800	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.

TABLE 3-15
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Sediment Concentration (mg/kg)	Maximum Detected Sediment Concentration (mg/kg)	Sample with Maximum Detect	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Direct Contact Sediment Screening Value (mg/kg)	Constituent of Interest	Comment
Inorganics (continued)									
Selenium	1 / 1	0.51	0.51	BCSED-1	**--**	**--**	510	No	Maximum detect below screening value.
Silver	0 / 1	ND	ND	ND	0.3	0.3	510	No	Constituent not detected.
Sodium	1 / 1	240	240	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Thallium	1 / 1	0.39	0.39	BCSED-1	--	--	NA	**YES**	Screening value not available; see Table 3-8.
Vanadium	1 / 1	51	51	BCSED-1	**--**	**--**	520	No	Maximum detect below screening value.
Zinc	1 / 1	46	46	BCSED-1	**--**	**--**	31000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	1 / 1	96	96	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Nitrate as N	1 / 1	4.1	4.1	BCSED-1	**--**	**--**	160000	No	Maximum detect below screening value.
Nitrite as N	0 / 1	ND	ND	ND	1.7	1.7	10000	No	Constituent not detected.
Total Kjeldhal Nitrogen (TKN)	1 / 1	1500	1500	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Total Organic Carbon (TOC)	1 / 1	25000	25000	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.
Sulfate	1 / 1	850	850	BCSED-1	--	--	NA	No	Screening value not available; see Table 3-8.

Notes:
ND - Not Detected
NA - Not Available
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-16
SURFACE WATER SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Surface Water Screening Value (ug/L)	Basis of Screening Values
Volatile Organics		
1,1,1,2-Tetrachloroethane	0.52	Tapwater RSL (USEPA, 2010a).
1,1,1-Trichloroethane	910	Tapwater RSL (USEPA, 2010a).
1,1,2,2-Tetrachloroethane	40	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,1,2-Trichloroethane	160	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,1-Dichloroethane	2.4	Tapwater RSL (USEPA, 2010a).
1,1-Dichloroethene	7100	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,2,3-Trichloropropane	0.00072	Tapwater RSL (USEPA, 2010a).
1,2-Dibromo-3-Chloropropane	0.00032	Tapwater RSL (USEPA, 2010a).
1,2-Dibromoethane	0.0065	Tapwater RSL (USEPA, 2010a).
1,2-Dichloroethane	370	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
trans-1,2-Dichloroethene	10000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,2-Dichloropropane	150	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
cis-1,3-Dichloropropene	210	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
trans-1,3-Dichloropropene	210	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2-Butanone (MEK)	710	Tapwater RSL (USEPA, 2010a).
2-Hexanone	4.7	Tapwater RSL (USEPA, 2010a).
2-Methyl-1-propanol	1100	Tapwater RSL (USEPA, 2010a).
4-Methyl-2-pentanone (MIBK)	200	Tapwater RSL (USEPA, 2010a).
Acetone	2200	Tapwater RSL (USEPA, 2010a).
Acetonitrile	13	Tapwater RSL (USEPA, 2010a).
Acrolein	9.3	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Acrylonitrile	2.5	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Allyl chloride	0.65	Tapwater RSL (USEPA, 2010a).
Benzene	510	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Benzyl chloride	0.079	Tapwater RSL (USEPA, 2010a).
Bromodichloromethane	170	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Bromoform	1400	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Bromomethane	1500	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Carbon Dioxide	NA	Low inherent toxicity.
Carbon disulfide	100	Tapwater RSL (USEPA, 2010a).
Carbon tetrachloride	16	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Chlorobenzene	1600	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Chloroethane	2100	Tapwater RSL (USEPA, 2010a).
Chloroform	11000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Chloromethane	19	Tapwater RSL (USEPA, 2010a).
Chloroprene	1.4	Tapwater RSL (USEPA, 2010a).
Dibromochloromethane	130	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Dibromomethane	0.82	Tapwater RSL (USEPA, 2010a).
Dichlorodifluoromethane	39	Tapwater RSL (USEPA, 2010a).
Diethyl ether	730	Tapwater RSL (USEPA, 2010a).
Ethyl methacrylate	330	Tapwater RSL (USEPA, 2010a).
Ethylbenzene	2100	Virginia Water Quality Standards for Human Health (9 VAC 25-260).

TABLE 3-16
SURFACE WATER SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Surface Water Screening Value (ug/L)	Basis of Screening Values
Volatile Organics (continued)		
Ethylene oxide	0.044	Tapwater RSL (USEPA, 2010a).
Methacrylonitrile	0.1	Tapwater RSL (USEPA, 2010a).
Methyl methacrylate	140	Tapwater RSL (USEPA, 2010a).
Methylene Chloride	4.8	Tapwater RSL (USEPA, 2010a).
Pentachloroethane	0.75	Tapwater RSL (USEPA, 2010a).
Propylene oxide	0.23	Tapwater RSL (USEPA, 2010a).
Styrene	160	Tapwater RSL (USEPA, 2010a).
t-Butanol	370	Based on the RSL for n-Butanol.
Tetrachloroethene	33	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Toluene	6000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
trans-1,4-Dichloro-2-btene	0.0012	Tapwater RSL (USEPA, 2010a).
Trichloroethylene	300	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Trichlorofluoromethane	130	Tapwater RSL (USEPA, 2010a).
Vinyl acetate	41	Tapwater RSL (USEPA, 2010a).
Vinyl chloride	24	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Xylenes, Total	20	Tapwater RSL (USEPA, 2010a).
Volatile Organics (TICs)		
Carbon Dioxide	NA	Low inherent toxicity.
Semi-Volatile Organics		
1,1,2,2-Tetrachloroethane	40	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,2,4,5-Tetrachlorobenzene	1.1	Tapwater RSL (USEPA, 2010a).
1,2,4-Trichlorobenzene	70	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,2-Dichlorobenzene	1300	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,3,5-Trinitrobenzene	110	Tapwater RSL (USEPA, 2010a).
1,3-Dichlorobenzene	960	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,4-Dichlorobenzene	190	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
1,4-Dioxane	6.1	Tapwater RSL (USEPA, 2010a).
2,2'-oxybis[1-chloropropane]	0.32	Tapwater RSL (USEPA, 2010a).
2,3,4,6-Tetrachlorophenol	110	Tapwater RSL (USEPA, 2010a).
2,4,5-Trichlorophenol	370	Tapwater RSL (USEPA, 2010a).
2,4,6-Trichlorophenol	24	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2,4-Dichlorophenol	290	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2,4-Dimethylphenol	850	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2,4-Dinitrophenol	5300	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2,4-Dinitrotoluene	34	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2,6-Dinitrotoluene	3.7	Tapwater RSL (USEPA, 2010a).
2-Acetylaminoflorene	0.018	Tapwater RSL (USEPA, 2010a).
2-Chloronaphthalene	1600	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2-Chlorophenol	150	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
2-Methylnaphthalene	15	Tapwater RSL (USEPA, 2010a).
2-Methylphenol	180	Tapwater RSL (USEPA, 2010a).
2-Naphthalenamine	0.037	Tapwater RSL (USEPA, 2010a).

TABLE 3-16
SURFACE WATER SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Surface Water Screening Value (ug/L)	Basis of Screening Values
Semi-Volatile Organics (continued)		
2-Nitroaniline	37	Tapwater RSL (USEPA, 2010a).
2-Nitrophenol	NA	Tapwater RSL (USEPA, 2010a).
2-Picoline	NA	Tapwater RSL (USEPA, 2010a).
2-sec-Btyl-4,6-dinitrophenol	765	Tapwater RSL (USEPA, 2010a).
3,3'-Dichlorobenzidine	0.28	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
3,3'-Dimethylbenzidine	0.0061	Tapwater RSL (USEPA, 2010a).
3-Methylcholanthrene	0.0031	Tapwater RSL (USEPA, 2010a).
4,6-Dinitro-2-methylphenol	280	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
4-Aminobiphenyl	0.0032	Tapwater RSL (USEPA, 2010a).
4-Chloro-3-methylphenol	370	Tapwater RSL (USEPA, 2010a).
4-Chloroaniline	0.34	Tapwater RSL (USEPA, 2010a).
4-Nitroaniline	3.4	Tapwater RSL (USEPA, 2010a).
5-Nitro-o-tolidine	2	Tapwater RSL (USEPA, 2010a).
7,12-Dimethylbenz(a)anthracene	0.00027	Tapwater RSL (USEPA, 2010a).
9-Hexadecenoic acid	NA	Constituent is a fatty acid; low inherent toxicity.
Acenaphthene	990	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Acetophenone	370	Tapwater RSL (USEPA, 2010a).
Aniline	12	Tapwater RSL (USEPA, 2010a).
Anthracene	40000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Aramite, Total	2.7	Tapwater RSL (USEPA, 2010a).
Benzo[a]anthracene	0.18	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Benzo[a]pyrene	0.18	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Benzo[b]fluoranthene	0.18	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Benzo[g,h,i]perylene	4000	Based on the Virginia WQS for pyrene.
Benzo[k]floranthene	0.18	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Benzyl alcohol	370	Tapwater RSL (USEPA, 2010a).
Bis(2-chloroethoxy)methane	11	Tapwater RSL (USEPA, 2010a).
Bis(2-chloroethyl)ether	5.3	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Bis(2-ethylhexyl) phthalate	22	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Butyl benzyl phthalate	1900	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Chrysene	0.018	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Diallate	1.1	Tapwater RSL (USEPA, 2010a).
Dibenz(a,h)anthracene	0.18	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Dibenzofuran	3.7	Tapwater RSL (USEPA, 2010a).
Diethyl phthalate	44000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Dimethoate	0.73	Tapwater RSL (USEPA, 2010a).
Dimethyl phthalate	1100000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Di-n-butyl phthalate	4500	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Fluoranthene	140	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Fluorene	5300	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Hexachlorobenzene	0.0029	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Hexachlorobutadiene	180	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Hexachlorocyclopentadiene	1100	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Hexachloroethane	33	Virginia Water Quality Standards for Human Health (9 VAC 25-260).

TABLE 3-16
SURFACE WATER SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Surface Water Screening Value (ug/L)	Basis of Screening Values
Semi-Volatile Organics (continued)		
Hexachlorophene	1.1	Tapwater RSL (USEPA, 2010a).
Indeno[1,2,3-cd]pyrene	0.18	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Isophorone	9600	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
m-Dinitrobenzene	0.37	Tapwater RSL (USEPA, 2010a).
Methyl methaneslfonate	0.68	Tapwater RSL (USEPA, 2010a).
Naphthalene	0.14	Tapwater RSL (USEPA, 2010a).
Nitrobenzene	690	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
N-Nitrosodiethylamine	0.00014	Tapwater RSL (USEPA, 2010a).
N-Nitrosodimethylamine	30	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
N-Nitrosodi-n-butylamine	0.0024	Tapwater RSL (USEPA, 2010a).
N-Nitrosodi-n-propylamine	5.1	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
N-Nitrosodiphenylamine	160.6	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
N-Nitrosomethylethylamine	0.0031	Tapwater RSL (USEPA, 2010a).
N-Nitrosomorpholine	0.01	Tapwater RSL (USEPA, 2010a).
N-Nitrosopiperidine	0.0072	Tapwater RSL (USEPA, 2010a).
N-Nitrosopyrrolidine	0.032	Tapwater RSL (USEPA, 2010a).
p-Dimethylamino azobenzene	0.015	Tapwater RSL (USEPA, 2010a).
Pentachlorobenzene	2.9	Tapwater RSL (USEPA, 2010a).
Pentachloronitrobenzene	0.26	Tapwater RSL (USEPA, 2010a).
Pentachlorophenol	30	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Phenacetin	31	Tapwater RSL (USEPA, 2010a).
Phenanthrene	40000	Based on the Virginia WQS for anthracene.
Phenol	860000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
p-Phenylene diamine	690	Tapwater RSL (USEPA, 2010a).
Pronamide	270	Tapwater RSL (USEPA, 2010a).
Pyrene	4000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Pyridine	3.7	Tapwater RSL (USEPA, 2010a).
Safrole, Total	0.31	Tapwater RSL (USEPA, 2010a).
Triphenylphosphine oxide	73	Tapwater RSL (USEPA, 2010a).
Semi-Volatile Organics (TICs)		
9,12,15-Octadecatrienal	NA	Constituent is a fatty acid; low inherent toxicity.
Bromacil	370	Calculated based on an oral reference dose of 0.1 mg/kg-day.
Ethane, 1,1'-oxybis[2-ethoxy-]	370	Based on the RSL for ethylene glycol monobutyl ether.
Hexadecanoic acid	NA	Constituent is a fatty acid; low inherent toxicity.
Oleic Acid	NA	Constituent is a fatty acid; low inherent toxicity.
Acrylamide, Acrylonitrile and Acrolein		
Acrylamide	0.043	Tapwater RSL (USEPA, 2010a).
Alcohols and Glycols		
Allyl alcohol	18	Tapwater RSL (USEPA, 2010a).
Diethylene glycol	7300	Based on the RSL for ethylene glycol.
Ethanol	370	Based on the RSL for n-butanol.
Ethylene glycol	7300	Tapwater RSL (USEPA, 2010a).

TABLE 3-16
SURFACE WATER SCREENING VALUES
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Surface Water Screening Value (ug/L)	Basis of Screening Values
Alcohols and Glycols (continued)		
Ethylene glycol monobutyl ether	370	Tapwater RSL (USEPA, 2010a).
Methanol	1800	Tapwater RSL (USEPA, 2010a).
Propylene glycol	73000	Tapwater RSL (USEPA, 2010a).
Total Inorganics		
Aluminum	3700	Tapwater RSL (USEPA, 2010a).
Antimony	640	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Arsenic	0.045	Tapwater RSL (USEPA, 2010a).
Barium	730	Tapwater RSL (USEPA, 2010a).
Beryllium	7.3	Tapwater RSL (USEPA, 2010a).
Cadmium	1.8	Tapwater RSL (USEPA, 2010a).
Calcium	NA	Essential Nutrient.
Chromium	0.043	Based on the RSL for chromium VI.
Cobalt	1.1	Tapwater RSL (USEPA, 2010a).
Copper	150	Tapwater RSL (USEPA, 2010a).
Iron	2600	Tapwater RSL (USEPA, 2010a).
Lead	15	Based on the Federal Maximum Contaminant Level (MCL; USEPA, 2009)
Magnesium	NA	Essential Nutrient.
Manganese	88	Tapwater RSL (USEPA, 2010a).
Mercury	0.051	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Nickel	4600	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Potassium	NA	Essential Nutrient.
Selenium	4200	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Silver	18	Tapwater RSL (USEPA, 2010a).
Sodium	NA	Essential Nutrient.
Thallium	0.47	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Vanadium	18	Tapwater RSL (USEPA, 2010a).
Zinc	26000	Virginia Water Quality Standards for Human Health (9 VAC 25-260).
Other Inorganics		
Chloride	250000	Based on Secondary Drinking Water Regulations (USEPA, 2009)
Nitrate as N	5800	Tapwater RSL (USEPA, 2010a).
Nitrite as N	370	Tapwater RSL (USEPA, 2010a).
Nitrogen, Kjeldahl	NA	Physical property.
Total Organic Carbon	NA	Physical property.
Sulfate	250000	Based on Secondary Drinking Water Regulations (USEPA, 2009)

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 6	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 6	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 6	ND	ND	ND	1	1	40	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 6	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 6	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 6	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 6	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 6	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 6	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 6	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 6	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 6	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 6	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 6	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	0 / 6	ND	ND	ND	10	10	710	No	Constituent not detected.
2-Hexanone	0 / 6	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 6	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 6	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	5 / 6	7.8	35	WLSW-3	25	25	2200	No	Maximum detect below screening value.
Acetonitrile	0 / 6	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 6	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 6	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 6	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 6	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 6	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 6	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 6	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 6	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon disulfide	0 / 6	ND	ND	ND	2	2	100	No	Constituent not detected.
Carbon tetrachloride	0 / 6	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 6	ND	ND	ND	1	1	1600	No	Constituent not detected.

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chloroethane	0 / 6	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 6	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 6	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 6	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 6	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 6	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 6	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 6	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	0 / 6	ND	ND	ND	10	10	730	No	Constituent not detected.
Ethyl methacrylate	0 / 6	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 6	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 6	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 6	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 6	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 6	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 6	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 6	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 6	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 6	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 6	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 6	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	1 / 6	2.9	2.9	ELSW-2	5	5	370	No	Maximum detect below screening value.
Tetrachloroethene	0 / 6	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 6	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 6	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 6	ND	ND	ND	1	1	300	No	Constituent not detected.
Trichlorofluoromethane	0 / 6	ND	ND	ND	1	1	130	No	Constituent not detected.
Vinyl acetate	0 / 6	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 6	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 6	ND	ND	ND	2	2	20	No	Constituent not detected.

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
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Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	6 / 6	13	29	WLSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 6	ND	ND	ND	**9.6**	**10**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 6	ND	ND	ND	9.6	10	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 6	ND	ND	ND	9.6	10	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 6	ND	ND	ND	9.6	10	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 6	ND	ND	ND	9.6	10	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 6	ND	ND	ND	9.6	10	190	No	Constituent not detected.
1,4-Dioxane	0 / 6	ND	ND	ND	**9.6**	**10**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 6	ND	ND	ND	**9.6**	**10**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 6	ND	ND	ND	9.6	10	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 6	ND	ND	ND	9.6	10	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 6	ND	ND	ND	9.6	10	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 6	ND	ND	ND	9.6	10	290	No	Constituent not detected.
2,4-Dimethylphenol	0 / 6	ND	ND	ND	9.6	10	850	No	Constituent not detected.
2,4-Dinitrophenol	0 / 6	ND	ND	ND	48	50	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 6	ND	ND	ND	9.6	10	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 6	ND	ND	ND	**9.6**	**10**		No	Constituent not detected.
2,6-Dinitrotoluene	0 / 6	ND	ND	ND	**9.6**	**10**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 6	ND	ND	ND	**9.6**	**10**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 6	ND	ND	ND	9.6	10	1600	No	Constituent not detected.
2-Chlorophenol	0 / 6	ND	ND	ND	9.6	10	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 6	ND	ND	ND	9.6	10	15	No	Constituent not detected.
2-Methylphenol	0 / 6	ND	ND	ND	9.6	10	180	No	Constituent not detected.
2-Naphthalenamine	0 / 6	ND	ND	ND	**9.6**	**10**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 6	ND	ND	ND	**48**	**50**	37	No	Constituent not detected.
2-Nitrophenol	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2-Picoline	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-sec-Btyl-4,6-dinitrophenol	0 / 6	ND	ND	ND	9.6	10	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 6	ND	ND	ND	**19**	**20**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 6	ND	ND	ND	**19**	**20**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 6	ND	ND	ND	**9.6**	**10**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 6	ND	ND	ND	48	50	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 6	ND	ND	ND	48	50	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 6	ND	ND	ND	**9.6**	**10**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 6	ND	ND	ND	9.6	10	370	No	Constituent not detected.
4-Chloroaniline	0 / 6	ND	ND	ND	**19**	**20**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
4-Nitroaniline	0 / 6	ND	ND	ND	**48**	**50**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 6	ND	ND	ND	48	50	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 6	ND	ND	ND	**9.6**	**10**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 6	ND	ND	ND	**9.6**	**10**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 6	ND	ND	ND	9.6	10	990	No	Constituent not detected.
Acenaphthylene	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Acetophenone	0 / 6	ND	ND	ND	9.6	10	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 6	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Aniline	0 / 6	ND	ND	ND	**19**	**20**	12	No	Constituent not detected.
Anthracene	0 / 6	ND	ND	ND	9.6	10	40000	No	Constituent not detected.
Aramite, Total	0 / 6	ND	ND	ND	**9.6**	**10**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 6	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzo[a]pyrene	1 / 6	1	1	ELSW-2	**9.6**	**9.7**	0.18	**YES**	Maximum detect exceeds screening value.
Benzo[b]fluoranthene	1 / 6	1.7	1.7	ELSW-2	**9.6**	**9.7**	0.18	**YES**	Maximum detect exceeds screening value.
Benzo[g,h,i]perylene	1 / 6	1.1	1.1	ELSW-2	9.6	9.7	4000	No	Maximum detect below screening value.
Benzo[k]floranthene	0 / 6	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 6	ND	ND	ND	9.6	10	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 6	ND	ND	ND	9.6	10	11	No	Constituent not detected.

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Bis(2-chloroethyl)ether	0 / 6	ND	ND	ND	**9.6**	**10**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	2 / 6	1.1	1.5	WLSW-2	9.6	10	22	No	Maximum detect below screening value.
Butyl benzyl phthalate	0 / 6	ND	ND	ND	9.6	10	1900	No	Constituent not detected.
Chrysene	0 / 6	ND	ND	ND	**9.6**	**10**	0.018	No	Constituent not detected.
Diallate	0 / 6	ND	ND	ND	**9.6**	**10**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 6	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Dibenzofuran	0 / 6	ND	ND	ND	**9.6**	**10**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 6	ND	ND	ND	9.6	10	44000	No	Constituent not detected.
Dimethoate	0 / 6	ND	ND	ND	**9.6**	**10**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 6	ND	ND	ND	9.6	10	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 6	ND	ND	ND	9.6	10	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Fluoranthene	0 / 6	ND	ND	ND	9.6	10	140	No	Constituent not detected.
Fluorene	0 / 6	ND	ND	ND	9.6	10	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 6	ND	ND	ND	**9.6**	**10**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 6	ND	ND	ND	9.6	10	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 6	ND	ND	ND	9.6	10	1100	No	Constituent not detected.
Hexachloroethane	0 / 6	ND	ND	ND	9.6	10	33	No	Constituent not detected.
Hexachlorophene	0 / 3	ND	ND	ND	**4800**	**5000**	1.1	No	Constituent not detected.
Hexachloropropene	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	1 / 6	0.86	0.86	ELSW-2	**9.6**	**9.7**	0.18	**YES**	Maximum detect exceeds screening value.
Isophorone	0 / 6	ND	ND	ND	9.6	10	9600	No	Constituent not detected.
Isosafrole	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 6	ND	ND	ND	**9.6**	**10**	0.37	No	Constituent not detected.
Methapyrilene	0 / 6	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Methyl methaneslfonate	0 / 6	ND	ND	ND	**9.6**	**10**	0.68	No	Constituent not detected.
Naphthalene	0 / 6	ND	ND	ND	**9.6**	**10**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 6	ND	ND	ND	9.6	10	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 6	ND	ND	ND	**9.6**	**10**	0.00014	No	Constituent not detected.

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
N-Nitrosodimethylamine	0 / 6	ND	ND	ND	9.6	10	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 6	ND	ND	ND	**9.6**	**10**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 6	ND	ND	ND	**9.6**	**10**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 6	ND	ND	ND	9.6	10	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 6	ND	ND	ND	**9.6**	**10**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 6	ND	ND	ND	**9.6**	**10**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 6	ND	ND	ND	**9.6**	**10**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 6	ND	ND	ND	**9.6**	**10**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
o-Toluidine	0 / 6	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 6	ND	ND	ND	**9.6**	**10**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 6	ND	ND	ND	**9.6**	**10**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 6	ND	ND	ND	**9.6**	**10**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 6	ND	ND	ND	**48**	**50**	30	No	Constituent not detected.
Phenacetin	0 / 6	ND	ND	ND	9.6	10	31	No	Constituent not detected.
Phenanthrene	0 / 6	ND	ND	ND	9.6	10	40000	No	Constituent not detected.
Phenol	0 / 6	ND	ND	ND	9.6	10	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 6	ND	ND	ND	**1900**	**2000**	690	No	Constituent not detected.
Pronamide	0 / 6	ND	ND	ND	9.6	10	270	No	Constituent not detected.
Pyrene	0 / 6	ND	ND	ND	9.6	10	4000	No	Constituent not detected.
Pyridine	0 / 6	ND	ND	ND	**48**	**50**	3.7	No	Constituent not detected.
Safrole, Total	0 / 6	ND	ND	ND	**9.6**	**10**	0.31	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
9,12,15-Octadecatrienal	1 / 1	11	11	ELSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Ethane, 1,1'-oxybis[2-ethoxy-]	2 / 2	77	120	WLSW-2	**--**	**--**	370	No	Maximum detect below screening value.
Hexadecanoic acid	3 / 3	5.2	41	WLSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 6	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
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Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 6	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 6	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Dipropylene glycol	0 / 6	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 6	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	0 / 6	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 6	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 6	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 6	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	0 / 6	ND	ND	ND	1000	1000	1800	No	Constituent not detected.
Propylene glycol	0 / 6	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	6 / 6	95	1700	WLSW-1	**--**	**--**	3700	No	Maximum detect below screening value.
Antimony	0 / 6	ND	ND	ND	2.5	2.5	640	No	Constituent not detected.
Arsenic	6 / 6	0.73	1.5	WLSW-1	**--**	**--**	0.045	**YES**	Maximum detect exceeds screening value.
Barium	6 / 6	7.4	16	WLSW-1	**--**	**--**	730	No	Maximum detect below screening value.
Beryllium	0 / 6	ND	ND	ND	0.5	0.5	7.3	No	Constituent not detected.
Cadmium	0 / 6	ND	ND	ND	0.5	0.5	1.8	No	Constituent not detected.
Calcium	6 / 6	4200	9600	WLSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	1 / 6	3.8	3.8	WLSW-1	**5**	**5**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	6 / 6	0.16	0.71	WLSW-1	**--**	**--**	1.1	No	Maximum detect below screening value.
Copper	6 / 6	2.3	6.4	WLSW-1	**--**	**--**	150	No	Maximum detect below screening value.
Iron	6 / 6	550	2500	WLSW-1	**--**	**--**	2600	No	Maximum detect below screening value.
Lead	6 / 6	0.56	2.9	WLSW-1	**--**	**--**	15	No	Maximum detect below screening value.
Magnesium	6 / 6	1500	2600	WLSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	6 / 6	25	84	ELSW-3	**--**	**--**	88	No	Maximum detect below screening value.
Mercury	0 / 6	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	6 / 6	1.6	5.1	WLSW-1	**--**	**--**	4600	No	Maximum detect below screening value.
Potassium	6 / 6	1600	3200	WLSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	0 / 6	ND	ND	ND	2.5	2.5	4200	No	Constituent not detected.
Silver	0 / 6	ND	ND	ND	1	1	18	No	Constituent not detected.

TABLE 3-17
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Total Inorganics (continued)									
Sodium	6 / 6	31000	59000	WLSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	1 / 6	0.26	0.26	ELSW-3	**1**	**1**	0.47	No	Maximum detect below screening value.
Vanadium	4 / 6	3.9	10	WLSW-1	5	5	18	No	Maximum detect below screening value.
Zinc	6 / 6	11	36	ELSW-1	**--**	**--**	26000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	6 / 6	11000	62000	ELSW-2	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	1 / 5	120	120	ELSW-1	50	50	5800	No	Maximum detect below screening value.
Nitrite as N	1 / 6	110	110	WLSW-1	50	50	370	No	Maximum detect below screening value.
Nitrogen, Kjeldahl	6 / 6	1600	4800	WLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	6 / 6	7100	30000	WLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	3 / 6	18000	3700000	ELSW-3	5000	5000	250000	No	Common inorganic/low inherent toxicity.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 2	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 2	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 2	ND	ND	ND	1	1	40	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 2	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 2	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 2	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 2	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 2	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 2	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 2	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 2	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 2	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 2	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 2	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	2 / 2	1.6	1.8	NLSW-2	**--**	**--**	710	No	Maximum detect below screening value.
2-Hexanone	0 / 2	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 2	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 2	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	0 / 2	ND	ND	ND	25	25	2200	No	Constituent not detected.
Acetonitrile	0 / 2	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 2	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 2	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 2	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 2	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 2	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 2	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 2	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 2	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon disulfide	0 / 2	ND	ND	ND	2	2	100	No	Constituent not detected.
Carbon tetrachloride	0 / 2	ND	ND	ND	1	1	16	No	Constituent not detected.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chlorobenzene	0 / 2	ND	ND	ND	1	1	1600	No	Constituent not detected.
Chloroethane	0 / 2	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 2	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 2	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 2	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 2	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 2	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 2	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 2	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	0 / 2	ND	ND	ND	10	10	730	No	Constituent not detected.
Ethyl methacrylate	0 / 2	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 2	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 2	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 2	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 2	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 2	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 2	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 2	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 2	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 2	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 2	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 2	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	0 / 2	ND	ND	ND	5	5	370	No	Constituent not detected.
Tetrachloroethene	0 / 2	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 2	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 2	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 2	ND	ND	ND	1	1	300	No	Constituent not detected.
Trichlorofluoromethane	0 / 2	ND	ND	ND	1	1	130	No	Constituent not detected.
Vinyl acetate	0 / 2	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 2	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 2	ND	ND	ND	2	2	20	No	Constituent not detected.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (TICs)									
Carbon Dioxide	2 / 2	12	15	NLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 2	ND	ND	ND	**9.4**	**9.4**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 2	ND	ND	ND	9.4	9.4	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 2	ND	ND	ND	9.4	9.4	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 2	ND	ND	ND	9.4	9.4	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 2	ND	ND	ND	9.4	9.4	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 2	ND	ND	ND	9.4	9.4	190	No	Constituent not detected.
1,4-Dioxane	0 / 2	ND	ND	ND	**9.4**	**9.4**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 2	ND	ND	ND	9.4	9.4	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 2	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 2	ND	ND	ND	9.4	9.4	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 2	ND	ND	ND	9.4	9.4	290	No	Constituent not detected.
2,4-Dimethylphenol	0 / 2	ND	ND	ND	9.4	9.4	850	No	Constituent not detected.
2,4-Dinitrophenol	0 / 2	ND	ND	ND	47	47	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 2	ND	ND	ND	9.4	9.4	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 2	ND	ND	ND	**9.4**	**9.4**		No	Constituent not detected.
2,6-Dinitrotoluene	0 / 2	ND	ND	ND	**9.4**	**9.4**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 2	ND	ND	ND	9.4	9.4	1600	No	Constituent not detected.
2-Chlorophenol	0 / 2	ND	ND	ND	9.4	9.4	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 2	ND	ND	ND	9.4	9.4	15	No	Constituent not detected.
2-Methylphenol	0 / 2	ND	ND	ND	9.4	9.4	180	No	Constituent not detected.
2-Naphthalenamine	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 2	ND	ND	ND	**47**	**47**	37	No	Constituent not detected.
2-Nitrophenol	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
2-Picoline	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-sec-Btyl-4,6-dinitrophenol	0 / 2	ND	ND	ND	9.4	9.4	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 2	ND	ND	ND	**19**	**19**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 2	ND	ND	ND	**19**	**19**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 2	ND	ND	ND	47	47	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 2	ND	ND	ND	47	47	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 2	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
4-Chloroaniline	0 / 2	ND	ND	ND	**19**	**19**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
4-Nitroaniline	0 / 2	ND	ND	ND	**47**	**47**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 2	ND	ND	ND	47	47	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 2	ND	ND	ND	**9.4**	**9.4**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 2	ND	ND	ND	9.4	9.4	990	No	Constituent not detected.
Acenaphthylene	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Acetophenone	0 / 2	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 2	ND	ND	ND	1900	1900	NA	No	Constituent not detected.
Aniline	0 / 2	ND	ND	ND	**19**	**19**	12	No	Constituent not detected.
Anthracene	0 / 2	ND	ND	ND	9.4	9.4	40000	No	Constituent not detected.
Aramite, Total	0 / 2	ND	ND	ND	**9.4**	**9.4**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Benzo[a]pyrene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 2	ND	ND	ND	9.4	9.4	4000	No	Constituent not detected.
Benzo[k]floranthene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 2	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 2	ND	ND	ND	9.4	9.4	11	No	Constituent not detected.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Bis(2-chloroethyl)ether	0 / 2	ND	ND	ND	**9.4**	**9.4**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 2	ND	ND	ND	9.4	9.4	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 2	ND	ND	ND	9.4	9.4	1900	No	Constituent not detected.
Chrysene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.018	No	Constituent not detected.
Diallate	0 / 2	ND	ND	ND	**9.4**	**9.4**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Dibenzofuran	0 / 2	ND	ND	ND	**9.4**	**9.4**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 2	ND	ND	ND	9.4	9.4	44000	No	Constituent not detected.
Dimethoate	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 2	ND	ND	ND	9.4	9.4	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 2	ND	ND	ND	9.4	9.4	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Fluoranthene	0 / 2	ND	ND	ND	9.4	9.4	140	No	Constituent not detected.
Fluorene	0 / 2	ND	ND	ND	9.4	9.4	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 2	ND	ND	ND	9.4	9.4	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 2	ND	ND	ND	9.4	9.4	1100	No	Constituent not detected.
Hexachloroethane	0 / 2	ND	ND	ND	9.4	9.4	33	No	Constituent not detected.
Hexachloropropene	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Isophorone	0 / 2	ND	ND	ND	9.4	9.4	9600	No	Constituent not detected.
Isosafrole	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.37	No	Constituent not detected.
Methapyrilene	0 / 2	ND	ND	ND	1900	1900	NA	No	Constituent not detected.
Methyl methaneslfonate	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.68	No	Constituent not detected.
Naphthalene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 2	ND	ND	ND	9.4	9.4	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 2	ND	ND	ND	9.4	9.4	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.0024	No	Constituent not detected.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
N-Nitrosodi-n-propylamine	0 / 2	ND	ND	ND	**9.4**	**9.4**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 2	ND	ND	ND	9.4	9.4	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
o-Toluidine	0 / 2	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 2	ND	ND	ND	**9.4**	**9.4**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 2	ND	ND	ND	**47**	**47**	30	No	Constituent not detected.
Phenacetin	0 / 2	ND	ND	ND	9.4	9.4	31	No	Constituent not detected.
Phenanthrene	0 / 2	ND	ND	ND	9.4	9.4	40000	No	Constituent not detected.
Phenol	0 / 2	ND	ND	ND	9.4	9.4	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 2	ND	ND	ND	**1900**	**1900**	690	No	Constituent not detected.
Pronamide	0 / 2	ND	ND	ND	9.4	9.4	270	No	Constituent not detected.
Pyrene	0 / 2	ND	ND	ND	9.4	9.4	4000	No	Constituent not detected.
Pyridine	0 / 2	ND	ND	ND	**47**	**47**	3.7	No	Constituent not detected.
Safrole, Total	0 / 2	ND	ND	ND	**9.4**	**9.4**	0.31	No	Constituent not detected.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 2	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 2	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 2	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Dipropylene glycol	0 / 2	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 2	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	0 / 2	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 2	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 2	ND	ND	ND	5000	5000	NA	No	Constituent not detected.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Alcohols and Glycols (continued)									
Isopropanol	0 / 2	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	0 / 2	ND	ND	ND	1000	1000	1800	No	Constituent not detected.
Propylene glycol	0 / 2	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	2 / 2	320	1200	NLSW-2	--	--	3700	No	Maximum detect below screening value.
Antimony	0 / 2	ND	ND	ND	2.5	2.5	640	No	Constituent not detected.
Arsenic	2 / 2	1	1.4	NLSW-2	--	--	0.045	**YES**	Maximum detect exceeds screening value.
Barium	2 / 2	14	17	NLSW-2	--	--	730	No	Maximum detect below screening value.
Beryllium	0 / 2	ND	ND	ND	0.5	0.5	7.3	No	Constituent not detected.
Cadmium	0 / 2	ND	ND	ND	0.5	0.5	1.8	No	Constituent not detected.
Calcium	2 / 2	3300	3400	NLSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	1 / 2	1.7	1.7	NLSW-2	**5**	**5**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	2 / 2	0.13	0.4	NLSW-2	--	--	1.1	No	Maximum detect below screening value.
Copper	2 / 2	2.6	3.9	NLSW-2	--	--	150	No	Maximum detect below screening value.
Iron	2 / 2	550	1500	NLSW-2	--	--	2600	No	Maximum detect below screening value.
Lead	1 / 2	1.6	1.6	NLSW-2	1.5	1.5	15	No	Maximum detect below screening value.
Magnesium	2 / 2	2200	2200	NLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	2 / 2	8.9	13	NLSW-2	--	--	88	No	Maximum detect below screening value.
Mercury	0 / 2	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	2 / 2	1	2	NLSW-2	--	--	4600	No	Maximum detect below screening value.
Potassium	2 / 2	1900	1900	NLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	0 / 2	ND	ND	ND	2.5	2.5	4200	No	Constituent not detected.
Silver	0 / 2	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	2 / 2	21000	22000	NLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	0 / 2	ND	ND	ND	**1**	**1**	0.47	No	Constituent not detected.
Vanadium	1 / 2	3.2	3.2	NLSW-2	5	5	18	No	Maximum detect below screening value.
Zinc	2 / 2	7.1	11	NLSW-2	--	--	26000	No	Maximum detect below screening value.

TABLE 3-18
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Other Inorganics									
Chloride	2 / 2	5400	5500	NLSW-2	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	0 / 2	ND	ND	ND	50	50	5800	No	Constituent not detected.
Nitrite as N	0 / 2	ND	ND	ND	50	50	370	No	Constituent not detected.
Nitrogen, Kjeldahl	2 / 2	1200	1300	NLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	2 / 2	9800	9900	NLSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	2 / 2	19000	20000	NLSW-1	**--**	**--**	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	2 / 3	8.9	10	SDB-SW-1	1	1	40	No	Maximum detect below screening value.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	2 / 3	1.2	1.8	SDB-SW-2	10	10	710	No	Maximum detect below screening value.
2-Hexanone	0 / 3	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	2 / 3	5.2	13	SDB-SW-2	25	25	2200	No	Maximum detect below screening value.
Acetonitrile	0 / 3	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon Dioxide	3 / 3	27.5	44	SDB-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Carbon disulfide	0 / 3	ND	ND	ND	2	2	100	No	Constituent not detected.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Carbon tetrachloride	0 / 3	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 3	ND	ND	ND	1	1	1600	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	0 / 3	ND	ND	ND	10	10	730	No	Constituent not detected.
Ethyl methacrylate	0 / 3	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 3	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	1 / 3	11	11	SDB-SW-2	5	5	370	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	1 / 3	0.51	0.51	SDB-SW-2	1	1	6000	No	Maximum detect below screening value.
trans-1,4-Dichloro-2-btene	0 / 3	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	1	1	300	No	Constituent not detected.
Trichlorofluoromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Vinyl acetate	0 / 3	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	2	2	20	No	Constituent not detected.
Semi-Volatile Organics									
1,1,2,2-Tetrachloroethane	2 / 2	8.9	10	SDB-SW-1	--	--	40	No	Maximum detect below screening value.
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	**9.4**	**9.7**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	9.4	9.7	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	9.4	9.7	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	9.4	9.7	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	9.4	9.7	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	9.4	9.7	190	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	**9.4**	**9.7**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	9.4	9.7	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	9.4	9.7	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	9.4	9.7	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	9.4	9.7	290	No	Constituent not detected.
2,4-Dimethylphenol	0 / 3	ND	ND	ND	9.4	9.7	850	No	Constituent not detected.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	47	49	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	9.4	9.7	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	**9.4**	**9.7**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	9.4	9.7	1600	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	9.4	9.7	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	9.4	9.7	15	No	Constituent not detected.
2-Methylphenol	0 / 3	ND	ND	ND	9.4	9.7	180	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.037	No	Constituent not detected.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Nitroaniline	0 / 3	ND	ND	ND	**47**	**49**	37	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
2-sec-Btyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	9.4	9.7	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 3	ND	ND	ND	**19**	**19**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**19**	**19**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	47	49	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	47	49	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	9.4	9.7	370	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	**19**	**19**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	**47**	**49**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	47	49	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 3	ND	ND	ND	**9.4**	**9.7**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.00027	No	Constituent not detected.
9-Hexadecenoic acid	1 / 1	4.2	4.2	SDB-SW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Acenaphthene	0 / 3	ND	ND	ND	9.4	9.7	990	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	9.4	9.7	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 3	ND	ND	ND	1900	1900	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	**19**	**19**	12	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	9.4	9.7	40000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	**9.4**	**9.7**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.18	No	Constituent not detected.
Benzo[a]pyrene	1 / 3	0.66	0.66	SDB-SW-1	**9.4**	**9.7**	0.18	**YES**	Maximum detect exceeds screening value.
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.18	No	Constituent not detected.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Benzo[g,h,i]perylene	2 / 3	0.71	1.2	SDB-SW-1	9.4	9.4	4000	No	Maximum detect below screening value.
Benzo[k]floranthene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	9.4	9.7	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	9.4	9.7	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	**9.4**	**9.7**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 3	ND	ND	ND	9.4	9.7	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	9.4	9.7	1900	No	Constituent not detected.
Chrysene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.018	No	Constituent not detected.
Diallate	0 / 3	ND	ND	ND	**9.4**	**9.7**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	2 / 3	0.64	1.3	SDB-SW-1	**9.4**	**9.4**	0.18	**YES**	Maximum detect exceeds screening value.
Dibenzofuran	0 / 3	ND	ND	ND	**9.4**	**9.7**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	9.4	9.7	44000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	9.4	9.7	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	9.4	9.7	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	**9.4**	**9.7**		No	Constituent not detected.
Ethyl methaneslfonate	0 / 3	ND	ND	ND	**9.4**	**9.7**		No	Constituent not detected.
Fluoranthene	0 / 3	ND	ND	ND	9.4	9.7	140	No	Constituent not detected.
Fluorene	0 / 3	ND	ND	ND	9.4	9.7	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	9.4	9.7	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	9.4	9.7	1100	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	9.4	9.7	33	No	Constituent not detected.
Hexachlorophene	0 / 3	ND	ND	ND	**4700**	**4900**	1.1	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	1 / 3	1.3	1.3	SDB-SW-1	**9.4**	**9.7**	0.18	**YES**	Maximum detect exceeds screening value.
Isophorone	0 / 3	ND	ND	ND	9.4	9.7	9600	No	Constituent not detected.
Isosafrole	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.37	No	Constituent not detected.
Methapyrilene	0 / 3	ND	ND	ND	1900	1900	NA	No	Constituent not detected.
Methyl methaneslfonate	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.68	No	Constituent not detected.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Naphthalene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	9.4	9.7	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	9.4	9.7	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**9.4**	**9.7**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	9.4	9.7	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	9.4	9.7	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	**9.4**	**9.7**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	**47**	**49**	30	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	9.4	9.7	31	No	Constituent not detected.
Phenanthrene	0 / 3	ND	ND	ND	9.4	9.7	40000	No	Constituent not detected.
Phenol	0 / 3	ND	ND	ND	9.4	9.7	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	**1900**	**1900**	690	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	9.4	9.7	270	No	Constituent not detected.
Pyrene	0 / 3	ND	ND	ND	9.4	9.7	4000	No	Constituent not detected.
Pyridine	0 / 3	ND	ND	ND	**47**	**49**	3.7	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	**9.4**	**9.7**	0.31	No	Constituent not detected.
Triphenylphosphine oxide	1 / 1	9.45	9.45	SDB-SW-3	--	--	73	No	Maximum detect below screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Alcohols and Glycols (continued)									
Dipropylene glycol	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	3 / 3	3500	5100	SDB-SW-2	--	--	7300	No	Maximum detect below screening value.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	0 / 3	ND	ND	ND	1000	1000	1800	No	Constituent not detected.
Propylene glycol	0 / 3	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	3 / 3	320	1025	SDB-SW-3	--	--	3700	No	Maximum detect below screening value.
Antimony	0 / 3	ND	ND	ND	2.5	2.5	640	No	Constituent not detected.
Arsenic	3 / 3	0.675	0.95	SDB-SW-1	--	--	0.045	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	7.1	32.5	SDB-SW-3	--	--	730	No	Maximum detect below screening value.
Beryllium	1 / 3	0.145	0.145	SDB-SW-3	0.5	0.5	7.3	No	Maximum detect below screening value.
Cadmium	1 / 3	0.15	0.15	SDB-SW-3	0.5	0.5	1.8	No	Maximum detect below screening value.
Calcium	3 / 3	2900	4050	SDB-SW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	3 / 3	1.8	2.2	SDB-SW-3	--	--	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	0.27	1.525	SDB-SW-3	--	--	1.1	**YES**	Maximum detect exceeds screening value.
Copper	2 / 3	1.6	5.4	SDB-SW-3	5	5	150	No	Maximum detect below screening value.
Iron	3 / 3	1600	5400	SDB-SW-1	--	--	2600	**YES**	Maximum detect exceeds screening value.
Lead	3 / 3	0.49	1.295	SDB-SW-3	--	--	15	No	Maximum detect below screening value.
Magnesium	3 / 3	1500	2000	SDB-SW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	3 / 3	49	235	SDB-SW-3	--	--	88	**YES**	Maximum detect exceeds screening value.
Mercury	0 / 3	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	3 / 3	1.3	3.6	SDB-SW-3	--	--	4600	No	Maximum detect below screening value.
Potassium	3 / 3	3900	4900	SDB-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	0 / 3	ND	ND	ND	2.5	2.5	4200	No	Constituent not detected.
Silver	0 / 3	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	3 / 3	3500	4100	SDB-SW-2	--	--	NA	No	Screening value not available; see Table 3-16.

TABLE 3-19
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Total Inorganics (continued)									
Thallium	0 / 3	ND	ND	ND	**1**	**1**	0.47	No	Constituent not detected.
Vanadium	3 / 3	2.6	4.15	SDB-SW-3	**--**	**--**	18	No	Maximum detect below screening value.
Zinc	3 / 3	8.1	46	SDB-SW-3	**--**	**--**	26000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	3 / 3	3500	6100	SDB-SW-1	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	1 / 3	105.5	105.5	SDB-SW-3	250	250	5800	No	Maximum detect below screening value.
Nitrite as N	0 / 3	ND	ND	ND	50	50	370	No	Constituent not detected.
Nitrogen, Kjeldahl	3 / 3	1000	1600	SDB-SW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	3 / 3	12000	20000	SDB-SW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	3 / 3	7300	14000	SDB-SW-3	**--**	**--**	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 1	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 1	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	1 / 1	12	12	VFSP-SW-1	--	--	40	No	Maximum detect below screening value.
1,1,2-Trichloroethane	0 / 1	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 1	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 1	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 1	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 1	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 1	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 1	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 1	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 1	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 1	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 1	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	0 / 1	ND	ND	ND	10	10	710	No	Constituent not detected.
2-Hexanone	0 / 1	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 1	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 1	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	0 / 1	ND	ND	ND	25	25	2200	No	Constituent not detected.
Acetonitrile	0 / 1	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 1	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 1	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 1	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 1	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 1	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 1	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 1	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 1	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon Dioxide	1 / 1	38	38	VFSP-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Carbon disulfide	0 / 1	ND	ND	ND	2	2	100	No	Constituent not detected.
Carbon tetrachloride	0 / 1	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 1	ND	ND	ND	1	1	1600	No	Constituent not detected.
Chloroethane	0 / 1	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 1	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 1	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 1	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 1	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 1	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 1	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 1	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	0 / 1	ND	ND	ND	10	10	730	No	Constituent not detected.
Ethyl methacrylate	0 / 1	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 1	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 1	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 1	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 1	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 1	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 1	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 1	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 1	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 1	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 1	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 1	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	1 / 1	4.9	4.9	VFSP-SW-1	--	--	370	No	Maximum detect below screening value.
Tetrachloroethene	0 / 1	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 1	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 1	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 1	ND	ND	ND	1	1	300	No	Constituent not detected.
Trichlorofluoromethane	0 / 1	ND	ND	ND	1	1	130	No	Constituent not detected.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Vinyl acetate	0 / 1	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 1	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 1	ND	ND	ND	2	2	20	No	Constituent not detected.
Semi-Volatile Organics									
1,1,2,2-Tetrachloroethane	1 / 1	12	12	VFSP-SW-1	--	--	40	No	Maximum detect below screening value.
1,2,4,5-Tetrachlorobenzene	0 / 1	ND	ND	ND	**9.4**	**9.4**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 1	ND	ND	ND	9.4	9.4	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 1	ND	ND	ND	9.4	9.4	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 1	ND	ND	ND	9.4	9.4	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 1	ND	ND	ND	9.4	9.4	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 1	ND	ND	ND	9.4	9.4	190	No	Constituent not detected.
1,4-Dioxane	0 / 1	ND	ND	ND	**9.4**	**9.4**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 1	ND	ND	ND	9.4	9.4	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 1	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 1	ND	ND	ND	9.4	9.4	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 1	ND	ND	ND	9.4	9.4	290	No	Constituent not detected.
2,4-Dimethylphenol	0 / 1	ND	ND	ND	9.4	9.4	850	No	Constituent not detected.
2,4-Dinitrophenol	0 / 1	ND	ND	ND	47	47	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 1	ND	ND	ND	9.4	9.4	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 1	ND	ND	ND	**9.4**	**9.4**		No	Constituent not detected.
2,6-Dinitrotoluene	0 / 1	ND	ND	ND	**9.4**	**9.4**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 1	ND	ND	ND	9.4	9.4	1600	No	Constituent not detected.
2-Chlorophenol	0 / 1	ND	ND	ND	9.4	9.4	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 1	ND	ND	ND	9.4	9.4	15	No	Constituent not detected.
2-Methylphenol	0 / 1	ND	ND	ND	9.4	9.4	180	No	Constituent not detected.
2-Naphthalenamine	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.037	No	Constituent not detected.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Nitroaniline	0 / 1	ND	ND	ND	**47**	**47**	37	No	Constituent not detected.
2-Nitrophenol	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
2-Picoline	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
2-sec-Btyl-4,6-dinitrophenol	0 / 1	ND	ND	ND	9.4	9.4	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 1	ND	ND	ND	**19**	**19**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 1	ND	ND	ND	**19**	**19**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 1	ND	ND	ND	47	47	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 1	ND	ND	ND	47	47	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 1	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
4-Chloroaniline	0 / 1	ND	ND	ND	**19**	**19**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
4-Nitroaniline	0 / 1	ND	ND	ND	**47**	**47**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 1	ND	ND	ND	47	47	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 1	ND	ND	ND	**9.4**	**9.4**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 1	ND	ND	ND	9.4	9.4	990	No	Constituent not detected.
Acenaphthylene	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Acetophenone	0 / 1	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 1	ND	ND	ND	1900	1900	NA	No	Constituent not detected.
Aniline	0 / 1	ND	ND	ND	**19**	**19**	12	No	Constituent not detected.
Anthracene	0 / 1	ND	ND	ND	9.4	9.4	40000	No	Constituent not detected.
Aramite, Total	0 / 1	ND	ND	ND	**9.4**	**9.4**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Benzo[a]pyrene	1 / 1	0.96	0.96	VFSP-SW-1	**--**	**--**	0.18	**YES**	Maximum detect exceeds screening value.
Benzo[b]fluoranthene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.18	No	Constituent not detected.
Benzo[g,h,i]perylene	1 / 1	1.5	1.5	VFSP-SW-1	**--**	**--**	4000	No	Maximum detect below screening value.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Benzo[k]floranthene	1 / 1	0.58	0.58	VFSP-SW-1	--	--	0.18	**YES**	Maximum detect exceeds screening value.
Benzyl alcohol	0 / 1	ND	ND	ND	9.4	9.4	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 1	ND	ND	ND	9.4	9.4	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 1	ND	ND	ND	**9.4**	**9.4**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 1	ND	ND	ND	9.4	9.4	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 1	ND	ND	ND	9.4	9.4	1900	No	Constituent not detected.
Chrysene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.018	No	Constituent not detected.
Diallate	0 / 1	ND	ND	ND	**9.4**	**9.4**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	1 / 1	2.6	2.6	VFSP-SW-1	--	--	0.18	**YES**	Maximum detect exceeds screening value.
Dibenzofuran	0 / 1	ND	ND	ND	**9.4**	**9.4**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 1	ND	ND	ND	9.4	9.4	44000	No	Constituent not detected.
Dimethoate	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 1	ND	ND	ND	9.4	9.4	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 1	ND	ND	ND	9.4	9.4	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Fluoranthene	0 / 1	ND	ND	ND	9.4	9.4	140	No	Constituent not detected.
Fluorene	0 / 1	ND	ND	ND	9.4	9.4	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 1	ND	ND	ND	9.4	9.4	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 1	ND	ND	ND	9.4	9.4	1100	No	Constituent not detected.
Hexachloroethane	0 / 1	ND	ND	ND	9.4	9.4	33	No	Constituent not detected.
Hexachlorophene	0 / 1	ND	ND	ND	**4700**	**4700**	1.1	No	Constituent not detected.
Hexachloropropene	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	1 / 1	1.7	1.7	VFSP-SW-1	--	--	0.18	**YES**	Maximum detect exceeds screening value.
Isophorone	0 / 1	ND	ND	ND	9.4	9.4	9600	No	Constituent not detected.
Isosafrole	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.37	No	Constituent not detected.
Methapyrilene	0 / 1	ND	ND	ND	1900	1900	NA	No	Constituent not detected.
Methyl methaneslfonate	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.68	No	Constituent not detected.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Naphthalene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 1	ND	ND	ND	9.4	9.4	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 1	ND	ND	ND	9.4	9.4	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 1	ND	ND	ND	**9.4**	**9.4**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 1	ND	ND	ND	9.4	9.4	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
o-Toluidine	0 / 1	ND	ND	ND	9.4	9.4	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 1	ND	ND	ND	**9.4**	**9.4**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 1	ND	ND	ND	**47**	**47**	30	No	Constituent not detected.
Phenacetin	0 / 1	ND	ND	ND	9.4	9.4	31	No	Constituent not detected.
Phenanthrene	0 / 1	ND	ND	ND	9.4	9.4	40000	No	Constituent not detected.
Phenol	0 / 1	ND	ND	ND	9.4	9.4	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 1	ND	ND	ND	**1900**	**1900**	690	No	Constituent not detected.
Pronamide	0 / 1	ND	ND	ND	9.4	9.4	270	No	Constituent not detected.
Pyrene	0 / 1	ND	ND	ND	9.4	9.4	4000	No	Constituent not detected.
Pyridine	0 / 1	ND	ND	ND	**47**	**47**	3.7	No	Constituent not detected.
Safrole, Total	0 / 1	ND	ND	ND	**9.4**	**9.4**	0.31	No	Constituent not detected.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 1	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 1	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	1 / 1	1000	1000	VFSP-SW-1	**--**	**--**	7300	No	Maximum detect below screening value.
Dipropylene glycol	0 / 1	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 1	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	1 / 1	1000	1000	VFSP-SW-1	**--**	**--**	7300	No	Maximum detect below screening value.
Ethylene glycol monobutyl ether	0 / 1	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 1	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 1	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	0 / 1	ND	ND	ND	1000	1000	1800	No	Constituent not detected.
Propylene glycol	0 / 1	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	1 / 1	830	830	VFSP-SW-1	**--**	**--**	3700	No	Maximum detect below screening value.
Antimony	1 / 1	0.52	0.52	VFSP-SW-1	**--**	**--**	640	No	Maximum detect below screening value.
Arsenic	1 / 1	1.2	1.2	VFSP-SW-1	**--**	**--**	0.045	**YES**	Maximum detect exceeds screening value.
Barium	1 / 1	41	41	VFSP-SW-1	**--**	**--**	730	No	Maximum detect below screening value.
Beryllium	1 / 1	0.1	0.1	VFSP-SW-1	**--**	**--**	7.3	No	Maximum detect below screening value.
Cadmium	0 / 1	ND	ND	ND	0.5	0.5	1.8	No	Constituent not detected.
Calcium	1 / 1	3300	3300	VFSP-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	1 / 1	4.2	4.2	VFSP-SW-1	**--**	**--**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	1 / 1	1.2	1.2	VFSP-SW-1	**--**	**--**	1.1	**YES**	Maximum detect exceeds screening value.
Copper	1 / 1	7.7	7.7	VFSP-SW-1	**--**	**--**	150	No	Maximum detect below screening value.
Iron	1 / 1	7000	7000	VFSP-SW-1	**--**	**--**	2600	**YES**	Maximum detect exceeds screening value.
Lead	1 / 1	5.2	5.2	VFSP-SW-1	**--**	**--**	15	No	Maximum detect below screening value.
Magnesium	1 / 1	940	940	VFSP-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	1 / 1	25	25	VFSP-SW-1	**--**	**--**	88	No	Maximum detect below screening value.
Mercury	0 / 1	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	1 / 1	3.8	3.8	VFSP-SW-1	**--**	**--**	4600	No	Maximum detect below screening value.
Potassium	1 / 1	2700	2700	VFSP-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	0 / 1	ND	ND	ND	2.5	2.5	4200	No	Constituent not detected.

TABLE 3-20
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Total Inorganics (continued)									
Silver	0 / 1	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	1 / 1	3600	3600	VFSP-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	0 / 1	ND	ND	ND	**1**	**1**	0.47	No	Constituent not detected.
Vanadium	1 / 1	5.4	5.4	VFSP-SW-1	**--**	**--**	18	No	Maximum detect below screening value.
Zinc	1 / 1	120	120	VFSP-SW-1	**--**	**--**	26000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	1 / 1	2800	2800	VFSP-SW-1	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	1 / 1	380	380	VFSP-SW-1	**--**	**--**	5800	No	Maximum detect below screening value.
Nitrite as N	1 / 1	15	15	VFSP-SW-1	**--**	**--**	370	No	Maximum detect below screening value.
Nitrogen, Kjeldahl	1 / 1	870	870	VFSP-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	1 / 1	6000	6000	VFSP-SW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	1 / 1	17000	17000	VFSP-SW-1	**--**	**--**	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	1	1	40	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	0 / 3	ND	ND	ND	10	10	710	No	Constituent not detected.
2-Hexanone	0 / 3	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
2-Methyl-1-propanol	0 / 1	ND	ND	ND	40	40	1100	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	1 / 3	20	20	EBSW-1	25	25	2200	No	Maximum detect below screening value.
Acetonitrile	0 / 3	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon Dioxide	2 / 2	36	43	EBSW-1	--	--	NA	No	Screening value not available; see Table 3-16.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Carbon disulfide	0 / 3	ND	ND	ND	2	2	100	No	Constituent not detected.
Carbon tetrachloride	0 / 3	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 3	ND	ND	ND	1	1	1600	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	0 / 3	ND	ND	ND	10	10	730	No	Constituent not detected.
Ethyl methacrylate	0 / 3	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 3	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	2 / 3	30	43	EBSW-3	5	5	370	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 3	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	1	1	300	No	Constituent not detected.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Trichlorofluoromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Vinyl acetate	0 / 3	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	2	2	20	No	Constituent not detected.
Volatile Organics (TICs)									
Carbon Dioxide	1 / 1	140	140	EBSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	**9.7**	**9.8**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	9.7	9.8	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	9.7	9.8	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	9.7	9.8	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	9.7	9.8	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	9.7	9.8	190	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	**9.7**	**9.8**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	9.7	9.8	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	9.7	9.8	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	9.7	9.8	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	9.7	9.8	290	No	Constituent not detected.
2,4-Dimethylphenol	1 / 3	9.7	9.7	EBSW-2	9.7	9.8	850	No	Maximum detect below screening value.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	49	49	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	9.7	9.8	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	**9.7**	**9.8**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	9.7	9.8	1600	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	9.7	9.8	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	9.7	9.8	15	No	Constituent not detected.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Methylphenol	0 / 3	ND	ND	ND	9.7	9.8	180	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	**49**	**49**	37	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
2-sec-Btyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	9.7	9.8	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 3	ND	ND	ND	**19**	**20**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**19**	**20**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	49	49	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	49	49	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	9.7	9.8	370	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	**19**	**20**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	**49**	**49**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	49	49	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 3	ND	ND	ND	**9.7**	**9.8**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	9.7	9.8	990	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	9.7	9.8	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 2	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	**19**	**20**	12	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	9.7	9.8	40000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	**9.7**	**9.8**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.18	No	Constituent not detected.
Benzo[a]pyrene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.18	No	Constituent not detected.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.18	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 3	ND	ND	ND	9.7	9.8	4000	No	Constituent not detected.
Benzo[k]floranthene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	9.7	9.8	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	9.7	9.8	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	**9.7**	**9.8**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 3	ND	ND	ND	9.7	9.8	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	9.7	9.8	1900	No	Constituent not detected.
Chrysene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.018	No	Constituent not detected.
Diallate	0 / 3	ND	ND	ND	**9.7**	**9.8**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.18	No	Constituent not detected.
Dibenzofuran	0 / 3	ND	ND	ND	**9.7**	**9.8**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	9.7	9.8	44000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	9.7	9.8	1100000	No	Constituent not detected.
Di-n-butyl phthalate	1 / 3	1	1	EBSW-1	9.7	9.7	4500	No	Maximum detect below screening value.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
Fluoranthene	0 / 3	ND	ND	ND	9.7	9.8	140	No	Constituent not detected.
Fluorene	0 / 3	ND	ND	ND	9.7	9.8	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	9.7	9.8	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	9.7	9.8	1100	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	9.7	9.8	33	No	Constituent not detected.
Hexachlorophene	0 / 2	ND	ND	ND	**4900**	**4900**	1.1	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.18	No	Constituent not detected.
Isophorone	0 / 3	ND	ND	ND	9.7	9.8	9600	No	Constituent not detected.
Isosafrole	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.37	No	Constituent not detected.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Methapyrilene	0 / 2	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Methyl methaneslfonate	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.68	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	9.7	9.8	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	9.7	9.8	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**9.7**	**9.8**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	9.7	9.8	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	9.7	9.8	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	**9.7**	**9.8**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	**49**	**49**	30	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	9.7	9.8	31	No	Constituent not detected.
Phenanthrene	0 / 3	ND	ND	ND	9.7	9.8	40000	No	Constituent not detected.
Phenol	0 / 3	ND	ND	ND	9.7	9.8	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	**1900**	**2000**	690	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	9.7	9.8	270	No	Constituent not detected.
Pyrene	0 / 3	ND	ND	ND	9.7	9.8	4000	No	Constituent not detected.
Pyridine	0 / 3	ND	ND	ND	**49**	**49**	3.7	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	**9.7**	**9.8**	0.31	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
Bromacil	1 / 1	11	11	EBSW-3	--	--	370	No	Maximum detect below screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	2 / 3	790	890	EBSW-1	1000	1000	1800	No	Maximum detect below screening value.
Propylene glycol	0 / 3	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	3 / 3	670	65000	EBSW-1	**--**	**--**	3700	**YES**	Maximum detect exceeds screening value.
Antimony	0 / 3	ND	ND	ND	2.5	2.5	640	No	Constituent not detected.
Arsenic	3 / 3	1	28	EBSW-1	**--**	**--**	0.045	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	73	340	EBSW-1	**--**	**--**	730	No	Maximum detect below screening value.
Beryllium	2 / 3	0.36	3.5	EBSW-1	0.5	0.5	7.3	No	Maximum detect below screening value.
Cadmium	2 / 3	0.37	1.4	EBSW-3	0.5	0.5	1.8	No	Maximum detect below screening value.
Calcium	3 / 3	15000	60000	EBSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	1 / 3	120	120	EBSW-1	**5**	**5**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	1.1	20	EBSW-1	**--**	**--**	1.1	**YES**	Maximum detect exceeds screening value.
Copper	3 / 3	2.9	81	EBSW-1	**--**	**--**	150	No	Maximum detect below screening value.
Iron	3 / 3	800	67000	EBSW-1	**--**	**--**	2600	**YES**	Maximum detect exceeds screening value.
Lead	3 / 3	1.5	46	EBSW-1	**--**	**--**	15	**YES**	Maximum detect exceeds screening value.
Magnesium	3 / 3	7400	12000	EBSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	3 / 3	410	1300	EBSW-3	**--**	**--**	88	**YES**	Maximum detect exceeds screening value.
Mercury	1 / 3	0.27	0.27	EBSW-1	**0.5**	**0.5**	0.051	**YES**	Maximum detect exceeds screening value.
Nickel	3 / 3	2.1	41	EBSW-1	**--**	**--**	4600	No	Maximum detect below screening value.
Potassium	3 / 3	2500	7500	EBSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	2 / 3	1.2	1.9	EBSW-1	2.5	2.5	4200	No	Maximum detect below screening value.

TABLE 3-21
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Total Inorganics (continued)									
Silver	0 / 3	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	3 / 3	11000	200000	EBSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	2 / 3	0.33	1.8	EBSW-1	**1**	**1**	0.47	**YES**	Maximum detect exceeds screening value.
Vanadium	2 / 3	44	140	EBSW-1	5	5	18	**YES**	Maximum detect exceeds screening value.
Zinc	3 / 3	19	380	EBSW-3	**--**	**--**	26000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	3 / 3	7900	48000	EBSW-2	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	2 / 3	64	17000	EBSW-3	50	50	5800	No	Common inorganic/low inherent toxicity.
Nitrite as N	2 / 3	26	220	EBSW-3	50	50	370	No	Maximum detect below screening value.
Nitrogen, Kjeldahl	3 / 3	1300	9400	EBSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	3 / 3	10000	200000	EBSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	2 / 3	17000	200000	EBSW-3	5000	5000	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	1	1	40	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	0 / 3	ND	ND	ND	10	10	710	No	Constituent not detected.
2-Hexanone	0 / 3	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	0 / 3	ND	ND	ND	25	25	2200	No	Constituent not detected.
Acetonitrile	0 / 3	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	1	1	1500	No	Constituent not detected.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Carbon disulfide	0 / 3	ND	ND	ND	2	2	100	No	Constituent not detected.
Carbon tetrachloride	0 / 3	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 3	ND	ND	ND	1	1	1600	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	3 / 3	9.2	16	WBSW-1	**--**	**--**	730	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 3	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 3	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	0 / 3	ND	ND	ND	5	5	370	No	Constituent not detected.
Tetrachloroethene	0 / 3	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 3	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	1	1	300	No	Constituent not detected.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Trichlorofluoromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Vinyl acetate	0 / 3	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	2	2	20	No	Constituent not detected.
Volatile Organics (TICs)									
Carbon Dioxide	3 / 3	42	56	WBSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	**9.7**	**10**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	9.7	10	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	9.7	10	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	9.7	10	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	9.7	10	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	9.7	10	190	No	Constituent not detected.
1,4-Dioxane	1 / 3	2.6	2.6	WBSW-3	**9.7**	**10**	6.1	No	Maximum detect below screening value.
1,4-Naphthoqinone	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	**9.7**	**10**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	9.7	10	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	9.7	10	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	9.7	10	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	9.7	10	290	No	Constituent not detected.
2,4-Dimethylphenol	2 / 3	9.7	10	WBSW-1	10	10	850	No	Maximum detect below screening value.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	49	50	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	9.7	10	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	**9.7**	**10**		No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	**9.7**	**10**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 3	ND	ND	ND	**9.7**	**10**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	9.7	10	1600	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	9.7	10	150	No	Constituent not detected.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Methylnaphthalene	0 / 3	ND	ND	ND	9.7	10	15	No	Constituent not detected.
2-Methylphenol	0 / 3	ND	ND	ND	9.7	10	180	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	**9.7**	**10**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	**49**	**50**	37	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
2-sec-Btyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	9.7	10	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	**9.7**	**10**		No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 2	ND	ND	ND	**19**	**20**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**19**	**20**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**9.7**	**10**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	**49**	**50**		No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	49	50	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**9.7**	**10**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	9.7	10	370	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	**19**	**20**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	**49**	**50**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	49	50	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 3	ND	ND	ND	**9.7**	**10**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**9.7**	**10**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	9.7	10	990	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	9.7	10	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 1	ND	ND	ND	2000	2000	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	**19**	**20**	12	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	9.7	10	40000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	**9.7**	**10**	2.7	No	Constituent not detected.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Benzo[a]anthracene	0 / 3	ND	ND	ND	**9.7**	**10**	0.18	No	Constituent not detected.
Benzo[a]pyrene	0 / 3	ND	ND	ND	**9.7**	**10**	0.18	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	**9.7**	**10**	0.18	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 3	ND	ND	ND	9.7	10	4000	No	Constituent not detected.
Benzo[k]floranthene	0 / 3	ND	ND	ND	**9.7**	**10**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	9.7	10	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	9.7	10	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	**9.7**	**10**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 3	ND	ND	ND	9.7	10	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	9.7	10	1900	No	Constituent not detected.
Chrysene	0 / 3	ND	ND	ND	**9.7**	**10**	0.018	No	Constituent not detected.
Diallate	0 / 3	ND	ND	ND	**9.7**	**10**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**9.7**	**10**	0.18	No	Constituent not detected.
Dibenzofuran	0 / 3	ND	ND	ND	**9.7**	**10**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	9.7	10	44000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	**9.7**	**10**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	9.7	10	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	9.7	10	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
Fluoranthene	0 / 3	ND	ND	ND	9.7	10	140	No	Constituent not detected.
Fluorene	0 / 3	ND	ND	ND	9.7	10	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	**9.7**	**10**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	9.7	10	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	9.7	10	1100	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	9.7	10	33	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 3	ND	ND	ND	**9.7**	**10**	0.18	No	Constituent not detected.
Isophorone	0 / 3	ND	ND	ND	9.7	10	9600	No	Constituent not detected.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Isosafrole	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	**9.7**	**10**	0.37	No	Constituent not detected.
Methyl methaneslfonate	0 / 3	ND	ND	ND	**9.7**	**10**	0.68	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	**9.7**	**10**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	9.7	10	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**9.7**	**10**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	9.7	10	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**9.7**	**10**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**9.7**	**10**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	9.7	10	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**9.7**	**10**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**9.7**	**10**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**9.7**	**10**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	**9.7**	**10**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	9.7	10	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**9.7**	**10**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	**9.7**	**10**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	**9.7**	**10**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	**49**	**50**	30	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	9.7	10	31	No	Constituent not detected.
Phenanthrene	0 / 3	ND	ND	ND	9.7	10	40000	No	Constituent not detected.
Phenol	0 / 3	ND	ND	ND	9.7	10	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	**1900**	**2000**	690	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	9.7	10	270	No	Constituent not detected.
Pyrene	0 / 3	ND	ND	ND	9.7	10	4000	No	Constituent not detected.
Pyridine	0 / 3	ND	ND	ND	**49**	**50**	3.7	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	**9.7**	**10**	0.31	No	Constituent not detected.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	0 / 3	ND	ND	ND	1000	1000	1800	No	Constituent not detected.
Propylene glycol	0 / 3	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	3 / 3	1100	4000	WBSW-2	**--**	**--**	3700	**YES**	Maximum detect exceeds screening value.
Antimony	3 / 3	1.5	1.8	WBSW-2	**--**	**--**	640	No	Maximum detect below screening value.
Arsenic	3 / 3	1.6	2.9	WBSW-2	**--**	**--**	0.045	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	68	90	WBSW-2	**--**	**--**	730	No	Maximum detect below screening value.
Beryllium	1 / 3	0.15	0.15	WBSW-2	0.5	0.5	7.3	No	Maximum detect below screening value.
Cadmium	0 / 3	ND	ND	ND	0.5	0.5	1.8	No	Constituent not detected.
Calcium	3 / 3	46000	59000	WBSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	3 / 3	1.6	6.5	WBSW-2	**--**	**--**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	0.74	2.7	WBSW-3	**--**	**--**	1.1	**YES**	Maximum detect exceeds screening value.
Copper	3 / 3	4.5	7.3	WBSW-2	**--**	**--**	150	No	Maximum detect below screening value.
Iron	3 / 3	1900	4400	WBSW-2	**--**	**--**	2600	**YES**	Maximum detect exceeds screening value.
Lead	3 / 3	3.9	8.9	WBSW-2	**--**	**--**	15	No	Maximum detect below screening value.
Magnesium	3 / 3	7100	8500	WBSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	3 / 3	320	580	WBSW-3	**--**	**--**	88	**YES**	Maximum detect exceeds screening value.
Mercury	0 / 3	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	3 / 3	2.9	5.6	WBSW-3	**--**	**--**	4600	No	Maximum detect below screening value.
Potassium	3 / 3	5800	7700	WBSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	3 / 3	0.6	0.97	WBSW-2	**--**	**--**	4200	No	Maximum detect below screening value.

TABLE 3-22
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Total Inorganics (continued)									
Silver	0 / 3	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	3 / 3	49000	56000	WBSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	2 / 3	0.34	0.4	WBSW-1	**1**	**1**	0.47	No	Maximum detect below screening value.
Vanadium	3 / 3	71	210	WBSW-2	**--**	**--**	18	**YES**	Maximum detect exceeds screening value.
Zinc	3 / 3	29	43	WBSW-2	**--**	**--**	26000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	3 / 3	33000	74000	WBSW-3	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	3 / 3	720	770	WBSW-1	**--**	**--**	5800	No	Maximum detect below screening value.
Nitrite as N	1 / 3	34	34	WBSW-3	50	50	370	No	Maximum detect below screening value.
Nitrogen, Kjeldahl	3 / 3	220	1100	WBSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	3 / 3	1100	4500	WBSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	3 / 3	77000	82000	WBSW-3	**--**	**--**	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-23
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	1	1	40	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	0 / 3	ND	ND	ND	10	10	710	No	Constituent not detected.
2-Hexanone	0 / 3	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	0 / 3	ND	ND	ND	25	25	2200	No	Constituent not detected.
Acetonitrile	0 / 3	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon Dioxide	2 / 2	85	100	UTSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Carbon disulfide	0 / 3	ND	ND	ND	2	2	100	No	Constituent not detected.
Carbon tetrachloride	0 / 3	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 3	ND	ND	ND	1	1	1600	No	Constituent not detected.

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Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Chloroethane	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	1 / 3	1.3	1.3	UTSW-3	10	10	730	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 3	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 2	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	1 / 3	51	51	UTSW-3	5	5	370	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 3	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	1	1	300	No	Constituent not detected.
Trichlorofluoromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Vinyl acetate	0 / 3	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	2	2	20	No	Constituent not detected.
Volatile Organics (TICs)									
Carbon Dioxide	1 / 1	51	51	UTSW-1	--	--	NA	No	Screening value not available; see Table 3-16.

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Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	9.6	10	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	9.6	10	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	9.6	10	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	9.6	10	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	9.6	10	190	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	**9.6**	**10**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	**9.6**	**10**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	9.6	10	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	9.6	10	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	9.6	10	290	No	Constituent not detected.
2,4-Dimethylphenol	0 / 3	ND	ND	ND	9.6	10	850	No	Constituent not detected.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	48	50	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	9.6	10	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	**9.6**	**10**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 3	ND	ND	ND	**9.6**	**10**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	9.6	10	1600	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	9.6	10	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	9.6	10	15	No	Constituent not detected.
2-Methylphenol	0 / 3	ND	ND	ND	9.6	10	180	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	**48**	**50**	37	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2-sec-Btyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	9.6	10	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 3	ND	ND	ND	**19**	**20**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**19**	**20**	0.0061	No	Constituent not detected.

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Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
3-Methylcholanthrene	0 / 3	ND	ND	ND	**9.6**	**10**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	**48**	**50**		No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	48	50	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**9.6**	**10**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	**19**	**20**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	**48**	**50**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	48	50	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 3	ND	ND	ND	**9.6**	**10**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**9.6**	**10**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	9.6	10	990	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	**9.6**	**10**		No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 3	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	**19**	**20**	12	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	9.6	10	40000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	**9.6**	**10**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzo[a]pyrene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 3	ND	ND	ND	9.6	10	4000	No	Constituent not detected.
Benzo[k]floranthene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	9.6	10	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	**9.6**	**10**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 3	ND	ND	ND	9.6	10	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	9.6	10	1900	No	Constituent not detected.
Chrysene	0 / 3	ND	ND	ND	**9.6**	**10**	0.018	No	Constituent not detected.
Diallate	0 / 3	ND	ND	ND	**9.6**	**10**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.

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Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Dibenzofuran	0 / 3	ND	ND	ND	**9.6**	**10**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	9.6	10	44000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	**9.6**	**10**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	9.6	10	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	9.6	10	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Fluoranthene	0 / 3	ND	ND	ND	9.6	10	140	No	Constituent not detected.
Fluorene	0 / 3	ND	ND	ND	9.6	10	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	9.6	10	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	9.6	10	1100	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	9.6	10	33	No	Constituent not detected.
Hexachlorophene	0 / 2	ND	ND	ND	**4800**	**5000**	1.1	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	**9.6**	**10**		No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Isophorone	0 / 3	ND	ND	ND	9.6	10	9600	No	Constituent not detected.
Isosafrole	0 / 3	ND	ND	ND	**9.6**	**10**		No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.37	No	Constituent not detected.
Methapyrilene	0 / 3	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Methyl methaneslfonate	0 / 3	ND	ND	ND	**9.6**	**10**	0.68	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	**9.6**	**10**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	9.6	10	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	9.6	10	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**9.6**	**10**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	9.6	10	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**9.6**	**10**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**9.6**	**10**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	**9.6**	**10**	0.032	No	Constituent not detected.

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Semi-Volatile Organics (continued)									
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	**48**	**50**	30	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	9.6	10	31	No	Constituent not detected.
Phenanthrene	0 / 3	ND	ND	ND	9.6	10	40000	No	Constituent not detected.
Phenol	0 / 3	ND	ND	ND	9.6	10	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	**1900**	**2000**	690	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	9.6	10	270	No	Constituent not detected.
Pyrene	0 / 3	ND	ND	ND	9.6	10	4000	No	Constituent not detected.
Pyridine	0 / 3	ND	ND	ND	**48**	**50**	3.7	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	**9.6**	**10**	0.31	No	Constituent not detected.
Semi-Volatile Organics (TICs)									
Ethane, 1,1'-oxybis[2-ethoxy-]	1 / 1	120	120	UTSW-3	**--**	**--**	370	No	Maximum detect below screening value.
Oleic Acid	1 / 1	6.4	6.4	UTSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	1 / 3	640	640	UTSW-3	1000	1000	1800	No	Maximum detect below screening value.
Propylene glycol	0 / 3	ND	ND	ND	5000	5000	73000	No	Constituent not detected.

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Total Inorganics									
Aluminum	3 / 3	68	4800	UTSW-3	--	--	3700	**YES**	Maximum detect exceeds screening value.
Antimony	0 / 3	ND	ND	ND	2.5	2.5	640	No	Constituent not detected.
Arsenic	3 / 3	2.1	4.5	UTSW-3	--	--	0.045	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	58	170	UTSW-3	--	--	730	No	Maximum detect below screening value.
Beryllium	1 / 3	0.3	0.3	UTSW-3	0.5	0.5	7.3	No	Maximum detect below screening value.
Cadmium	1 / 3	0.31	0.31	UTSW-3	0.5	0.5	1.8	No	Maximum detect below screening value.
Calcium	3 / 3	55000	120000	UTSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	2 / 3	2.6	8	UTSW-3	**5**	**5**	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	0.62	3.9	UTSW-3	--	--	1.1	**YES**	Maximum detect exceeds screening value.
Copper	3 / 3	2.1	12	UTSW-3	--	--	150	No	Maximum detect below screening value.
Iron	3 / 3	1000	20000	UTSW-3	--	--	2600	**YES**	Maximum detect exceeds screening value.
Lead	2 / 3	4.9	17	UTSW-3	1.5	1.5	15	**YES**	Maximum detect exceeds screening value.
Magnesium	3 / 3	9000	15000	UTSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	3 / 3	100	900	UTSW-3	--	--	88	**YES**	Maximum detect exceeds screening value.
Mercury	0 / 3	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	3 / 3	3.2	10	UTSW-3	--	--	4600	No	Maximum detect below screening value.
Potassium	3 / 3	6200	11000	UTSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	1 / 3	0.66	0.66	UTSW-3	2.5	2.5	4200	No	Maximum detect below screening value.
Silver	0 / 3	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	3 / 3	26000	81000	UTSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	0 / 3	ND	ND	ND	**1**	**1**	0.47	No	Constituent not detected.
Vanadium	3 / 3	4.6	66	UTSW-3	--	--	18	**YES**	Maximum detect exceeds screening value.
Zinc	3 / 3	8.6	300	UTSW-3	--	--	26000	No	Maximum detect below screening value.

TABLE 3-23
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Other Inorganics									
Chloride	3 / 3	7400	53000	UTSW-3	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	3 / 3	33	310	UTSW-3	**--**	**--**	5800	No	Maximum detect below screening value.
Nitrite as N	0 / 3	ND	ND	ND	50	50	370	No	Constituent not detected.
Nitrogen, Kjeldahl	3 / 3	580	1900	UTSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	3 / 3	2800	8400	UTSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	3 / 3	30000	130000	UTSW-3	**--**	**--**	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 3	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 3	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 3	ND	ND	ND	1	1	40	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 3	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 3	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 3	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 3	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 3	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 3	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 3	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 3	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	0 / 3	ND	ND	ND	10	10	710	No	Constituent not detected.
2-Hexanone	0 / 3	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 3	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	1 / 3	10	10	CCSW-3	25	25	2200	No	Maximum detect below screening value.
Acetonitrile	0 / 3	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 3	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 3	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 3	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 3	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 3	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 3	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon disulfide	0 / 3	ND	ND	ND	2	2	100	No	Constituent not detected.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Carbon tetrachloride	0 / 3	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 3	ND	ND	ND	1	1	1600	No	Constituent not detected.
Chloroethane	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 3	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 3	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 3	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 3	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 3	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	1 / 3	0.79	0.79	CCSW-3	10	10	730	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 3	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 3	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 3	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 3	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 3	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 3	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 3	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 2	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 3	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 3	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 3	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	1 / 3	5.1	5.1	CCSW-3	5	5	370	No	Maximum detect below screening value.
Tetrachloroethene	0 / 3	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 3	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 3	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.
Trichloroethylene	0 / 3	ND	ND	ND	1	1	300	No	Constituent not detected.
Trichlorofluoromethane	0 / 3	ND	ND	ND	1	1	130	No	Constituent not detected.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Vinyl acetate	0 / 3	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 3	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 3	ND	ND	ND	2	2	20	No	Constituent not detected.
Volatile Organics (TICs)									
Carbon Dioxide	3 / 3	32	41	CCSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 3	ND	ND	ND	9.6	10	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 3	ND	ND	ND	9.6	10	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 3	ND	ND	ND	9.6	10	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 3	ND	ND	ND	9.6	10	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 3	ND	ND	ND	9.6	10	190	No	Constituent not detected.
1,4-Dioxane	0 / 3	ND	ND	ND	**9.6**	**10**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 3	ND	ND	ND	**9.6**	**10**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 3	ND	ND	ND	9.6	10	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 3	ND	ND	ND	9.6	10	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 3	ND	ND	ND	9.6	10	290	No	Constituent not detected.
2,4-Dimethylphenol	0 / 3	ND	ND	ND	9.6	10	850	No	Constituent not detected.
2,4-Dinitrophenol	0 / 3	ND	ND	ND	48	50	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 3	ND	ND	ND	9.6	10	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 3	ND	ND	ND	**9.6**	**10**		No	Constituent not detected.
2,6-Dinitrotoluene	0 / 3	ND	ND	ND	**9.6**	**10**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 3	ND	ND	ND	**9.6**	**10**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 3	ND	ND	ND	9.6	10	1600	No	Constituent not detected.
2-Chlorophenol	0 / 3	ND	ND	ND	9.6	10	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 3	ND	ND	ND	9.6	10	15	No	Constituent not detected.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Methylphenol	0 / 3	ND	ND	ND	9.6	10	180	No	Constituent not detected.
2-Naphthalenamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 3	ND	ND	ND	**48**	**50**	37	No	Constituent not detected.
2-Nitrophenol	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2-Picoline	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
2-sec-Btyl-4,6-dinitrophenol	0 / 3	ND	ND	ND	9.6	10	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 3	ND	ND	ND	**9.6**	**10**		No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 2	ND	ND	ND	**20**	**20**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 3	ND	ND	ND	**19**	**20**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 3	ND	ND	ND	**9.6**	**10**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 3	ND	ND	ND	**48**	**50**		No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 3	ND	ND	ND	48	50	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 3	ND	ND	ND	**9.6**	**10**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
4-Chloroaniline	0 / 3	ND	ND	ND	**19**	**20**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
4-Nitroaniline	0 / 3	ND	ND	ND	**48**	**50**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 3	ND	ND	ND	48	50	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 3	ND	ND	ND	**9.6**	**10**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 3	ND	ND	ND	**9.6**	**10**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 3	ND	ND	ND	9.6	10	990	No	Constituent not detected.
Acenaphthylene	0 / 3	ND	ND	ND	**9.6**	**10**		No	Constituent not detected.
Acetophenone	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 3	ND	ND	ND	1900	2000	NA	No	Constituent not detected.
Aniline	0 / 3	ND	ND	ND	**19**	**20**	12	No	Constituent not detected.
Anthracene	0 / 3	ND	ND	ND	9.6	10	40000	No	Constituent not detected.
Aramite, Total	0 / 3	ND	ND	ND	**9.6**	**10**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Benzo[a]pyrene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzo[b]fluoranthene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 3	ND	ND	ND	9.6	10	4000	No	Constituent not detected.
Benzo[k]floranthene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 3	ND	ND	ND	9.6	10	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 3	ND	ND	ND	9.6	10	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 3	ND	ND	ND	**9.6**	**10**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 3	ND	ND	ND	9.6	10	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 3	ND	ND	ND	9.6	10	1900	No	Constituent not detected.
Chrysene	0 / 3	ND	ND	ND	**9.6**	**10**	0.018	No	Constituent not detected.
Diallate	0 / 3	ND	ND	ND	**9.6**	**10**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Dibenzofuran	0 / 3	ND	ND	ND	**9.6**	**10**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 3	ND	ND	ND	9.6	10	44000	No	Constituent not detected.
Dimethoate	0 / 3	ND	ND	ND	**9.6**	**10**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 3	ND	ND	ND	9.6	10	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 3	ND	ND	ND	9.6	10	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Fluoranthene	0 / 3	ND	ND	ND	9.6	10	140	No	Constituent not detected.
Fluorene	0 / 3	ND	ND	ND	9.6	10	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 3	ND	ND	ND	9.6	10	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 3	ND	ND	ND	9.6	10	1100	No	Constituent not detected.
Hexachloroethane	0 / 3	ND	ND	ND	9.6	10	33	No	Constituent not detected.
Hexachlorophene	0 / 1	ND	ND	ND	**5000**	**5000**	1.1	No	Constituent not detected.
Hexachloropropene	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 3	ND	ND	ND	**9.6**	**10**	0.18	No	Constituent not detected.
Isophorone	0 / 3	ND	ND	ND	9.6	10	9600	No	Constituent not detected.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Isosafrole	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.37	No	Constituent not detected.
Methapyrilene	0 / 2	ND	ND	ND	2000	2000	NA	No	Constituent not detected.
Methyl methaneslfonate	0 / 3	ND	ND	ND	**9.6**	**10**	0.68	No	Constituent not detected.
Naphthalene	0 / 3	ND	ND	ND	**9.6**	**10**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 3	ND	ND	ND	9.6	10	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 3	ND	ND	ND	9.6	10	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 3	ND	ND	ND	**9.6**	**10**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 3	ND	ND	ND	9.6	10	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 3	ND	ND	ND	**9.6**	**10**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 3	ND	ND	ND	**9.6**	**10**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 3	ND	ND	ND	**9.6**	**10**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 3	ND	ND	ND	**9.6**	**10**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
o-Toluidine	0 / 3	ND	ND	ND	9.6	10	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 3	ND	ND	ND	**9.6**	**10**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 3	ND	ND	ND	**48**	**50**	30	No	Constituent not detected.
Phenacetin	0 / 3	ND	ND	ND	9.6	10	31	No	Constituent not detected.
Phenanthrene	0 / 3	ND	ND	ND	9.6	10	40000	No	Constituent not detected.
Phenol	0 / 3	ND	ND	ND	9.6	10	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 3	ND	ND	ND	**1900**	**2000**	690	No	Constituent not detected.
Pronamide	0 / 3	ND	ND	ND	9.6	10	270	No	Constituent not detected.
Pyrene	0 / 3	ND	ND	ND	9.6	10	4000	No	Constituent not detected.
Pyridine	0 / 3	ND	ND	ND	**48**	**50**	3.7	No	Constituent not detected.
Safrole, Total	0 / 3	ND	ND	ND	**9.6**	**10**	0.31	No	Constituent not detected.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (TICs)									
Ethane, 1,1'-oxybis[2-ethoxy-]	1 / 1	11	11	CCSW-3	--	--	370	No	Maximum detect below screening value.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 3	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.
Alcohols and Glycols									
Allyl alcohol	0 / 3	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Dipropylene glycol	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	0 / 3	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 3	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 3	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 3	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	0 / 3	ND	ND	ND	1000	1000	1800	No	Constituent not detected.
Propylene glycol	0 / 3	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	3 / 3	940	1700	CCSW-2	--	--	3700	No	Maximum detect below screening value.
Antimony	0 / 3	ND	ND	ND	2.5	2.5	640	No	Constituent not detected.
Arsenic	3 / 3	4.05	5.9	CCSW-2	--	--	0.045	**YES**	Maximum detect exceeds screening value.
Barium	3 / 3	68.5	77	CCSW-1	--	--	730	No	Maximum detect below screening value.
Beryllium	0 / 3	ND	ND	ND	0.5	0.5	7.3	No	Constituent not detected.
Cadmium	2 / 3	0.11	0.12	CCSW-2	0.5	0.5	1.8	No	Maximum detect below screening value.
Calcium	3 / 3	33000	46000	CCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	3 / 3	2.25	3.7	CCSW-2	--	--	0.043	**YES**	Maximum detect exceeds screening value.
Cobalt	3 / 3	2.3	2.6	CCSW-2	--	--	1.1	**YES**	Maximum detect exceeds screening value.
Copper	3 / 3	4.3	10	CCSW-2	--	--	150	No	Maximum detect below screening value.
Iron	3 / 3	3100	4900	CCSW-2	--	--	2600	**YES**	Maximum detect exceeds screening value.
Lead	3 / 3	4.75	6.8	CCSW-2	--	--	15	No	Maximum detect below screening value.
Magnesium	3 / 3	6200	7700	CCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	3 / 3	505	570	CCSW-1	--	--	88	**YES**	Maximum detect exceeds screening value.

TABLE 3-24
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Total Inorganics (continued)									
Mercury	0 / 3	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	3 / 3	4.2	5.8	CCSW-2	**--**	**--**	4600	No	Maximum detect below screening value.
Potassium	3 / 3	5000	6400	CCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	0 / 3	ND	ND	ND	2.5	2.5	4200	No	Constituent not detected.
Silver	0 / 3	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	3 / 3	38000	43000	CCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	1 / 3	0.26	0.26	CCSW-3	**1**	**1**	0.47	No	Maximum detect below screening value.
Vanadium	3 / 3	3.1	6.8	CCSW-2	**--**	**--**	18	No	Maximum detect below screening value.
Zinc	3 / 3	34.5	61	CCSW-2	**--**	**--**	26000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	3 / 3	18000	24000	CCSW-1	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	3 / 3	520	1150	CCSW-3	**--**	**--**	5800	No	Maximum detect below screening value.
Nitrite as N	3 / 3	32	66	CCSW-3	**--**	**--**	370	No	Maximum detect below screening value.
Nitrogen, Kjeldahl	3 / 3	1300	2300	CCSW-2	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	3 / 3	7100	10150	CCSW-3	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	3 / 3	63000	130000	CCSW-1	**--**	**--**	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics									
1,1,1,2-Tetrachloroethane	0 / 1	ND	ND	ND	**1**	**1**	0.52	No	Constituent not detected.
1,1,1-Trichloroethane	0 / 1	ND	ND	ND	1	1	910	No	Constituent not detected.
1,1,2,2-Tetrachloroethane	0 / 1	ND	ND	ND	1	1	40	No	Constituent not detected.
1,1,2-Trichloroethane	0 / 1	ND	ND	ND	1	1	160	No	Constituent not detected.
1,1-Dichloroethane	0 / 1	ND	ND	ND	1	1	2.4	No	Constituent not detected.
1,1-Dichloroethene	0 / 1	ND	ND	ND	1	1	7100	No	Constituent not detected.
1,2,3-Trichloropropane	0 / 1	ND	ND	ND	**1**	**1**	0.00072	No	Constituent not detected.
1,2-Dibromo-3-Chloropropane	0 / 1	ND	ND	ND	**1**	**1**	0.00032	No	Constituent not detected.
1,2-Dibromoethane	0 / 1	ND	ND	ND	**1**	**1**	0.0065	No	Constituent not detected.
1,2-Dichloroethane	0 / 1	ND	ND	ND	1	1	370	No	Constituent not detected.
trans-1,2-Dichloroethene	0 / 1	ND	ND	ND	1	1	10000	No	Constituent not detected.
1,2-Dichloropropane	0 / 1	ND	ND	ND	1	1	150	No	Constituent not detected.
cis-1,3-Dichloropropene	0 / 1	ND	ND	ND	1	1	210	No	Constituent not detected.
trans-1,3-Dichloropropene	0 / 1	ND	ND	ND	1	1	210	No	Constituent not detected.
2-Butanone (MEK)	0 / 1	ND	ND	ND	10	10	710	No	Constituent not detected.
2-Hexanone	0 / 1	ND	ND	ND	**10**	**10**	4.7	No	Constituent not detected.
3-Methylhexane	0 / 1	ND	ND	ND	1	1	NA	No	Constituent not detected.
4-Methyl-2-pentanone (MIBK)	0 / 1	ND	ND	ND	10	10	200	No	Constituent not detected.
Acetone	0 / 1	ND	ND	ND	25	25	2200	No	Constituent not detected.
Acetonitrile	0 / 1	ND	ND	ND	**40**	**40**	13	No	Constituent not detected.
Acrolein	0 / 1	ND	ND	ND	**20**	**20**	9.3	No	Constituent not detected.
Acrylonitrile	0 / 1	ND	ND	ND	**20**	**20**	2.5	No	Constituent not detected.
Allyl chloride	0 / 1	ND	ND	ND	**1**	**1**	0.65	No	Constituent not detected.
Benzene	0 / 1	ND	ND	ND	1	1	510	No	Constituent not detected.
Benzyl chloride	0 / 1	ND	ND	ND	**1**	**1**	0.079	No	Constituent not detected.
Bromodichloromethane	0 / 1	ND	ND	ND	1	1	170	No	Constituent not detected.
Bromoform	0 / 1	ND	ND	ND	1	1	1400	No	Constituent not detected.
Bromomethane	0 / 1	ND	ND	ND	1	1	1500	No	Constituent not detected.
Carbon Dioxide	1 / 1	27	27	BCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Carbon disulfide	0 / 1	ND	ND	ND	2	2	100	No	Constituent not detected.
Carbon tetrachloride	0 / 1	ND	ND	ND	1	1	16	No	Constituent not detected.
Chlorobenzene	0 / 1	ND	ND	ND	1	1	1600	No	Constituent not detected.
Chloroethane	0 / 1	ND	ND	ND	1	1	2100	No	Constituent not detected.
Chloroform	0 / 1	ND	ND	ND	1	1	11000	No	Constituent not detected.
Chloromethane	0 / 1	ND	ND	ND	1	1	19	No	Constituent not detected.
Chloroprene	0 / 1	ND	ND	ND	1	1	1.4	No	Constituent not detected.
Dibromochloromethane	0 / 1	ND	ND	ND	1	1	130	No	Constituent not detected.
Dibromomethane	0 / 1	ND	ND	ND	**1**	**1**	0.82	No	Constituent not detected.
Dichlorodifluoromethane	0 / 1	ND	ND	ND	1	1	39	No	Constituent not detected.
Dichlorofluoromethane	0 / 1	ND	ND	ND	1	1	NA	No	Constituent not detected.
Diethyl ether	1 / 1	0.45	0.45	BCSW-1	--	--	730	No	Maximum detect below screening value.
Ethyl methacrylate	0 / 1	ND	ND	ND	1	1	330	No	Constituent not detected.
Ethylbenzene	0 / 1	ND	ND	ND	1	1	2100	No	Constituent not detected.
Ethylene oxide	0 / 1	ND	ND	ND	**200**	**200**	0.044	No	Constituent not detected.
Iodomethane	0 / 1	ND	ND	ND	5	5	NA	No	Constituent not detected.
Methacrylonitrile	0 / 1	ND	ND	ND	**20**	**20**	0.1	No	Constituent not detected.
Methyl methacrylate	0 / 1	ND	ND	ND	1	1	140	No	Constituent not detected.
Methylene Chloride	0 / 1	ND	ND	ND	**5**	**5**	4.8	No	Constituent not detected.
n-Heptane	0 / 1	ND	ND	ND	1	1	NA	No	Constituent not detected.
Pentachloroethane	0 / 1	ND	ND	ND	**5**	**5**	0.75	No	Constituent not detected.
Propionitrile	0 / 1	ND	ND	ND	20	20	NA	No	Constituent not detected.
Propylene oxide	0 / 1	ND	ND	ND	**200**	**200**	0.23	No	Constituent not detected.
Styrene	0 / 1	ND	ND	ND	1	1	160	No	Constituent not detected.
t-Butanol	0 / 1	ND	ND	ND	5	5	370	No	Constituent not detected.
Tetrachloroethene	0 / 1	ND	ND	ND	1	1	33	No	Constituent not detected.
Toluene	0 / 1	ND	ND	ND	1	1	6000	No	Constituent not detected.
trans-1,4-Dichloro-2-btene	0 / 1	ND	ND	ND	**2**	**2**	0.0012	No	Constituent not detected.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Volatile Organics (continued)									
Trichloroethylene	0 / 1	ND	ND	ND	1	1	300	No	Constituent not detected.
Trichlorofluoromethane	0 / 1	ND	ND	ND	1	1	130	No	Constituent not detected.
Vinyl acetate	0 / 1	ND	ND	ND	2	2	41	No	Constituent not detected.
Vinyl chloride	0 / 1	ND	ND	ND	1	1	24	No	Constituent not detected.
Xylenes, Total	0 / 1	ND	ND	ND	2	2	20	No	Constituent not detected.
Semi-Volatile Organics									
1,2,4,5-Tetrachlorobenzene	0 / 1	ND	ND	ND	**10**	**10**	1.1	No	Constituent not detected.
1,2,4-Trichlorobenzene	0 / 1	ND	ND	ND	10	10	70	No	Constituent not detected.
1,2-Dichlorobenzene	0 / 1	ND	ND	ND	10	10	1300	No	Constituent not detected.
1,3,5-Trinitrobenzene	0 / 1	ND	ND	ND	10	10	110	No	Constituent not detected.
1,3-Dichlorobenzene	0 / 1	ND	ND	ND	10	10	960	No	Constituent not detected.
1,4-Dichlorobenzene	0 / 1	ND	ND	ND	10	10	190	No	Constituent not detected.
1,4-Dioxane	0 / 1	ND	ND	ND	**10**	**10**	6.1	No	Constituent not detected.
1,4-Naphthoqinone	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
1-Naphthalenamine	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
2,2'-oxybis[1-chloropropane]	0 / 1	ND	ND	ND	**10**	**10**	0.32	No	Constituent not detected.
2,3,4,6-Tetrachlorophenol	0 / 1	ND	ND	ND	10	10	110	No	Constituent not detected.
2,4,5-Trichlorophenol	0 / 1	ND	ND	ND	10	10	370	No	Constituent not detected.
2,4,6-Trichlorophenol	0 / 1	ND	ND	ND	10	10	24	No	Constituent not detected.
2,4-Dichlorophenol	0 / 1	ND	ND	ND	10	10	290	No	Constituent not detected.
2,4-Dimethylphenol	0 / 1	ND	ND	ND	10	10	850	No	Constituent not detected.
2,4-Dinitrophenol	0 / 1	ND	ND	ND	50	50	5300	No	Constituent not detected.
2,4-Dinitrotoluene	0 / 1	ND	ND	ND	10	10	34	No	Constituent not detected.
2,6-Dichlorophenol	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
2,6-Dinitrotoluene	0 / 1	ND	ND	ND	**10**	**10**	3.7	No	Constituent not detected.
2-Acetylaminoflorene	0 / 1	ND	ND	ND	**10**	**10**	0.018	No	Constituent not detected.
2-Chloronaphthalene	0 / 1	ND	ND	ND	10	10	1600	No	Constituent not detected.
2-Chlorophenol	0 / 1	ND	ND	ND	10	10	150	No	Constituent not detected.
2-Methylnaphthalene	0 / 1	ND	ND	ND	10	10	15	No	Constituent not detected.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
2-Methylphenol	0 / 1	ND	ND	ND	10	10	180	No	Constituent not detected.
2-Naphthalenamine	0 / 1	ND	ND	ND	**10**	**10**	0.037	No	Constituent not detected.
2-Nitroaniline	0 / 1	ND	ND	ND	**50**	**50**	37	No	Constituent not detected.
2-Nitrophenol	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
2-Picoline	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
2-sec-Btyl-4,6-dinitrophenol	0 / 1	ND	ND	ND	10	10	765	No	Constituent not detected.
3 & 4 Methylphenol	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
3,3'-Dichlorobenzidine	0 / 1	ND	ND	ND	**20**	**20**	0.28	No	Constituent not detected.
3,3'-Dimethylbenzidine	0 / 1	ND	ND	ND	**20**	**20**	0.0061	No	Constituent not detected.
3-Methylcholanthrene	0 / 1	ND	ND	ND	**10**	**10**	0.0031	No	Constituent not detected.
3-Nitroaniline	0 / 1	ND	ND	ND	50	50	NA	No	Constituent not detected.
4,6-Dinitro-2-methylphenol	0 / 1	ND	ND	ND	50	50	280	No	Constituent not detected.
4-Aminobiphenyl	0 / 1	ND	ND	ND	**10**	**10**	0.0032	No	Constituent not detected.
4-Bromophenyl phenyl ether	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
4-Chloro-3-methylphenol	0 / 1	ND	ND	ND	10	10	370	No	Constituent not detected.
4-Chloroaniline	0 / 1	ND	ND	ND	**20**	**20**	0.34	No	Constituent not detected.
4-Chlorophenyl phenyl ether	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
4-Nitroaniline	0 / 1	ND	ND	ND	**50**	**50**	3.4	No	Constituent not detected.
4-Nitrophenol	0 / 1	ND	ND	ND	50	50	NA	No	Constituent not detected.
5-Nitro-o-tolidine	0 / 1	ND	ND	ND	**10**	**10**	2	No	Constituent not detected.
7,12-Dimethylbenz(a)anthracene	0 / 1	ND	ND	ND	**10**	**10**	0.00027	No	Constituent not detected.
Acenaphthene	0 / 1	ND	ND	ND	10	10	990	No	Constituent not detected.
Acenaphthylene	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
Acetophenone	0 / 1	ND	ND	ND	10	10	370	No	Constituent not detected.
alpha,alpha-Dimethyl phenethylamine	0 / 1	ND	ND	ND	2000	2000	NA	No	Constituent not detected.
Aniline	0 / 1	ND	ND	ND	**20**	**20**	12	No	Constituent not detected.
Anthracene	0 / 1	ND	ND	ND	10	10	40000	No	Constituent not detected.
Aramite, Total	0 / 1	ND	ND	ND	**10**	**10**	2.7	No	Constituent not detected.
Benzo[a]anthracene	0 / 1	ND	ND	ND	**10**	**10**	0.18	No	Constituent not detected.
Benzo[a]pyrene	0 / 1	ND	ND	ND	**10**	**10**	0.18	No	Constituent not detected.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Benzo[b]fluoranthene	0 / 1	ND	ND	ND	**10**	**10**	0.18	No	Constituent not detected.
Benzo[g,h,i]perylene	0 / 1	ND	ND	ND	10	10	4000	No	Constituent not detected.
Benzo[k]floranthene	0 / 1	ND	ND	ND	**10**	**10**	0.18	No	Constituent not detected.
Benzyl alcohol	0 / 1	ND	ND	ND	10	10	370	No	Constituent not detected.
Bis(2-chloroethoxy)methane	0 / 1	ND	ND	ND	10	10	11	No	Constituent not detected.
Bis(2-chloroethyl)ether	0 / 1	ND	ND	ND	**10**	**10**	5.3	No	Constituent not detected.
Bis(2-ethylhexyl) phthalate	0 / 1	ND	ND	ND	10	10	22	No	Constituent not detected.
Butyl benzyl phthalate	0 / 1	ND	ND	ND	10	10	1900	No	Constituent not detected.
Chrysene	0 / 1	ND	ND	ND	**10**	**10**	0.018	No	Constituent not detected.
Diallate	0 / 1	ND	ND	ND	**10**	**10**	1.1	No	Constituent not detected.
Dibenz(a,h)anthracene	0 / 1	ND	ND	ND	**10**	**10**	0.18	No	Constituent not detected.
Dibenzofuran	0 / 1	ND	ND	ND	**10**	**10**	3.7	No	Constituent not detected.
Diethyl phthalate	0 / 1	ND	ND	ND	10	10	44000	No	Constituent not detected.
Dimethoate	0 / 1	ND	ND	ND	**10**	**10**	0.73	No	Constituent not detected.
Dimethyl phthalate	0 / 1	ND	ND	ND	10	10	1100000	No	Constituent not detected.
Di-n-butyl phthalate	0 / 1	ND	ND	ND	10	10	4500	No	Constituent not detected.
Di-n-octyl phthalate	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
Ethyl methaneslfonate	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
Fluoranthene	0 / 1	ND	ND	ND	10	10	140	No	Constituent not detected.
Fluorene	0 / 1	ND	ND	ND	10	10	5300	No	Constituent not detected.
Hexachlorobenzene	0 / 1	ND	ND	ND	**10**	**10**	0.0029	No	Constituent not detected.
Hexachlorobutadiene	0 / 1	ND	ND	ND	10	10	180	No	Constituent not detected.
Hexachlorocyclopentadiene	0 / 1	ND	ND	ND	10	10	1100	No	Constituent not detected.
Hexachloroethane	0 / 1	ND	ND	ND	10	10	33	No	Constituent not detected.
Hexachloropropene	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
Indeno[1,2,3-cd]pyrene	0 / 1	ND	ND	ND	**10**	**10**	0.18	No	Constituent not detected.
Isophorone	0 / 1	ND	ND	ND	10	10	9600	No	Constituent not detected.
Isosafrole	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
m-Dinitrobenzene	0 / 1	ND	ND	ND	**10**	**10**	0.37	No	Constituent not detected.
Methapyrilene	0 / 1	ND	ND	ND	2000	2000	NA	No	Constituent not detected.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Semi-Volatile Organics (continued)									
Methyl methaneslfonate	0 / 1	ND	ND	ND	**10**	**10**	0.68	No	Constituent not detected.
Naphthalene	0 / 1	ND	ND	ND	**10**	**10**	0.14	No	Constituent not detected.
Nitrobenzene	0 / 1	ND	ND	ND	10	10	690	No	Constituent not detected.
N-Nitrosodiethylamine	0 / 1	ND	ND	ND	**10**	**10**	0.00014	No	Constituent not detected.
N-Nitrosodimethylamine	0 / 1	ND	ND	ND	10	10	30	No	Constituent not detected.
N-Nitrosodi-n-butylamine	0 / 1	ND	ND	ND	**10**	**10**	0.0024	No	Constituent not detected.
N-Nitrosodi-n-propylamine	0 / 1	ND	ND	ND	**10**	**10**	5.1	No	Constituent not detected.
N-Nitrosodiphenylamine	0 / 1	ND	ND	ND	10	10	160.6	No	Constituent not detected.
N-Nitrosomethylethylamine	0 / 1	ND	ND	ND	**10**	**10**	0.0031	No	Constituent not detected.
N-Nitrosomorpholine	0 / 1	ND	ND	ND	**10**	**10**	0.01	No	Constituent not detected.
N-Nitrosopiperidine	0 / 1	ND	ND	ND	**10**	**10**	0.0072	No	Constituent not detected.
N-Nitrosopyrrolidine	0 / 1	ND	ND	ND	**10**	**10**	0.032	No	Constituent not detected.
o,o',o''-Triethylphosphorothioate	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
o-Toluidine	0 / 1	ND	ND	ND	10	10	NA	No	Constituent not detected.
p-Dimethylamino azobenzene	0 / 1	ND	ND	ND	**10**	**10**	0.015	No	Constituent not detected.
Pentachlorobenzene	0 / 1	ND	ND	ND	**10**	**10**	2.9	No	Constituent not detected.
Pentachloronitrobenzene	0 / 1	ND	ND	ND	**10**	**10**	0.26	No	Constituent not detected.
Pentachlorophenol	0 / 1	ND	ND	ND	**50**	**50**	30	No	Constituent not detected.
Phenacetin	0 / 1	ND	ND	ND	10	10	31	No	Constituent not detected.
Phenanthrene	0 / 1	ND	ND	ND	10	10	40000	No	Constituent not detected.
Phenol	0 / 1	ND	ND	ND	10	10	860000	No	Constituent not detected.
p-Phenylene diamine	0 / 1	ND	ND	ND	**2000**	**2000**	690	No	Constituent not detected.
Pronamide	0 / 1	ND	ND	ND	10	10	270	No	Constituent not detected.
Pyrene	0 / 1	ND	ND	ND	10	10	4000	No	Constituent not detected.
Pyridine	0 / 1	ND	ND	ND	**50**	**50**	3.7	No	Constituent not detected.
Safrole, Total	0 / 1	ND	ND	ND	**10**	**10**	0.31	No	Constituent not detected.
Acrylamide, Acrylonitrile and Acrolein									
Acrylamide	0 / 1	ND	ND	ND	**100**	**100**	0.043	No	Constituent not detected.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Alcohols and Glycols									
Allyl alcohol	0 / 1	ND	ND	ND	**1000**	**1000**	18	No	Constituent not detected.
Diethylene glycol	0 / 1	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Dipropylene glycol	0 / 1	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Ethanol	0 / 1	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Ethylene glycol	0 / 1	ND	ND	ND	5000	5000	7300	No	Constituent not detected.
Ethylene glycol monobutyl ether	0 / 1	ND	ND	ND	**5000**	**5000**	370	No	Constituent not detected.
Ethylene glycol monopropyl ether	0 / 1	ND	ND	ND	5000	5000	NA	No	Constituent not detected.
Isopropanol	0 / 1	ND	ND	ND	1000	1000	NA	No	Constituent not detected.
Methanol	0 / 1	ND	ND	ND	1000	1000	1800	No	Constituent not detected.
Propylene glycol	0 / 1	ND	ND	ND	5000	5000	73000	No	Constituent not detected.
Total Inorganics									
Aluminum	1 / 1	510	510	BCSW-1	**--**	**--**	3700	No	Maximum detect below screening value.
Antimony	0 / 1	ND	ND	ND	2.5	2.5	640	No	Constituent not detected.
Arsenic	1 / 1	1.5	1.5	BCSW-1	**--**	**--**	0.045	**YES**	Maximum detect exceeds screening value.
Barium	1 / 1	52	52	BCSW-1	**--**	**--**	730	No	Maximum detect below screening value.
Beryllium	0 / 1	ND	ND	ND	0.5	0.5	7.3	No	Constituent not detected.
Cadmium	0 / 1	ND	ND	ND	0.5	0.5	1.8	No	Constituent not detected.
Calcium	1 / 1	12000	12000	BCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Chromium	0 / 1	ND	ND	ND	**5**	**5**	0.043	No	Constituent not detected.
Cobalt	1 / 1	0.92	0.92	BCSW-1	**--**	**--**	1.1	No	Maximum detect below screening value.
Copper	1 / 1	1.7	1.7	BCSW-1	**--**	**--**	150	No	Maximum detect below screening value.
Iron	1 / 1	3300	3300	BCSW-1	**--**	**--**	2600	**YES**	Maximum detect exceeds screening value.
Lead	1 / 1	2	2	BCSW-1	**--**	**--**	15	No	Maximum detect below screening value.
Magnesium	1 / 1	1900	1900	BCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Manganese	1 / 1	160	160	BCSW-1	**--**	**--**	88	**YES**	Maximum detect exceeds screening value.
Mercury	0 / 1	ND	ND	ND	**0.5**	**0.5**	0.051	No	Constituent not detected.
Nickel	1 / 1	1.8	1.8	BCSW-1	**--**	**--**	4600	No	Maximum detect below screening value.
Potassium	1 / 1	2000	2000	BCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Selenium	0 / 1	ND	ND	ND	2.5	2.5	4200	No	Constituent not detected.

TABLE 3-25
IDENTIFICATION OF CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Frequency of Detection	Minimum Detected Surface Water Concentration (ug/L)	Maximum Detected Surface Water Concentration (ug/L)	Sample with Maximum Detect	Minimum Detection Limit (ug/L)	Maximum Detection Limit (ug/L)	Surface Water Screening Value (ug/L)	Constituent of Interest	Comment
Total Inorganics (continued)									
Silver	0 / 1	ND	ND	ND	1	1	18	No	Constituent not detected.
Sodium	1 / 1	7800	7800	BCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Thallium	0 / 1	ND	ND	ND	**1**	**1**	0.47	No	Constituent not detected.
Vanadium	1 / 1	2.5	2.5	BCSW-1	**--**	**--**	18	No	Maximum detect below screening value.
Zinc	1 / 1	9.5	9.5	BCSW-1	**--**	**--**	26000	No	Maximum detect below screening value.
Other Inorganics									
Chloride	1 / 1	10000	10000	BCSW-1	**--**	**--**	250000	No	Maximum detect below screening value.
Nitrate as N	1 / 1	430	430	BCSW-1	**--**	**--**	5800	No	Maximum detect below screening value.
Nitrite as N	0 / 1	ND	ND	ND	50	50	370	No	Constituent not detected.
Nitrogen, Kjeldahl	1 / 1	850	850	BCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Total Organic Carbon	1 / 1	6000	6000	BCSW-1	--	--	NA	No	Screening value not available; see Table 3-16.
Sulfate	1 / 1	11000	11000	BCSW-1	**--**	**--**	250000	No	Maximum detect below screening value.

Notes:
ND - Not Detected
NA - Not Available
Values in bold indicate detection limit exceeds screening value.
"--" - Constituent detected in every sample; detection limit not presented.
Values in bold indicate detection limit exceeds screening value.

TABLE 3-26
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SOIL
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (mg/Kg)	Probable Identity or Probable Chemical Class [1]	USEPA Industrial Soil Regional Screening Level [2] (mg/kg)	Constituent of Interest	Comment
Landill Areas	OLF-1	8260B-TIC	Unknown	0.8 J	phenol	18000	No	Detect below RSL.
Landfill Areas	OLF-1DUP	8260B-TIC	Unknown	0.0073 J	phenol	18000	No	Detect below RSL.
Landfill Areas	OLF-2	8260B-TIC	Unknown	0.019 J	Chemical Class: fluorinated VOC	18000	No	Detect below RSL. RSL is based on Freon 113.
	OLF-2	8260B-TIC	Unknown	0.44 J	phenol	18000	No	Detect below RSL.
Landfill Areas	OLF-3	8260B-TIC	Unknown	0.12 J	phenol	18000	No	Detect below RSL.
Landfill Areas	OLF-4	8260B-TIC	Unknown	0.053 J	phenol	18000	No	Detect below RSL.
Landfill Areas	OLF-5	8260B-TIC	Unknown Alkane	0.053 J	Chemical Class: alkane ring	2900	No	Detect below RSL. RSL is based on cyclohexane.
	OLF-5	8260B-TIC	Unknown Alkene	0.031 J	Chemical Class: dichlorobenzene	12	No	Detect below RSL. RSL is based on 1,4-dichlorobenzene.
	OLF-5	8260B-TIC	Unknown	0.029 J	phenol	18000	No	Detect below RSL.
Landfill Areas	OLF-6	8260B-TIC	Unknown	0.02 J	Chemical Class: fluorinated VOC	18000	No	Detect below RSL. RSL is based on Freon 113.
	OLF-6	8260B-TIC	Unknown	0.082 J	phenol	18000	No	Detect below RSL.
	OLF-6	8270C-TIC	Unknown Alkane [3]	0.47 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
	OLF-6	8270C-TIC	Unknown Alkane [3]	0.79 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
Landfill Areas	OLF-7	8260B-TIC	Unknown	0.011 J	phenol	18000	No	Detect below RSL.
Landfill Areas	OLF-8	8260B-TIC	Unknown	0.015 J	phenol	18000	No	Detect below RSL.
	OLF-8	8270C-TIC	Unknown Alkane [3]	0.25 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
	OLF-8	8270C-TIC	Unknown Alkane [3]	0.32 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
SDB	SDB-5	8270C-TIC	Unknown	0.33 J	Chemical Class: sitosterol	NA	No	Structurally similar to cholesterol; low inherent toxicity.
VFSP	VFSP-2	8270C-TIC	Unknown	3.7 J	Chemical Class: sitosterol	NA	No	Structurally similar to cholesterol; low inherent toxicity.
VFSP	VFSP-6	8270C-TIC	Unknown	35 J	Chemical Class: sitosterol	NA	No	Structurally similar to cholesterol; low inherent toxicity.
VFSP	VFSP-8	8270C-TIC	Unknown [3]	16 J	Chemical Class: alkyl aromatic	4500	No	Detect below RSL. RSL is based on toluene.
	VFSP-8	8270C-TIC	Unknown [3]	23 J	Chemical Class: sitosterol	NA	No	Structurally similar to cholesterol; low inherent toxicity.

Notes:
mg/Kg - milligrams per kilogram.
TIC - Tentatively Identified Compound.
J - The positive result for this analyte is a quantitative estimate.
[1] See Section 2.5 and Appendix B for Unknown TIC identification process.
[2] Screening levels are the USEPA Industrial Soil Regional Screening Levels (RSLs; USEPA, 2010a). Non-cancer based screening levels are adjusted to reflect a hazard quotient of 0.1.
[3] The compound/analyte was identified during laboratory processes but determined unknown by a data validator.

TABLE 3-27
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Probable Identity or Probable Chemical Class [1]	USEPA Tapwater Regional Screening Level [2] (ug/L)	Constituent of Interest	Comment
WW Lagoons	WWL-1	8260B-TIC	Unknown	5.1 J	silanol, trimethyl-	NA	No	Silicon base; low inherent toxicity.
	WWL-1	8260B-TIC	Unknown	34 J	ethane, 1,2-diethoxy-	730	No	Detect below RSL. RSL is based on ethyl ether.
	WWL-1	8270C-TIC	Unknown	5300 J	Chemical Class: glycol ether derivative	370	**YES**	Detect exceeds RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	WWL-1	8270C-TIC	Unknown	9300 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
WW Lagoons	WWL-3U	8260B-TIC	Unknown	6.4 J	ethane, 1,2-diethoxy-	730	No	Detect below RSL. RSL is based on ethyl ether.
	WWL-3U	8270C-TIC	Unknown	6.3 J	Chemical Class: chlorinated VOC	2	**YES**	Detect exceeds RSL. RSL is based on trichloroethene.
WW Lagoons	WWL-3L	8270C-TIC	Unknown	8 J	Chemical Class: chlorinated VOC	2	**YES**	Detect exceeds RSL. RSL is based on trichloroethene.
	WWL-3L	8270C-TIC	Unknown	12 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	WWL-3L	8270C-TIC	Unknown	140 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Natrosol Lagoon	NAT-2	8260B-TIC	Unknown	18 J	Chemical Class: alkene	88	No	Detect below RSL. RSL is based on hexane.
	NAT-2	8260B-TIC	Unknown	1600 J	Chemical Class: alcohol	370	**YES**	Detect exceeds RSL. RSL is based on n-butanol.
Natrosol Lagoon	NAT-3	8260B-TIC	Unknown	30 J	2-methyl-1-propene	88	No	Detect below RSL. RSL is based on hexane.
	NAT-3	8270C-TIC	Unknown	350 J	Chemical Class: alcohol	370	No	Detect below RSL. RSL is based on n-butanol.
Natrosol Lagoon	NAT-3DUP	8260B-TIC	Unknown Alkene	38 J	Chemical Class: alkene	88	No	Detect below RSL. RSL is based on hexane.
	NAT-3DUP	8260B-TIC	Unknown	9.5 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
Main Holding Basin	MW-1	8270C-TIC	Unknown	94 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-1	8270C-TIC	Unknown	8.7 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding Basin	MW-2	8270C-TIC	Unknown	14 J	Chemical Class: chlorinated VOC	2	**YES**	Detect exceeds RSL. RSL is based on trichloroethene.
	MW-2	8270C-TIC	Unknown	120 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-2	8270C-TIC	Unknown	65 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-2	8270C-TIC	Unknown	18 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding Basin	MW-3	8270C-TIC	Unknown	5.3 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-3	8270C-TIC	Unknown	11 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-3	8270C-TIC	Unknown	110 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-3	8270C-TIC	Unknown	11 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-3	8270C-TIC	Unknown	89 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-3	8270C-TIC	Unknown	16 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
	MW-3	8270C-TIC	Unknown	20 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding Basin	MW-4	8260B-TIC	Unknown	5.2 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
	MW-4	8270C-TIC	Unknown	370 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-4	8270C-TIC	Unknown	32 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-4	8270C-TIC	Unknown	37 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-4	8270C-TIC	Unknown	260 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-4	8270C-TIC	Unknown	24 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.

TABLE 3-27
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Probable Identity or Probable Chemical Class [1]	USEPA Tapwater Regional Screening Level [2] (ug/L)	Constituent of Interest	Comment
Main Holding	MW-4U	8270C-TIC	Unknown	330 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Basin	MW-4U	8270C-TIC	Unknown	30 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-4U	8270C-TIC	Unknown	240 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-4U	8270C-TIC	Unknown	25 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
	MW-4U	8270C-TIC	Unknown	74 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding	MW-5	8270C-TIC	Unknown	180 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Basin	MW-5	8270C-TIC	Unknown	170 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-5	8270C-TIC	Unknown	210 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding	MW-5U	8270C-TIC	Unknown	54 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Basin	MW-5U	8270C-TIC	Unknown	160 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-5U	8270C-TIC	Unknown	120 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding	MW-6	8270C-TIC	Unknown	70 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Basin	MW-6	8270C-TIC	Unknown	33 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-6	8270C-TIC	Unknown	260 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-6	8270C-TIC	Unknown	150 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-6	8270C-TIC	Unknown	52 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding	MW-7L	8270C-TIC	Unknown	8.3 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Basin	MW-7L	8270C-TIC	Unknown	25 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-7L	8270C-TIC	Unknown	18 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding	MW-7U	8270C-TIC	Unknown	4.1 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Basin	MW-7U	8270C-TIC	Unknown	210 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-7U	8270C-TIC	Unknown	28 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding	MW-8L	8270C-TIC	Unknown	1400 J	Chemical Class: glycol ether derivative	370	**YES**	Detect exceeds RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Basin	MW-8L	8270C-TIC	Unknown	48 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-8L	8270C-TIC	Unknown	890 J	Chemical Class: glycol ether derivative	370	**YES**	Detect exceeds RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-8L	8270C-TIC	Unknown	570 J	Chemical Class: glycol ether derivative	370	**YES**	Detect exceeds RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-8L	8270C-TIC	Unknown	150 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding	MW-8U	8260B-TIC	Unknown	11 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
Basin	MW-8U	8260B-TIC	Unknown	12 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-8U	8270C-TIC	Unknown	16 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-8U	8270C-TIC	Unknown	280 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-8U	8270C-TIC	Unknown	170 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-8U	8270C-TIC	Unknown	62 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
	MW-8U	8270C-TIC	Unknown	49 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.

TABLE 3-27
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER - DIRECT CONTACT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Probable Identity or Probable Chemical Class [1]	USEPA Tapwater Regional Screening Level [2] (ug/L)	Constituent of Interest	Comment
Main Holding Basin	MW-9	8260B-TIC	Unknown	15 J	silanol, trimethyl-	NA	No	Silicon base; low inherent toxicity.
	MW-9	8260B-TIC	Unknown	14 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9	8270C-TIC	Unknown	7.7 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9	8270C-TIC	Unknown	9.6 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9	8270C-TIC	Unknown	230 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9	8270C-TIC	Unknown	35 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9	8270C-TIC	Unknown	7.4 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding Basin	MW-9DUP	8260B-TIC	Unknown	11 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
	MW-9DUP	8260B-TIC	Unknown	11 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9DUP	8270C-TIC	Unknown	6.4 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9DUP	8270C-TIC	Unknown	4.7 J	Chemical Class: chlorinated VOC	2	**YES**	Detect exceeds RSL. RSL is based on trichloroethene.
	MW-9DUP	8270C-TIC	Unknown	6.5 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9DUP	8270C-TIC	Unknown	12 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9DUP	8270C-TIC	Unknown	240 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
	MW-9DUP	8270C-TIC	Unknown	37 J	Chemical Class: glycol ether derivative	370	No	Detect below RSL. RSL is based on Ethylene Glycol Monobutyl Ether.
Main Holding Basin	MW-10	8270C-TIC	Unknown	7.5 J	Chemical Class: chlorinated VOC	2	**YES**	Detect exceeds RSL. RSL is based on trichloroethene.

Notes:
ug/L - micrograms per liter.
TIC - Tentatively Identified Compound.
J - The positive result for this analyte is a quantitative estimate.
[1] See Section 2.5 and Appendix B for Unknown TIC identification process.
[2] Screening levels are the USEPA Tapwater Regional Screening Levels (RSLs; USEPA, 2010a). Non-cancer based screening levels are adjusted to reflect a hazard quotient of 0.1.

TABLE 3-28
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER - VAPOR INTRUSION
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Probable Identity or Probable Chemical Class [1]	USEPA Vapor Intrusion Screening Value [1] (ug/L)	Constituent of Interest	Comment
WW Lagoons	WWL-1	8260B-TIC	Unknown	5.1 J	silanol, trimethyl-	NA	No	Silicon base; low inherent toxicity.
	WWL-1	8260B-TIC	Unknown	34 J	ethane, 1,2-diethoxy-	520	No	Detect below SV. Screening value is based on ethyl ether.
	WWL-1	8270C-TIC	Unknown	5300 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	WWL-1	8270C-TIC	Unknown	9300 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
WW Lagoons	WWL-3U	8260B-TIC	Unknown	6.4 J	ethane, 1,2-diethoxy-	520	No	Detect below SV. Screening value is based on ethyl ether.
	WWL-3U	8270C-TIC	Unknown	6.3 J	Chemical Class: chlorinated VOC	5	**YES**	Detect exceeds SV. Screening value is based on trichloroethene.
WW Lagoons	WWL-3L	8270C-TIC	Unknown	8 J	Chemical Class: chlorinated VOC	5	**YES**	Detect exceeds SV. Screening value is based on trichloroethene.
	WWL-3L	8270C-TIC	Unknown	12 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	WWL-3L	8270C-TIC	Unknown	140 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Natrosol Lagoon	NAT-2	8260B-TIC	Unknown	18 J	Chemical Class: alkene	2.9	**YES**	Detect exceeds SV. Screening value is based on hexane.
	NAT-2	8260B-TIC	Unknown	1600 J	Chemical Class: alcohol	NV	No	Constituent not sufficiently volatile.
Natrosol Lagoon	NAT-3	8260B-TIC	Unknown	30 J	2-methyl-1-propene	2.9	**YES**	Detect exceeds SV. Screening value is based on hexane.
	NAT-3	8270C-TIC	Unknown	350 J	Chemical Class: alcohol	NV	No	Constituent not sufficiently volatile.
Natrosol Lagoon	NAT-3DUP	8260B-TIC	Unknown Alkene	38 J	Chemical Class: alkene	2.9	**YES**	Detect exceeds SV. Screening value is based on hexane.
	NAT-3DUP	8260B-TIC	Unknown	9.5 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
Main Holding	MW-1	8270C-TIC	Unknown	94 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-1	8270C-TIC	Unknown	8.7 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-2	8270C-TIC	Unknown	14 J	Chemical Class: chlorinated VOC	5	**YES**	Detect exceeds SV. Screening value is based on trichloroethene.
Basin	MW-2	8270C-TIC	Unknown	120 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-2	8270C-TIC	Unknown	65 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-2	8270C-TIC	Unknown	18 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-3	8270C-TIC	Unknown	5.3 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-3	8270C-TIC	Unknown	11 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-3	8270C-TIC	Unknown	110 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-3	8270C-TIC	Unknown	11 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-3	8270C-TIC	Unknown	89 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-3	8270C-TIC	Unknown	16 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
	MW-3	8270C-TIC	Unknown	20 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-4	8260B-TIC	Unknown	5.2 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
Basin	MW-4	8270C-TIC	Unknown	370 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-4	8270C-TIC	Unknown	32 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-4	8270C-TIC	Unknown	37 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-4	8270C-TIC	Unknown	260 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-4	8270C-TIC	Unknown	24 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.

TABLE 3-28
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER - VAPOR INTRUSION
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Probable Identity or Probable Chemical Class [1]	USEPA Vapor Intrusion Screening Value [1] (ug/L)	Constituent of Interest	Comment
Main Holding	MW-4U	8270C-TIC	Unknown	330 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-4U	8270C-TIC	Unknown	30 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-4U	8270C-TIC	Unknown	240 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-4U	8270C-TIC	Unknown	25 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
	MW-4U	8270C-TIC	Unknown	74 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-5	8270C-TIC	Unknown	180 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-5	8270C-TIC	Unknown	170 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-5	8270C-TIC	Unknown	210 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-5U	8270C-TIC	Unknown	54 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-5U	8270C-TIC	Unknown	160 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-5U	8270C-TIC	Unknown	120 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-6	8270C-TIC	Unknown	70 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-6	8270C-TIC	Unknown	33 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-6	8270C-TIC	Unknown	260 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-6	8270C-TIC	Unknown	150 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-6	8270C-TIC	Unknown	52 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-7L	8270C-TIC	Unknown	8.3 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-7L	8270C-TIC	Unknown	25 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-7L	8270C-TIC	Unknown	18 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-7U	8270C-TIC	Unknown	4.1 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-7U	8270C-TIC	Unknown	210 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-7U	8270C-TIC	Unknown	28 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-8L	8270C-TIC	Unknown	1400 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Basin	MW-8L	8270C-TIC	Unknown	48 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-8L	8270C-TIC	Unknown	890 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-8L	8270C-TIC	Unknown	570 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-8L	8270C-TIC	Unknown	150 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding	MW-8U	8260B-TIC	Unknown	11 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
Basin	MW-8U	8260B-TIC	Unknown	12 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-8U	8270C-TIC	Unknown	16 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-8U	8270C-TIC	Unknown	280 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-8U	8270C-TIC	Unknown	170 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-8U	8270C-TIC	Unknown	62 J	Chemical Class: acid	NA	No	Acetic acid; low inherent toxicity.
	MW-8U	8270C-TIC	Unknown	49 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.

TABLE 3-28
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER - VAPOR INTRUSION
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Probable Identity or Probable Chemical Class [1]	USEPA Vapor Intrusion Screening Value [1] (ug/L)	Constituent of Interest	Comment
Main Holding Basin	MW-9	8260B-TIC	Unknown	15 J	silanol, trimethyl-	NA	No	Silicon base; low inherent toxicity.
	MW-9	8260B-TIC	Unknown	14 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9	8270C-TIC	Unknown	7.7 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9	8270C-TIC	Unknown	9.6 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9	8270C-TIC	Unknown	230 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9	8270C-TIC	Unknown	35 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9	8270C-TIC	Unknown	7.4 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding Basin	MW-9DUP	8260B-TIC	Unknown	11 J	Chemical Class: alkyl silicon	NA	No	Silicon base; low inherent toxicity.
	MW-9DUP	8260B-TIC	Unknown	11 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9DUP	8270C-TIC	Unknown	6.4 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9DUP	8270C-TIC	Unknown	4.7 J	Chemical Class: chlorinated VOC	5	No	Detect below SV. Screening value is based on trichloroethene.
	MW-9DUP	8270C-TIC	Unknown	6.5 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9DUP	8270C-TIC	Unknown	12 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9DUP	8270C-TIC	Unknown	240 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
	MW-9DUP	8270C-TIC	Unknown	37 J	Chemical Class: glycol ether derivative	NV	No	Constituent not sufficiently volatile.
Main Holding Basin	MW-10	8270C-TIC	Unknown	7.5 J	Chemical Class: chlorinated VOC	5	**YES**	Detect exceeds SV. Screening value is based on trichloroethene.

Notes:
ug/L - micrograms per liter.
TIC - Tentatively Identified Compound.
J - The positive result for this analyte is a quantitative estimate.
NV - Constituent is not sufficiently toxic and/or volatile.
SV - Screening Value.
[1] See Section 2.5 and Appendix B for Unknown TIC identification process.
[1] Vapor intrusion from groundwater screening values are from Table 2c of the USEPA (2002a) Vapor Guidance and are based on a target risk of 10^{6}.

TABLE 3-29
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (mg/Kg)	Probable Identity or Probable Chemical Class [1]	USEPA Industrial Soil Regional Screening Level [2] (mg/kg)	Constituent of Interest	Comment
Eastern WW Lagoon	ELSS-1A	8260B-TIC	Unknown	0.028 J	carbon disulfide	370	No	Detect below RSL.
	ELSS-1A	8260B-TIC	Unknown Alkene	0.13 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
Eastern WW Lagoon	ELSS-1B	8260B-TIC	Unknown	0.018 J	acetaldehyde	52	No	Detect below RSL.
	ELSS-1B	8260B-TIC	Unknown	0.0099 J	carbon disulfide	370	No	Detect below RSL.
Eastern WW	ELSS-2A	8260B-TIC	Unknown	0.032 J	carbon disulfide	370	No	Detect below RSL.
Lagoon	ELSS-2A	8270C-TIC	Unknown Alcohol	2.4 J	cholestan-3-ol, 6-methyl-, (3.beta.,5.alpha.,6.alpha)-	NA	No	Structurally similar to cholesterol; low inherent toxicity.
Eastern WW Lagoon	ELSS-3A	8260B-TIC	Unknown	0.14 J	carbon disulfide	370	No	Detect below RSL.
Eastern WW Lagoon	ELSS-4A	8260B-TIC	Unknown	0.14 J	carbon disulfide	370	No	Detect below RSL.
	ELSS-4A	8270C-TIC	Unknown PAH	4.5 J	Chemical Class: PAH	0.21	**YES**	Detect exceeds RSL. RSL is based on benzo(a)pyrene.
Eastern WW Lagoon	ELSS-4B	8260B-TIC	Unknown	0.031 J	acetaldehyde	52	No	Detect below RSL.
	ELSS-4B	8260B-TIC	Unknown	0.013 J	carbon disulfide	370	No	Detect below RSL.
Eastern WW Lagoon	ELSS-5A	8260B-TIC	Unknown	0.078 J	acetaldehyde	52	No	Detect below RSL.
	ELSS-5A	8260B-TIC	Unknown	0.12 J	carbon disulfide	370	No	Detect below RSL.
Eastern WW Lagoon	ELSS-5B	8260B-TIC	Unknown	0.029 J	acetaldehyde	52	No	Detect below RSL.
	ELSS-5B	8260B-TIC	Unknown	0.01 J	carbon disulfide	370	No	Detect below RSL.
Western WW Lagoon	WLSS-1A	8260B-TIC	Unknown	0.15 J	acetaldehyde	52	No	Detect below RSL.
	WLSS-1A	8260B-TIC	Unknown	0.13 J	carbon disulfide	370	No	Detect below RSL.
Western WW Lagoon	WLSS-1B	8260B-TIC	Unknown	0.036 J	acetaldehyde	52	No	Detect below RSL.
Western WW Lagoon	WLSS-2A	8260B-TIC	Unknown	0.51 J	acetaldehyde	52	No	Detect below RSL.
Western WW Lagoon	WLSS-2B	8260B-TIC	Unknown	0.16 J	acetaldehyde	52	No	Detect below RSL.
	WLSS-2B	8260B-TIC	Unknown	0.051 J	ethane, methoxy	20000	No	Detect below RSL. RSL is based on ethyl ether.
	WLSS-2B	8260B-TIC	Unknown	0.14 J	Chemical Class: alkyl ether	20000	No	Detect below RSL. RSL is based on ethyl ether.
	WLSS-2B	8260B-TIC	Unknown Alkene	0.0051 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
Western WW Lagoon	WLSS-3B	8260B-TIC	Unknown	0.023 J	acetaldehyde	52	No	Detect below RSL.
	WLSS-3B	8260B-TIC	Unknown Alkene	0.055 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
Western WW Lagoon	WLSS-4A	8260B-TIC	Unknown	0.067 J	carbon disulfide	370	No	Detect below RSL.
	WLSS-4A	8270C-TIC	Unknown Cycloalka	1.3 J	Chemical Class: alkyl ring	4500	No	Detect below RSL. RSL is based on toluene.
Western WW Lagoon	WLSS-4ADU	8260B-TIC	Unknown Alkene	0.27 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
	WLSS-4ADU	8270C-TIC	Unknown Cycloalka	4.4 J	Chemical Class: alkyl ring	4500	No	Detect below RSL. RSL is based on toluene.

TABLE 3-29
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (mg/Kg)	Probable Identity or Probable Chemical Class [1]	USEPA Industrial Soil Regional Screening Level [2] (mg/kg)	Constituent of Interest	Comment
Western WW	WLSS-4B	8260B-TIC	Unknown	0.012 J	Chemical Class: alkyl chain	260	No	Detect below RSL. RSL is based on hexane.
Western WW	WLSS-5A	8260B-TIC	Unknown	0.4 J	Chemical Class: dichlorobenzene	12	No	Detect below RSL. RSL is based on 1,4-dichlorobenzene.
Western WW	WLSS-5B	8260B-TIC	Unknown	0.03 J	acetaldehyde	52	No	Detect below RSL.
Lagoon	WLSS-5B	8260B-TIC	Unknown	0.0073 J	carbon disulfide	370	No	Detect below RSL.
	WLSS-5B	8260B-TIC	Unknown Alkane	0.016 J	ethane, 1,2-diethoxy	20000	No	Detect below RSL. RSL is based on ethyl ether.
Natrosol Lagoon	NLSS-1A	8260B-TIC	Unknown Alkene	0.053 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
	NLSS-1A	8260B-TIC	Unknown	0.026 J	acetaldehyde	52	No	Detect below RSL.
Natrosol Lagoon	NLSS-1B	8260B-TIC	Unknown Alkene	0.021 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
	NLSS-1B	8260B-TIC	Unknown	0.045 J	acetaldehyde	52	No	Detect below RSL.
Natrosol Lagoon	NLSS-2A	8260B-TIC	Unknown	0.018 J	acetaldehyde	52	No	Detect below RSL.
	NLSS-2A	8260B-TIC	Unknown	0.013 J	carbon disulfide	370	No	Detect below RSL.
	NLSS-2A	8270C-TIC	Unknown Amide	0.18 J	Chemical Class: amide	1500	No	Detect below RSL. RSL is based on diphenylamine.
Natrosol Lagoon	NLSS-2B	8260B-TIC	Unknown Alkene	0.068 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
Natrosol Lagoon	NLSS-3A	8260B-TIC	Unknown Alkene	0.023 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
	NLSS-3A	8260B-TIC	Unknown	0.029 J	acetaldehyde	52	No	Detect below RSL.
Natrosol Lagoon	NLSS-3B	8260B-TIC	Unknown Alkene	0.12 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
	NLSS-3B	8260B-TIC	Unknown	0.01 J	acetaldehyde	52	No	Detect below RSL.
East Bear Creek	EBSED-1	8260B-TIC	Unknown	0.015 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
	EBSED-1	8260B-TIC	Unknown Alkene	0.011 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
	EBSED-1	8260B-TIC	Unknown	0.014 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
	EBSED-1	8260B-TIC	Unknown Alkene	0.017 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
East Bear Creek	EBSED-2	8260B-TIC	Unknown	0.039 J	acetaldehyde	52	No	Detect below RSL.
	EBSED-2	8260B-TIC	Unknown Alkane	0.034 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
	EBSED-2	8260B-TIC	Unknown Alkene	0.01 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
East Bear Creek	EBSED-3	8260B-TIC	Unknown	0.073 J	acetaldehyde	52	No	Detect below RSL.
	EBSED-3	8260B-TIC	Unknown	0.019 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
	EBSED-3	8270C-TIC	Unknown Alcohol	0.27 J	Chemical Class: alcohol	6200	No	Detect below RSL. RSL is based on n-butanol.
West Bear Creek	WBSED-1	8260B-TIC	Unknown	0.051 J	acetaldehyde	52	No	Detect below RSL.
	WBSED-1	8260B-TIC	Unknown	0.031 J	Chemical Class: silane	NA	No	Silicon base; low inherent toxicity.
	WBSED-1	8260B-TIC	Unknown	0.028 J	Chemical Class: silanol	NA	No	Silicon base; low inherent toxicity.
	WBSED-1	8260B-TIC	Unknown	0.012 J	Chemical Class: hexanal	34	No	Detect below RSL. RSL is based on propionaldehyde.
West Bear Creek	WBSED-2	8260B-TIC	Unknown	0.083 J	acetaldehyde	52	No	Detect below RSL.
	WBSED-2	8260B-TIC	Unknown Alkane	0.016 J	Chemical Class: alkane	260	No	Detect below RSL. RSL is based on hexane.
	WBSED-2	8270C-TIC	Unknown Ketone	0.28 J	Chemical Class: ketone	20000	No	Detect below RSL. RSL is based on methyl ethyl ketone.

TABLE 3-29
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (mg/Kg)	Probable Identity or Probable Chemical Class [1]	USEPA Industrial Soil Regional Screening Level [2] (mg/kg)	Constituent of Interest	Comment	
West Bear Creek	WBSED-3	8270C-TIC	Unknown Alkene	1.1 J	Chemical Class: alkene	260	No	Detect below RSL.	RSL is based on hexane.
	WBSED-3	8270C-TIC	Unknown Ketone	3.4 J	Chemical Class: ketone	20000	No	Detect below RSL.	RSL is based on methyl ethyl ketone.
	WBSED-3	8270C-TIC	Unknown PAH	2.7 J	Chemical Class: PAH	0.21	**YES**	Detect exceeds RSL.	RSL is based on benzo(a)pyrene.
	WBSED-3	8270C-TIC	Unknown Alcohol	1.5 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
Unnamed	UTSED-1	8260B-TIC	Unknown	0.067 J	acetaldehyde	52	No	Detect below RSL.	
Tributary	UTSED-1	8260B-TIC	Unknown	0.012 J	Chemical Class: hexanal	34	No	Detect below RSL.	RSL is based on propionaldehyde.
Unnamed	UTSED-2	8260B-TIC	Unknown	0.069 J	acetaldehyde	52	No	Detect below RSL.	
Tributary	UTSED-2	8260B-TIC	Unknown	0.034 J	carbon disulfide	370	No	Detect below RSL.	
	UTSED-2	8270C-TIC	Unknown PAH	0.53 J	Chemical Class: PAH	0.21	**YES**	Detect exceeds RSL.	RSL is based on benzo(a)pyrene.
	UTSED-2	8270C-TIC	Unknown Alkene	0.85 J	Chemical Class: alkene	260	No	Detect below RSL.	RSL is based on hexane.
	UTSED-2	8270C-TIC	Unknown Alkane	0.37 J	Chemical Class: alkane	260	No	Detect below RSL.	RSL is based on hexane.
	UTSED-2	8270C-TIC	Unknown Alcohol	1 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
Cattail Creek	CCSED-1	8260B-TIC	Unknown	0.04 J	carbon disulfide	370	No	Detect below RSL.	
	CCSED-1	8270C-TIC	Unknown Alkene	0.49 J	Chemical Class: alkene	260	No	Detect below RSL.	RSL is based on hexane.
Cattail Creek	CCSED-2	8270C-TIC	Unknown Ketone	0.55 J	Chemical Class: ketone	20000	No	Detect below RSL.	RSL is based on methyl ethyl ketone.
	CCSED-2	8270C-TIC	Unknown Alkane	0.6 J	Chemical Class: alkane	260	No	Detect below RSL.	RSL is based on hexane.
	CCSED-2	8270C-TIC	Unknown Alcohol	0.67 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-2	8270C-TIC	Unknown Alcohol	1.3 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
Cattail Creek	CCSED-3	8270C-TIC	Unknown Alcohol	6.9 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-3	8270C-TIC	Unknown Alcohol	9.1 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-3	8270C-TIC	Unknown Alcohol	3.9 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-3	8270C-TIC	Unknown Cycloalka	0.55 J	Chemical Class: cycloalkane	2900	No	Detect below RSL.	RSL is based on cyclohexane.
	CCSED-3	8270C-TIC	Unknown Alcohol	0.73 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
Cattail Creek	CCSED-3DU	8260B-TIC	Unknown	0.11 J	acetaldehyde	52	No	Detect below RSL.	
	CCSED-3DU	8260B-TIC	Unknown	0.18 J	Chemical Class: alkane	260	No	Detect below RSL.	RSL is based on hexane.
	CCSED-3DU	8260B-TIC	Unknown Alkane	0.024 J	Chemical Class: alkane	260	No	Detect below RSL.	RSL is based on hexane.
	CCSED-3DU	8270C-TIC	Unknown Alcohol	4.9 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-3DU	8270C-TIC	Unknown Alcohol	7.6 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-3DU	8270C-TIC	Unknown Alcohol	2.7 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-3DU	8270C-TIC	Unknown Alcohol	0.41 J	Chemical Class: alcohol	6200	No	Detect below RSL.	RSL is based on n-butanol.
	CCSED-3DU	8270C-TIC	Unknown Ketone	0.45 J	Chemical Class: ketone	20000	No	Detect below RSL.	RSL is based on methyl ethyl ketone.
	CCSED-3DU	8270C-TIC	Unknown PAH	0.9 J	Chemical Class: PAH	0.21	**YES**	Detect exceeds RSL.	RSL is based on benzo(a)pyrene.

TABLE 3-29
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (mg/Kg)	Probable Identity or Probable Chemical Class [1]	USEPA Industrial Soil Regional Screening Level [2] (mg/kg)	Constituent of Interest	Comment
Bailey Creek	BCSED-1	8260B-TIC	Unknown	0.078 J	acetaldehyde	52	No	Detect below RSL.
	BCSED-1	8260B-TIC	Unknown	0.021 J	Chemical Class: propanal	34	No	Detect below RSL. RSL is based on propionaldehyde.
	BCSED-1	8260B-TIC	Unknown Alkene	0.13 J	Chemical Class: alkene	260	No	Detect below RSL. RSL is based on hexane.
	BCSED-1	8270C-TIC	Unknown Alcohol	0.68 J	Chemical Class: alcohol	6200	No	Detect below RSL. RSL is based on n-butanol.
	BCSED-1	8270C-TIC	Unknown Cycloalka	0.62 J	Chemical Class: cycloalkane	2900	No	Detect below RSL. RSL is based on cyclohexane.
	BCSED-1	8270C-TIC	Unknown Alcohol	1.2 J	Chemical Class: alcohol	6200	No	Detect below RSL. RSL is based on n-butanol.

Notes:
mg/Kg - milligrams per kilogram.
TIC - Tentatively Identified Compound.
J - The positive result for this analyte is a quantitative estimate.
[1] See Section 2.5 and Appendix B for Unknown TIC identification process.
[2] Screening levels are the USEPA Industrial Soil Regional Screening Levels (RSLs; USEPA, 2010a). Non-cancer based screening levels are adjusted to reflect a hazard quotient of 0.1.

TABLE 3-30
IDENTIFICATION OF CONSTITUENTS OF INTEREST FOR UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Probable Identity or Probable Chemical Class [1]	USEPA Tapwater Regional Screening Level [2] (ug/L)	Constituent of Interest	Comment
Eastern WW Lagoon	ELSW-3	8260B-TIC	Unknown Alkane	5.2 J	Chemical Class: alkane	88	No	Detect below RSL. RSL is based on hexane.
Western WW Lagoon	WLSW-2	8270C-TIC	Unknown Organic Acid	250 J	Chemical Class: organic acid	NA	No	Acetic acid; low inherent toxicity.

Notes:
ug/L - micrograms per liter.
TIC - Tentatively Identified Compound.
J - The positive result for this analyte is a quantitative estimate.
[1] See Section 2.5 and Appendix B for Unknown TIC identification process.
[2] Screening levels are the USEPA Tapwater Regional Screening Levels (RSLs; USEPA, 2010a). Non-cancer based screening levels are adjusted to reflect a hazard quotient of 0.1.

TABLE 3-31
SUMMARY OF CONSTITUENTS OF INTEREST IN SOIL FOR THE HUMAN HEALTH RISK ASSESSMENT
Hercules Incorporated Facility - Hopewell, Virginia

Area	Pathway	Constituents of Interest	
Landfill Areas (SWMU 5)	Direct Contact	28-Norolean-17-en-3-one 2,2-dimethoxy-propane Arsenic	Chromium Thallium
Sludge Drying Beds (SWMU 14)	Direct Contact	Arsenic	Chromium
Vacuum Filter Sludge Pile (SWMU 15)	Direct Contact	Arsenic Chromium	Iron

TABLE 3-32
SUMMARY OF CONSTITUENTS OF INTEREST IN GROUNDWATER FOR THE HUMAN HEALTH RISK ASSESSMENT
Hercules Incorporated Facility - Hopewell, Virginia

Area	Pathway	Constituents of Interest	
Site-wide	Direct Contact	1,1,2,2-Tetrachloroethane	Arsenic (Total & Dissolved)
		1,1-Dichloroethane	Barium (Total)
		Chloroform	Cadmium (Total)
		Diethyl ether	Chromium (Total & Dissolved)
		t-Butanol	Cobalt (Total & Dissolved)
		Tetrachloroethene	Iron (Total & Dissolved)
		Trichloroethene	Lead (Total)
		1,4-Dioxane	Manganese (Total & Dissolved)
		1,1,2-Trichloro-1-propene	Mercury (Total)
		1,2,3-Trichloro-1-propene	Nickel (Total)
		1,1'-Oxybis[2-ethoxy-]ethane	Vanadium (Total)
		Ethanol	Unknown; Chemical Class: glycol ether derivative
		Methanol	Unknown; Chemical Class: chlorinated VOC
		Aluminum (Total)	Unknown; Chemical Class: alcohol
	Vapor Intrusion	Diethyl ether	Mercury
		Tetrachloroethene	Unknown; Chemical Class: chlorinated VOC
		Trichloroethene	Unknown; Chemical Class: alkene
		1,1,2-Trichloro-1-propene	Unknown; 2-methyl-1-propene
		1,2,3-Trichloro-1-propene	

TABLE 3-33

SUMMARY OF CONSTITUENTS OF INTEREST IN SEDIMENT AND SURFACE WATER FOR THE HUMAN HEALTH RISK ASSESSMENT

Hercules Incorporated Facility - Hopewell, Virginia

Area	Medium	Constituents of Interest
Eastern and Western Whitewater Lagoons (SWMUs 3 and 4)	Sediment	Arsenic Chromium Thallium Unknown; Chemical Class: PAH
	Surface Water	Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene Arsenic Chromium
Natrosol Lagoon (SWMU 7)	Sediment	Arsenic Chromium Thallium
	Surface Water	Arsenic Chromium
Sludge Drying Beds (SWMU 14)	Surface Water	Benzo(a)pyrene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Arsenic Chromium Cobalt Iron Manganese

TABLE 3-33

SUMMARY OF CONSTITUENTS OF INTEREST IN SEDIMENT AND SURFACE WATER FOR THE HUMAN HEALTH RISK ASSESSMENT

Hercules Incorporated Facility - Hopewell, Virginia

Area	Medium	Constituents of Interest
Vacuum Filter Sludge Pile (SWMU 15)	Surface Water	Benzo(a)pyrene Benzo(k)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Arsenic Chromium Cobalt Iron
East Bear Creek	Sediment	Arsenic Chromium Thallium
	Surface Water	Aluminum Arsenic Chromium Cobalt Iron Lead Manganese Mercury Thallium Vanadium

TABLE 3-33

SUMMARY OF CONSTITUENTS OF INTEREST IN SEDIMENT AND SURFACE WATER FOR THE HUMAN HEALTH RISK ASSESSMENT

Hercules Incorporated Facility - Hopewell, Virginia

Area	Medium	Constituents of Interest
West Bear Creek	Sediment	2,3,3',4,4',5-Hexachloro-1,1'-biphenyl PCB-1254 Pentachlorobiphenyl Arsenic Chromium Thallium Unknown; Chemical Class: PAH
	Surface Water	Aluminum Arsenic Chromium Cobalt Iron Manganese Vanadium
Unnamed Tributary	Sediment	PCB-1254 Pentachlorobiphenyl Arsenic Chromium Thallium Unknown; Chemical Class: PAH
	Surface Water	Aluminum Arsenic Chromium Cobalt Iron Lead Manganese Vanadium

TABLE 3-33

SUMMARY OF CONSTITUENTS OF INTEREST IN SEDIMENT AND SURFACE WATER FOR THE HUMAN HEALTH RISK ASSESSMENT

Hercules Incorporated Facility - Hopewell, Virginia

Area	Medium	Constituents of Interest
Cattail Creek	Sediment	Hexadecane Arsenic Chromium Thallium Unknown; Chemical Class: PAH
	Surface Water	Arsenic Chromium Cobalt Iron Manganese
Bailey Creek	Sediment	Arsenic Chromium Thallium
	Surface Water	Arsenic Iron Manganese

TABLE 4-1
CONCEPTUAL SITE EXPOSURE MODEL FOR ONSITE SWMUs and AREAS OF CONCERN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure Medium	Exposure Area	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selecting Potentially Complete Exposure Pathways
Surface Soil	Landfill Areas, Sludge Drying Beds & Vacuum Filter Sludge Pile	Outdoor Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
				Dermal Contact	Quantitative	
				Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Inhalation of Particulates	Quantitative	
		Indoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors.
				Dermal Contact	None	
				Inhalation of Volatile Emissions (Ambient Air)	None	
				Inhalation of Particulates	None	
		Construction Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
				Dermal Contact	Quantitative	
				Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Inhalation of Particulates	Quantitative	
Groundwater	Whitewater Lagoons, Landfill Areas, Natrosol Lagoon, RA Basin, Sludge Drying Beds, Vacuum Filter Sludge Pile & Main Holding Basin.	Outdoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Direct contact unlikely due to the nature of work activities (i.e., excavation is unlikely). The construction worker is more likely to have direct contact with groundwater.
				Dermal Contact	None	
				Inhalation of Volatile Emissions (Ambient Air)	None	
		Indoor Worker	Adult	Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors, and groundwater is not used as a potable water source.
				Dermal Contact	None	
				Inhalation of Volatile Emissions (Ambient Air)	None	
		Construction Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
				Dermal Contact	Quantitative	
				Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
Indoor Air	Whitewater Lagoons, Landfill Areas, Natrosol Lagoon, RA Basin, Sludge Drying Beds, Vacuum Filter Sludge Pile & Main Holding Basin.	Outdoor Worker	Adult	Inhalation of Volatile Emissions (Vapor Intrusion from Groundwater)	None	Pathway incomplete. Worker assumed to spend entire work day outdoors.
		Indoor Worker	Adult	Inhalation of Volatile Emissions (Vapor Intrusion from Groundwater)	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
		Construction Worker	Adult	Inhalation of Volatile Emissions (Vapor Intrusion from Groundwater)	None	Pathway incomplete. Worker assumed to spend entire work day outdoors.

TABLE 4-1
CONCEPTUAL SITE EXPOSURE MODEL FOR ONSITE SWMUs and AREAS OF CONCERN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure Medium	Exposure Area	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selecting Potentially Complete Exposure Pathways
Sediment	Eastern Whitewater Lagoon, Western Whitewater Lagoon, and Natrosol Lagoon	Outdoor Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
				Dermal Contact	Quantitative	
		Indoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors.
				Dermal Contact	None	
		Construction Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
				Dermal Contact	Quantitative	
Surface Water	Eastern Whitewater Lagoon, Western Whitewater Lagoon, Natrosol Lagoon, Sludge Drying Beds, and Vacuum Filter Sludge Pile.	Outdoor Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
				Dermal Contact	Quantitative	
		Indoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors.
				Dermal Contact	None	
		Construction Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
				Dermal Contact	Quantitative	

TABLE 4-2
CONCEPTUAL SITE EXPOSURE MODEL FOR ONSITE AND OFFSITE STREAMS
Hercules Incorporated Facility - Hopewell, Virginia

Location	Exposure Medium	Exposure Area	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selecting Potentially Complete Exposure Pathways
Onsite	Sediment	East Bear Creek, West Bear Creek & Unnamed Tributary	Outdoor Worker & Construction Worker	Adult	Incidental Ingestion	None	Potentially complete exposure pathway that is not quantitatively evaluated in the risk assessment because a more frequently exposed receptor (trespasser) is already being considered.
					Dermal Contact	None	
			Trespasser	Youth (7 through 16)	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
					Dermal Contact	Quantitative	
	Surface Water	East Bear Creek, West Bear Creek & Unnamed Tributary	Outdoor Worker & Construction Worker	Adult	Incidental Ingestion	None	Potentially complete exposure pathway that will not be quantitatively evaluated in the risk assessment because a more frequently exposed receptor (trespasser) is already being considered.
					Dermal Contact	None	
			Trespasser	Youth (7 through 16)	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
					Dermal Contact	Quantitative	
Offsite	Sediment	Cattail Creek & Bailey Creek	Recreational Visitor	Adult & Youth (7 through 16)	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
					Dermal Contact	Quantitative	
	Surface Water	Cattail Creek & Bailey Creek	Recreational Visitor	Adult & Youth (7 through 16)	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that is evaluated in the risk assessment.
					Dermal Contact	Quantitative	

TABLE 4-3
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE SOIL
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Arithmetic Mean [1] (mg/kg)	Distribution	Upper Confidence Limit [1] (mg/kg)	Exposure Point Concentration [2] (mg/kg)
Semi-Volatile Organics (TICs)							
28-Norolean-17-en-3-one	1	0.0%	1.50	NA	NA	NA	1.50
2,2-dimethoxy-propane	2	0.0%	1.80	NA	NA	NA	1.80
Inorganics							
Arsenic	8	0.0%	22.0	4.62	Non-parametric	15.5	15.5
Chromium	8	0.0%	31.0	20.0	Normal	25.9	25.9
Thallium	8	37.5%	0.89	0.29	Gamma	0.46	0.46

Notes:

NA - Statistics are not applicable because the data set is too small to compute reliable and meaningful statistics and estimates.

[1] Details of all statistical calculations are provided in Appendix C-1.

[2] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the Upper Confidence Limit (UCL).

TABLE 4-4
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE SOIL
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Arithmetic Mean [1] (mg/kg)	Distribution	Upper Confidence Limit [1] (mg/kg)	Exposure Point Concentration [2] (mg/kg)
Inorganics							
Arsenic	9	0.0%	3.80	2.40	Normal	3.03	3.03
Chromium	9	0.0%	52.2	29.5	Normal	36.4	36.4

Notes:

[1] Details of all statistical calculations are provided in Appendix C-2.

[2] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the Upper Confidence Limit (UCL).

TABLE 4-5
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE SOIL
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Arithmetic Mean [1] (mg/kg)	Distribution	Upper Confidence Limit [1] (mg/kg)	Exposure Point Concentration [2] (mg/kg)
Inorganics							
Arsenic	9	0.0%	9.10	7.54	Gamma	9.18	9.10
Chromium	9	0.0%	205	144	Normal	168	168
Iron	9	0.0%	112650	76217	Normal	93535	93535

Notes:

[1] Details of all statistical calculations are provided in Appendix C-3.

[2] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the Upper Confidence Limit (UCL).

TABLE 4-6
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN GROUNDWATER
EASTERN AND WESTERN WHITEWATER LAGOONS (SWMU 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Volatile Organics				
1,1,2,2-Tetrachloroethane	4	100%	ND	ND
1,1-Dichloroethane	4	100%	ND	ND
Chloroform	4	100%	ND	ND
Diethyl ether *	4	25%	8200	8200
t-Butanol	4	50%	190	190
Tetrachloroethene *	4	100%	ND	ND
Trichloroethene *	4	100%	ND	ND
Semi-Volatile Organics				
1,4-Dioxane	4	50%	33.0	33.0
Semi-Volatile Organics (TICs)				
1,1'-Oxybis[2-ethoxy-]ethane	2	0.0%	340	340
Alcohols and Glycols				
Ethanol	4	50%	9700	9700
Methanol	4	0.0%	1900	1900
Total Inorganics				
Aluminum	4	0.0%	490	490
Arsenic	4	0.0%	4.80	4.80
Barium	4	0.0%	1600	1600
Cadmium	4	75%	0.14	0.14
Chromium	4	0.0%	12.0	12.0
Cobalt	4	0.0%	79.0	79.0
Iron	4	0.0%	180000	180000
Lead	4	100%	ND	ND
Manganese	4	0.0%	16000	16000
Mercury *	4	100%	ND	ND
Nickel	4	0.0%	22.0	22.0
Vanadium	4	100%	ND	ND
Unknown (TICs)				
Unknown; Chemical Class: glycol ether derivative	3	0.0%	5300	5300
Unknown; Chemical Class: chlorinated VOC *	2	0.0%	8.00	8.00

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.
* This constituent is a COI for both the direct contact and vapor intrusion from groundwater pathways.

TABLE 4-7
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN GROUNDWATER
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Volatile Organics				
1,1,2,2-Tetrachloroethane	5	100%	ND	ND
1,1-Dichloroethane	5	80%	1.10	1.10
Chloroform	5	100%	ND	ND
Diethyl ether *	5	20%	200	200
t-Butanol	5	20%	680	680
Tetrachloroethene *	5	100%	ND	ND
Trichloroethene *	5	100%	ND	ND
Semi-Volatile Organics				
1,4-Dioxane	5	60%	24.0	24.0
Semi-Volatile Organics (TICs)				
1,1,2-Trichloro-1-propene *	2	0.0%	7.40	7.40
1,2,3-Trichloro-1-propene *	1	0.0%	6.70	6.70
1,1'-Oxybis[2-ethoxy-]ethane	1	0.0%	220	220
Alcohols and Glycols				
Ethanol	5	100%	ND	ND
Methanol	5	100%	ND	ND
Total Inorganics				
Aluminum	5	0.0%	340	340
Arsenic	5	60%	0.68	0.68
Barium	5	0.0%	150	150
Cadmium	5	100%	ND	ND
Chromium	5	20%	4.20	4.20
Cobalt	5	0.0%	5.90	5.90
Iron	5	0.0%	10000	10000
Lead [2]	5	80%	0.92	0.78
Manganese	5	0.0%	3000	3000
Mercury *	5	100%	ND	ND
Nickel	5	0.0%	7.70	7.70
Vanadium	5	80%	3.20	3.20

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.
[2] The EPC for lead is based on the arithmetic mean calculated using one half the detection limit to represent non-detect samples.
* This constituent is a COI for both the direct contact and vapor intrusion from groundwater pathways.

TABLE 4-8
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN GROUNDWATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Volatile Organics				
1,1,2,2-Tetrachloroethane	4	100%	ND	ND
1,1-Dichloroethane	4	100%	ND	ND
Chloroform	4	100%	ND	ND
Diethyl ether *	4	75%	0.50	0.50
t-Butanol	4	25%	92000	92000
Tetrachloroethene *	4	100%	ND	ND
Trichloroethene *	4	50%	8.40	8.40
Semi-Volatile Organics				
1,4-Dioxane	4	50%	13.0	13.0
Alcohols and Glycols				
Ethanol	4	100%	ND	ND
Methanol	4	100%	ND	ND
Total Inorganics				
Aluminum	4	0.0%	3200	3200
Arsenic	4	0.0%	7.00	7.00
Barium	4	0.0%	125	125
Cadmium	4	75%	0.29	0.29
Chromium	4	0.0%	19.0	19.0
Cobalt	4	0.0%	27.0	27.0
Iron	4	0.0%	9600	9600
Lead [2]	4	0.0%	2.20	1.00
Manganese	4	0.0%	2750	2750
Mercury *	4	100%	ND	ND
Nickel	4	0.0%	34.5	34.5
Vanadium	4	0.0%	14.0	14.0
Unknown (TICs)				
Unknown; Chemical Class: alcohol	2	0.0%	1600	1600
Unknown; Chemical Class: alkene **	2	0.0%	38.0	38.0
Unknown; 2-methyl-1-propene **	1	0.0%	30.0	30.0

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.
[2] The EPC for lead is based on the arithmetic mean calculated using one half the detection limit to represent non-detect samples.
* This constituent is a COI for both the direct contact and vapor intrusion from groundwater pathways.
** This constituent is a COI for the vapor intrusion from groundwater pathway only.

TABLE 4-9
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN GROUNDWATER
RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Volatile Organics				
1,1,2,2-Tetrachloroethane	3	100%	ND	ND
1,1-Dichloroethane	3	100%	ND	ND
Chloroform	3	100%	ND	ND
Diethyl ether *	3	0.0%	11.0	11.0
t-Butanol	3	0.0%	560	560
Tetrachloroethene *	3	100%	ND	ND
Trichloroethene *	3	100%	ND	ND
Semi-Volatile Organics				
1,4-Dioxane	3	100%	ND	ND
Alcohols and Glycols				
Ethanol	3	100%	ND	ND
Methanol	3	33.3%	1100	1100
Dissolved Inorganics				
Arsenic	2	50%	3.50	3.50
Chromium	2	50%	2.40	2.40
Cobalt	2	0.0%	120	120
Iron	2	0.0%	110000	110000
Manganese	2	0.0%	11000	11000
Total Inorganics				
Aluminum	3	0.0%	24000	24000
Arsenic	3	0.0%	9.30	9.30
Barium	3	0.0%	200	200
Cadmium	3	33.3%	0.47	0.47
Chromium	3	0.0%	79.0	79.0
Cobalt	3	0.0%	150	150
Iron	3	0.0%	150000	150000
Lead [2]	3	0.0%	18.0	11.90
Manganese	3	0.0%	12000	12000
Mercury *	3	0.0%	0.52	0.52
Nickel	3	0.0%	100	100
Vanadium	3	0.0%	95.0	95.0

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics
[2] The EPC for lead is based on the arithmetic mean calculated using one half the detection limit to represent non-detect samples.
* This constituent is a COI for both the direct contact and vapor intrusion from groundwater pathways.

TABLE 4-10
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN GROUNDWATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Volatile Organics				
1,1,2,2-Tetrachloroethane	3	100%	ND	ND
1,1-Dichloroethane	3	100%	ND	ND
Chloroform	3	100%	ND	ND
Diethyl ether *	3	66.7%	0.54	0.54
t-Butanol	3	33.3%	3.00	3.00
Tetrachloroethene *	3	100%	ND	ND
Trichloroethene *	3	100%	ND	ND
Semi-Volatile Organics				
1,4-Dioxane	3	100%	ND	ND
Alcohols and Glycols				
Ethanol	3	100%	ND	ND
Methanol	3	100%	ND	ND
Dissolved Inorganics				
Arsenic	1	0.0%	6.30	6.30
Chromium	1	0.0%	4.10	4.10
Cobalt	1	0.0%	9.80	9.80
Iron	1	0.0%	170000	170000
Manganese	1	0.0%	2200	2200
Total Inorganics				
Aluminum	3	0.0%	9800	9800
Arsenic	3	0.0%	7.30	7.30
Barium	3	0.0%	540	540
Cadmium	3	0.0%	0.38	0.38
Chromium	3	0.0%	22.0	22.0
Cobalt	3	0.0%	14.0	14.0
Iron	3	0.0%	190000	190000
Lead [2]	3	66.7%	26.0	9.17
Manganese	3	0.0%	2300	2300
Mercury *	3	100%	ND	ND
Nickel	3	0.0%	31.0	31.0
Vanadium	3	66.7%	45.0	45.0

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics
[2] The EPC for lead is based on the arithmetic mean calculated using one half the detection limit to represent non-detect samples.
* This constituent is a COI for both the direct contact and vapor intrusion from groundwater pathways.

TABLE 4-11
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN GROUNDWATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Volatile Organics				
1,1,2,2-Tetrachloroethane	1	100%	ND	ND
1,1-Dichloroethane	1	100%	ND	ND
Chloroform	1	100%	ND	ND
Diethyl ether *	1	0.0%	76.0	76.0
t-Butanol	1	100%	ND	ND
Tetrachloroethene *	1	100%	ND	ND
Trichloroethene *	1	100%	ND	ND
Semi-Volatile Organics				
1,4-Dioxane	1	100%	ND	ND
Alcohols and Glycols				
Ethanol	1	100%	ND	ND
Methanol	1	100%	ND	ND
Total Inorganics				
Aluminum	1	0.0%	270	270
Arsenic	1	0.0%	1.50	1.50
Barium	1	0.0%	140	140
Cadmium	1	100%	ND	ND
Chromium	1	0.0%	1.40	1.40
Cobalt	1	0.0%	2.50	2.50
Iron	1	0.0%	4300	4300
Lead [2]	1	0.0%	0.22	0.22
Manganese	1	0.0%	750	750
Mercury *	1	100%	ND	ND
Nickel	1	0.0%	2.10	2.10
Vanadium	1	0.0%	1.50	1.50

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.
[2] The EPC for lead is based on the arithmetic mean calculated using one half the detection limit to represent non-detect samples.
* This constituent is a COI for both the direct contact and vapor intrusion from groundwater pathways.

TABLE 4-12
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Arithmetic Mean [1] (ug/L)	Distribution	Upper Confidence Limit [1] (ug/L)	Exposure Point Concentration [2] (ug/L)
Volatile Organics							
1,1,2,2-Tetrachloroethane	15	93.3%	0.96	NA	NA	NA	0.96
1,1-Dichloroethane	15	93.3%	2.50	NA	NA	NA	2.50
Chloroform	15	93.3%	0.65	NA	NA	NA	0.65
Diethyl ether *	15	6.67%	11000	1597	Gamma	4734	4734
t-Butanol	15	33.3%	5000	971	Normal	1652	1652
Tetrachloroethene *	15	93.3%	22.0	NA	NA	NA	22.0
Trichloroethene *	15	93.3%	3.20	NA	NA	NA	3.20
Semi-Volatile Organics							
1,4-Dioxane	15	46.7%	24.0	11.8	Normal	15.4	15.4
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene *	2	0.0%	7.00	NA	NA	NA	7.00
1,2,3-Trichloro-1-propene *	1	0.0%	5.40	NA	NA	NA	5.40
1,1'-Oxybis[2-ethoxy-]ethane	10	0.0%	875	415	Normal	546	546
Alcohols and Glycols							
Ethanol	15	20.0%	11000	2046	Gamma	3267	3267
Methanol	15	13.3%	3000	1432	Normal	1775	1775
Total Inorganics							
Aluminum	15	0.0%	1200	353	Gamma	574	574
Arsenic	15	20.0%	46.0	7.38	Gamma	21.4	21.4
Barium	15	0.0%	1100	368	Gamma	628	628
Cadmium	15	66.7%	9.60	1.22	Normal	2.50	2.50
Chromium	15	0.0%	26.0	8.58	Gamma	12.5	12.5
Cobalt	15	0.0%	330	40.1	Gamma	104	104
Iron	15	0.0%	160000	39110	Gamma	75872	75872
Lead [3]	15	53.3%	1.20	0.77	NA	NA	0.77
Manganese	15	0.0%	32000	4953	Gamma	9071	9071
Mercury *	15	86.7%	1.30	0.69	Non-parametric	0.80	0.80
Nickel	15	0.0%	100	20.0	Lognormal	47.3	47.3
Vanadium	15	46.7%	1700	118	Non-parametric	1279	1279
Unknown (TICs)							
Unknown: Chemical Class: glycol ether derivative	58	0.0%	1400	136	Lognormal	266	266
Unknown: Chemical Class: chlorinated VOC *	3	0.0%	14.0	NA	NA	NA	14.0

Notes:
NA - Statistics are not applicable because the data set is too small to compute reliable and meaningful statistics and estimates.
[1] Details of all statistical calculations are provided in Appendix C-4.
[2] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the Upper Confidence Limit (UCL).
[3] The EPC for lead is based on the arithmetic mean calculated using one half the detection limit to represent non-detect samples.
* This constituent is a COI for both the direct contact and vapor intrusion from groundwater pathways.

TABLE 4-13
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
EASTERN WHITEWATER LAGOON (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Arithmetic Mean (mg/kg)	Distribution	Upper Confidence Limit [1] (mg/kg)	Exposure Point Concentration [2] (mg/kg)
Inorganics							
Arsenic	10	0.0%	6.50	3.86	Normal	4.98	4.98
Chromium	10	0.0%	78.0	47.4	Normal	57.7	57.7
Thallium	10	20%	0.50	0.37	Non-parametric	0.44	0.44
Unknown TICs							
Unknown; Chemical Class: PAH	1	0.0%	4.50	NA	NA	NA	4.50

Notes:

[1] Details of all statistical calculations are provided in Appendix C-5.

[2] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the Upper Confidence Limit (UCL).

NA - Statistics are not applicable because the data set is too small to compute reliable and meaningful statistics and estimates.

TABLE 4-14
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
WESTERN WHITEWATER LAGOON (SWMU 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Arithmetic Mean (mg/kg)	Distribution	Upper Confidence Limit [1] (mg/kg)	Exposure Point Concentration [2] (mg/kg)
Inorganics							
Arsenic	10	0.0%	6.50	3.30	Normal	4.55	4.55
Chromium	10	0.0%	52.0	28.7	Normal	37.4	37.4
Thallium	10	60%	0.31	0.20	Normal	0.27	0.27

Notes:
[1] Details of all statistical calculations are provided in Appendix C-6.
[2] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the Upper Confidence Limit (UCL).

TABLE 4-15
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Arithmetic Mean (mg/kg)	Distribution	Upper Confidence Limit [1] (mg/kg)	Exposure Point Concentration [2] (mg/kg)
Inorganics							
Arsenic	6	0.0%	5.00	2.28	Non-parametric	4.80	4.80
Chromium	6	0.0%	39.0	29.2	Normal	35.3	35.3
Thallium	6	0.0%	0.32	0.21	Normal	0.28	0.28

Notes:
[1] Details of all statistical calculations are provided in Appendix C-7.
[2] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the Upper Confidence Limit (UCL).

TABLE 4-16
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Exposure Point Concentration [1] (mg/kg)
Inorganics				
Arsenic	3	0.0%	12.0	12.0
Chromium	3	0.0%	71.0	71.0
Thallium	3	0.0%	0.72	0.72

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-17
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Exposure Point Concentration [1] (mg/kg)
Semi-Volatile Organics (TICs)				
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	1	0.0%	0.22	0.22
PCBs				
PCB 1254	1	0.0%	1.32	1.32
Pentachlorobiphenyl	1	0.0%	0.12	0.12
Inorganics				
Arsenic	3	0.0%	7.30	7.30
Chromium	3	0.0%	35.0	35.0
Thallium	3	0.0%	0.32	0.32
Unknown TICs				
Unknown; Chemical Class: PAH	1	0.0%	2.70	2.70

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-18
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Exposure Point Concentration [1] (mg/kg)
PCBs				
PCB-1254	2	0.0%	3.60	3.60
Pentachlorobiphenyl	2	0.0%	0.23	0.23
Inorganics				
Arsenic	3	0.0%	12.0	12.0
Chromium	3	0.0%	46.0	46.0
Thallium	3	0.0%	0.33	0.33
Unknown TICs				
Unknown; Chemical Class: PAH	1	0.0%	0.53	0.53

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-19
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Exposure Point Concentration [1] (mg/kg)
Semi-Volatile Organics (TICs)				
Hexadecane	1	0.0%	480	480
Inorganics				
Arsenic	3	0.0%	75.0	75.0
Chromium	3	0.0%	39.5	39.5
Thallium	3	0.0%	0.51	0.51
Unknown TICs				
Unknown; Chemical Class: PAH	1	0.0%	0.90	0.90

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-20
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SEDIMENT
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (mg/kg)	Exposure Point Concentration [1] (mg/kg)
Inorganics				
Arsenic	1	0.0%	4.80	4.80
Chromium	1	0.0%	34.0	34.0
Thallium	1	0.0%	0.39	0.39

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-21
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
EASTERN WHITEWATER LAGOON (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
PAHs				
Benzo(a)pyrene	3	66.7%	1.00	1.00
Benzo(b)fluoranthene	3	66.7%	1.70	1.70
Indeno(1,2,3-cd)pyrene	3	66.7%	0.86	0.86
Inorganics				
Arsenic	3	0.0%	1.20	1.20
Chromium	3	100%	ND	ND

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-22
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
WESTERN WHITEWATER LAGOON (SWMU 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
PAHs				
Benzo(a)pyrene	3	100%	ND	ND
Benzo(b)fluoranthene	3	100%	ND	ND
Indeno(1,2,3-cd)pyrene	3	100%	ND	ND
Inorganics				
Arsenic	3	0.0%	1.50	1.50
Chromium	3	66.7%	3.80	3.80

Notes:
ND - Non-Detect.
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-23
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Inorganics				
Arsenic	2	0.0%	1.40	1.40
Chromium	2	50%	1.70	1.70

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-24
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
PAHs				
Benzo(a)pyrene	3	66.7%	0.66	0.66
Dibenz(a,h)anthracene	3	33.3%	1.30	1.30
Indeno(1,2,3-cd)pyrene	3	66.7%	1.30	1.30
Inorganics				
Arsenic	3	0.0%	0.95	0.95
Chromium	3	0.0%	2.20	2.20
Cobalt	3	0.0%	1.53	1.53
Iron	3	0.0%	5400	5400
Manganese	3	0.0%	235	235

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-25
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
PAHs				
Benzo(a)pyrene	1	0.0%	0.96	0.96
Benzo(k)fluoranthene	1	0.0%	0.58	0.58
Dibenz(a,h)anthracene	1	0.0%	2.60	2.60
Indeno(1,2,3-cd)pyrene	1	0.0%	1.70	1.70
Inorganics				
Arsenic	1	0.0%	1.20	1.20
Chromium	1	0.0%	4.20	4.20
Cobalt	1	0.0%	1.20	1.20
Iron	1	0.0%	7000	7000

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-26
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Inorganics				
Aluminum	3	0.0%	65000	65000
Arsenic	3	0.0%	28.0	28.0
Chromium	3	66.7%	120	120
Cobalt	3	0.0%	20.0	20.0
Iron	3	0.0%	67000	67000
Lead [2]	3	0.0%	46.0	16.4
Manganese	3	0.0%	1300	1300
Mercury	3	66.7%	0.27	0.27
Thallium	3	33.3%	1.80	1.80
Vanadium	3	33.3%	140	140

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-27
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
WEST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Inorganics				
Aluminum	3	0.0%	4000	4000
Arsenic	3	0.0%	2.90	2.90
Chromium	3	0.0%	6.50	6.50
Cobalt	3	0.0%	2.70	2.70
Iron	3	0.0%	4400	4400
Manganese	3	0.0%	580	580
Vanadium	3	0.0%	210	210

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-28
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Inorganics				
Aluminum	3	0.0%	4800	4800
Arsenic	3	0.0%	4.50	4.50
Chromium	3	33.3%	8.00	8.00
Cobalt	3	0.0%	3.90	3.90
Iron	3	0.0%	20000	20000
Lead [2]	3	33.3%	17.0	7.55
Manganese	3	0.0%	900	900
Vanadium	3	0.0%	66.0	66.0

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.
[2] The EPC for lead is based on the arithmetic mean calculated using one half the detection limit to represent non-detect samples.

TABLE 4-29
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
CATTAIL CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Inorganics				
Arsenic	3	0.0%	5.90	5.90
Chromium	3	0.0%	3.70	3.70
Cobalt	3	0.0%	2.60	2.60
Iron	3	0.0%	4900	4900
Manganese	3	0.0%	570	570

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-30
EXPOSURE POINT CONCENTRATIONS FOR CONSTITUENTS OF INTEREST IN SURFACE WATER
BAILEY CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Number of Samples	Percent Non-detect	Maximum Detection (ug/L)	Exposure Point Concentration [1] (ug/L)
Inorganics				
Arsenic	1	0.0%	1.50	1.50
Iron	1	0.0%	3300	3300
Manganese	1	0.0%	160	160

Notes:
[1] The Exposure Point Concentration (EPC) is the maximum detected concentration because the data set is too small to compute reliable and meaningful statistics.

TABLE 4-31
CALCULATION OF SOIL VOLATILIZATION FACTORS FOR AMBIENT (OUTDOOR) AIR
WORKER SCENARIOS
Hercules Incorporated Facility - Hopewell, Virginia

USEPA (2002b) Equation 4-8:

$$VF\ (m^3/kg) = Q/C_{vol} \times \frac{(3.14 \times Da \times T)^{1/2}}{(2 \times Pb \times Da)} \times 10^{-4}\ (m^2/cm^2)$$

where:

$$Da\ (cm^2/s) = \frac{(Ea^{10/3} \times DiH'_{TS} + Ew^{10/3} Dw)\ / n^2}{Pb\ Kd + Ew + Ea\ H'_{TS}}$$

Parameter	Value	Variable	Units	Source
dispersion factor	68.18	Q/C_{vol}	$\frac{(g/m^2\text{-}s)}{(kg/m^3)}$	USEPA (2002b) default
air-filled soil porosity	0.265	Ea	L_{air}/L_{soil}	USEPA (2004a) default for silty clay
total soil porosity	0.481	n	L_{pore}/L_{soil}	USEPA (2004a) default for silty clay
water-filled soil porosity	0.216	Ew	L_{water}/L_{soil}	USEPA (2004a) default for silty clay
dry soil bulk density	1.38	Pb	g/cm^3	USEPA (2004a) default for silty clay
soil particle density	2.65	Ps	g/cm^3	(USEPA, 2002b) default
diffusivity in air	--	Di	cm^2/sec	constituent-specific
Henry's Law Constant at system temperature	--	H'_{TS}	unitless	constituent-specific
diffusivity in water	--	Dw	cm^2/sec	constituent-specific
soil-water partition coefficient	--	Kd	cm^3/g	Koc x foc
soil-organic carbon partition coefficient	--	Koc	cm^3/g	constituent-specific
exposure interval	7.88E+08	T	sec	based on an exposure duration of 25 yrs
	3.15E+07	T	sec	based on an exposure duration of 1 yr
fraction organic carbon	0.006	foc	g/g	USEPA (2002b) default

Constituent-Specific Factors

Constituent	H'_{TS} (unitless)	Di (cm^2/sec)	Dw (cm^2/sec)	Koc (cm^3/g)	Da (cm^2/s)	VF (25-yr) (m^3/kg)	VF (1-yr) (m^3/kg)
2,2-dimethoxy-propane[1]	3.34E-03	3.20E-02	8.90E-06	1.16E+02	4.90E-06	55520	11104

Notes:
[1] Values for 2,2-dimethoxy-propane are based on 1,2-dibromo-3-chloropropane.
H'_{TS} is calculated assuming the default soil temperature of 13.9°C and using the equations provided in the vapor intrusion User's Guide (USEPA, 2004a). Other constituent-specific factors are based on USEPA (2004a).

TABLE 4-32
EXPOSURE POINT CONCENTRATIONS FOR VOLATILES IN AMBIENT AIR (GROUNDWATER SOURCE)
Hercules Incorporated Facility - Hopewell, Virginia

Source Area	Constituent of Interest	Exposure Point Concentration (ug/L)	VF_{wamb} [1] $(mg/m^3)/(mg/L)$	Exposure Point Concentration in Air (mg/m^3)
Eastern and Western Whitewater Lagoons (SWMUS 3 and 4)	Diethyl ether	8200	1.23E-02	1.01E-01
	Unknown; Chemical Class: chlorinated VOC [2]	8.00	3.42E-03	2.74E-05
Landfill Areas (SWMU 5)	1,1-Dichloroethane	1.10	1.88E-03	2.07E-06
	Diethyl ether	200	1.23E-02	2.45E-03
	1,1,2-trichloro-1-propene [3]	7.40	5.22E-03	3.86E-05
	1,2,3-trichloro-1-propene [3]	6.70	5.22E-03	3.49E-05
Natrosol Lagoon (SWMU 7)	Diethyl ether	0.50	1.23E-02	6.13E-06
	Trichloroethene	8.40	3.42E-03	2.87E-05
Reten/Aqualon Basin (SWMUS 8 and 29)	Diethyl ether	11.0	1.23E-02	1.35E-04
	Mercury	0.52	8.91E-04	4.63E-07
Sludge Drying Beds (SWMU 14)	Diethyl ether	0.54	1.23E-02	6.62E-06
Vacuum Filter Sludge Pile (SWMU 15)	Diethyl ether	76.0	1.23E-02	9.32E-04
Main Holding Basin	1,1,2,2-Tetrachloroethane	0.96	9.11E-05	8.75E-08
	1,1-Dichloroethane	2.50	1.88E-03	4.71E-06
	Chloroform	0.65	1.71E-03	1.11E-06
	Diethyl ether	4734	1.23E-02	5.81E-02
	Tetrachloroethene	22.0	5.22E-03	1.15E-04
	Trichloroethene	3.20	3.42E-03	1.09E-05
	1,1,2-trichloro-1-propene [3]	7.00	5.22E-03	3.65E-05
	1,2,3-trichloro-1-propene [3]	5.40	5.22E-03	2.82E-05
	Mercury	0.80	8.91E-04	7.11E-07
	Unknown; Chemical Class: chlorinated VOC [2]	14.0	3.42E-03	4.79E-05

Notes:
[1] Details of the VF_{wamb} calculation are provided in Appendix D.
[2] VF_{wamb} values for Unknown; Chemical Class; chlorinated VOC are based on trichloroethene.
[3] VF_{wamb} values for 1,1,2-trichloro-1-propene and 1,2,3-trichloro-1-propene are based on tetrachloroethene.

TABLE 4-33
CALCULATION OF SOIL GAS CONCENTRATIONS (GROUNDWATER SOURCE) AND INDOOR AIR CONCENTRATIONS
Hercules Incorporated Facility - Hopewell, Virginia

Source Area	Constituent of Interest	Groundwater EPC (mg/L)	H_{TS} [1] (unitless)	Soil Gas Concentration [2] (mg/m^3)	TF for Soil Gas to Indoor Air [3] (cm^3/cm^3)	Volatile EPC Indoor Air [4] (mg/m^3)
Eastern and Western Whitewater Lagoons (SWMUS 3 and 4)	Diethyl ether	8.20	9.07E-01	7.43E+03	2.34E-06	1.74E-02
	Unknown; Chemical Class: chlorinated VOC [5]	0.008	2.50E-01	2.00E+00	2.85E-06	5.72E-06
Landfill Areas (SWMU 5)	Diethyl ether	0.20	9.07E-01	1.81E+02	5.18E-06	9.40E-04
	1,1,2-trichloro-1-propene [6]	0.0074	4.19E-01	3.10E+00	5.26E-06	1.63E-05
	1,2,3-trichloro-1-propene [6]	0.0067	4.19E-01	2.81E+00	5.26E-06	1.48E-05
Natrosol Lagoon (SWMU 7)	Diethyl ether	0.0005	9.07E-01	4.53E-01	2.37E-06	1.07E-06
	Trichloroethene	0.0084	2.50E-01	2.10E+00	2.89E-06	6.08E-06
	Unknown; Chemical Class: alkene [7]	0.038	4.27E+01	1.62E+03	4.91E-06	7.97E-03
	Unknown; 2-methyl-1-propene [7]	0.030	4.27E+01	1.28E+03	4.91E-06	6.29E-03
Reten/Aqualon Basin (SWMUS 8 and 29)	Diethyl ether	0.0110	9.07E-01	9.97E+00	2.37E-06	2.37E-05
	Mercury	0.00052	1.68E-01	8.72E-02	1.71E-06	1.49E-07
Sludge Drying Beds (SWMU 14)	Diethyl ether	0.00054	9.07E-01	4.90E-01	2.36E-06	1.16E-06
Vacuum Filter Sludge Pile (SWMU 15)	Diethyl ether	0.076	9.07E-01	6.89E+01	1.21E-05	8.31E-04
Main Holding Basin	Diethyl ether	4.73	9.07E-01	4.29E+03	2.38E-06	1.02E-02
	Tetrachloroethene	0.022	4.19E-01	9.21E+00	2.42E-06	2.23E-05
	Trichloroethene	0.0032	2.50E-01	8.01E-01	2.90E-06	2.33E-06
	1,1,2-trichloro-1-propene [6]	0.007	4.19E-01	2.93E+00	2.42E-06	7.10E-06
	1,2,3-trichloro-1-propene [6]	0.0054	4.19E-01	2.26E+00	2.42E-06	5.47E-06
	Mercury	0.0008	1.68E-01	1.34E-01	1.72E-06	2.31E-07
	Unknown: Chemical Class: chlorinated VOC [5]	0.0140	2.50E-01	3.50E+00	2.90E-06	1.02E-05

Notes:

[1] H'_{TS} is calculated assuming a system temperature of 13.9°C and using the equations provided in the vapor intrusion User's Guide (USEPA, 2004a).

[2] Soil gas concentration is calculated as EPC GW x 1000 L/m^3 x H'_{TS}, as per the vapor intrusion User's Guide (USEPA, 2004a).

[3] Details of Transport Factor (TF) calculations are provided in Appendix E.

[4] Indoor air concentration is calculated as the soil gas concentration multiplied by the TF.

[5] H'_{TS} and TF values for Unknown; Chemical Class; chlorinated VOC are based on trichloroethene.

[6] H'_{TS} and TF values for 1,1,2-trichloro-1-propene and 1,2,3-trichloro-1-propene are based on tetrachloroethene.

[7] H'_{TS} and TF values for Unknown; Chemical Class; alkene and 2-methyl-1-propene are based on hexane.

TABLE 4-34
GENERAL FORMULA FOR CALCULATION OF CONSTITUENT INTAKES
Hercules Incorporated Facility - Hopewell, Virginia

Symbol	Factor	Units	Comments
C	Constituent Concentration	mg/kg, mg/L, mg/m^3	Concentration of constituent in environmental medium
CR	Contact Rate	mg/day, L/day, m^3/day	Receptor's rate of contact with environmental medium
EF	Exposure Frequency	days/year	Days per year that the receptor may be exposed
ED	Exposure Duration	years	Number of years during which receptor may be exposed
BW	Body Weight	kilograms	Intake is normalized for receptor's body weight
AT	Averaging Time	days	Period over which exposure is averaged

$$\text{Intake (mg/kg-day)} = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

TABLE 4-35
DERMAL ABSORPTION FRACTIONS FOR CONSTITUENTS OF INTEREST IN SOIL AND SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Constituents of Interest	Dermal Absorption Fraction	Source
Semi-Volatile Organics (TICs)		
28-Norolean-17-en-3-one	0.10	Default value for SVOCs; USEPA (2004b), Exhibit 3-4
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	0.14	USEPA (2004b), Exhibit 3-4
2,2-dimethoxy-propane	0.10	Default value for SVOCs; USEPA (2004b), Exhibit 3-4
Hexadecane	0.10	Default value for SVOCs; USEPA (2004b), Exhibit 3-4
Pesticides and PCBs		
PCB-1254	0.14	USEPA (2004b), Exhibit 3-4
Pentchlorobiphenyl	0.14	USEPA (2004b), Exhibit 3-4
Inorganics		
Arsenic	0.03	USEPA (2004b), Exhibit 3-4
Chromium	NA	Dermal exposure is negligible (USEPA, 2004b)
Iron	NA	Dermal exposure is negligible (USEPA, 2004b)
Thallium	NA	Dermal exposure is negligible (USEPA, 2004b)
Unknown TICs		
Unknown; Chemical Class: PAH[1]	0.13	USEPA (2004b), Exhibit 3-4

Notes:
[1] Dermal Absorption Fraction is based on benzo(a)pyrene.

TABLE 4-36
CALCULATION OF DERMAL ABSORBED DOSE PER EVENT FOR CONSTITUENTS IN GROUNDWATER AND SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

For organics, if t_{event} is ≤ t* :

$$DA_{event} = 2FA \times K_P \times C_W \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

For organics, if t_{event} is > t* :

$$DA_{event} = 2FA \times K_P \times C_W \left[\frac{t_{event}}{1+B} + 2\tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

For inorganics :

$$DA_{event} = K_P \times C_W \times t_{event}$$

Parameter	Definition	units	Value
DA_{event}	Absorbed dose per event	mg/cm^2-event	Calculated
FA	Fraction absorbed water	unitless	Constituent-specific*
K_P	Dermal permeability coefficient in water	cm/hr	Constituent-specific*
C_w	Chemical Concentration in water	mg/cm^3	Set to 1 mg/cm^3 for dose calculations
τ_{event}	Lag time per event	hr/event	Constituent-specific*
t_{event}	Event duration	hr/event	Receptor-specific
t*	time to reach steady state	hr	2.4 x τ_{event}
B	ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	unitless	Constituent-specific*

* Note: Constituent-specific factors are from USEPA (2004b).

Constituent	FA	K_P	Cw	τ_{event}	t_{event}	t*	B	(t_{event} ≤ t*)	(t_{event} > t*)	DA_{event}
Volatile Organics										
1,1,2,2-Tetrachloroethane	1	6.90E-03	1	0.93	2	2.23	0.0	2.60E-02	2.66E-02	2.60E-02
1,1-Dichloroethane	1	6.70E-03	1	0.38	2	0.91	0.0	1.61E-02	1.85E-02	1.85E-02
Chloroform	1	6.80E-03	1	0.50	2	1.20	0.0	1.88E-02	2.04E-02	2.04E-02
Diethyl ether	1	2.30E-03	1	0.28	2	0.67	0.0	4.76E-03	5.89E-03	5.89E-03
t-Butanol	1	2.30E-03	1	0.28	2	0.67	0.0	4.76E-03	5.89E-03	5.89E-03
Tetrachloroethene	1	3.30E-02	1	0.91	2	2.18	0.20	1.23E-01	1.27E-01	1.23E-01
Trichloroethene	1	1.20E-02	1	0.58	2	1.39	0.10	3.57E-02	3.71E-02	3.71E-02
Semi-Volatile Organics/PAHs										
1,4-Dioxane	1	3.30E-04	1	0.33	2	0.79	0.0	7.41E-04	8.78E-04	8.78E-04
Benzo(a)pyrene	1	7.00E-01	1	2.69	2	6.46	4.30	4.49E+00	9.56E+00	4.49E+00
Benzo(b)fluoranthene	1	7.00E-01	1	2.77	2	6.65	4.30	4.55E+00	9.84E+00	4.55E+00
Benzo(k)fluoranthene [1]	1	7.00E-01	1	2.77	2	6.65	4.30	4.55E+00	9.84E+00	4.55E+00
Dibenzo(a,h)anthracene	0.6	1.50E+00	1	3.88	2	9.31	9.70	6.93E+00	1.92E+01	6.93E+00
Indeno(1,2,3-cd)pyrene	0.6	1.00E+00	1	3.78	2	9.07	6.70	4.56E+00	1.21E+01	4.56E+00
Semi-Volatile Organics (TICs)										
1,1,2-Trichloro-1-propene [2]	1	3.30E-02	1	0.91	2	2.18	0.20	1.23E-01	1.27E-01	1.23E-01
1,2,3-Trichloro-1-propene [2]	1	3.30E-02	1	0.91	2	2.18	0.20	1.23E-01	1.27E-01	1.23E-01
1,1'-Oxybis[2-ethoxy-]ethane [3]	1	2.30E-03	1	0.28	2	0.67	0.0	4.76E-03	5.89E-03	5.89E-03

Notes:
[1] Values based on benzo(b)fluoranthene.
[2] Values based on tetrachloroethene.
[3] Values based on diethyl ether.

TABLE 4-36
CALCULATION OF DERMAL ABSORBED DOSE PER EVENT FOR CONSTITUENTS IN GROUNDWATER AND SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

For organics, if t_{event} is ≤ t* :

$$DA_{event} = 2FA \times K_P \times C_W \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

For organics, if t_{event} is > t* :

$$DA_{event} = 2FA \times K_P \times C_W \left[\frac{t_{event}}{1+B} + 2\tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

For inorganics :

$$DA_{event} = K_P \times C_W \times t_{event}$$

Parameter	Definition	units	Value
DA_{event}	Absorbed dose per event	mg/cm^2-event	Calculated
FA	Fraction absorbed water	unitless	Constituent-specific*
K_P	Dermal permeability coefficient in water	cm/hr	Constituent-specific*
C_w	Chemical Concentration in water	mg/cm^3	Set to 1 mg/cm^3 for dose calculations
τ_{event}	Lag time per event	hr/event	Constituent-specific*
t_{event}	Event duration	hr/event	Receptor-specific
t*	time to reach steady state	hr	2.4 x τ_{event}
B	ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	unitless	Constituent-specific*

* Note: Constituent-specific factors are from USEPA (2004b).

Constituent	FA	K_P	Cw	τ_{event}	t_{event}	t*	B	(t_{event} ≤ t*)	(t_{event} > t*)	DA_{event}
Alcohols and Glycols										
Ethanol	1	5.40E-04	1	0.19	2	0.46	0.0	9.20E-04	1.29E-03	1.29E-03
Methanol	1	3.20E-04	1	0.16	2	0.38	0.0	5.00E-04	7.42E-04	7.42E-04
Inorganics										
Aluminum	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Arsenic	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Barium	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Cadmium	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Chromium (evaluated as Chromium VI)	NA	2.00E-03	1	NA	2	NA	NA	NA	NA	4.00E-03
Cobalt	NA	4.00E-04	1	NA	2	NA	NA	NA	NA	8.00E-04
Iron	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Manganese	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Mercury	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Nickel	NA	2.00E-04	1	NA	2	NA	NA	NA	NA	4.00E-04
Vanadium	NA	1.00E-03	1	NA	2	NA	NA	NA	NA	2.00E-03
Unknown TICs										
Unknown; Chemical Class: glycol ether derivative [4]	1	2.30E-03	1	0.28	2	0.67	0.0	4.76E-03	5.89E-03	5.89E-03
Unknown; Chemical Class: chlorinated VOC [5]	1	1.20E-02	1	0.58	2	1.39	0.10	3.57E-02	3.71E-02	3.71E-02
Unknown; Chemical Class: alcohol [6]	1	2.30E-03	1	0.28	2	0.67	0.0	4.76E-03	5.89E-03	5.89E-03

Notes:
NA - Not Applicable
[4] Values based on ethylene glycol monobutyl ether.
[5] Values based on trichloroethene.
[6] Values based on n-butanol.

TABLE 4-37
FACTORS USED IN DOSE CALCULATIONS: INCIDENTAL INGESTION OF SOIL OR SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Symbol	Exposure Factor	Outdoor Worker (Soil/Sediment)	Construction Worker (Soil/Sediment)	Youth Trespasser (Sediment)	Recreational Adult (Sediment)	Recreational Youth (Sediment)
CS	Constituent Concentration (mg/kg)	Constituent-Specific; see Tables 4-3 through 4-5 and 4-13 through 4-20				
IR	Soil Ingestion Rate	100 mg/day	330 mg/day	100 mg/day	100 mg/day	100 mg/day
ABS	Gastrointestinal Absorption Factor	100% for all constituents				
CF	Conversion Factor	1×10^{-6} kg/mg	1×10^{-6} kg/mg	1×10^{-6} kg/mg	1×10^{-6} kg/mg	1×10^{-6} kg/mg
EF	Exposure Frequency	225 days/year	20 days/year	24 days/year	45 days/year	45 days/year
ED	Exposure Duration	25 years	1 year	10 years	30 years	10 years
BW	Body Weight	70 kg	70 kg	43.4	70 kg	43.4 kg
AT	Averaging Time	9,125 days (NC) 25,550 days (C)	365 days (NC) 25,550 days (C)	3,650 days (NC) 25,550 days (C)	10,950 days (NC) 25,550 days (C)	3,650 days (NC) 25,550 days (C)

Total Ingested Dose = CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT

(NC) - Non-carcinogenic Averaging Time
(C) - Carcinogenic Averaging Time

TABLE 4-38
FACTORS USED IN DOSE CALCULATIONS: DERMAL CONTACT WITH SOIL OR SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Symbol	Exposure Factor	Outdoor Worker (Soil/Sediment)	Construction Worker (Soil/Sediment)	Youth Trespasser (Sediment)	Recreational Adult (Sediment)	Recreational Youth (Sediment)
CS	Constituent Concentration (mg/kg)	Constituent-Specific; see Tables 4-3 through 4-5 and 4-13 through 4-20				
CF	Conversion Factor	1×10^{-6} kg/mg	1×10^{-6} kg/mg	1×10^{-6} kg/mg	1×10^{-6} kg/mg	1×10^{-6} kg/mg
SA	Skin Surface Area	3,300 cm^2	3,300 cm^2	5,000 cm^2	5,700 cm^2	5,000 cm^2
AF	Soil Adherence Factor	0.2 mg/cm^2	0.3 mg/cm^2	0.2 mg/cm^2	0.07 mg/cm^2	0.2 mg/cm^2
DAF	Dermal Absorption Fraction (unitless)	Constituent-Specific; see Table 4-35				
EF	Exposure Frequency	225 days/year	20 days/year	24 days/year	45 days/year	45 days/year
ED	Exposure Duration	25 years	1 year	10 years	30 years	10 years
BW	Body Weight	70 kg	70 kg	43.4	70 kg	43.4
AT	Averaging Time	9,125 days (NC) 25,550 days (C)	365 days (NC) 25,550 days (C)	3,650 days (NC) 25,550 days (C)	10,950 days (NC) 25,550 days (C)	3,650 days (NC) 25,550 days (C)

Total Absorbed Dose = CS x CF x SA x AF x DAF x EF x ED x 1/BW x 1/AT

(NC) - Non-carcinogenic Averaging Time
(C) - Carcinogenic Averaging Time

TABLE 4-39
FACTORS USED TO CALCULATE THE EXPOSURE CONCENTRATION: INHALATION OF AMBIENT AND INDOOR AIR
Hercules Incorporated Facility - Hopewell, Virginia

Symbol	Exposure Factor	Outdoor Worker	Indoor Worker	Construction Worker
CA	Constituent Concentration in Air (mg/m^3)	Constituent- and area-specific.		
ET	Exposure Time	8 hr/day	8 hr/day	8 hr/day (soil) 2 hr/day (groundwater)
EF	Exposure Frequency	225 days/year	250 days/year	20 days/year
ED	Exposure Duration	25 years	25 years	1 year
AT	Averaging Time	219,000 hours (NC) 613,200 hours (C)	219,000 hours (NC) 613,200 hours (C)	8,760 hours (NC) 613,200 hours (C)

Exposure Concentration = CA x ET x EF x ED x 1/AT

(NC) - Non-carcinogenic Averaging Time
(C) - Carcinogenic Averaging Time

TABLE 4-40
FACTORS USED IN DOSE CALCULATIONS: INCIDENTAL INGESTION OF GROUNDWATER OR SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

Symbol	Exposure Factor	Outdoor Worker (Surface Water)	Construction Worker (Groundwater/ Surface Water)	Youth Trespasser (Surface Water)	Recreational Adult (Surface Water)	Recreational Youth (Surface Water)
CW	Constituent Concentration in Water (mg/L)	Constituent-specific; see Tables 4-6 through 4-12 and 4-21 through 4-30				
IR_W	Water Ingestion Rate	0.05 L/day	0.05 L/day	0.05 L/day	0.05 L/day	0.05 L/day
AF	Gastrointestinal Absorption Factor	100% for all constituents				
EF	Exposure Frequency	20 days/year	20 days/year	24 days/year	45 days/year	45 days/year
ED	Exposure Duration	25 years	1 year	10 years	30 years	10 years
BW	Body Weight	70 kg	70 kg	43.4 kg	70 kg	43.4 kg
AT	Averaging Time	9,125 days (NC)	365 days (NC)	3,650 days (NC)	10,950 days (NC)	3,650 days (NC)
		25,550 days (C)	25,550 days (C)	25,550 days (C)	25,550 days (C)	25,550 days (C)

Total Ingested Dose = $CW \times IR_W \times AF \times EF \times ED \times 1/BW \times 1/AT$

(NC) - Non-carcinogenic Averaging Time
(C) - Carcinogenic Averaging Time

TABLE 4-41
FACTORS USED IN DOSE CALCULATIONS: DERMAL CONTACT WITH GROUNDWATER OR SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

Symbol	Exposure Factor	Outdoor Worker (Surface Water)	Construction Worker (Groundwater/ Surface Water)	Youth Trespasser (Surface Water)	Recreational Adult (Surface Water)	Recreational Youth (Surface Water)
CW	Constituent Concentration in Water (mg/L)	Constituent-specific; see Tables 4-6 through 4-12 and 4-21 through 4-30				
CF	Conversion Factor	1×10^{-3} L/cm^3	1×10^{-3} L/cm^3	1×10^{-3} L/cm^3	1×10^{-3} L/cm^3	1×10^{-3} L/cm^3
SA	Skin Surface Area	900 cm^2	3,300 cm^2	5,000 cm^2	18,000 cm^2	13,200 cm^2
DA_{event}	Dermal Absorbed Dose per Event (mg/cm^2-day)	Constituent-Specific; see Table 4-36				
EF	Exposure Frequency	20 days/year	20 days/year	24 days/year	45 days/year	45 days/year
ED	Exposure Duration	25 years	1 year	10 years	30 years	10 years
BW	Body Weight	70 kg	70 kg	43.4 kg	70 kg	43.4 kg
AT	Averaging Time	9,125 days (NC)	365 days (NC)	3,650 days (NC)	10,950 days (NC)	3,650 days (NC)
		25,550 days (C)	25,550 days (C)	25,550 days (C)	25,550 days (C)	25,550 days (C)

Total Absorbed Dose = CW x CF x SA x DA_{event} x EF x ED x 1/BW x 1/AT

(NC) - Non-carcinogenic Averaging Time
(C) - Carcinogenic Averaging Time

TABLE 5-1
TOXICITY VALUES FOR NONCARCINOGENIC EFFECTS
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Target Organ or Critical Effect	Chronic Oral Reference Dose (mg/kg-day)		Subchronic Oral Reference Dose (mg/kg-day)		Absorption Efficiency Factor	Chronic Dermal Reference Dose [1] (mg/kg-day)	Subchronic Dermal Reference Dose [1] (mg/kg-day)	Chronic Reference Concentration (mg/m^3)		Subchronic Reference Concentration (mg/m^3)	
Volatile Organics												
1,1,2,2-Tetrachloroethane	liver	2.00E-02	I	5.00E-02	I	1	2.00E-02	5.00E-02	NA		NA	
1,1-Dichloroethane	kidney, CNS	2.00E-01	P	2.00E+00	P	1	2.00E-01	2.00E+00	NA		NA	
Chloroform	liver	1.00E-02	I	1.00E-02	H	1	1.00E-02	1.00E-02	9.80E-02	A	9.80E-02	ch
Diethyl Ether	body weight	2.00E-01	I	2.00E-01	ch	1	2.00E-01	2.00E-01	NA		NA	
t-Butanol [2]	nervous system	1.00E-01	I	1.00E-01	ch	1	1.00E-01	1.00E-01	NA		NA	
Tetrachloroethene	liver, CNS	1.00E-02	I	1.00E-02	ch	1	1.00E-02	1.00E-02	2.70E-01	A	2.70E-01	ch
Trichloroethene	- -	NA		NA		1	NA	NA	NA		NA	
Semi-Volatile Organics												
Benzo(a)pyrene	- -	NA		NA		1	NA	NA	NA		NA	
Benzo(b)fluoranthene	- -	NA		NA		1	NA	NA	NA		NA	
Benzo(k)fluoranthene	- -	NA		NA		1	NA	NA	NA		NA	
Dibenz(a,h)anthracene	- -	NA		NA		1	NA	NA	NA		NA	
Indeno(1,2,3-cd)pyrene	- -	NA		NA		1	NA	NA	NA		NA	
1,4-Dioxane	liver	3.00E-02	I	3.00E-02	ch	1	3.00E-02	3.00E-02	3.60E+00	A	3.60E+00	ch
Semi-Volatile Organics (TICs)												
1,1,2-Trichloro-1-propene [3]	liver, CNS	1.00E-02	I	1.00E-02	ch	1	1.00E-02	1.00E-02	2.70E-01	A	2.70E-01	ch
1,2,3-Trichloro-1-propene [3]	liver, CNS	1.00E-02	I	1.00E-02	ch	1	1.00E-02	1.00E-02	2.70E-01	A	2.70E-01	ch
28-Norolean-17-en-3-one [4]	--	NA		NA		1	NA	NA	NA		NA	
Hexadecane [5]	testes, CNS, nasal epithelium	6.00E-02	H	6.00E-01	H	1	6.00E-02	6.00E-01	7.00E-01	I	7.00E-01	ch
2,2-dimethoxy-propane [6]	testes	2.00E-04	P	2.00E-03	A	1	2.00E-04	2.00E-03	2.00E-04	I	2.00E-04	ch
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	--	NA		NA		1	NA	NA	NA		NA	
1,1'-Oxybis[2-ethoxy-]ethane [7]	liver	1.00E-01	I	1.00E-01	ch	1	1.00E-01	1.00E-01	1.60E+00	I	1.60E+00	ch
Alcohols and Glycols												
Ethanol [2]	nervous system	1.00E-01	I	1.00E-01	ch	1	1.00E-01	1.00E-01	NA		NA	
Methanol	liver	5.00E-01	I	5.00E-01	ch	1	5.00E-01	5.00E-01	4.00E+00	C	4.00E+00	ch
PCBs												
PCB-1254	immune system	2.00E-05	I	5.00E-05	H	1	2.00E-05	5.00E-05	NA		NA	
Pentachlorobiphenyl	- -	NA		NA		1	NA	NA	NA		NA	
Inorganics												
Aluminum	developmental nervous system	1.00E+00	P	1.00E+00	A	1	1.00E+00	1.00E+00	5.00E-03	P	5.00E-03	ch
Arsenic	skin, vascular, cardiovascular, nervous system	3.00E-04	I	3.00E-04	H	1	3.00E-04	3.00E-04	1.50E-05	C	1.50E-05	ch

TABLE 5-1
TOXICITY VALUES FOR NONCARCINOGENIC EFFECTS
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Target Organ or Critical Effect	Chronic Oral Reference Dose (mg/kg-day)		Subchronic Oral Reference Dose (mg/kg-day)		Absorption Efficiency Factor	Chronic Dermal Reference Dose [1] (mg/kg-day)	Subchronic Dermal Reference Dose [1] (mg/kg-day)	Chronic Reference Concentration (mg/m^3)		Subchronic Reference Concentration (mg/m^3)	
Inorganics (Continued)												
Barium	kidney, fetus	2.00E-01	I	2.00E-01	A	0.07	1.40E-02	1.40E-02	5.00E-04	H	5.00E-03	H
Cadmium (water)	kidney	5.00E-04	I	5.00E-04	A	0.05	2.50E-05	2.50E-05	1.00E-05	A	1.00E-05	ch
Chromium [8]	respiratory	3.00E-03	I	3.00E-03	ch	0.025	7.50E-05	7.50E-05	1.00E-04	I	1.00E-04	ch
Cobalt	not specified	3.00E-04	P	3.00E-04	ch	1	3.00E-04	3.00E-04	6.00E-06	P	6.00E-06	ch
Iron	blood, liver, GI tract	7.00E-01	P	7.00E-01	ch	1	7.00E-01	7.00E-01	NA		NA	
Manganese (water)	CNS	2.40E-02	I	2.40E-02	ch	0.04	9.60E-04	9.60E-04	5.00E-05	I	5.00E-05	ch
Mercury	CNS	1.60E-04	C	1.60E-04	ch	1	1.60E-04	1.60E-04	3.00E-04	I	3.00E-04	H
Nickel	whole body	2.00E-02	I	2.00E-02	H	0.04	8.00E-04	8.00E-04	9.00E-05	A	9.00E-05	ch
Thallium	liver, blood, hair	NA		NA		1	NA	NA	NA		NA	
Vanadium	kidney	5.00E-03	P	5.00E-03	ch	0.026	1.30E-04	1.30E-04	NA		NA	
Unknown TICs												
Unknown; Chemical Class: glycol ether derivative [9]	liver	1.00E-01	I	1.00E-01	ch	1	1.00E-01	1.00E-01	1.60E+00	I	1.60E+00	ch
Unknown; Chemical Class: chlorinated VOC [10]	- -	NA		NA		1	NA	NA	NA		NA	
Unknown; Chemical Class: alcohol [11]	nervous system	1.00E-01	I	1.00E-01	ch	1	1.00E-01	1.00E-01	NA		NA	
Unknown; Chemical Class: alkene [12]	testes, CNS, nasal epithelium	6.00E-02	H	6.00E-01	H	1	6.00E-02	6.00E-01	7.00E-01	I	7.00E-01	ch
Unknown; 2-methyl-1-propene [12]	testes, CNS, nasal epithelium	6.00E-02	H	6.00E-01	H	1	6.00E-02	6.00E-01	7.00E-01	I	7.00E-01	ch
Unknown; Chemical Class: PAH [13]	- -	NA		NA		1	NA	NA	NA		NA	

Notes:

[1] Dermal RfDs are calculated by multiplying the oral RfDs by the absorption efficiency factor, in accordance with USEPA (2004b).

[2] Toxicity values for t-butanol and ethanol are based on the values for n-butanol.

[3] Toxicity values for 1,1,2-trichloro-1-propene and 1,2,3-trichloro-1-propene are based on the values for tetrachloroethene.

[4] Toxicity values for 28-Norolean-17-en-3-one are based on the values for quinoline.

[5] Toxicity values for hexadecane are based on the values for hexane.

[6] Toxicity values for 2,2-dimethoxy-propane are based on the values for 1,2-dibromo-3-chloropropane.

[7] Toxicity values for ethane, 1,1'-oxybis[2-ethoxy-] are based on the values for ethylene glycol monobutyl ether.

[8] Toxicity values for chromium are conservatively based on the values for hexavalent chromium.

[9] Toxicity values for TIC Unknown; Chemical Class: glycol ether derivative are based on the values for ethylene glycol monobutyl ether.

[10] Toxicity values for TIC Unknown; Chemical Class: chlorinated VOC are based on the values for trichloroethene.

[11] Toxicity values for TIC Unknown; Chemical Class: alcohol are based on the values for n-butanol.

[12] Toxicity values for TIC Unknown; Chemical Class: alkene and Unknown; 2-methyl-1-propene are based on the values for hexane.

[13] Toxicity values for TIC Unknown; Chemical Class: PAH are based on the values for benzo(a)pyrene.

(I) - Integrated Risk Information System (IRIS; USEPA 2010c)

(A) - ATSDR Minimal Risk Levels (MRLs; ATSDR, 2010)

(C) - California EPA Toxicity Value as presented in USEPA Regional Screening Levels Tables (USEPA 2010a)

(H) - Heath Effects Assessment Summary Tables (HEAST; USEPA, 1997b)

(P) - Provisional Peer-Reviewed Toxicity Value (PPRTV) as presented in USEPA Regional Screening Levels Tables (USEPA, 2010a)

(ch) - In the absence of specific information on a subchronic RfD, the chronic RfD is used to be conservative.

NA - Not Available

TABLE 5-2
TOXICITY VALUES FOR POTENTIALLY CARCINOGENIC EFFECTS
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Weight of Evidence Classification	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$		Absorption Efficiency Factor	Dermal Cancer Slope Factor [1] $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk $(mg/m^3)^{-1}$	
Volatile Organics							
1,1,2,2-Tetrachloroethane	likely to be carcinogenic to humans	2.00E-01	I	1	2.00E-01	5.80E-02	I
1,1-Dichloroethane	C	5.70E-03	C	1	5.70E-03	1.60E-03	C
Chloroform	B2	3.10E-02	C	1	3.10E-02	2.30E-02	I
Diethyl Ether	NA	NA		1	NA	NA	
t-Butanol [2]	D	NA		1	NA	NA	
Tetrachloroethene	C	5.40E-01	C	1	5.40E-01	5.90E-03	C
Trichloroethene	in review	5.90E-03	C	1	5.90E-03	2.00E-03	C
Semi-Volatile Organics							
Benzo(a)pyrene *	B2	7.30E+00	I	1	7.30E+00	1.10E+00	C
Benzo(b)fluoranthene *	B2	7.30E-01	E	1	7.30E-01	1.10E-01	C
Benzo(k)fluoranthene *	B2	7.30E-02	E	1	7.30E-02	1.10E-01	C
Dibenz(a,h)anthracene *	B2	7.30E+00	E	1	7.30E+00	1.20E+00	C
Indeno(1,2,3-cd)pyrene *	B2	7.30E-01	E	1	7.30E-01	1.10E-01	C
1,4-Dioxane	likely to be carcinogenic to humans	1.00E-01	I	1	1.00E-01	7.70E-03	C
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene [3]	C	5.40E-01	C	1	5.40E-01	5.90E-03	C
1,2,3-Trichloro-1-propene [3]	C	5.40E-01	C	1	5.40E-01	5.90E-03	C
28-Norolean-17-en-3-one [4]	B2	3.00E+00	I	1	3.00E+00	NA	
Hexadecane [5]	inadequate information to assess carcinogenic potential	NA		1	NA	NA	
2,2-dimethoxy-propane [6*]	B2	8.00E-01	P	1	8.00E-01	6.00E+00	P
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	B2	6.50E+01	C	1	6.50E+01	1.90E+01	C
1,1'-Oxybis[2-ethoxy-]ethane [7]	not likely to be carcinogenic to humans	NA		1	NA	NA	
Alcohols and Glycols							
Ethanol [2]	D	NA		1	NA	NA	
Methanol	NA	NA		1	NA	NA	

TABLE 5-2
TOXICITY VALUES FOR POTENTIALLY CARCINOGENIC EFFECTS
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Weight of Evidence Classification	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$		Absorption Efficiency Factor	Dermal Cancer Slope Factor [1] $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk $(mg/m^3)^{-1}$	
PCBs							
PCB-1254	B2	2.00E+00	I	1	2.00E+00	5.70E-01	I
Pentachlorobiphenyl	B2	1.30E+01	C	1	1.30E+01	3.80E+00	C
Inorganics							
Aluminum	NA	NA		1	NA	NA	
Arsenic	A	1.50E+00	I	1	1.50E+00	4.30E+00	I
Barium	D	NA		0.07	NA	NA	
Cadmium (water)	B1	NA		0.05	NA	1.80E+00	I
Chromium[8 *]	A	5.00E-01	J	0.025	2.00E+01	8.40E+01	I
Cobalt	likely to be carcinogenic to humans	NA		1	NA	9.00E+00	P
Iron	NA	NA		1	NA	NA	
Manganese (water)	D	NA		0.04	NA	NA	
Mercury	D	NA		1	NA	NA	
Nickel	A	NA		0.04	NA	2.60E-01	C
Thallium	inadequate information to assess carcinogenic potential	NA		1	NA	NA	
Vanadium	NA	NA		0.026	NA	NA	

TABLE 5-2
TOXICITY VALUES FOR POTENTIALLY CARCINOGENIC EFFECTS
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Weight of Evidence Classification	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$		Absorption Efficiency Factor	Dermal Cancer Slope Factor [1] $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk $(mg/m^3)^{-1}$	
Unknown TICs							
Unknown; Chemical Class: glycol ether derivative[9]	not likely to be carcinogenic to humans	NA		1	NA	NA	
Unknown; Chemical Class: chlorinated VOC[10]	in review	5.90E-03	C	1	5.90E-03	2.00E-03	C
Unknown; Chemical Class: alcohol[11]	D	NA		1	NA	NA	
Unknown; Chemical Class: alkene[12]	inadequate information to assess carcinogenic potential	NA		1	NA	NA	
Unknown; 2-methyl-1-propene[12]	inadequate information to assess carcinogenic potential	NA		1	NA	NA	
Unknown; Chemical Class: PAH[13*]	B2	7.30E+00	I	1	7.30E+00	1.10E+00	C

Notes:

* Constituent is considered to have a mutagenic mode of action. An age-dependant adjustment factor (ADAF) of 3 is applied to the CSF to evaluate the recreational youth receptor (ages 7 to 16).

[1] The dermal CSF is calculated by dividing the oral CSF by the absorption efficiency factor, in accordance with USEPA (2004b).

[2] Toxicity values for t-butanol and ethanol are based on the values for n-butanol.

[3] Toxicity values for 1,1,2-trichloro-1-propene and 1,2,3-trichloro-1-propene are based on the values for tetrachloroethene.

[4] Toxicity values for 28-Norolean-17-en-3-one are based on the values for quinoline.

[5] Toxicity values for hexadecane are based on the values for hexane.

[6] Toxicity values for 2,2-dimethoxy-propane are based on the values for 1,2-dibromo-3-chloropropane.

[7] Toxicity values for ethane, 1,1'-oxybis[2-ethoxy-] are based on the values for ethylene glycol monobutyl ether.

[8] Toxicity values for chromium are conservatively based on the values for hexavalent chromium.

[9] Toxicity values for TIC Unknown; Chemical Class: glycol ether derivative are based on the values for ethylene glycol monobutyl ether.

[10] Toxicity values for TIC Unknown; Chemical Class: chlorinated VOC are based on the values for trichloroethene.

[11] Toxicity values for TIC Unknown; Chemical Class: alcohol are based on the values for n-butanol.

[12] Toxicity values for TIC Unknown; Chemical Class: alkene and Unknown: 2-methyl-1-propene are based on the values for hexane.

[13] Toxicity values for TIC Unknown; Chemical Class: PAH are based on the values for benzo(a)pyrene.

(I) - Integrated Risk Information System (IRIS; USEPA 2010c)

(C) - California EPA Toxicity Value as presented in USEPA Regional Screening Levels Tables (USEPA 2010a)

(P) - Provisional Peer-Reviewed Toxicity Value (PPRTV) as presented in USEPA Regional Screening Levels Tables (USEPA, 2010a)

(E) - Environmental Criteria and Assessment Office, as presented in USEPA Regional Screening Levels Tables (USEPA 2010a)

(J) - New Jersey toxicity value, as presented in USEPA Regional Screening Levels Tables (USEPA 2010a)

NA - Not Available

TABLE 6-1
SUMMARY OF THEORETICAL EXCESS LIFETIME CANCER RISKS AND NONCANCER HAZARD INDICES FOR ALL RECEPTORS
Hercules Incorporated Facility - Hopewell, Virginia

Risk Assessment Exposure Area	Receptor	Exposure Pathways	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk	Predicted Fetal Blood Lead Level (ug/dL)
Eastern Whitewater Lagoon (SWMU 3)	Outdoor Worker	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.035	4.16E-05	- -
	Construction Worker	Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.16	1.88E-06	- -
Whitewater Lagoons (SWMUS 3 and 4)	Indoor Worker	Inhalation of Volatiles in Indoor Air (Groundwater Source)	NA	9.32E-10	- -
Western Whitewater Lagoon (SWMU 4)	Outdoor Worker	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.027	8.59E-06	- -
	Construction Worker	Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.16	1.56E-07	- -
Landfill Areas (SWMU 5)	Outdoor Worker	Incidental Ingestion of Soil Dermal Contact with Soil Inhalation of Particulate & Volatile Emissions from Soil	0.11	3.03E-05	- -

TABLE 6-1
SUMMARY OF THEORETICAL EXCESS LIFETIME CANCER RISKS AND NONCANCER HAZARD INDICES FOR ALL RECEPTORS
Hercules Incorporated Facility - Hopewell, Virginia

Risk Assessment Exposure Area	Receptor	Exposure Pathways	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk	Predicted Fetal Blood Lead Level (ug/dL)
Landfill Areas (SWMU 5)	Construction Worker	Incidental Ingestion of Soil Dermal Contact with Soil Inhalation of Particulate & Volatile Emissions from Soil Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater	0.056	4.79E-07	5.63
	Indoor Worker	Inhalation of Volatiles in Indoor Air (Groundwater Source)	0.000026	1.49E-08	- -
Natrosol Lagoon (SWMU 7)	Outdoor Worker	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.028	8.34E-06	- -
	Construction Worker	Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.087	1.70E-07	5.63
	Indoor Worker	Inhalation of Volatiles in Indoor Air (Groundwater Source)	0.0047	9.92E-10	- -
Reten/Aqualon Basin SWMUS 8 and 29)	Construction Worker	Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater	0.13	2.64E-07	5.64
	Indoor Worker	Inhalation of Volatiles in Indoor Air (Groundwater Source)	0.00011	NA	- -
Sludge Drying Beds (SWMU 14)	Outdoor Worker	Incidental Ingestion of Soil Dermal Contact with Soil Inhalation of Particulate & Volatile Emissions from Soil Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.023	3.10E-05	- -

TABLE 6-1
SUMMARY OF THEORETICAL EXCESS LIFETIME CANCER RISKS AND NONCANCER HAZARD INDICES FOR ALL RECEPTORS
Hercules Incorporated Facility - Hopewell, Virginia

Risk Assessment Exposure Area	Receptor	Exposure Pathways	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk	Predicted Fetal Blood Lead Level (ug/dL)
Sludge Drying Beds (SWMU 14)	Construction Worker	Incidental Ingestion of Soil Dermal Contact with Soil Inhalation of Particulate & Volatile Emissions from Soil Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.046	3.56E-06	5.64
	Indoor Worker	Inhalation of Volatiles in Indoor Air (Groundwater Source)	NA	NA	- -
Vacuum Filter Sludge Pile (SWMU 15)	Outdoor Worker	Incidental Ingestion of Soil Dermal Contact with Soil Inhalation of Particulate & Volatile Emissions from Soil Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.20	7.53E-05	- -
	Construction Worker	Incidental Ingestion of Soil Dermal Contact with Soil Inhalation of Particulate & Volatile Emissions from Soil Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.065	6.63E-06	5.63
	Indoor Worker	Inhalation of Volatiles in Indoor Air (Groundwater Source)	NA	NA	- -
Main Holding Basin	Construction Worker	Incidental Ingestion of Groundwater Dermal Contact with Groundwater Inhalation of Volatiles from Groundwater	0.16	1.57E-07	5.63
	Indoor Worker	Inhalation of Volatiles in Indoor Air (Groundwater Source)	0.00021	1.88E-08	- -
East Bear Creek	Youth Trespasser	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.13	3.65E-05	5.64

TABLE 6-1
SUMMARY OF THEORETICAL EXCESS LIFETIME CANCER RISKS AND NONCANCER HAZARD INDICES FOR ALL RECEPTORS
Hercules Incorporated Facility - Hopewell, Virginia

Risk Assessment Exposure Area	Receptor	Exposure Pathways	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk	Predicted Fetal Blood Lead Level (ug/dL)
West Bear Creek	Youth Trespasser	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.074	7.20E-06	- -
Unnamed Tributary	Youth Trespasser	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.11	5.40E-06	5.64
Cattail Creek	Recreational Adult	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.10	1.64E-05	- -
	Recreational Youth	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.16	1.53E-05	- -
Bailey Creek	Recreational Adult	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.018	2.04E-06	- -
	Recreational Youth	Incidental Ingestion of Sediment Dermal Contact with Sediment Incidental Ingestion of Surface Water Dermal Contact with Surface Water	0.025	2.52E-06	- -

Notes:
NA - Toxicity values are not available for this endpoint or exposure pathway.
'- -' Lead is not a COI for this area or exposure medium.
Appendix F presents a detailed breakdown of the risk calculations by pathway and constituent.

TABLE 6-2

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE OUTDOOR WORKER - EASTERN WHITEWATER LAGOON (SWMU 3)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics		
Benzo(a)pyrene	NA	8.34E-06
Benzo(b)fluoranthene	NA	1.44E-06
Indeno(1,2,3-cd)pyrene	NA	7.29E-07
Inorganics		
Arsenic	0.018	2.84E-06
Chromium (evaluated as chromium VI)	0.017	9.07E-06
Thallium	NA	NA
Unknown TICs		
Unknown: Chemical Class: PAH	NA	1.92E-05
Cumulative Results	**0.035**	**4.16E-05**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-3

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - EASTERN WHITEWATER LAGOON (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl Ether	0.0022	NA
t-Butanol	0.0001	NA
Semi-Volatile Organics		
Benzo(a)pyrene	NA	1.21E-06
Benzo(b)fluoranthene	NA	2.09E-07
Indeno(1,2,3-cd)pyrene	NA	1.06E-07
1.4-Dioxane	0.000046	1.95E-09
Semi-Volatile Organics (TICs)		
1,1'-Oxybis[2-ethoxy-]ethane	0.00018	NA
Alcohols and Glycols		
Ethanol	0.0041	NA
Methanol	0.00016	NA
Inorganics		
Aluminum	0.000022	NA
Arsenic	0.0056	3.57E-08
Barium	0.0009	NA
Cadmium (water)	0.00004	NA
Chromium (evaluated as chromium VI)	0.0068	1.45E-07
Cobalt	0.011	NA
Iron	0.011	NA
Manganese (water)	0.11	NA
Nickel	0.000071	NA
Thallium	NA	NA
Unknown TICs		
Unknown: Chemical Class: glycol ether derivative	0.0029	NA
Unknown: Chemical Class: chlorinated VOC	NA	9.46E-11
Unknown: Chemical Class: PAH	NA	1.69E-07
Cumulative Results	**0.16**	**1.88E-06**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-4

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE INDOOR WORKER - EASTERN AND WESTERN WHITEWATER LAGOONS (SWMUS 3 AND 4)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl ether	NA	NA
Unknown TICs		
Unknown; Chemical Class: chlorinated VOC	NA	9.32E-10
Cumulative Results	**0.000**	**9.32E-10**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-5

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE OUTDOOR WORKER - WESTERN WHITEWATER LAGOON (SWMU 4)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Inorganics		
Arsenic	0.016	2.60E-06
Chromium (evaluated as chromium VI)	0.011	5.99E-06
Thallium	NA	NA
Cumulative Results	**0.027**	**8.59E-06**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-6

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - WESTERN WHITEWATER LAGOON (SWMU 4)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl Ether	0.0022	NA
t-Butanol	0.0001	NA
Semi-Volatile Organics		
1.4-Dioxane	0.000046	1.95E-09
Semi-Volatile Organics (TICs)		
1,1'-Oxybis[2-ethoxy-]ethane	0.00018	NA
Alcohols and Glycols	NA	
Ethanol	0.0041	NA
Methanol	0.00016	NA
Inorganics		
Aluminum	0.000022	NA
Arsenic	0.0052	3.34E-08
Barium	0.0009	NA
Cadmium (water)	0.00004	NA
Chromium (evaluated as chromium VI)	0.0056	1.20E-07
Cobalt	0.011	NA
Iron	0.011	NA
Manganese (water)	0.11	NA
Nickel	0.000071	NA
Thallium	NA	NA
Unknown TICs		
Unknown: Chemical Class: glycol ether derivative	0.0029	NA
Unknown: Chemical Class: chlorinated VOC	NA	9.46E-11
Cumulative Results	**0.16**	**1.56E-07**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-7

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE OUTDOOR WORKER - LANDFILL AREAS (SWMU 5)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)		
28-Norolean-17-en-3-one	NA	2.35E-06
2,2-dimethoxy-propane	0.046	1.50E-05
Inorganics		
Arsenic	0.055	8.76E-06
Chromium (evaluated as chromium VI)	0.0076	4.19E-06
Thallium	NA	NA
Cumulative Results	**0.11**	**3.03E-05**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-8

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - LANDFILL AREAS (SWMU 5)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
1,1-Dichloroethane	0.000000048	8.00E-12
Diethyl Ether	0.000054	NA
t-Butanol	0.00037	NA
Semi-Volatile Organics		
1.4-Dioxane	0.000033	1.42E-09
Semi-Volatile Organics (TICs)		
1,1,2-Trichloro-1-propene	0.00026	2.04E-08
1,2,3-Trichloro-1-propene	0.00024	1.85E-08
28-Norolean-17-en-3-one	NA	2.16E-08
2,2-dimethoxy-propane	0.015	2.61E-07
1,1'-Oxybis[2-ethoxy-]ethane	0.00012	NA
Inorganics		
Aluminum	0.000015	NA
Arsenic	0.015	9.42E-08
Barium	0.000085	NA
Chromium (evaluated as chromium VI)	0.0029	6.18E-08
Cobalt	0.00081	NA
Iron	0.00063	NA
Manganese (water)	0.021	NA
Nickel	0.000025	NA
Thallium	NA	NA
Vanadium	0.00015	NA
Cumulative Results	**0.056**	**4.79E-07**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-9

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE INDOOR WORKER - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl ether	NA	NA
Semi-Volatile Organics (TICs)		
1,1,2-Trichloro-1-propene	0.000014	7.84E-09
1,2,3-Trichloro-1-propene	0.000012	7.10E-09
Cumulative Results	**0.000026**	**1.49E-08**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-10
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE CONSTRUCTION WORKER POTENTIALLY EXPOSED TO GROUNDWATER - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	0.78	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	20	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.26	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.63	µg/dL

TABLE 6-11

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE OUTDOOR WORKER - NATROSOL LAGOON (SWMU 7)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Inorganics		
Arsenic	0.017	2.75E-06
Chromium (evaluated as chromium VI)	0.010	5.60E-06
Thallium	NA	NA
Cumulative Results	**0.028**	**8.34E-06**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-12

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl Ether	0.00000013	NA
t-Butanol	0.050	NA
Trichloroethene	NA	9.93E-11
Semi-Volatile Organics		
1.4-Dioxane	0.000018	7.69E-10
Inorganics		
Aluminum	0.00014	NA
Arsenic	0.0057	3.70E-08
Barium	0.000071	NA
Cadmium (water)	0.000083	NA
Chromium (evaluated as chromium VI)	0.0062	1.32E-07
Cobalt	0.0037	NA
Iron	0.00061	NA
Manganese (water)	0.019	NA
Nickel	0.00011	NA
Thallium	NA	NA
Vanadium	0.00067	NA
Unknown TICs		
Unknown: Chemical Class: alcohol	0.00087	NA
Cumulative Results	**0.087**	**1.70E-07**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-13

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE INDOOR WORKER - NATROSOL LAGOON (SWMU 7)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl ether	NA	NA
Trichloroethene	NA	9.92E-10
Unknown TICs		
Unknown; Chemical Class: alkene	0.0026	NA
Unknown; 2-methyl-1-propene	0.0021	NA
Cumulative Results	**0.0047**	**9.92E-10**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-14
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE CONSTRUCTION WORKER POTENTIALLY EXPOSED TO GROUNDWATER - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	1.0	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	20	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.26	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.63	µg/dL

TABLE 6-15

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl Ether	0.000003	NA
t-Butanol	0.0003	NA
Alcohols and Glycols		
Methanol	0.00009	NA
Inorganics		
Aluminum	0.0011	NA
Arsenic	0.0014	8.83E-09
Barium	0.00011	NA
Cadmium (water)	0.00013	NA
Chromium (evaluated as chromium VI)	0.012	2.55E-07
Cobalt	0.021	NA
Iron	0.0095	NA
Manganese (water)	0.084	NA
Mercury	0.00015	NA
Nickel	0.00032	NA
Vanadium	0.0045	NA
Cumulative Results	**0.13**	**2.64E-07**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-16

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE INDOOR WORKER - RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl ether	NA	NA
Inorganics		
Mercury	0.00011	NA
Cumulative Results	**0.00011**	**NA**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-17
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE CONSTRUCTION WORKER POTENTIALLY EXPOSED TO GROUNDWATER - RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	11.9	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	20	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.26	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.64	µg/dL

TABLE 6-18

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE OUTDOOR WORKER - SLUDGE DRYING BEDS (SWMU 14)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics		
Benzo(a)pyrene	NA	5.51E-06
Dibenz(a,h)anthracene	NA	1.67E-05
Indeno(1,2,3-cd)pyrene	NA	1.10E-06
Inorganics		
Arsenic	0.011	1.73E-06
Chromium (evaluated as chromium VI)	0.011	5.94E-06
Cobalt	0.0002	NA
Iron	0.00031	NA
Manganese (water)	0.00073	NA
Cumulative Results	**0.023**	**3.10E-05**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-19

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl Ether	0.00000015	NA
t-Butanol	0.0000016	NA
Semi-Volatile Organics		
Benzo(a)pyrene	NA	8.01E-07
Dibenz(a,h)anthracene	NA	2.43E-06
Indeno(1,2,3-cd)pyrene	NA	1.60E-07
Inorganics		
Aluminum	0.00043	NA
Arsenic	0.0041	2.61E-08
Barium	0.0003	NA
Cadmium (water)	0.00011	NA
Chromium (evaluated as chromium VI)	0.0068	1.46E-07
Cobalt	0.0021	NA
Iron	0.012	NA
Manganese (water)	0.018	NA
Nickel	0.0001	NA
Vanadium	0.0021	NA
Cumulative Results	**0.046**	**3.56E-06**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-20

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE INDOOR WORKER - SLUDGE DRYING BEDS (SWMU 14)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl ether	0.0	0.00E+00
Cumulative Results	**NA**	**NA**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-21
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE CONSTRUCTION WORKER POTENTIALLY EXPOSED TO GROUNDWATER - SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	9.17	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	20	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.26	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.64	µg/dL

TABLE 6-22

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE OUTDOOR WORKER - VACUUM FILTER SLUDGE PILE (SWMU 15)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics		
Benzo(a)pyrene	NA	8.01E-06
Benzo(k)fluoranthene	NA	4.91E-08
Dibenz(a,h)anthracene	NA	3.34E-05
Indeno(1,2,3-cd)pyrene	NA	1.44E-06
Inorganics		
Arsenic	0.032	5.17E-06
Chromium (evaluated as chromium VI)	0.050	2.73E-05
Cobalt	0.00016	NA
Iron	0.12	NA
Cumulative Results	**0.20**	**7.53E-05**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-23

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl Ether	0.000021	NA
Semi-Volatile Organics		
Benzo(a)pyrene	NA	1.16E-06
Benzo(k)fluoranthene	NA	7.14E-09
Dibenz(a,h)anthracene	NA	4.86E-06
Indeno(1,2,3-cd)pyrene	NA	2.10E-07
Inorganics		
Aluminum	0.000012	NA
Arsenic	0.0089	5.75E-08
Barium	0.000079	NA
Chromium (evaluated as chromium VI)	0.015	3.31E-07
Cobalt	0.00051	NA
Iron	0.035	NA
Manganese (water)	0.0053	NA
Nickel	0.0000068	NA
Vanadium	0.000071	NA
Cumulative Results	**0.065**	**6.63E-06**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-24

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE INDOOR WORKER - VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl ether	0.00	0.00E+00
Cumulative Results	**NA**	**NA**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-25
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE CONSTRUCTION WORKER POTENTIALLY EXPOSED TO GROUNDWATER -
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	0.22	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	20	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.26	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.63	µg/dL

TABLE 6-26

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - MAIN HOLDING BASIN

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
1,1,2,2-Tetrachloroethane	0.000002	2.92E-10
1,1-Dichloroethane	0.00000011	1.82E-11
Chloroform	0.000006	2.81E-11
Diethyl Ether	0.0013	NA
t-Butanol	0.0009	NA
Tetrachloroethene	0.00079	6.06E-08
Trichloroethene	NA	3.78E-11
Semi-Volatile Organics		
1.4-Dioxane	0.000021	9.13E-10
Semi-Volatile Organics (TICs)		
1,1,2-Trichloro-1-propene	0.00025	1.93E-08
1,2,3-Trichloro-1-propene	0.00019	1.49E-08
1,1'-Oxybis[2-ethoxy-]ethane	0.0003	NA

TABLE 6-26

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE CONSTRUCTION WORKER - MAIN HOLDING BASIN

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Alcohols and Glycols		
Ethanol	0.0014	NA
Methanol	0.00015	NA
Inorganics		
Aluminum	0.000025	NA
Arsenic	0.0032	2.03E-08
Barium	0.00035	NA
Cadmium (water)	0.00071	NA
Chromium (evaluated as chromium VI)	0.0019	4.05E-08
Cobalt	0.014	NA
Iron	0.0048	NA
Manganese (water)	0.064	NA
Mercury	0.00023	NA
Nickel	0.00015	NA
Vanadium	0.061	NA
Unknown TICs		
Unknown: Chemical Class: glycol ether derivative	0.00014	NA
Unknown: Chemical Class: chlorinated VOC	NA	1.66E-10
Cumulative Results	**0.16**	**1.57E-07**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-27

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE INDOOR WORKER - MAIN HOLDING BASIN

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Volatile Organics		
Diethyl ether	NA	NA
Tetrachloroethene	0.000019	1.07E-08
Trichloroethene	NA	3.79E-10
Semi-Volatile Organics (TICs)		
1,1,2-Trichloro-1-propene	0.000006	3.41E-09
1,2,3-Trichloro-1-propene	0.0000046	2.63E-09
Inorganics		
Mercury	0.00018	NA
Unknown TICs		
Unknown; Chemical Class: chlorinated VOC	NA	1.66E-09
Cumulative Results	**0.00021**	**1.88E-08**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-28
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE CONSTRUCTION WORKER POTENTIALLY EXPOSED TO GROUNDWATER - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	0.77	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	20	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.26	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.63	µg/dL

TABLE 6-29

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE YOUTH TRESPASSER - EAST BEAR CREEK

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Inorganics		
Aluminum	0.0059	NA
Arsenic	0.016	1.05E-06
Chromium (evaluated as chromium VI)	0.055	3.54E-05
Cobalt	0.0055	NA
Iron	0.0087	NA
Manganese (water)	0.025	NA
Mercury	0.00015	NA
Thallium	NA	NA
Vanadium	0.018	NA
Cumulative Results	**0.13**	**3.65E-05**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-30
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE YOUTH TRESPASSER POTENTIALLY EXPOSED TO SURFACE WATER - EAST BEAR CREEK
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	16.4	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	24	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.27	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.64	µg/dL

TABLE 6-31

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE YOUTH TRESPASSER - WEST BEAR CREEK

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)		
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	NA	7.43E-07
PCBs		
PCB-1254	0.024	1.37E-07
Pentachlorobiphenyl	NA	8.10E-08
Inorganics		
Aluminum	0.00036	NA
Arsenic	0.0057	3.65E-07
Chromium (evaluated as chromium VI)	0.0046	2.93E-06
Cobalt	0.00074	NA
Iron	0.00057	NA
Manganese (water)	0.011	NA
Thallium	NA	NA
Vanadium	0.028	NA
Unknown TICs		
Unknown: Chemical Class: PAH	NA	2.94E-06
Cumulative Results	**0.074**	**7.20E-06**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-32

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE YOUTH TRESPASSER - UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
PCBs		
PCB-1254	0.065	3.74E-07
Pentachlorobiphenyl	NA	1.55E-07
Inorganics		
Aluminum	0.00044	NA
Arsenic	0.0092	5.94E-07
Chromium (evaluated as chromium VI)	0.0058	3.70E-06
Cobalt	0.0011	NA
Iron	0.0026	NA
Manganese (water)	0.017	NA
Thallium	NA	NA
Vanadium	0.0087	NA
Unknown TICs		
Unknown: Chemical Class: PAH	NA	5.78E-07
Cumulative Results	**0.11**	**5.40E-06**

Notes:
NA = Toxicity values are not available for this endpoint.

TABLE 6-33
CALCULATED BLOOD LEAD CONCENTRATIONS FOR THE YOUTH TRESPASSER POTENTIALLY EXPOSED TO LEAD IN SURFACE WATER - UNNAMED TRIBUTARY
Hercules Incorporated Facility - Hopewell, Virginia

Equation:

$$PbB_{adult,central} = PbB_{adult,0} + (PbW \times BKSF \times IR_W \times AF_W \times EF_W) / AT$$

$$PbB_{adult,0.95} = PbB_{adult,central} \times GSDi^{1.645}$$

$$PbB_{fetal,0.95} = PbB_{adult,0.95} \times R_{fetal/maternal}$$

Symbol	Input Parameter	Value	
$PbB_{adult,0}$	Typical blood lead concentration	2.0	µg/dL
BKSF	Biokinetic slope factor	0.4	[µg/dL] / [µg/day]
PbW	Average water lead concentration	7.55	µg/L
IR_W	Intake rate of water	0.050	L/day
AF_W	Absolute absorption fraction	0.20	unitless
EF_W	Exposure frequency - water	24	days/year
AT	Averaging time	365	days/year
GSDi	Geometric standard deviation	2.0	unitless
$R_{fetal/maternal}$	Transfer factor	0.9	unitless

	Calculated Results	Value	
$PbB_{adult,central}$	Blood lead level: Adult, central tendency	2.00	µg/dL
$PbB_{adult,0.95}$	Blood lead level: Adult, 95th Percentile	6.26	µg/dL
$PbB_{fetal,0.95}$	Blood lead level: Fetus, 95th Percentile	5.64	µg/dL

TABLE 6-34

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE RECREATIONAL ADULT - CATTAIL CREEK

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)		
Hexadecane	0.002	NA
Inorganics		
Arsenic	0.052	1.01E-05
Chromium (evaluated as chromium VI)	0.0087	5.58E-06
Cobalt	0.00098	NA
Iron	0.0011	NA
Manganese (water)	0.040	NA
Thallium	NA	NA
Unknown TICs		
Unknown: Chemical Class: PAH	NA	7.53E-07
Cumulative Results	**0.10**	**1.64E-05**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-35

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE RECREATIONAL YOUTH - CATTAIL CREEK

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)		
Hexadecane	0.0045	NA
Inorganics		
Arsenic	0.097	6.21E-06
Chromium (evaluated as chromium VI)	0.011	7.27E-06
Cobalt	0.0015	NA
Iron	0.0015	NA
Manganese (water)	0.048	NA
Thallium	NA	NA
Unknown TICs		
Unknown: Chemical Class: PAH	NA	1.84E-06
Cumulative Results	**0.16**	**1.53E-05**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-36

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE RECREATIONAL ADULT - BAILEY CREEK

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Inorganics		
Arsenic	0.0039	7.55E-07
Chromium (evaluated as chromium VI)	0.002	1.28E-06
Iron	0.00071	NA
Manganese (water)	0.011	NA
Thallium	NA	NA
Cumulative Results	**0.018**	**2.04E-06**

Notes:

NA = Toxicity values are not available for this endpoint.

TABLE 6-37

THEORETICAL EXCESS LIFETIME CANCER RISK AND NONCANCER HAZARD INDEX FOR THE RECREATIONAL YOUTH - BAILEY CREEK

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Noncancer Hazard Index	Theoretical Excess Lifetime Cancer Risk
Inorganics		
Arsenic	0.007	4.50E-07
Chromium	0.0032	2.07E-06
Iron	0.001	NA
Manganese (water)	0.013	NA
Thallium	NA	NA
Cumulative Results	**0.025**	**2.52E-06**

Notes:

NA = Toxicity values are not available for this endpoint.

APPENDIX A

ANALYTICAL DATA

STANDARD ANALYTICAL RESULTS AND KNOWN TENTATIVELY INDENTIFIED COMPOUNDS

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-1	OLF-1 DUP	OLF-2	OLF-3	OLF-4	OLF-5	OLF-6	OLF-7
Sample Date		7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007
Sample Type		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**								
Volatile Organics (mg/kg)									
1,1,1,2-Tetrachloroethane	630-20-6	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,1,1-Trichloroethane	71-55-6	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,1,2,2-Tetrachloroethane	79-34-5	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,1,2-Trichloroethane	79-00-5	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,1-Dichloroethane	75-34-3	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,1-Dichloroethene	75-35-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,2,3-Trichloropropane	96-18-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.0091	< 0.0094	< 0.012	< 0.0098	< 0.009	< 0.01	< 0.023	< 0.0084
1,2-Dibromoethane	106-93-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,2-Dichloroethane	107-06-2	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
trans-1,2-Dichloroethene	156-60-5	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,2-Dichloropropane	78-87-5	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
cis-1,3-Dichloropropene	10061-01-5	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
trans-1,3-Dichloropropene	10061-02-6	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
1,4-Dioxane	123-91-1	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	78-93-3	< 0.023	< 0.024	< 0.03	< 0.024	< 0.022	< 0.026	0.025 J	< 0.021
2-Hexanone	591-78-6	< 0.023	< 0.024	< 0.03	< 0.024	< 0.022	< 0.026	< 0.057	< 0.021
2-Methyl-1-propanol (Isobutyl Alcohol)	78-83-1	< 0.18	< 0.19	< 0.24	< 0.2	< 0.18	< 0.21	< 0.46	< 0.17
3-Methylhexane	589-34-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
4-Methyl-2-pentanone (MIBK)	108-10-1	< 0.023	< 0.024	< 0.03	< 0.024	< 0.022	< 0.026	< 0.057	< 0.021
Acetone	67-64-1	< 0.046	< 0.047	< 0.061	0.0057 B	< 0.045	< 0.052	0.14	0.012 B
Acetonitrile	75-05-8	< 0.18	< 0.19	< 0.24	< 0.2	< 0.18	< 0.21	< 0.46	< 0.17
Acrolein	107-02-08	< 0.091	< 0.094	< 0.12	< 0.098	< 0.09	< 0.1	< 0.23	< 0.084
Acrylonitrile	107-13-1	< 0.091	< 0.094	< 0.12	< 0.098	< 0.09	< 0.1	< 0.23	< 0.084
Allyl alcohol	107-18-6	NA	NA	NA	NA	NA	NA	NA	NA
Allyl chloride	107-05-1	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Benzene	71-43-2	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Benzyl chloride	100-44-7	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Bromodichloromethane	75-27-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Bromoform	75-25-2	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Bromomethane	74-83-9	< 0.0046 J	< 0.0047 J	< 0.0061 J	< 0.0049 J	< 0.0045 J	< 0.0052 J	< 0.011 J	< 0.0042 J
Carbon disulfide	75-15-0	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Carbon tetrachloride	56-23-5	< 0.0046 J	< 0.0047 J	< 0.0061 J	< 0.0049 J	< 0.0045 J	< 0.0052 J	< 0.011 J	< 0.0042 J
Chlorobenzene	108-90-7	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Chloroethane	75-00-3	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Chloroform	67-66-3	< 0.0046	< 0.0047	< 0.0061	< 0.0049	0.0022 J	< 0.0052	< 0.011	< 0.0042
Chloromethane	74-87-3	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Chloroprene	126-99-8	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Dibromochloromethane	124-48-1	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Dibromomethane	74-95-3	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-1	OLF-1 DUP	OLF-2	OLF-3	OLF-4	OLF-5	OLF-6	OLF-7
Sample Date		7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007
Sample Type		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**								
Dichlorodifluoromethane	75-71-8	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Dichlorofluoromethane	75-43-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Diethyl ether	60-29-7	< 0.0091	< 0.0094	< 0.012	< 0.0098	< 0.009	< 0.01	< 0.023	< 0.0084
Ethanol	64-17-5	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl methacrylate	97-63-2	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Ethylbenzene	100-41-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Ethylene oxide	75-21-8	< 0.091	< 0.094	< 0.12	< 0.098	< 0.09	< 0.1	< 0.23	< 0.084
Iodomethane	74-88-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Methacrylonitrile	126-98-7	< 0.091	< 0.094	< 0.12	< 0.098	< 0.09	< 0.1	< 0.23	< 0.084
Methyl methacrylate	80-62-6	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Methylene Chloride	75-09-2	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
n-Heptane	142-82-5	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Pentachloroethane	76-01-7	< 0.023	< 0.024	< 0.03	< 0.024	< 0.022	< 0.026	< 0.057	< 0.021
Propionitrile	107-12-0	< 0.091	< 0.094	< 0.12	< 0.098	< 0.09	< 0.1	< 0.23	< 0.084
Propylene oxide	75-56-9	< 0.091	< 0.094	< 0.12	< 0.098	< 0.09	< 0.1	< 0.23	< 0.084
Styrene	100-42-5	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
t-Butanol	75-65-0	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Tetrachloroethene	127-18-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Toluene	108-88-3	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
trans-1,4-Dichloro-2-butene	110-57-6	< 0.0091	< 0.0094	< 0.012	< 0.0098	< 0.009	< 0.01	< 0.023	< 0.0084
Trichloroethylene	79-01-6	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Trichlorofluoromethane	75-69-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Vinyl acetate	108-05-4	< 0.0091	< 0.0094	< 0.012	< 0.0098	< 0.009	< 0.01	< 0.023	< 0.0084
Vinyl chloride	75-01-4	< 0.0046	< 0.0047	< 0.0061	< 0.0049	< 0.0045	< 0.0052	< 0.011	< 0.0042
Xylenes, Total	1330-20-7	< 0.0091	< 0.0094	< 0.012	< 0.0098	< 0.009	< 0.01	< 0.023	< 0.0084
Volatile Organics (TICs) (mg/kg)									
4-Isopropyltoluene	99-87-6	NA	NA	0.0019 J	NA	NA	0.0014 J	NA	NA
Carbon Dioxide	124-38-9	1 B	0.86 B	2.4 B	1.2 B	1.9 B	2.4 B	2.4 B	1.6 B
1,2,4-Trimethylbenzene	95-63-6	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	108-67-8	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	NA	NA	NA	NA	NA	NA	NA	NA
3-Ethyltoluene	620-14-4	NA	NA	NA	NA	NA	NA	NA	NA
Acetaldehyde	75-07-0	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, 3-methyl-	590-86-3	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, isomer		NA	NA	NA	NA	NA	NA	NA	NA
C10H16		NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	NA	NA	NA	NA	NA	NA	NA	NA
Heptanal	111-71-7	NA	NA	NA	NA	NA	NA	NA	NA
Hexanal	66-25-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexane	110-54-3	NA	NA	NA	NA	NA	NA	NA	NA
Pentanal	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	OLF-1 7/5/2007 Investigation Landfill Surface	OLF-1 DUP 7/5/2007 Duplicate Landfill Surface	OLF-2 7/5/2007 Investigation Landfill Surface	OLF-3 7/5/2007 Investigation Landfill Surface	OLF-4 7/5/2007 Investigation Landfill Surface	OLF-5 7/5/2007 Investigation Landfill Surface	OLF-6 7/5/2007 Investigation Landfill Surface	OLF-7 7/5/2007 Investigation Landfill Surface
Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1,2,4-Trichlorobenzene	120-82-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1,2-Dichlorobenzene	95-50-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1,3,5-Trinitrobenzene	99-35-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1,3-Dichlorobenzene	541-73-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1,4-Dichlorobenzene	106-46-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1,4-Dioxane	123-91-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1,4-Naphthoquinone	130-15-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
1-Naphthalenamine	134-32-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,2'-oxybis[1-chloropropane]	108-60-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,3,4,6-Tetrachlorophenol	58-90-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,4,5-Trichlorophenol	95-95-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,4,6-Trichlorophenol	88-06-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,4-Dichlorophenol	120-83-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,4-Dimethylphenol	105-67-9	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,4-Dinitrophenol	51-28-5	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
2,4-Dinitrotoluene	121-14-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,6-Dichlorophenol	87-65-0	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2,6-Dinitrotoluene	606-20-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Acetylaminofluorene	53-96-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Chloronaphthalene	91-58-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Chlorophenol	95-57-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Methylnaphthalene	91-57-6	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Methylphenol	95-48-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Naphthalenamine	91-59-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Nitroaniline	88-74-4	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
2-Nitrophenol	88-75-5	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-Picoline	109-06-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
3 & 4 Methylphenol	15831-10-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
3,3'-Dichlorobenzidine	91-94-1	< 0.74	< 0.76	< 0.78	< 0.81	< 0.72	< 0.7	< 0.97	< 0.73
3,3'-Dimethylbenzidine	119-93-7	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
3-Methylcholanthrene	56-49-5	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
3-Nitroaniline	99-09-2	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
4,6-Dinitro-2-methylphenol	534-52-1	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
4-Aminobiphenyl	92-67-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
4-Bromophenyl phenyl ether	101-55-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
4-Chloro-3-methylphenol	59-50-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
4-Chloroaniline	106-47-8	< 0.74	< 0.76	< 0.78	< 0.81	< 0.72	< 0.7	< 0.97	< 0.73
4-Chlorophenyl phenyl ether	7005-72-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-1	OLF-1 DUP	OLF-2	OLF-3	OLF-4	OLF-5	OLF-6	OLF-7
Sample Date		7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007
Sample Type		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**								
4-Nitroaniline	100-01-6	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
4-Nitrophenol	100-02-7	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
4-Nitroquinoline-1-oxide	56-57-5	3.7 R	3.8 R	3.9 R	4 R	3.6 R	3.5 R	4.8 R	3.7 R
5-Nitro-o-toluidine	99-55-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
7,12-Dimethylbenz(a)anthracene	57-97-6	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Acenaphthene	83-32-9	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Acenaphthylene	208-96-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Acetophenone	98-86-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 75	< 77	< 80	< 82	< 73	< 71	< 98	< 74
Aniline	62-53-3	< 0.74	< 0.76	< 0.78	< 0.81	< 0.72	< 0.7	< 0.97	< 0.73
Anthracene	120-12-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Aramite, Total	140-57-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Benzo[a]anthracene	56-55-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	0.043 J	< 0.48	< 0.37
Benzo[a]pyrene	50-32-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	0.045 J	< 0.48	< 0.37
Benzo[b]fluoranthene	205-99-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	0.069 J	< 0.48	< 0.37
Benzo[g,h,i]perylene	191-24-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	0.031 J	< 0.48	< 0.37
Benzo[k]fluoranthene	207-08-09	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	0.029 J	< 0.48	< 0.37
Benzyl alcohol	100-51-6	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Bis(2-chloroethoxy)methane	111-91-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Bis(2-chloroethyl)ether	111-44-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Bis(2-ethylhexyl) phthalate	117-81-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Butyl benzyl phthalate	85-68-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Chrysene	218-01-9	< 0.37	< 0.38	< 0.39	< 0.4	0.024 J	0.066 J	< 0.48	< 0.37
Diallate	2303-16-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Dibenz(a,h)anthracene	53-70-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Dibenzofuran	132-64-9	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Diethyl phthalate	84-66-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Dimethoate	60-51-5	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Dimethyl phthalate	131-11-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Di-n-butyl phthalate	84-74-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Di-n-octyl phthalate	117-84-0	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Ethyl methanesulfonate	62-50-0	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Fluoranthene	206-44-0	< 0.37	< 0.38	< 0.39	< 0.4	0.024 J	0.17 J	< 0.48	< 0.37
Fluorene	86-73-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Hexachlorobenzene	118-74-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Hexachlorobutadiene	87-68-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Hexachlorocyclopentadiene	77-47-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Hexachloroethane	67-72-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Hexachlorophene	70-30-4	< 190	< 190	< 200	< 210	< 190	< 180	< 250	< 190
Hexachloropropene	1888-71-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Indeno[1,2,3-cd]pyrene	193-39-5	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-1	OLF-1 DUP	OLF-2	OLF-3	OLF-4	OLF-5	OLF-6	OLF-7
Sample Date		7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007
Sample Type		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**								
Isophorone	78-59-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Isosafrole	120-58-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
m-Dinitrobenzene	99-65-0	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Methapyrilene	91-80-5	< 75	< 77	< 80	< 82	< 73	< 71	< 98	< 74
Methyl methanesulfonate	66-27-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Naphthalene	91-20-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Nitrobenzene	98-95-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosodiethylamine	55-18-5	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosodimethylamine	62-75-9	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosodi-n-butylamine	924-16-3	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosodi-n-propylamine	621-64-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosodiphenylamine	86-30-6	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosomethylethylamine	10595-95-6	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosomorpholine	59-89-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosopiperidine	100-75-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
N-Nitrosopyrrolidine	930-55-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
o,o',o''-Triethylphosphorothioate	126-68-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
o-Toluidine	95-53-4	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
p-Dimethylamino azobenzene	60-11-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Pentachlorobenzene	608-93-5	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Pentachloronitrobenzene	82-68-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Pentachlorophenol	87-86-5	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
Phenacetin	62-44-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Phenanthrene	85-01-8	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	0.13 J	< 0.48	< 0.37
Phenol	108-95-2	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
p-Phenylene diamine	106-50-3	< 1.9	< 1.9	< 2	< 2.1	< 1.9	< 1.8	< 2.5	< 1.9
Pronamide	23950-58-5	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Pyrene	129-00-0	< 0.37	< 0.38	< 0.39	< 0.4	0.021 J	0.12 J	< 0.48	< 0.37
Pyridine	110-86-1	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37
Safrole, Total	94-59-7	< 0.37	< 0.38	< 0.39	< 0.4	< 0.36	< 0.35	< 0.48	< 0.37

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-1		OLF-1 DUP		OLF-2		OLF-3		OLF-4		OLF-5		OLF-6		OLF-7	
Sample Date		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007	
Sample Type		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		Landfill		Landfill		Landfill		Landfill		Landfill		Landfill		Landfill		Landfill	
Surface/Subsurface		Surface		Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**																
Semi-Volatile Organics (TICs) (mg/kg)																	
Ergostanol	6538-02-9	NA		NA		NA		NA		NA		NA		NA		NA	
.gamma.-Sitosterol	83-47-6	NA		NA		NA		NA		NA		NA		0.37	JN	NA	
28-Norolean-17-en-3-one	5912-72-1	NA		1.5	JN	NA		NA		NA		NA		NA		NA	
2-Pentanone, 4-hydroxy-4-methyl-	123-42-2	NA		19	A	NA		NA		NA		NA		NA		NA	
2-Pentanone, 4-methoxy-4-methyl-	107-70-0	0.26	A	0.39	A	0.29	A	0.29	A	0.29	A	0.26	A	0.4	A	0.38	A
3-Penten-2-one, 4-methyl-	141-79-7	NA		0.41	A	0.29	A	NA		NA		0.27	A	0.43	A	0.37	A
4,5-Dimethylthiazole S-oxide		NA		NA		NA		NA		NA		NA		NA		NA	
alpha-Pinene		NA		0.74		NA		NA		NA		NA		NA		NA	
Benzene, 1-methyl-4-(1-methylethyl)-	99-87-6	NA		0.21	JN	NA		NA		NA		NA		NA		NA	
Benzyl cinnamate	103-41-3	NA		0.27	JN	NA		NA		NA		NA		NA		NA	
Cholest-5-ene, 3-bromo-, (3.beta.)-	516-91-6	NA		NA		NA		NA		NA		NA		NA		NA	
Cholesterol	57-88-5	NA		NA		NA		NA		NA		NA		NA		NA	
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	14021-23-9	NA		NA		NA		0.19	A	NA		NA		NA		NA	
Methylene Chloride	75-09-2	NA		NA		NA		NA		NA		NA		NA		0.21	T
Phenol, 2-(2-propenyl)-	1745-81-9	NA		0.7	JN	NA		NA		NA		NA		NA		NA	
Propane, 2,2-dimethoxy-	77-76-9	NA		1.8	JN	NA		NA		NA		NA		NA		1.2	JN
.alpha.-Amyrin	638-95-9	NA		NA		NA		NA		NA		NA		NA		NA	
.beta.-Amyrin	559-70-6	NA		NA		NA		NA		NA		NA		NA		NA	
1-Docosanethiol	7773-83-3	NA		NA		NA		NA		NA		NA		NA		NA	
1-Dotriacontanol	6624-79-9	NA		NA		NA		NA		NA		NA		NA		NA	
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA		NA		NA		NA		NA		NA		NA		NA	
9-Hexacosene		NA		NA		NA		NA		NA		NA		NA		NA	
Benzo[b]naphtho[2,3-d]furan	243-42-5	NA		NA		NA		NA		NA		NA		NA		NA	
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2089-02-3	NA		NA		NA		NA		NA		NA		NA		NA	
Cyclooctacosane	297-24-5	NA		NA		NA		NA		NA		NA		NA		NA	
D:C-Friedooleanan-3-one	5945-53-9	NA		NA		NA		NA		NA		NA		NA		NA	
Ergost-5-en-3-ol, (3.beta.)-	4651-51-8	NA		NA		NA		NA		NA		NA		NA		NA	
Nonadecane	629-92-5	NA		NA		NA		NA		NA		NA		NA		NA	
Pentacosane	629-99-2	NA		NA		NA		NA		NA		NA		NA		NA	
Pentatriacontane	630-07-9	NA		NA		NA		NA		NA		NA		NA		NA	
Stigmasterol	83-48-7	NA		NA		NA		NA		NA		NA		NA		NA	
bis(2-Ethylhexyl) phthalate	83-48-7	NA		NA		NA		NA		NA		NA		NA		NA	
4-Chloroaniline	106-47-8	NA		NA		NA		NA		NA		NA		NA		NA	

Table A-1 **Soil Analytical Data**

Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-1		OLF-1 DUP		OLF-2		OLF-3		OLF-4		OLF-5		OLF-6		OLF-7	
Sample Date		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007		7/5/2007	
Sample Type		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		Landfill		Landfill		Landfill		Landfill		Landfill		Landfill		Landfill		Landfill	
Surface/Subsurface		Surface		Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**																
Acrylamide, Acrylonitrile and Acrolein (mg/kg)																	
Acrylamide	79-06-1	< 1.1		< 1.1		< 1.2		< 1.2		< 1.1		< 1		< 1.4		< 1.1	
Alcohols and Glycols (mg/kg)																	
2-Butoxyethanol	111-76-2	NA		NA		NA		NA		NA		NA		NA		NA	
Allyl alcohol	107-18-6	< 1.1		< 1.2		< 1.2		< 1.2		< 1.1		< 1.1		< 1.5		< 1.1	
Diethylene glycol	111-46-6	< 5.7		< 5.8		< 6		< 6.1		< 5.5		< 5.3		< 7.3		< 5.6	
Dipropylene glycol	25265-71-8	< 5.7		< 5.8		< 6		< 6.1		< 5.5		< 5.3		< 7.3		< 5.6	
Ethanol	64-17-5	< 1.1		< 1.2		< 1.2		< 1.2		< 1.1		< 1.1		< 1.5		< 1.1	
Ethylene glycol	107-21-1	< 5.7		< 5.8		< 6		< 6.1		< 5.5		< 5.3		< 7.3		< 5.6	
Ethylene glycol monobutyl ether	111-76-2	< 5.7		< 5.8		< 6		< 6.1		< 5.5		< 5.3		< 7.3		< 5.6	
Ethylene glycol monopropyl ether	2807-30-9	< 5.7		< 5.8		< 6		< 6.1		< 5.5		< 5.3		< 7.3		< 5.6	
Isopropanol	67-63-0	< 1.1		< 1.2		< 1.2		< 1.2		< 1.1		< 1.1		< 1.5		< 1.1	
Methanol	67-56-1	< 1.1		< 1.2		< 1.2		< 1.2		< 1.1		< 1.1		< 1.5		< 1.1	
Propyl cellosolve	2807-30-9	NA		NA		NA		NA		NA		NA		NA		NA	
Propylene glycol	57-55-6	< 5.7		< 5.8		< 6		< 6.1		< 5.5		< 5.3		< 7.3		< 5.6	
tert-Butyl alcohol	75-65-0	NA		NA		NA		NA		NA		NA		NA		NA	
Inorganics (mg/kg)																	
Aluminum	7429-90-5	14000		13000		17000		14000		8700		7200		7300		4900	
Arsenic	7440-38-2	1.6		1.5		2.8		2.1		3.5		2.2		22		1.1	
Barium	7440-39-3	61		58		52		70		70		54		270		45	
Beryllium	7440-41-7	0.46		0.44		0.38		0.82		0.54		0.42		4.1		0.3	
Cadmium	7440-43-9	< 0.1		< 0.11		0.036	J	< 0.1		0.082	J	0.076	J	0.25		< 0.11	
Calcium	7440-70-2	790	J	750	J	670	J	740	J	1300	J	620	J	2700	J	560	J
Chromium	7440-47-3	26	K	29	K	31	K	30	K	23	K	12	K	14	K	9.7	K
Cobalt	7440-48-4	3.6	K	3.5	K	2.5	K	5.3	K	4.7	K	4.5	K	14	K	3	K
Copper	7440-50-8	9.6	K	9.3	K	8.6	K	14	K	25	K	7.2	K	110	K	9.5	K
Iron	7439-89-6	18000		19000		32000		19000		14000		8800		9700		6300	
Lead	7439-92-1	13	K	13	K	17	K	16	K	99	K	22	K	33	K	16	
Magnesium	7439-95-4	1100	J	1000	J	710	J	1200	J	780	J	660	J	550	J	470	J
Manganese	7439-96-5	56	K	54	K	24	K	82	K	83	K	430	K	66	K	110	K
Mercury	7487-94-7	< 0.1		< 0.11		< 0.11		< 0.1		0.074	J	0.045	J	0.49		< 0.11	
Nickel	7440-02-0	6.1	K	7.1	K	5.8	K	7.9	K	12	K	4.5	K	28	K	5.2	K
Potassium	7440-09-7	460		420		370		610		460		420		630		290	
Selenium	7782-49-2	0.25	J	0.25	J	0.4	J	0.36	J	0.31	J	0.24	J	1.8		0.13	J
Silver	7440-22-4	0.044	J	0.033	J	0.041	J	0.042	J	0.14	J	0.052	J	0.25	J	0.036	J
Sodium	7440-23-5	610		660		42	J	1200		700		700		98		660	
Thallium	7440-28-0	0.22		0.19	J	0.29		0.26		0.16	J	< 0.19		0.89		< 0.21	
Vanadium	7440-62-2	45		45		69		56		47		22		37		25	
Zinc	7440-66-6	18		17		33		22		66		25		72		20	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / CAS No.	OLF-1	OLF-1 DUP	OLF-2	OLF-3	OLF-4	OLF-5	OLF-6	OLF-7
Sample Date		7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007	7/5/2007
Sample Type		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Other Inorganics (mg/kg)									
Chlorides	16887-00-6	150	970	6.7 B	220	140	200	13 B	60
Nitrates	14797-55-8	< 5.7	< 5.8	< 5.7	< 6.1	< 5.3	< 5.1	16	< 5.7
Nitrites	14797-65-0	< 1.1	< 1.2	< 1.2	< 1.2	< 1.1	< 1	< 1.5	< 1.1
Sulfate	14808-79-8	750	34 B	460	27 B	800	< 100	11 B	36 B
Nitrogen, Kjeldahl	7727-37-9	340 K	180 K	270 K	460 K	390 K	740 K	3700 K	260 K
Total Organic Carbon	7440-44-0	7000	3600	3200	6800	11000	9000	330000	2000

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	Sample Date	Sample Type	Sample Location	Surface/Subsurface	Result	Qualifier
		OLF-8	7/5/2007	Investigation	Landfill	Surface		
		LSS-1	3/18/2009	Investigation	Landfill	Surface		
		LSS-2	3/18/2009	Investigation	Landfill	Surface		
		LSS-3	3/18/2009	Investigation	Landfill	Surface		
		LSS-4	3/18/2009	Investigation	Landfill	Surface		
		LSS-5	3/18/2009	Investigation	Landfill	Surface		
		SDB-1	3/6/2007	Investigation	SDB	Surface		
		SDB-2	3/6/2007	Investigation	SDB	Surface		
Volatile Organics (mg/kg)								
1,1,1,2-Tetrachloroethane	630-20-6	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,1,1-Trichloroethane	71-55-6	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,1,2,2-Tetrachloroethane	79-34-5	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,1,2-Trichloroethane	79-00-5	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,1-Dichloroethane	75-34-3	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,1-Dichloroethene	75-35-4	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,2,3-Trichloropropane	96-18-4	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,2-Dibromo-3-Chloropropane	96-12-8	OLF-8					< 0.012	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,2-Dibromoethane	106-93-4	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,2-Dichloroethane	107-06-2	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
trans-1,2-Dichloroethene	156-60-5	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,2-Dichloropropane	78-87-5	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
cis-1,3-Dichloropropene	10061-01-5	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
trans-1,3-Dichloropropene	10061-02-6	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
1,4-Dioxane	123-91-1	OLF-8					NA	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
2-Butanone (MEK)	78-93-3	OLF-8					< 0.031	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
2-Hexanone	591-78-6	OLF-8					< 0.031	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
2-Methyl-1-propanol (Isobutyl Alcohol)	78-83-1	OLF-8					< 0.25	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
3-Methylhexane	589-34-4	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
4-Methyl-2-pentanone (MIBK)	108-10-1	OLF-8					< 0.031	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Acetone	67-64-1	OLF-8					0.026	B
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Acetonitrile	75-05-8	OLF-8					< 0.25	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Acrolein	107-02-08	OLF-8					< 0.12	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Acrylonitrile	107-13-1	OLF-8					< 0.12	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Allyl alcohol	107-18-6	OLF-8					NA	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Allyl chloride	107-05-1	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Benzene	71-43-2	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Benzyl chloride	100-44-7	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Bromodichloromethane	75-27-4	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Bromoform	75-25-2	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Bromomethane	74-83-9	OLF-8					< 0.0062	J
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Carbon disulfide	75-15-0	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Carbon tetrachloride	56-23-5	OLF-8					< 0.0062	J
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Chlorobenzene	108-90-7	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Chloroethane	75-00-3	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Chloroform	67-66-3	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Chloromethane	74-87-3	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Chloroprene	126-99-8	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Dibromochloromethane	124-48-1	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	
Dibromomethane	74-95-3	OLF-8					< 0.0062	
		LSS-1					NA	
		LSS-2					NA	
		LSS-3					NA	
		LSS-4					NA	
		LSS-5					NA	
		SDB-1					NA	
		SDB-2					NA	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	Sample Date	Sample Type	Sample Location	Surface/Subsurface
		OLF-8	7/5/2007	Investigation	Landfill	Surface
		LSS-1	3/18/2009	Investigation	Landfill	Surface
		LSS-2	3/18/2009	Investigation	Landfill	Surface
		LSS-3	3/18/2009	Investigation	Landfill	Surface
		LSS-4	3/18/2009	Investigation	Landfill	Surface
		LSS-5	3/18/2009	Investigation	Landfill	Surface
		SDB-1	3/6/2007	Investigation	SDB	Surface
		SDB-2	3/6/2007	Investigation	SDB	Surface
Dichlorodifluoromethane	75-71-8	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Dichlorofluoromethane	75-43-4	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Diethyl ether	60-29-7	< 0.012	NA	NA	NA	NA	NA	NA	NA
Ethanol	64-17-5	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl methacrylate	97-63-2	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Ethylene oxide	75-21-8	< 0.12	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Methacrylonitrile	126-98-7	< 0.12	NA	NA	NA	NA	NA	NA	NA
Methyl methacrylate	80-62-6	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	< 0.0062	NA	NA	NA	NA	NA	NA	NA
n-Heptane	142-82-5	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	76-01-7	< 0.031	NA	NA	NA	NA	NA	NA	NA
Propionitrile	107-12-0	< 0.12	NA	NA	NA	NA	NA	NA	NA
Propylene oxide	75-56-9	< 0.12	NA	NA	NA	NA	NA	NA	NA
Styrene	100-42-5	< 0.0062	NA	NA	NA	NA	NA	NA	NA
t-Butanol	75-65-0	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	127-18-4	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Toluene	108-88-3	< 0.0062	NA	NA	NA	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	110-57-6	< 0.012	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	79-01-6	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Vinyl acetate	108-05-4	< 0.012	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	75-01-4	< 0.0062	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	1330-20-7	< 0.012	NA	NA	NA	NA	NA	NA	NA
Volatile Organics (TICs) (mg/kg)									
4-Isopropyltoluene	99-87-6	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	2.8 B	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	95-63-6	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	108-67-8	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	NA	NA	NA	NA	NA	NA	NA	NA
3-Ethyltoluene	620-14-4	NA	NA	NA	NA	NA	NA	NA	NA
Acetaldehyde	75-07-0	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, 3-methyl-	590-86-3	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, isomer		NA	NA	NA	NA	NA	NA	NA	NA
C10H16		NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	NA	NA	NA	NA	NA	NA	NA	NA
Heptanal	111-71-7	NA	NA	NA	NA	NA	NA	NA	NA
Hexanal	66-25-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexane	110-54-3	NA	NA	NA	NA	NA	NA	NA	NA
Pentanal	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.		OLF-8 7/5/2007 Investigation Landfill Surface	LSS-1 3/18/2009 Investigation Landfill Surface	LSS-2 3/18/2009 Investigation Landfill Surface	LSS-3 3/18/2009 Investigation Landfill Surface	LSS-4 3/18/2009 Investigation Landfill Surface	LSS-5 3/18/2009 Investigation Landfill Surface	SDB-1 3/6/2007 Investigation SDB Surface	SDB-2 3/6/2007 Investigation SDB Surface
Semi-Volatile Organics (mg/kg)										
1,2,4,5-Tetrachlorobenzene	95-94-3	<	0.35	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	<	0.35	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	95-50-1	<	0.35	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene	99-35-4	<	0.35	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	<	0.35	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	<	0.35	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	123-91-1	<	0.35	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	130-15-4	<	0.35	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenamine	134-32-7	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,2'-oxybis[1-chloropropane]	108-60-1	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	58-90-2	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	105-67-9	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	51-28-5	<	1.8	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	87-65-0	<	0.35	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	53-96-3	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	91-58-7	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	95-57-8	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-6	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	95-48-7	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Naphthalenamine	91-59-8	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	88-74-4	<	1.8	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	88-75-5	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-Picoline	109-06-8	<	0.35	NA	NA	NA	NA	NA	NA	NA
2-sec-Butyl-4,6-dinitrophenol	88-85-7	<	0.35	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	15831-10-4	<	0.35	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	<	0.69	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	119-93-7	<	1.8	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	56-49-5	<	0.35	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	99-09-2	<	1.8	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	534-52-1	<	1.8	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	92-67-1	<	0.35	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	101-55-3	<	0.35	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	59-50-7	<	0.35	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	<	0.69	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	7005-72-3	<	0.35	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-8		LSS-1	LSS-2	LSS-3	LSS-4	LSS-5	SDB-1	SDB-2
Sample Date		7/5/2007		3/18/2009	3/18/2009	3/18/2009	3/18/2009	3/18/2009	3/6/2007	3/6/2007
Sample Type		Investigation		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Landfill		Landfill	Landfill	Landfill	Landfill	Landfill	SDB	SDB
Surface/Subsurface		Surface		Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	CAS No.									
4-Nitroaniline	100-01-6	< 1.8		NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	100-02-7	< 1.8		NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	56-57-5	3.5	R	NA	NA	NA	NA	NA	NA	NA
5-Nitro-o-toluidine	99-55-8	< 0.35		NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	57-97-6	< 0.35		NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	< 0.35		NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	208-96-8	< 0.35		NA	NA	NA	NA	NA	NA	NA
Acetophenone	98-86-2	< 0.35		NA	NA	NA	NA	NA	NA	NA
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 71		NA	NA	NA	NA	NA	NA	NA
Aniline	62-53-3	< 0.69		NA	NA	NA	NA	NA	NA	NA
Anthracene	120-12-7	< 0.35		NA	NA	NA	NA	NA	NA	NA
Aramite, Total	140-57-8	< 0.35		NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	0.04	J	NA	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene	50-32-8	0.034	J	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	0.067	J	NA	NA	NA	NA	NA	NA	NA
Benzo[g,h,i]perylene	191-24-2	0.026	J	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	207-08-09	0.032	J	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol	100-51-6	< 0.35		NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	111-91-1	< 0.35		NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	111-44-4	< 0.35		NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	117-81-7	< 0.35		NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	85-68-7	< 0.35		NA	NA	NA	NA	NA	NA	NA
Chrysene	218-01-9	0.071	J	NA	NA	NA	NA	NA	NA	NA
Diallate	2303-16-4	< 0.35		NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3	< 0.35		NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	< 0.35		NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	84-66-2	< 0.35		NA	NA	NA	NA	NA	NA	NA
Dimethoate	60-51-5	< 0.35		NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	131-11-3	< 0.35		NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	84-74-2	< 0.35		NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	117-84-0	< 0.35		NA	NA	NA	NA	NA	NA	NA
Ethyl methanesulfonate	62-50-0	< 0.35		NA	NA	NA	NA	NA	NA	NA
Fluoranthene	206-44-0	0.075	J	NA	NA	NA	NA	NA	NA	NA
Fluorene	86-73-7	< 0.35		NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	118-74-1	< 0.35		NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	< 0.35		NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	< 0.35		NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	67-72-1	< 0.35		NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	70-30-4	< 180		NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	1888-71-7	< 0.35		NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	193-39-5	< 0.35		NA	NA	NA	NA	NA	NA	NA

Table A-1 **Soil Analytical Data**
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	OLF-8 7/5/2007 Investigation Landfill Surface	LSS-1 3/18/2009 Investigation Landfill Surface	LSS-2 3/18/2009 Investigation Landfill Surface	LSS-3 3/18/2009 Investigation Landfill Surface	LSS-4 3/18/2009 Investigation Landfill Surface	LSS-5 3/18/2009 Investigation Landfill Surface	SDB-1 3/6/2007 Investigation SDB Surface	SDB-2 3/6/2007 Investigation SDB Surface
Isophorone	78-59-1	< 0.35	NA	NA	NA	NA	NA	NA	NA
Isosafrole	120-58-1	< 0.35	NA	NA	NA	NA	NA	NA	NA
m-Dinitrobenzene	99-65-0	< 0.35	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	91-80-5	< 71	NA	NA	NA	NA	NA	NA	NA
Methyl methanesulfonate	66-27-3	< 0.35	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	< 0.35	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	98-95-3	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiethylamine	55-18-5	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodimethylamine	62-75-9	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-propylamine	621-64-7	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	86-30-6	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosomethylethylamine	10595-95-6	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosomorpholine	59-89-2	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosopiperidine	100-75-4	< 0.35	NA	NA	NA	NA	NA	NA	NA
N-Nitrosopyrrolidine	930-55-2	< 0.35	NA	NA	NA	NA	NA	NA	NA
o,o',o''-Triethylphosphorothioate	126-68-1	< 0.35	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	95-53-4	< 0.35	NA	NA	NA	NA	NA	NA	NA
p-Dimethylamino azobenzene	60-11-7	< 0.35	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	608-93-5	< 0.35	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	82-68-8	< 0.35	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	< 1.8	NA	NA	NA	NA	NA	NA	NA
Phenacetin	62-44-2	< 0.35	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	0.025 J	NA	NA	NA	NA	NA	NA	NA
Phenol	108-95-2	< 0.35	NA	NA	NA	NA	NA	NA	NA
p-Phenylene diamine	106-50-3	< 1.8	NA	NA	NA	NA	NA	NA	NA
Pronamide	23950-58-5	< 0.35	NA	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	0.064 J	NA	NA	NA	NA	NA	NA	NA
Pyridine	110-86-1	< 0.35	NA	NA	NA	NA	NA	NA	NA
Safrole, Total	94-59-7	< 0.35	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		OLF-8		LSS-1	LSS-2	LSS-3	LSS-4	LSS-5	SDB-1	SDB-2
Sample Date		7/5/2007		3/18/2009	3/18/2009	3/18/2009	3/18/2009	3/18/2009	3/6/2007	3/6/2007
Sample Type		Investigation		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Landfill		Landfill	Landfill	Landfill	Landfill	Landfill	SDB	SDB
Surface/Subsurface		Surface		Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**									
Semi-Volatile Organics (TICs) (mg/kg)										
Ergostanol	6538-02-9	NA		NA	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA		NA	NA	NA	NA	NA	NA	NA
28-Norolean-17-en-3-one	5912-72-1	NA		NA	NA	NA	NA	NA	NA	NA
2-Pentanone, 4-hydroxy-4-methyl-	123-42-2	15	A	NA	NA	NA	NA	NA	NA	NA
2-Pentanone, 4-methoxy-4-methyl-	107-70-0	0.3	A	NA	NA	NA	NA	NA	NA	NA
3-Penten-2-one, 4-methyl-	141-79-7	0.56	A	NA	NA	NA	NA	NA	NA	NA
4,5-Dimethylthiazole S-oxide		0.78	JN	NA	NA	NA	NA	NA	NA	NA
alpha-Pinene		NA		NA	NA	NA	NA	NA	NA	NA
Benzene, 1-methyl-4-(1-methylethyl)-	99-87-6	NA		NA	NA	NA	NA	NA	NA	NA
Benzyl cinnamate	103-41-3	NA		NA	NA	NA	NA	NA	NA	NA
Cholest-5-ene, 3-bromo-, (3.beta.)-	516-91-6	0.24	JN	NA	NA	NA	NA	NA	NA	NA
Cholesterol	57-88-5	0.44	JN	NA	NA	NA	NA	NA	NA	NA
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	14021-23-9	NA		NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	0.29	T	NA	NA	NA	NA	NA	NA	NA
Phenol, 2-(2-propenyl)-	1745-81-9	NA		NA	NA	NA	NA	NA	NA	NA
Propane, 2,2-dimethoxy-	77-76-9	NA		NA	NA	NA	NA	NA	NA	NA
.alpha.-Amyrin	638-95-9	NA		NA	NA	NA	NA	NA	NA	NA
.beta.-Amyrin	559-70-6	NA		NA	NA	NA	NA	NA	NA	NA
1-Docosanethiol	7773-83-3	NA		NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA		NA	NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA		NA	NA	NA	NA	NA	NA	NA
9-Hexacosene		NA		NA	NA	NA	NA	NA	NA	NA
Benzo[b]naphtho[2,3-d]furan	243-42-5	NA		NA	NA	NA	NA	NA	NA	NA
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2089-02-3	NA		NA	NA	NA	NA	NA	NA	NA
Cyclooctacosane	297-24-5	NA		NA	NA	NA	NA	NA	NA	NA
D:C-Friedooleanan-3-one	5945-53-9	NA		NA	NA	NA	NA	NA	NA	NA
Ergost-5-en-3-ol, (3.beta.)-	4651-51-8	NA		NA	NA	NA	NA	NA	NA	NA
Nonadecane	629-92-5	NA		NA	NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA		NA	NA	NA	NA	NA	NA	NA
Pentatriacontane	630-07-9	NA		NA	NA	NA	NA	NA	NA	NA
Stigmasterol	83-48-7	NA		NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	83-48-7	NA		NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	NA		NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	OLF-8	LSS-1	LSS-2	LSS-3	LSS-4	LSS-5	SDB-1	SDB-2
		Sample Date	7/5/2007	3/18/2009	3/18/2009	3/18/2009	3/18/2009	3/18/2009	3/6/2007	3/6/2007
		Sample Type	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
		Sample Location	Landfill	Landfill	Landfill	Landfill	Landfill	Landfill	SDB	SDB
		Surface/Subsurface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Acrylamide, Acrylonitrile and Acrolein (mg/kg)										
Acrylamide	79-06-1		< 1	NA	NA	NA	NA	NA	NA	NA
Alcohols and Glycols (mg/kg)										
2-Butoxyethanol	111-76-2		NA	NA	NA	NA	NA	NA	< 6.5	< 6
Allyl alcohol	107-18-6		< 1.1	NA	NA	NA	NA	NA	< 1.3	< 1.2
Diethylene glycol	111-46-6		< 5.3	NA	NA	NA	NA	NA	< 6.5	< 6
Dipropylene glycol	25265-71-8		< 5.3	NA	NA	NA	NA	NA	< 6.5	< 6
Ethanol	64-17-5		< 1.1	NA	NA	NA	NA	NA	< 1.3	< 1.2
Ethylene glycol	107-21-1		< 5.3	NA	NA	NA	NA	NA	< 6.5	< 6
Ethylene glycol monobutyl ether	111-76-2		< 5.3	NA	NA	NA	NA	NA	NA	NA
Ethylene glycol monopropyl ether	2807-30-9		< 5.3	NA	NA	NA	NA	NA	NA	NA
Isopropanol	67-63-0		< 1.1	NA	NA	NA	NA	NA	< 1.3	< 1.2
Methanol	67-56-1		< 1.1	NA	NA	NA	NA	NA	< 1.3	< 1.2
Propyl cellosolve	2807-30-9		NA	NA	NA	NA	NA	NA	< 6.5	< 6
Propylene glycol	57-55-6		< 5.3	NA	NA	NA	NA	NA	< 6.5	< 6
tert-Butyl alcohol	75-65-0		NA	NA	NA	NA	NA	NA	< 1.3	< 1.2
Inorganics (mg/kg)										
Aluminum	7429-90-5		4100	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2		1.7	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3		29	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-41-7		0.26	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9		0.058 J	NA	NA	NA	NA	NA	NA	NA
Calcium	7440-70-2		650 J	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3		13 K	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4		2.2 K	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8		13 K	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6		5600	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1		17 K	17	18	22	45	18	NA	NA
Magnesium	7439-95-4		350 J	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5		65 K	NA	NA	NA	NA	NA	NA	NA
Mercury	7487-94-7		0.045 J	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0		5.4 K	NA	NA	NA	NA	NA	NA	NA
Potassium	7440-09-7		240	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2		0.2 J	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4		0.035 J	NA	NA	NA	NA	NA	NA	NA
Sodium	7440-23-5		56	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0		< 0.2	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2		13	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6		16	NA	NA	NA	NA	NA	NA	NA

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	OLF-8 7/5/2007 Investigation Landfill Surface	LSS-1 3/18/2009 Investigation Landfill Surface	LSS-2 3/18/2009 Investigation Landfill Surface	LSS-3 3/18/2009 Investigation Landfill Surface	LSS-4 3/18/2009 Investigation Landfill Surface	LSS-5 3/18/2009 Investigation Landfill Surface	SDB-1 3/6/2007 Investigation SDB Surface	SDB-2 3/6/2007 Investigation SDB Surface
Other Inorganics (mg/kg)									
Chlorides	16887-00-6	< 21	NA	NA	NA	NA	NA	NA	NA
Nitrates 14797-55-8		5.6	NA	NA	NA	NA	NA	NA	NA
Nitrites 14797-65-0		< 1.1	NA	NA	NA	NA	NA	NA	NA
Sulfate	14808-79-8	19 B	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	7727-37-9	1200 K	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	7440-44-0	21000	NA	NA	NA	NA	NA	NA	NA

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-2 DUP 3/6/2007 Duplicate SDB Surface	SDB-3 3/6/2007 Investigation SDB Surface	SDB-4 3/6/2007 Investigation SDB Surface	SDB-5 3/6/2007 Investigation SDB Surface	SDB-6 3/6/2007 Investigation SDB Surface	SDB-7 3/6/2007 Investigation SDB Surface	SDB-8 3/6/2007 Investigation SDB Surface	SDB-9 3/6/2007 Investigation SDB Surface
Volatile Organics (mg/kg)									
1,1,1,2-Tetrachloroethane	630-20-6	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	79-00-5	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	75-34-3	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	75-35-4	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	96-18-4	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	96-12-8	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	106-93-4	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	107-06-2	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	156-60-5	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	78-87-5	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	10061-01-5	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	10061-02-6	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	123-91-1	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	78-93-3	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	591-78-6	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-1-propanol (Isobutyl Alcohol)	78-83-1	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylhexane	589-34-4	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	108-10-1	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	75-05-8	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	107-02-08	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	107-13-1	NA	NA	NA	NA	NA	NA	NA	NA
Allyl alcohol	107-18-6	NA	NA	NA	NA	NA	NA	NA	NA
Allyl chloride	107-05-1	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	71-43-2	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl chloride	100-44-7	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	75-27-4	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	75-25-2	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	74-83-9	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	75-15-0	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	56-23-5	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	108-90-7	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	75-00-3	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	67-66-3	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	74-87-3	NA	NA	NA	NA	NA	NA	NA	NA
Chloroprene	126-99-8	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	74-95-3	NA	NA	NA	NA	NA	NA	NA	NA

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-2 DUP 3/6/2007 Duplicate SDB Surface	SDB-3 3/6/2007 Investigation SDB Surface	SDB-4 3/6/2007 Investigation SDB Surface	SDB-5 3/6/2007 Investigation SDB Surface	SDB-6 3/6/2007 Investigation SDB Surface	SDB-7 3/6/2007 Investigation SDB Surface	SDB-8 3/6/2007 Investigation SDB Surface	SDB-9 3/6/2007 Investigation SDB Surface
Dichlorodifluoromethane	75-71-8	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorofluoromethane	75-43-4	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl ether	60-29-7	NA	NA	NA	NA	NA	NA	NA	NA
Ethanol	64-17-5	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl methacrylate	97-63-2	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	NA	NA	NA	NA	NA	NA	NA	NA
Ethylene oxide	75-21-8	NA	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	NA	NA	NA	NA	NA	NA	NA	NA
Methacrylonitrile	126-98-7	NA	NA	NA	NA	NA	NA	NA	NA
Methyl methacrylate	80-62-6	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	NA	NA	NA	NA	NA	NA	NA	NA
n-Heptane	142-82-5	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	76-01-7	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile	107-12-0	NA	NA	NA	NA	NA	NA	NA	NA
Propylene oxide	75-56-9	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100-42-5	NA	NA	NA	NA	NA	NA	NA	NA
t-Butanol	75-65-0	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	127-18-4	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	108-88-3	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	110-57-6	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	79-01-6	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl acetate	108-05-4	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	75-01-4	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	1330-20-7	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organics (TICs) (mg/kg)									
4-Isopropyltoluene	99-87-6	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	95-63-6	NA	NA	NA	NA	0.0025 J	NA	NA	NA
1,3,5-Trimethylbenzene	108-67-8	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	NA	NA	NA	NA	NA	NA	NA	NA
3-Ethyltoluene	620-14-4	NA	NA	NA	NA	NA	NA	NA	NA
Acetaldehyde	75-07-0	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, 3-methyl-	590-86-3	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, isomer		NA	NA	NA	NA	NA	NA	NA	NA
C10H16		NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	NA	NA	NA	NA	NA	NA	NA	NA
Heptanal	111-71-7	NA	NA	NA	NA	NA	NA	NA	NA
Hexanal	66-25-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexane	110-54-3	NA	NA	NA	NA	NA	NA	NA	NA
Pentanal	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface	CAS No.	SDB-2 DUP 3/6/2007 Duplicate SDB Surface	SDB-3 3/6/2007 Investigation SDB Surface	SDB-4 3/6/2007 Investigation SDB Surface	SDB-5 3/6/2007 Investigation SDB Surface	SDB-6 3/6/2007 Investigation SDB Surface	SDB-7 3/6/2007 Investigation SDB Surface	SDB-8 3/6/2007 Investigation SDB Surface	SDB-9 3/6/2007 Investigation SDB Surface
Semi-Volatile Organics (mg/kg)										
1,2,4,5-Tetrachlorobenzene		95-94-3	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene		120-82-1	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene		95-50-1	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene		99-35-4	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene		541-73-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene		106-46-7	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane		123-91-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone		130-15-4	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenamine		134-32-7	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-oxybis[1-chloropropane]		108-60-1	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol		58-90-2	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol		95-95-4	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol		88-06-2	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol		120-83-2	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol		105-67-9	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol		51-28-5	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene		121-14-2	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol		87-65-0	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene		606-20-2	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene		53-96-3	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene		91-58-7	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol		95-57-8	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene		91-57-6	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol		95-48-7	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthalenamine		91-59-8	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline		88-74-4	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol		88-75-5	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline		109-06-8	NA	NA	NA	NA	NA	NA	NA	NA
2-sec-Butyl-4,6-dinitrophenol		88-85-7	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol		15831-10-4	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine		91-94-1	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine		119-93-7	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene		56-49-5	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline		99-09-2	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol		534-52-1	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl		92-67-1	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether		101-55-3	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol		59-50-7	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline		106-47-8	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether		7005-72-3	NA	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification	SDB-2 DUP	SDB-3	SDB-4	SDB-5	SDB-6	SDB-7	SDB-8	SDB-9
Sample Date	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007
Sample Type	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB
Surface/Subsurface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	CAS No.							
4-Nitroaniline	100-01-6	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	100-02-7	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	56-57-5	NA	NA	NA	NA	NA	NA	NA	NA
5-Nitro-o-toluidine	99-55-8	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	57-97-6	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	208-96-8	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	98-86-2	NA	NA	NA	NA	NA	NA	NA	NA
alpha,alpha-Dimethyl phenethylamine	122-09-8	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	62-53-3	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	120-12-7	NA	NA	NA	NA	NA	NA	NA	NA
Aramite, Total	140-57-8	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene	50-32-8	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[g,h,i]perylene	191-24-2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	207-08-09	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol	100-51-6	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	111-44-4	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	117-81-7	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	85-68-7	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	218-01-9	NA	NA	NA	NA	NA	NA	NA	NA
Diallate	2303-16-4	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	84-66-2	NA	NA	NA	NA	NA	NA	NA	NA
Dimethoate	60-51-5	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	131-11-3	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	84-74-2	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	117-84-0	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl methanesulfonate	62-50-0	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	206-44-0	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	86-73-7	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	118-74-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	67-72-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	70-30-4	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	1888-71-7	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	193-39-5	NA	NA	NA	NA	NA	NA	NA	NA

Table A-1 **Soil Analytical Data**
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-2 DUP 3/6/2007 Duplicate SDB Surface	SDB-3 3/6/2007 Investigation SDB Surface	SDB-4 3/6/2007 Investigation SDB Surface	SDB-5 3/6/2007 Investigation SDB Surface	SDB-6 3/6/2007 Investigation SDB Surface	SDB-7 3/6/2007 Investigation SDB Surface	SDB-8 3/6/2007 Investigation SDB Surface	SDB-9 3/6/2007 Investigation SDB Surface
Isophorone	78-59-1	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	120-58-1	NA	NA	NA	NA	NA	NA	NA	NA
m-Dinitrobenzene	99-65-0	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	91-80-5	NA	NA	NA	NA	NA	NA	NA	NA
Methyl methanesulfonate	66-27-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	98-95-3	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiethylamine	55-18-5	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodimethylamine	62-75-9	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-propylamine	621-64-7	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	86-30-6	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosomethylethylamine	10595-95-6	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosomorpholine	59-89-2	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosopiperidine	100-75-4	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosopyrrolidine	930-55-2	NA	NA	NA	NA	NA	NA	NA	NA
o,o',o''-Triethylphosphorothioate	126-68-1	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	95-53-4	NA	NA	NA	NA	NA	NA	NA	NA
p-Dimethylamino azobenzene	60-11-7	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	608-93-5	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	82-68-8	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	62-44-2	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	108-95-2	NA	NA	NA	NA	NA	NA	NA	NA
p-Phenylene diamine	106-50-3	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	23950-58-5	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	110-86-1	NA	NA	NA	NA	NA	NA	NA	NA
Safrole, Total	94-59-7	NA	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-2 DUP	SDB-3	SDB-4		SDB-5	SDB-6	SDB-7	SDB-8	SDB-9
Sample Date		3/6/2007	3/6/2007	3/6/2007		3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007
Sample Type		Duplicate	Investigation	Investigation		Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		SDB	SDB	SDB		SDB	SDB	SDB	SDB	SDB
Surface/Subsurface		Surface	Surface	Surface		Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**									
Semi-Volatile Organics (TICs) (mg/kg)										
Ergostanol	6538-02-9	NA	NA	NA		NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA	NA	0.34	JN	NA	NA	NA	NA	NA
28-Norolean-17-en-3-one	5912-72-1	NA	NA	NA		NA	NA	NA	NA	NA
2-Pentanone, 4-hydroxy-4-methyl-	123-42-2	NA	NA	NA		NA	NA	NA	NA	NA
2-Pentanone, 4-methoxy-4-methyl-	107-70-0	NA	NA	NA		NA	NA	NA	NA	NA
3-Penten-2-one, 4-methyl-	141-79-7	NA	NA	NA		NA	NA	NA	NA	NA
4,5-Dimethylthiazole S-oxide		NA	NA	NA		NA	NA	NA	NA	NA
alpha-Pinene		NA	NA	NA		NA	NA	NA	NA	NA
Benzene, 1-methyl-4-(1-methylethyl)-	99-87-6	NA	NA	NA		NA	NA	NA	NA	NA
Benzyl cinnamate	103-41-3	NA	NA	NA		NA	NA	NA	NA	NA
Cholest-5-ene, 3-bromo-, (3.beta.)-	516-91-6	NA	NA	NA		NA	NA	NA	NA	NA
Cholesterol	57-88-5	NA	NA	NA		NA	NA	NA	NA	NA
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	14021-23-9	NA	NA	NA		NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	NA	NA	NA		NA	NA	NA	NA	NA
Phenol, 2-(2-propenyl)-	1745-81-9	NA	NA	NA		NA	NA	NA	NA	NA
Propane, 2,2-dimethoxy-	77-76-9	NA	NA	NA		NA	NA	NA	NA	NA
.alpha.-Amyrin	638-95-9	NA	NA	NA		NA	NA	NA	NA	NA
.beta.-Amyrin	559-70-6	NA	NA	NA		NA	NA	NA	NA	NA
1-Docosanethiol	7773-83-3	NA	NA	NA		NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA		NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA		NA	NA	NA	NA	NA
9-Hexacosene		NA	NA	NA		NA	NA	NA	NA	NA
Benzo[b]naphtho[2,3-d]furan	243-42-5	NA	NA	NA		NA	NA	NA	NA	NA
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2089-02-3	NA	NA	NA		NA	NA	NA	NA	NA
Cyclooctacosane	297-24-5	NA	NA	NA		NA	NA	NA	NA	NA
D:C-Friedooleanan-3-one	5945-53-9	NA	NA	NA		NA	NA	NA	NA	NA
Ergost-5-en-3-ol, (3.beta.)-	4651-51-8	NA	NA	NA		NA	NA	NA	NA	NA
Nonadecane	629-92-5	NA	NA	0.2	JN	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA		NA	NA	NA	NA	NA
Pentatriacontane	630-07-9	NA	NA	NA		NA	NA	NA	NA	NA
Stigmasterol	83-48-7	NA	NA	NA		NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	83-48-7	NA	NA	NA		NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	NA	NA	NA		NA	NA	NA	NA	NA

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-2 DUP	SDB-3	SDB-4	SDB-5	SDB-6	SDB-7	SDB-8	SDB-9
Sample Date		3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007
Sample Type		Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**								
Acrylamide, Acrylonitrile and Acrolein (mg/kg)									
Acrylamide	79-06-1	NA	NA	NA	NA	NA	NA	NA	NA
Alcohols and Glycols (mg/kg)									
2-Butoxyethanol	111-76-2	< 6	< 6.6	< 6.9	< 6.3	< 6.7	< 6.9	< 6.7	< 5.8
Allyl alcohol	107-18-6	< 1.2	< 1.3	< 1.4	< 1.3	< 1.3	< 1.4	< 1.3	< 1.2
Diethylene glycol	111-46-6	< 6	< 6.6	< 6.9	< 6.3	< 6.7	< 6.9	< 6.7	< 5.8
Dipropylene glycol	25265-71-8	< 6	< 6.6	< 6.9	< 6.3	< 6.7	< 6.9	< 6.7	< 5.8
Ethanol	64-17-5	< 1.2	< 1.3	< 1.4	< 1.3	< 1.3	< 1.4	< 1.3	< 1.2
Ethylene glycol	107-21-1	< 6	< 6.6	< 6.9	< 6.3	< 6.7	< 6.9	< 6.7	< 5.8
Ethylene glycol monobutyl ether	111-76-2	NA	NA	NA	NA	NA	NA	NA	NA
Ethylene glycol monopropyl ether	2807-30-9	NA	NA	NA	NA	NA	NA	NA	NA
Isopropanol	67-63-0	< 1.2	< 1.3	< 1.4	< 1.3	< 1.3	< 1.4	< 1.3	< 1.2
Methanol	67-56-1	< 1.2	< 1.3	< 1.4	< 1.3	< 1.3	< 1.4	< 1.3	< 1.2
Propyl cellosolve	2807-30-9	< 6	< 6.6	< 6.9	< 6.3	< 6.7	< 6.9	< 6.7	< 5.8
Propylene glycol	57-55-6	< 6	< 6.6	< 6.9	< 6.3	< 6.7	< 6.9	< 6.7	< 5.8
tert-Butyl alcohol	75-65-0	< 1.2	< 1.3	< 1.4	< 1.3	< 1.3	< 1.4	< 1.3	< 1.2
Inorganics (mg/kg)									
Aluminum	7429-90-5	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-41-7	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	7440-70-2	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4	NA	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8	NA	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	7487-94-7	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	7440-09-7	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	7440-23-5	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	NA	NA	NA	NA	NA	NA	NA	NA

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-2 DUP 3/6/2007 Duplicate SDB Surface	SDB-3 3/6/2007 Investigation SDB Surface	SDB-4 3/6/2007 Investigation SDB Surface	SDB-5 3/6/2007 Investigation SDB Surface	SDB-6 3/6/2007 Investigation SDB Surface	SDB-7 3/6/2007 Investigation SDB Surface	SDB-8 3/6/2007 Investigation SDB Surface	SDB-9 3/6/2007 Investigation SDB Surface
Other Inorganics (mg/kg)									
Chlorides	16887-00-6	NA	NA	NA	NA	NA	NA	NA	NA
Nitrates 14797-55-8		NA	NA	NA	NA	NA	NA	NA	NA
Nitrites 14797-65-0		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	14808-79-8	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	7727-37-9	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	7440-44-0	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-1 B		SDB-2 B		SDB-3 B		SDB-4 B		SDB-5 B		SDB-6 B		SDB-7 B		SDB-8 B	
Sample Date		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB		SDB		SDB		SDB		SDB		SDB		SDB		SDB	
Surface/Subsurface		Surface		Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**																
Volatile Organics (mg/kg)																	
1,1,1,2-Tetrachloroethane	630-20-6	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,1,1-Trichloroethane	71-55-6	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,1,2,2-Tetrachloroethane	79-34-5	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,1,2-Trichloroethane	79-00-5	0.001	J	< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		0.001	J
1,1-Dichloroethane	75-34-3	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,1-Dichloroethene	75-35-4	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,2,3-Trichloropropane	96-18-4	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
1,2-Dibromoethane	106-93-4	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,2-Dichloroethane	107-06-2	0.0076		0.0047	J	0.0074	J	0.011		< 0.0054		0.014	J	0.012		0.011	
trans-1,2-Dichloroethene	156-60-5	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,2-Dichloropropane	78-87-5	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
cis-1,3-Dichloropropene	10061-01-5	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
trans-1,3-Dichloropropene	10061-02-6	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
1,4-Dioxane	123-91-1	0.65	R	0.89	R	1.5	R	0.62	R	0.54	R	5.8	R	0.57	R	0.62	R
2-Butanone (MEK)	78-93-3	0.047		0.018		< 0.03		0.0033	J	0.016	J	0.26	J	< 0.011		0.065	
2-Hexanone	591-78-6	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
2-Methyl-1-propanol (Isobutyl Alcohol)	78-83-1	0.26	R	0.36	R	0.61	R	0.25	R	0.22	R	2.3	R	0.23	R	0.25	R
3-Methylhexane	589-34-4	NA		NA		NA		NA		NA		NA		NA		NA	
4-Methyl-2-pentanone (MIBK)	108-10-1	0.006	J	< 0.018		< 0.03		< 0.012		< 0.011		0.068	J	< 0.011		0.0067	J
Acetone	67-64-1	0.35	J	0.16		0.15		0.075		0.19		2.3		0.029	J	0.16	J
Acetonitrile	75-05-8	0.065	R	0.089	R	0.15	R	0.062	R	0.054	R	0.58	R	0.057	R	0.062	R
Acrolein	107-02-08	0.065	R	0.089	R	0.15	R	0.062	R	0.054	R	0.58	R	0.057	R	0.062	R
Acrylonitrile	107-13-1	< 0.065		< 0.089		< 0.15		< 0.062		< 0.054		< 0.58		< 0.057		< 0.062	
Allyl alcohol	107-18-6	0.17	R	0.23	R	0.39	R	0.16	R	0.14	R	1.5	R	0.15	R	0.16	R
Allyl chloride	107-05-1	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Benzene	71-43-2	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Benzyl chloride	100-44-7	NA		NA		NA		NA		NA		NA		NA		NA	
Bromodichloromethane	75-27-4	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Bromoform	75-25-2	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Bromomethane	74-83-9	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
Carbon disulfide	75-15-0	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Carbon tetrachloride	56-23-5	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Chlorobenzene	108-90-7	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Chloroethane	75-00-3	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
Chloroform	67-66-3	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Chloromethane	74-87-3	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
Chloroprene	126-99-8	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Dibromochloromethane	124-48-1	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Dibromomethane	74-95-3	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-1 B		SDB-2 B		SDB-3 B		SDB-4 B		SDB-5 B		SDB-6 B		SDB-7 B		SDB-8 B	
Sample Date		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB		SDB		SDB		SDB		SDB		SDB		SDB		SDB	
Surface/Subsurface		Surface		Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**																
Dichlorodifluoromethane	75-71-8	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Dichlorofluoromethane	75-43-4	NA		NA		NA		NA		NA		NA		NA		NA	
Diethyl ether	60-29-7	NA		NA		NA		NA		NA		NA		NA		NA	
Ethanol	64-17-5	0.26	R*	0.36	R*	0.61	R*	0.25	R*	0.22	R*	2.3	R*	0.23	R*	0.25	R*
Ethyl methacrylate	97-63-2	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Ethylbenzene	100-41-4	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Ethylene oxide	75-21-8	3.9	R	5.4	R	9.1	R	3.7	R	3.2	R	35	R	3.4	R	3.7	R
Iodomethane	74-88-4	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Methacrylonitrile	126-98-7	< 0.026		< 0.036		< 0.061		< 0.025		< 0.022		< 0.23		< 0.023		< 0.025	
Methyl methacrylate	80-62-6	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Methylene Chloride	75-09-2	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		0.01	J	< 0.0057		0.0011	J
n-Heptane	142-82-5	NA		NA		NA		NA		NA		NA		NA		NA	
Pentachloroethane	76-01-7	NA		NA		NA		NA		NA		NA		NA		NA	
Propionitrile	107-12-0	0.026	R	0.036	R	0.061	R	0.025	R	0.022	R	0.23	R	0.023	R	0.025	R
Propylene oxide	75-56-9	0.13	R	0.18	R	0.3	R	0.12	R	0.11	R	< 1.2	R	0.11	R	0.12	R
Styrene	100-42-5	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
t-Butanol	75-65-0	NA		NA		NA		NA		NA		NA		NA		NA	
Tetrachloroethene	127-18-4	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Toluene	108-88-3	0.009		< 0.0089		< 0.015		< 0.0062		< 0.0054		0.017	J	< 0.0057		0.007	
trans-1,4-Dichloro-2-butene	110-57-6	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Trichloroethylene	79-01-6	< 0.3		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Trichlorofluoromethane	75-69-4	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
Vinyl acetate	108-05-4	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
Vinyl chloride	75-01-4	< 0.013		< 0.018		< 0.03		< 0.012		< 0.011		< 0.12		< 0.011		< 0.012	
Xylenes, Total	1330-20-7	< 0.0065		< 0.0089		< 0.015		< 0.0062		< 0.0054		< 0.058		< 0.0057		< 0.0062	
Volatile Organics (TICs) (mg/kg)																	
4-Isopropyltoluene	99-87-6	NA		NA		NA		NA		NA		NA		NA		0.021	J
Carbon Dioxide	124-38-9	NA		NA		NA		NA		NA		NA		NA		NA	
1,2,4-Trimethylbenzene	95-63-6	0.0027	J	NA		NA		NA		NA		0.025	J	NA		0.0018	J
1,3,5-Trimethylbenzene	108-67-8	NA		NA		NA		NA		NA		NA		NA		NA	
1,3-Dichlorobenzene	541-73-1	NA		NA		NA		NA		NA		NA		NA		NA	
1,4-Dichlorobenzene	106-46-7	NA		NA		NA		NA		NA		NA		NA		NA	
3-Ethyltoluene	620-14-4	0.0016	J	0.0014	J	0.0021	J	0.00075	J	0.001	J	NA		0.00055	J	0.0012	J
Acetaldehyde	75-07-0	NA		NA		NA		NA		0.0073	J	NA		NA		NA	
Butanal, 3-methyl-	590-86-3	0.0071	J	NA		NA		NA		NA		NA		NA		NA	
Butanal, isomer		NA		NA		NA		NA		NA		0.031	J	NA		NA	
C10H16		NA		NA		NA		NA		NA		NA		NA		0.071	J
cis-1,2-Dichloroethene	156-59-2	NA		NA		NA		NA		NA		NA		NA		NA	
Heptanal	111-71-7	0.0082	J	NA		NA		NA		0.021	J	0.031	J	NA		0.011	J
Hexanal	66-25-1	0.1	J	0.041	J	NA		0.064	J	0.18	J	0.39	J	0.028	J	0.09	J
Hexane	110-54-3	0.0052	J	0.0016	J	NA		NA		0.0054	J	0.041	J	NA		0.0041	J
Pentanal	110-62-3	0.034	J	NA		NA		0.016	J	0.06	J	0.12	J	NA		0.029	J

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / CAS No.	SDB-1 B	SDB-2 B	SDB-3 B	SDB-4 B	SDB-5 B	SDB-6 B	SDB-7 B	SDB-8 B
	Sample Date	12/2001	12/2001	12/2001	12/2001	12/2001	12/2001	12/2001	12/2001
	Sample Type	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
	Sample Location	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB
	Surface/Subsurface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
1,2,4-Trichlorobenzene	120-82-1	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
1,2-Dichlorobenzene	95-50-1	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
1,3,5-Trinitrobenzene	99-35-4	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
1,3-Dichlorobenzene	541-73-1	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
1,4-Dichlorobenzene	106-46-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
1,4-Dioxane	123-91-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	130-15-4	< 3.9	< 1.1	< 1.1	< 4.3	< 2	< 17	< 2.1	< 2
1-Naphthalenamine	134-32-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,2'-oxybis[1-chloropropane]	108-60-1	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,3,4,6-Tetrachlorophenol	58-90-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,4,5-Trichlorophenol	95-95-4	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,4,6-Trichlorophenol	88-06-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,4-Dichlorophenol	120-83-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,4-Dimethylphenol	105-67-9	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,4-Dinitrophenol	51-28-5	< 3.8	< 1.1	< 1.1	< 4.1	< 1.9	< 16	< 2	< 1.9
2,4-Dinitrotoluene	121-14-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,6-Dichlorophenol	87-65-0	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2,6-Dinitrotoluene	606-20-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Acetylaminofluorene	53-96-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Chloronaphthalene	91-58-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Chlorophenol	95-57-8	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Methylnaphthalene	91-57-6	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Methylphenol	95-48-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Naphthalenamine	91-59-8	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Nitroaniline	88-74-4	< 3.8	< 1.1	< 1.1	< 4.1	< 1.9	< 16	< 2	< 1.9
2-Nitrophenol	88-75-5	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-Picoline	109-06-8	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 1.6	< 1.1	< 1.1	< 1.7	< 0.79	< 6.8	< 0.85	< 0.79
3 & 4 Methylphenol	15831-10-4	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	< 3.9	< 1.1	< 1.1	< 4.3	< 2	< 17	< 2.1	< 2
3,3'-Dimethylbenzidine	119-93-7	< 3.9	< 1.1	< 1.1	< 4.3	< 2	< 17	< 2.1	< 2
3-Methylcholanthrene	56-49-5	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
3-Nitroaniline	99-09-2	< 3.8	< 1.1	< 1.1	< 4.1	< 1.9	< 16	< 2	< 1.9
4,6-Dinitro-2-methylphenol	534-52-1	< 3.8	< 1.1	< 1.1	< 4.1	< 1.9	< 16	< 2	< 1.9
4-Aminobiphenyl	92-67-1	< 3.9	< 5.3	< 5.8	< 4.3	< 2	< 17	< 2.1	< 2
4-Bromophenyl phenyl ether	101-55-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
4-Chloro-3-methylphenol	59-50-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39
4-Chloroaniline	106-47-8	0.78 R	1.1 R	1.1 R	0.84 R	0.39 R	3.4 R	0.42 R	0.39 R
4-Chlorophenyl phenyl ether	7005-72-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 4.2	< 0.39

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-1 B		SDB-2 B		SDB-3 B		SDB-4 B		SDB-5 B		SDB-6 B		SDB-7 B		SDB-8 B	
Sample Date		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB		SDB		SDB		SDB		SDB		SDB		SDB		SDB	
Surface/Subsurface		Surface		Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	CAS No.																
4-Nitroaniline	100-01-6	< 3.8		< 1.1		< 1.1		< 4.1		< 1.9		< 16		< 2		< 1.9	
4-Nitrophenol	100-02-7	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
4-Nitroquinoline-1-oxide	56-57-5	< 3.9		< 1.1		< 1.1		< 4.3		< 2		< 17		< 2.1		< 2	
5-Nitro-o-toluidine	99-55-8	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
7,12-Dimethylbenz(a)anthracene	57-97-6	NA		NA		NA		NA		NA		NA		NA		NA	
Acenaphthene	83-32-9	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
Acenaphthylene	208-96-8	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
Acetophenone	98-86-2	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
alpha,alpha-Dimethyl phenethylamine	122-09-8	NA		NA		NA		NA		NA		NA		NA		NA	
Aniline	62-53-3	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
Anthracene	120-12-7	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
Aramite, Total	140-57-8	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
Benzo[a]anthracene	56-55-3	0.17	L	< 1.1	L	< 1.1	L	< 0.84	L	< 0.39	L	< 3.4	L	< 0.42	L	< 0.39	L
Benzo[a]pyrene	50-32-8	0.14	L	< 1.1	L	< 1.1	L	< 0.84	L	0.044	L	< 3.4	L	< 0.42	L	< 0.39	L
Benzo[b]fluoranthene	205-99-2	0.21	J	< 1.1		< 1.1		< 0.84		0.053	J	< 3.4		< 0.42		< 0.39	
Benzo[g,h,i]perylene	191-24-2	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 4.2		< 0.39	
Benzo[k]fluoranthene	207-08-09	0.18	J	< 1.1		< 1.1		< 0.84		0.055	J	< 3.4		< 0.42		< 0.39	
Benzyl alcohol	100-51-6	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Bis(2-chloroethoxy)methane	111-91-1	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Bis(2-chloroethyl)ether	111-44-4	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Bis(2-ethylhexyl) phthalate	117-81-7	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		0.2	B	< 0.39	
Butyl benzyl phthalate	85-68-7	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Chrysene	218-01-9	0.4	J	< 1.1		< 1.1		< 0.84		0.064	J	< 3.4		< 0.42		< 0.39	
Diallate	2303-16-4	NA		NA		NA		NA		NA		NA		NA		NA	
Dibenz(a,h)anthracene	53-70-3	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Dibenzofuran	132-64-9	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Diethyl phthalate	84-66-2	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Dimethoate	60-51-5	NA		NA		NA		NA		NA		NA		NA		NA	
Dimethyl phthalate	131-11-3	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Di-n-butyl phthalate	84-74-2	NA		NA		NA		NA		NA		NA		NA		NA	
Di-n-octyl phthalate	117-84-0	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Ethyl methanesulfonate	62-50-0	NA		NA		NA		NA		NA		NA		NA		NA	
Fluoranthene	206-44-0	0.12	L	< 1.1	L	< 1.1	L	< 0.84	L	0.067	L	< 3.4	L	< 0.42	L	< 0.39	L
Fluorene	86-73-7	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Hexachlorobenzene	118-74-1	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Hexachlorobutadiene	87-68-3	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Hexachlorocyclopentadiene	77-47-4	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Hexachloroethane	67-72-1	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Hexachlorophene	70-30-4	NA		NA		NA		NA		NA		NA		NA		NA	
Hexachloropropene	1888-71-7	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	
Indeno[1,2,3-cd]pyrene	193-39-5	< 0.78		< 1.1		< 1.1		< 0.84		< 0.39		< 3.4		< 0.42		< 0.39	

Table A-1 **Soil Analytical Data**

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	SDB-1 B 12/2001 Investigation SDB Surface	SDB-2 B 12/2001 Investigation SDB Surface	SDB-3 B 12/2001 Investigation SDB Surface	SDB-4 B 12/2001 Investigation SDB Surface	SDB-5 B 12/2001 Investigation SDB Surface	SDB-6 B 12/2001 Investigation SDB Surface	SDB-7 B 12/2001 Investigation SDB Surface	SDB-8 B 12/2001 Investigation SDB Surface
Isophorone	78-59-1	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Isosafrole	120-58-1	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
m-Dinitrobenzene	99-65-0	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	91-80-5	< 3.9	< 1.1	< 1.1	< 4.3	< 2	< 17	< 2.1	< 2
Methyl methanesulfonate	66-27-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Naphthalene	91-20-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Nitrobenzene	98-95-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosodiethylamine	55-18-5	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosodimethylamine	62-75-9	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosodi-n-butylamine	924-16-3	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosodi-n-propylamine	621-64-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosodiphenylamine	86-30-6	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosomethylethylamine	10595-95-6	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosomorpholine	59-89-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosopiperidine	100-75-4	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
N-Nitrosopyrrolidine	930-55-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
o,o',o''-Triethylphosphorothioate	126-68-1	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	95-53-4	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
p-Dimethylamino azobenzene	60-11-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Pentachlorobenzene	608-93-5	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Pentachloronitrobenzene	82-68-8	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Pentachlorophenol	87-86-5	< 3.8	< 1.1	< 1.1	< 4.1	< 1.9	< 16	< 2	< 1.9
Phenacetin	62-44-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Phenanthrene	85-01-8	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Phenol	108-95-2	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
p-Phenylene diamine	106-50-3	< 7.8	< 1.1	< 1.1	< 8.4	< 3.9	< 34	< 4.2	< 3.9
Pronamide	23950-58-5	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Pyrene	129-00-0	< 0.78 L	< 1.1 L	< 1.1 L	< 0.84 L	0.059 L	< 3.4 L	< 0.42 L	< 0.39 L
Pyridine	110-86-1	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39
Safrole, Total	94-59-7	< 0.78	< 1.1	< 1.1	< 0.84	< 0.39	< 3.4	< 0.42	< 0.39

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-1 B	SDB-2 B	SDB-3 B	SDB-4 B	SDB-5 B	SDB-6 B	SDB-7 B	SDB-8 B
Sample Date		12/2001	12/2001	12/2001	12/2001	12/2001	12/2001	12/2001	12/2001
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**								
Semi-Volatile Organics (TICs) (mg/kg)									
Ergostanol	6538-02-9	NA	NA	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA	NA	NA	NA	NA	NA	NA	NA
28-Norolean-17-en-3-one	5912-72-1	NA	NA	NA	NA	NA	NA	NA	NA
2-Pentanone, 4-hydroxy-4-methyl-	123-42-2	NA	NA	NA	NA	NA	NA	NA	NA
2-Pentanone, 4-methoxy-4-methyl-	107-70-0	NA	NA	NA	NA	NA	NA	NA	NA
3-Penten-2-one, 4-methyl-	141-79-7	NA	NA	NA	NA	NA	NA	NA	NA
4,5-Dimethylthiazole S-oxide		NA	NA	NA	NA	NA	NA	NA	NA
alpha-Pinene		NA	NA	NA	NA	NA	NA	NA	NA
Benzene, 1-methyl-4-(1-methylethyl)-	99-87-6	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl cinnamate	103-41-3	NA	NA	NA	NA	NA	NA	NA	NA
Cholest-5-ene, 3-bromo-, (3.beta.)-	516-91-6	NA	NA	NA	NA	NA	NA	NA	NA
Cholesterol	57-88-5	NA	NA	NA	NA	NA	NA	NA	NA
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	14021-23-9	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	NA	NA	NA	NA	NA	NA	NA	NA
Phenol, 2-(2-propenyl)-	1745-81-9	NA	NA	NA	NA	NA	NA	NA	NA
Propane, 2,2-dimethoxy-	77-76-9	NA	NA	NA	NA	NA	NA	NA	NA
.alpha.-Amyrin	638-95-9	NA	NA	NA	NA	NA	NA	NA	NA
.beta.-Amyrin	559-70-6	NA	NA	NA	NA	NA	NA	NA	NA
1-Docosanethiol	7773-83-3	NA	NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA	NA	NA	NA	NA	NA
9-Hexacosene		NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]naphtho[2,3-d]furan	243-42-5	NA	NA	NA	NA	NA	NA	NA	NA
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2089-02-3	NA	NA	NA	NA	NA	NA	NA	NA
Cyclooctacosane	297-24-5	NA	NA	NA	NA	NA	NA	NA	NA
D:C-Friedooleanan-3-one	5945-53-9	NA	NA	NA	NA	NA	NA	NA	NA
Ergost-5-en-3-ol, (3.beta.)-	4651-51-8	NA	NA	NA	NA	NA	NA	NA	NA
Nonadecane	629-92-5	NA	NA	NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA	NA	NA	NA	NA	NA
Pentatriacontane	630-07-9	NA	NA	NA	NA	NA	NA	NA	NA
Stigmasterol	83-48-7	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	83-48-7	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	NA	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-1 B		SDB-2 B		SDB-3 B		SDB-4 B		SDB-5 B		SDB-6 B		SDB-7 B		SDB-8 B	
Sample Date		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001		12/2001	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB		SDB		SDB		SDB		SDB		SDB		SDB		SDB	
Surface/Subsurface		Surface		Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**																
Acrylamide, Acrylonitrile and Acrolein (mg/kg)																	
Acrylamide	79-06-1	NA		NA		NA		NA		NA		NA		NA		NA	
Alcohols and Glycols (mg/kg)																	
2-Butoxyethanol	111-76-2	5.8	R	7.8	R	8.2	R	6.3	R	5.8	R	25	R	6.1	R	5.9	R
Allyl alcohol	107-18-6	NA		NA		NA		NA		NA		NA		NA		NA	
Diethylene glycol	111-46-6	29	R	39	R	41	R	31	R	29	R	120	R	31	R	29	R
Dipropylene glycol	25265-71-8	29	R	39	R	41	R	31	R	29	R	120	R	6.1	R	29	R
Ethanol	64-17-5	5.8	R	7.8	R	8.2	R	6.3	R	5.8	R	25	R	6.1	R	5.9	R
Ethylene glycol	107-21-1	29	R	39	R	41	R	31	R	29	R	120	R	31	R	29	R
Ethylene glycol monobutyl ether	111-76-2	NA		NA		NA		NA		NA		NA		NA		NA	
Ethylene glycol monopropyl ether	2807-30-9	NA		NA		NA		NA		NA		NA		NA		NA	
Isopropanol	67-63-0	5.8	R	7.8	R	8.2	R	6.3	R	5.8	R	25	R	6.1	R	5.9	R
Methanol	67-56-1	5.8	R	7.8	R	8.2	R	6.3	R	5.8	R	25	R	6.1	R	5.9	R
Propyl cellosolve	2807-30-9	5.8	R	7.8	R	8.2	R	6.3	R	5.8	R	25	R	6.1	R	5.9	R
Propylene glycol	57-55-6	29	R	39	R	41	R	31	R	29	R	120	R	31	R	29	R
tert-Butyl alcohol	75-65-0	5.8	R	7.8	R	8.2	R	6.3	R	5.8	R	25	R	31	R	5.9	R
Inorganics (mg/kg)																	
Aluminum	7429-90-5	13800	K	16100	K	37700	K	25900	K	10200	K	21300	K	26000	K	16200	K
Arsenic	7440-38-2	1.8		1.1		3.5		3.8		2.5		3.2		2.9		1.6	J
Barium	7440-39-3	35		31.5		62.8		37.5		58.9		58.9		32.2		60.4	
Beryllium	7440-41-7	0.36		0.4		0.91		0.69		0.75		0.75		0.71		0.69	
Cadmium	7440-43-9	< 0.59		< 0.8		0.14		< 0.64		< 0.59		< 2.6		< 0.64		0.14	
Calcium	7440-70-2	1060		1310		1160		2570		1620		1580		1360		2120	J
Chromium	7440-47-3	28.3		28.3		52.2		32.2		10.5		27.8		33.1		21.7	J
Cobalt	7440-48-4	2.6		3.1		7.1		6.5		4.5		6.1		5.7		7.1	
Copper	7440-50-8	12.8		15.3		22.9		12.4		7.8		23.3		13		14.5	K
Iron	7439-89-6	13200	K	10900	K	28600	K	25200	K	7640	K	19100	K	19500	K	11700	L
Lead	7439-92-1	14	J	13.5	J	36.3	J	20.1	J	48.7	J	23	J	14.5		42.8	
Magnesium	7439-95-4	721		936		1290		1570		857		970		1350		899	J
Manganese	7439-96-5	65.7		43.8		48.4		67.3		299		51.8		26.3		289	L
Mercury	7487-94-7	0.072	K	0.069	K	0.14	K	0.044	K	0.029	K	0.11	K	0.025	K	0.04	K
Nickel	7440-02-0	6.1	K	7.8	K	15	K	9.8	K	4.8	K	13.8	K	9	K	8.7	L
Potassium	7440-09-7	385		670		877		692		465		912		613		619	
Selenium	7782-49-2	< 0.59		< 0.8		< 0.87		< 0.64		< 0.59		< 2.6		< 0.64		0.81	
Silver	7440-22-4	< 1.2		< 1.6		< 1.7		< 1.3		< 1.2		< 5.1		< 1.3		< 1.2	
Sodium	7440-23-5	58.3		< 797		< 867		< 639		< 594		< 2,560		58.6		< 591	
Thallium	7440-28-0	< 1.2		< 1.6		< 1.7		< 1.3		< 1.2		< 5.1		< 1.3		< 1.2	
Vanadium	7440-62-2	35.6	K	34.8	K	76.4	K	48.6	K	18.3	K	54.9	K	57.4	K	37.3	
Zinc	7440-66-6	63.6		63.5		141		39.5		49		102		29.4		88.9	

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-1 B 12/2001 Investigation SDB Surface	SDB-2 B 12/2001 Investigation SDB Surface	SDB-3 B 12/2001 Investigation SDB Surface	SDB-4 B 12/2001 Investigation SDB Surface	SDB-5 B 12/2001 Investigation SDB Surface	SDB-6 B 12/2001 Investigation SDB Surface	SDB-7 B 12/2001 Investigation SDB Surface	SDB-8 B 12/2001 Investigation SDB Surface
Other Inorganics (mg/kg)									
Chlorides	16887-00-6	19.7 J	17.5 J	25.1 J	9.9 BJ	10.8 BJ	104 J	12.8 J	12.7 J
Nitrates 14797-55-8		14.5	40.3	17.5	2.6 B	5.7 B	8.7 B	2.6 B	17.6
Nitrites 14797-65-0		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	14808-79-8	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	7727-37-9	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	7440-44-0	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-9 B 12/2001 Investigation SDB Surface	VFSP-1 3/6/2007 Investigation VFSP Surface	VFSP-2 3/6/2007 Investigation VFSP Surface	VFSP-3 3/6/2007 Investigation VFSP Surface	VFSP-4 3/6/2007 Investigation VFSP Surface	VFSP-5 3/6/2007 Investigation VFSP Surface	VFSP-6 3/6/2007 Investigation VFSP Surface	VFSP-7 3/6/2007 Investigation VFSP Surface
Volatile Organics (mg/kg)									
1,1,1,2-Tetrachloroethane	630-20-6	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	79-00-5	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	75-34-3	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	75-35-4	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	96-18-4	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.019	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	106-93-4	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	107-06-2	0.012	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	156-60-5	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	78-87-5	< 0.0096	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	10061-01-5	< 0.0096	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	10061-02-6	< 0.0096	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	123-91-1	0.96 R	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	78-93-3	0.018 J	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	591-78-6	< 0.019	NA	NA	NA	NA	NA	NA	NA
2-Methyl-1-propanol (Isobutyl Alcohol)	78-83-1	0.38 R	NA	NA	NA	NA	NA	NA	NA
3-Methylhexane	589-34-4	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	108-10-1	< 0.019	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	0.14	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	75-05-8	0.096 R	NA	NA	NA	NA	NA	NA	NA
Acrolein	107-02-08	0.096 R	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	107-13-1	< 0.096	NA	NA	NA	NA	NA	NA	NA
Allyl alcohol	107-18-6	0.25 R	NA	NA	NA	NA	NA	NA	NA
Allyl chloride	107-05-1	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Benzene	71-43-2	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Benzyl chloride	100-44-7	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	75-27-4	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Bromoform	75-25-2	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Bromomethane	74-83-9	< 0.019	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	75-15-0	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	56-23-5	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	108-90-7	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Chloroethane	75-00-3	< 0.019	NA	NA	NA	NA	NA	NA	NA
Chloroform	67-66-3	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Chloromethane	74-87-3	< 0.019	NA	NA	NA	NA	NA	NA	NA
Chloroprene	126-99-8	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	74-95-3	< 0.0096	NA	NA	NA	NA	NA	NA	NA

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Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-9 B 12/2001 Investigation SDB Surface	VFSP-1 3/6/2007 Investigation VFSP Surface	VFSP-2 3/6/2007 Investigation VFSP Surface	VFSP-3 3/6/2007 Investigation VFSP Surface	VFSP-4 3/6/2007 Investigation VFSP Surface	VFSP-5 3/6/2007 Investigation VFSP Surface	VFSP-6 3/6/2007 Investigation VFSP Surface	VFSP-7 3/6/2007 Investigation VFSP Surface
Dichlorodifluoromethane	75-71-8	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Dichlorofluoromethane	75-43-4	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl ether	60-29-7	NA	NA	NA	NA	NA	NA	NA	NA
Ethanol	64-17-5	0.38 R*	NA	NA	NA	NA	NA	NA	NA
Ethyl methacrylate	97-63-2	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Ethylene oxide	75-21-8	5.7 R	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Methacrylonitrile	126-98-7	< 0.038	NA	NA	NA	NA	NA	NA	NA
Methyl methacrylate	80-62-6	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	0.0022 J	NA	NA	NA	NA	NA	NA	NA
n-Heptane	142-82-5	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	76-01-7	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile	107-12-0	0.038 R	NA	NA	NA	NA	NA	NA	NA
Propylene oxide	75-56-9	0.19 R	NA	NA	NA	NA	NA	NA	NA
Styrene	100-42-5	< 0.0096	NA	NA	NA	NA	NA	NA	NA
t-Butanol	75-65-0	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	127-18-4	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Toluene	108-88-3	< 0.0096	NA	NA	NA	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	110-57-6	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	79-01-6	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	< 0.019	NA	NA	NA	NA	NA	NA	NA
Vinyl acetate	108-05-4	< 0.019	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	75-01-4	< 0.019	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	1330-20-7	< 0.0096	NA	NA	NA	NA	NA	NA	NA
Volatile Organics (TICs) (mg/kg)									
4-Isopropyltoluene	99-87-6	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	95-63-6	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	108-67-8	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	NA	NA	NA	NA	NA	NA	NA	NA
3-Ethyltoluene	620-14-4	NA	NA	NA	NA	NA	NA	NA	NA
Acetaldehyde	75-07-0	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, 3-methyl-	590-86-3	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, isomer		NA	NA	NA	NA	NA	NA	NA	NA
C10H16		NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	NA	NA	NA	NA	NA	NA	NA	NA
Heptanal	111-71-7	NA	NA	NA	NA	NA	NA	NA	NA
Hexanal	66-25-1	0.023 J	NA	NA	NA	NA	NA	NA	NA
Hexane	110-54-3	0.001 J	NA	NA	NA	NA	NA	NA	NA
Pentanal	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA

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Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	95-50-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene	99-35-4	< 0.45	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	123-91-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	130-15-4	< 2.3	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenamine	134-32-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,2'-oxybis[1-chloropropane]	108-60-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	58-90-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	105-67-9	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	51-28-5	< 2.2	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	87-65-0	< 0.45	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	53-96-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	91-58-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	95-57-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-6	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	95-48-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Naphthalenamine	91-59-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	88-74-4	< 2.2	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	88-75-5	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-Picoline	109-06-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 0.9	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	15831-10-4	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	< 2.3	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	119-93-7	< 2.3	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	56-49-5	< 0.45	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	99-09-2	< 2.2	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	534-52-1	< 2.2	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	92-67-1	< 2.3	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	101-55-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	59-50-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	0.45 R	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	7005-72-3	< 0.45	NA	NA	NA	NA	NA	NA	NA

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4-Nitroaniline	100-01-6	< 2.2	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	100-02-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	56-57-5	< 2.3	NA	NA	NA	NA	NA	NA	NA
5-Nitro-o-toluidine	99-55-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	57-97-6	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	< 0.45	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	208-96-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
Acetophenone	98-86-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
alpha,alpha-Dimethyl phenethylamine	122-09-8	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	62-53-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
Anthracene	120-12-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
Aramite, Total	140-57-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	< 0.45 L	NA	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene	50-32-8	< 0.45 L	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
Benzo[g,h,i]perylene	191-24-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	207-08-09	< 0.45	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol	100-51-6	< 0.45	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	111-91-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	111-44-4	< 0.45	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	117-81-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	85-68-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
Chrysene	218-01-9	< 0.45	NA	NA	NA	NA	NA	NA	NA
Diallate	2303-16-4	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	< 0.45	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	84-66-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
Dimethoate	60-51-5	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	131-11-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	84-74-2	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	117-84-0	< 0.45	NA	NA	NA	NA	NA	NA	NA
Ethyl methanesulfonate	62-50-0	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	206-44-0	< 0.45 L	NA	NA	NA	NA	NA	NA	NA
Fluorene	86-73-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	118-74-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	< 0.45	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	67-72-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	70-30-4	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	1888-71-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	193-39-5	< 0.45	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / CAS No.	SDB-9 B 12/2001 Investigation SDB Surface	VFSP-1 3/6/2007 Investigation VFSP Surface	VFSP-2 3/6/2007 Investigation VFSP Surface	VFSP-3 3/6/2007 Investigation VFSP Surface	VFSP-4 3/6/2007 Investigation VFSP Surface	VFSP-5 3/6/2007 Investigation VFSP Surface	VFSP-6 3/6/2007 Investigation VFSP Surface	VFSP-7 3/6/2007 Investigation VFSP Surface
Isophorone	78-59-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
Isosafrole	120-58-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
m-Dinitrobenzene	99-65-0	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	91-80-5	< 2.3	NA	NA	NA	NA	NA	NA	NA
Methyl methanesulfonate	66-27-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	98-95-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiethylamine	55-18-5	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodimethylamine	62-75-9	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-propylamine	621-64-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	86-30-6	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosomethylethylamine	10595-95-6	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosomorpholine	59-89-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosopiperidine	100-75-4	< 0.45	NA	NA	NA	NA	NA	NA	NA
N-Nitrosopyrrolidine	930-55-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
o,o',o''-Triethylphosphorothioate	126-68-1	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	95-53-4	< 0.45	NA	NA	NA	NA	NA	NA	NA
p-Dimethylamino azobenzene	60-11-7	< 0.45	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	608-93-5	< 0.45	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	82-68-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	< 2.2	NA	NA	NA	NA	NA	NA	NA
Phenacetin	62-44-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	< 0.45	NA	NA	NA	NA	NA	NA	NA
Phenol	108-95-2	< 0.45	NA	NA	NA	NA	NA	NA	NA
p-Phenylene diamine	106-50-3	< 4.5	NA	NA	NA	NA	NA	NA	NA
Pronamide	23950-58-5	< 0.45	NA	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	< 0.45 L	NA	NA	NA	NA	NA	NA	NA
Pyridine	110-86-1	< 0.45	NA	NA	NA	NA	NA	NA	NA
Safrole, Total	94-59-7	< 0.45	NA	NA	NA	NA	NA	NA	NA

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Soil Analytical Data
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Sample Identification		SDB-9 B	VFSP-1		VFSP-2		VFSP-3		VFSP-4		VFSP-5		VFSP-6		VFSP-7	
Sample Date		12/2001	3/6/2007		3/6/2007		3/6/2007		3/6/2007		3/6/2007		3/6/2007		3/6/2007	
Sample Type		Investigation	Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB	VFSP		VFSP		VFSP		VFSP		VFSP		VFSP		VFSP	
Surface/Subsurface		Surface	Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**															
Semi-Volatile Organics (TICs) (mg/kg)																
Ergostanol	6538-02-9	NA	NA		NA		21	JN	11	JN	12	JN	41	R	36	JN
.gamma.-Sitosterol	83-47-6	NA	14	JN	NA		32	JN	NA		9.5	JN	26	JN	24	JN
28-Norolean-17-en-3-one	5912-72-1	NA	NA		NA		NA		NA		NA		NA		NA	
2-Pentanone, 4-hydroxy-4-methyl-	123-42-2	NA	NA		NA		NA		NA		NA		NA		NA	
2-Pentanone, 4-methoxy-4-methyl-	107-70-0	NA	NA		NA		NA		NA		NA		NA		NA	
3-Penten-2-one, 4-methyl-	141-79-7	NA	NA		NA		NA		NA		NA		NA		NA	
4,5-Dimethylthiazole S-oxide		NA	NA		NA		NA		NA		NA		NA		NA	
alpha-Pinene		NA	NA		NA		NA		NA		NA		NA		NA	
Benzene, 1-methyl-4-(1-methylethyl)-	99-87-6	NA	NA		NA		NA		NA		NA		NA		NA	
Benzyl cinnamate	103-41-3	NA	NA		NA		NA		NA		NA		NA		NA	
Cholest-5-ene, 3-bromo-, (3.beta.)-	516-91-6	NA	NA		NA		NA		NA		NA		NA		NA	
Cholesterol	57-88-5	NA	NA		NA		NA		NA		NA		NA		NA	
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	14021-23-9	NA	NA		NA		NA		NA		NA		NA		NA	
Methylene Chloride	75-09-2	NA	NA		NA		NA		NA		NA		NA		NA	
Phenol, 2-(2-propenyl)-	1745-81-9	NA	NA		NA		NA		NA		NA		NA		NA	
Propane, 2,2-dimethoxy-	77-76-9	NA	NA		NA		NA		NA		NA		NA		NA	
.alpha.-Amyrin	638-95-9	NA	NA		NA		NA		9.8	JN	6.5	JN	23	JN	26	JN
.beta.-Amyrin	559-70-6	NA	NA		NA		NA		NA		NA		NA		NA	
1-Docosanethiol	7773-83-3	NA	NA		NA		11	JN	NA		NA		NA		NA	
1-Dotriacontanol	6624-79-9	NA	NA		NA		NA		9.5	JN	NA		NA		NA	
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA		3	JN	27	JN	NA		13	JN	NA		NA	
9-Hexacosene		NA	NA		NA		NA		28	R	NA		NA		NA	
Benzo[b]naphtho[2,3-d]furan	243-42-5	NA	NA		NA		13	JN	NA		NA		NA		NA	
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2089-02-3	NA	NA		NA		9.5	JN	NA		NA		NA		12	JN
Cyclooctacosane	297-24-5	NA	NA		NA		NA		NA		NA		NA		NA	
D:C-Friedooleanan-3-one	5945-53-9	NA	NA		NA		NA		NA		NA		31	R	NA	
Ergost-5-en-3-ol, (3.beta.)-	4651-51-8	NA	NA		NA		NA		4.2	JN	NA		NA		NA	
Nonadecane	629-92-5	NA	NA		NA		NA		NA		NA		NA		NA	
Pentacosane	629-99-2	NA	NA		NA		NA		NA		NA		NA		NA	
Pentatriacontane	630-07-9	NA	NA		NA		NA		NA		NA		NA		NA	
Stigmasterol	83-48-7	NA	NA		NA		8.1	JN	NA		NA		NA		NA	
bis(2-Ethylhexyl) phthalate	83-48-7	NA	NA		NA		NA		NA		NA		NA		NA	
4-Chloroaniline	106-47-8	NA	NA		NA		NA		NA		NA		NA		NA	

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Soil Analytical Data
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Constituent	CAS No.	Sample Identification	Sample Date	Sample Type	Sample Location	Surface/Subsurface
		SDB-9 B	12/2001	Investigation	SDB	Surface
		VFSP-1	3/6/2007	Investigation	VFSP	Surface
		VFSP-2	3/6/2007	Investigation	VFSP	Surface
		VFSP-3	3/6/2007	Investigation	VFSP	Surface
		VFSP-4	3/6/2007	Investigation	VFSP	Surface
		VFSP-5	3/6/2007	Investigation	VFSP	Surface
		VFSP-6	3/6/2007	Investigation	VFSP	Surface
		VFSP-7	3/6/2007	Investigation	VFSP	Surface
Acrylamide, Acrylonitrile and Acrolein (mg/kg)						
Acrylamide	79-06-1	NA		NA	NA	NA	NA	NA	NA
Alcohols and Glycols (mg/kg)						
2-Butoxyethanol	111-76-2	6.6 R	< 56	< 7.7	< 37	< 67	< 27	< 56	< 57
Allyl alcohol	107-18-6	NA	< 11	< 1.5	< 7.4	< 13	< 5.4	< 11	< 11
Diethylene glycol	111-46-6	33 R	< 56	< 7.7	< 37	< 67	< 27	< 56	< 57
Dipropylene glycol	25265-71-8	33 R	< 56	< 7.7	< 37	< 67	< 27	< 56	< 57
Ethanol	64-17-5	6.6 R	< 11	< 1.5	< 7.4	< 13	< 5.4	< 11	< 11
Ethylene glycol	107-21-1	33 R	< 56	< 7.7	< 37	< 67	< 27	< 56	< 57
Ethylene glycol monobutyl ether	111-76-2	NA	NA	NA	NA	NA	NA	NA	NA
Ethylene glycol monopropyl ether	2807-30-9	NA	NA	NA	NA	NA	NA	NA	NA
Isopropanol	67-63-0	6.6 R	< 11	< 1.5	< 7.4	< 13	< 5.4	< 11	< 11
Methanol	67-56-1	6.6 R	< 11	< 1.5	< 7.4	< 13	< 5.4	< 11	< 11
Propyl cellosolve	2807-30-9	6.6 R	< 56	< 7.7	< 37	< 67	< 27	< 56	< 57
Propylene glycol	57-55-6	33 R	< 56	< 7.7	< 37	< 67	< 27	< 56	< 57
tert-Butyl alcohol	75-65-0	6.6 R	< 11	< 1.5	< 7.4	< 13	< 5.4	< 11	< 11
Inorganics (mg/kg)						
Aluminum	7429-90-5	22700 K	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	1.2 J	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	55.8	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-41-7	0.65	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	< 0.68	NA	NA	NA	NA	NA	NA	NA
Calcium	7440-70-2	727 J	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	31.8 J	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4	5.8	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8	12.9 K	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6	16500 L	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	15.5	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4	1090 J	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	64.3 L	NA	NA	NA	NA	NA	NA	NA
Mercury	7487-94-7	0.036 K	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	9.7 L	NA	NA	NA	NA	NA	NA	NA
Potassium	7440-09-7	687	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	< 0.68	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	< 1.4	NA	NA	NA	NA	NA	NA	NA
Sodium	7440-23-5	< 678	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0	< 1.4	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2	45.8	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	45	NA	NA	NA	NA	NA	NA	NA

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Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	SDB-9 B 12/2001 Investigation SDB Surface	VFSP-1 3/6/2007 Investigation VFSP Surface	VFSP-2 3/6/2007 Investigation VFSP Surface	VFSP-3 3/6/2007 Investigation VFSP Surface	VFSP-4 3/6/2007 Investigation VFSP Surface	VFSP-5 3/6/2007 Investigation VFSP Surface	VFSP-6 3/6/2007 Investigation VFSP Surface	VFSP-7 3/6/2007 Investigation VFSP Surface
Other Inorganics (mg/kg)									
Chlorides	16887-00-6	6.2 BJ	NA	NA	NA	NA	NA	NA	NA
Nitrates 14797-55-8		6.9	NA	NA	NA	NA	NA	NA	NA
Nitrites 14797-65-0		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	14808-79-8	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	7727-37-9	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	7440-44-0	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

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Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	VFSP-8 3/6/2007 Investigation VFSP Surface	VFSP-9 3/6/2007 Investigation VFSP Surface	VFSP-1 B 12/18/2001 Investigation VFSP Surface	VFSP-1 B DUP 12/18/2001 Duplicate VFSP Surface	VFSP-2 B 12/18/2001 Investigation VFSP Surface	VFSP-3 B 12/18/2001 Investigation VFSP Surface	VFSP-4 B 12/18/2001 Investigation VFSP Surface	VFSP-5 B 12/18/2001 Investigation VFSP Surface
Volatile Organics (mg/kg)									
1,1,1,2-Tetrachloroethane	630-20-6	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
1,1,1-Trichloroethane	71-55-6	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
1,1,2-Trichloroethane	79-00-5	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
1,1-Dichloroethane	75-34-3	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
1,1-Dichloroethene	75-35-4	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
1,2,3-Trichloropropane	96-18-4	NA	NA	< 0.038 J	< 0.036 J	< 0.024 J	< 0.054 J	< 0.032 J	< 0.038 J
1,2-Dibromo-3-Chloropropane	96-12-8	NA	NA	< 0.077 J	< 0.071 J	< 0.049 J	< 0.11 J	< 0.065 J	< 0.077 J
1,2-Dibromoethane	106-93-4	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
1,2-Dichloroethane	107-06-2	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
trans-1,2-Dichloroethene	156-60-5	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
1,2-Dichloropropane	78-87-5	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
cis-1,3-Dichloropropene	10061-01-5	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
trans-1,3-Dichloropropene	10061-02-6	NA	NA	< 0.038	< 0.036 J	< 0.024	< 0.054	< 0.032	< 0.038
1,4-Dioxane	123-91-1	NA	NA	3.8 R	3.6 R	2.4 R	5.4 R	3.2 R	3.8 R
2-Butanone (MEK)	78-93-3	NA	NA	0.63	1	0.38	0.44	0.27	0.4
2-Hexanone	591-78-6	NA	NA	< 0.077	< 0.072 J	< 0.049 J	< 0.11	< 0.065	< 0.077
2-Methyl-1-propanol (Isobutyl Alcohol)	78-83-1	NA	NA	< 1.5	1.4 R	0.98 R	2.2 R	1.3 R	1.5 R
3-Methylhexane	589-34-4	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
4-Methyl-2-pentanone (MIBK)	108-10-1	NA	NA	< 0.077	< 0.072	< 0.049	< 0.11	< 0.065	< 0.077
Acetone	67-64-1	NA	NA	3.1	2.6	1.4 J	1.6	0.93	1.5
Acetonitrile	75-05-8	NA	NA	0.38 R	0.36 R	0.24 R	0.54 R	0.32 R	0.38 R
Acrolein	107-02-08	NA	NA	0.38 R	0.36 R	0.24 R	0.54 R	0.32 R	0.38 R
Acrylonitrile	107-13-1	NA	NA	< 0.38	< 0.36	< 0.24	< 0.54	< 0.32	< 0.38
Allyl alcohol	107-18-6	NA	NA	1 R	0.94 R	0.63 R	1.4 R	0.84 R	1 R
Allyl chloride	107-05-1	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Benzene	71-43-2	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Benzyl chloride	100-44-7	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Bromodichloromethane	75-27-4	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Bromoform	75-25-2	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
Bromomethane	74-83-9	NA	NA	< 0.077 J	< 0.072 J	< 0.049 J	< 0.11 J	< 0.065 J	< 0.077 J
Carbon disulfide	75-15-0	NA	NA	0.016 J	0.032 J	0.01 J	< 0.054	< 0.032	< 0.038
Carbon tetrachloride	56-23-5	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Chlorobenzene	108-90-7	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
Chloroethane	75-00-3	NA	NA	< 0.077	< 0.071	< 0.049	< 0.11	< 0.065	< 0.077
Chloroform	67-66-3	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Chloromethane	74-87-3	NA	NA	< 0.077 L	< 0.072 L	< 0.049 L	< 0.11 L	< 0.065 L	< 0.077 L
Chloroprene	126-99-8	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
Dibromomethane	74-95-3	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	VFSP-8 3/6/2007 Investigation VFSP Surface	VFSP-9 3/6/2007 Investigation VFSP Surface	VFSP-1 B 12/18/2001 Investigation VFSP Surface	VFSP-1 B DUP 12/18/2001 Duplicate VFSP Surface	VFSP-2 B 12/18/2001 Investigation VFSP Surface	VFSP-3 B 12/18/2001 Investigation VFSP Surface	VFSP-4 B 12/18/2001 Investigation VFSP Surface	VFSP-5 B 12/18/2001 Investigation VFSP Surface
Dichlorodifluoromethane	75-71-8	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Dichlorofluoromethane	75-43-4	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Diethyl ether	60-29-7	NA	NA	NA	NA	NA	NA	NA	NA
Ethanol	64-17-5	NA	NA	1.5 R	1.4 R	0.98 R	2.2 R	1.3 R	1.5 R
Ethyl methacrylate	97-63-2	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
Ethylbenzene	100-41-4	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
Ethylene oxide	75-21-8	NA	NA	23 R	22 R	15 R	33 R	19 R	23 R
Iodomethane	74-88-4	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Methacrylonitrile	126-98-7	NA	NA	0.15 R	< 0.14	< 0.098	< 0.22	< 0.13	< 0.15
Methyl methacrylate	80-62-6	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Methylene Chloride	75-09-2	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
n-Heptane	142-82-5	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Pentachloroethane	76-01-7	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile	107-12-0	NA	NA	0.15 R	0.14 R	0.098 R	0.22 R	0.13 R	0.15 R
Propylene oxide	75-56-9	NA	NA	0.77 R	0.72 R	0.49 R	1.1 R	0.65 R	0.77 R
Styrene	100-42-5	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
t-Butanol	75-65-0	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	127-18-4	NA	NA	< 0.038	< 0.036 J	< 0.024 J	< 0.054	< 0.032	< 0.038
Toluene	108-88-3	NA	NA	< 0.038	< 0.036 J	< 0.024	< 0.054	< 0.032	< 0.038
trans-1,4-Dichloro-2-butene	110-57-6	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Trichloroethylene	79-01-6	NA	NA	< 0.038	< 0.036	< 0.024	< 0.054	< 0.032	< 0.038
Trichlorofluoromethane	75-69-4	NA	NA	< 0.077	< 0.072	< 0.049	< 0.11	< 0.032	< 0.077
Vinyl acetate	108-05-4	NA	NA	< 0.077	< 0.072	< 0.049	< 0.11	< 0.065	< 0.077
Vinyl chloride	75-01-4	NA	NA	< 0.077	< 0.072	< 0.049	< 0.11	< 0.065	< 0.077
Xylenes, Total	1330-20-7	NA	NA	< 0.038	< 0.036	< 0.024 J	< 0.054	< 0.032	< 0.038
Volatile Organics (TICs) (mg/kg)									
4-Isopropyltoluene	99-87-6	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	95-63-6	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	108-67-8	NA	NA	0.019 J	0.025 J	0.019 J	0.025 J	0.015 J	0.029 J
1,3-Dichlorobenzene	541-73-1	NA	NA	0.023 J	0.019 J	0.013 J	NA	NA	0.043 J
1,4-Dichlorobenzene	106-46-7	NA	NA	NA	NA	NA	NA	NA	0.0067 J
3-Ethyltoluene	620-14-4	NA	NA	NA	NA	NA	NA	NA	NA
Acetaldehyde	75-07-0	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, 3-methyl-	590-86-3	NA	NA	NA	NA	NA	NA	NA	NA
Butanal, isomer		NA	NA	NA	NA	NA	NA	NA	NA
C10H16		NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	NA	NA	NA	NA	NA	NA	NA	NA
Heptanal	111-71-7	NA	NA	NA	NA	NA	NA	NA	NA
Hexanal	66-25-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexane	110-54-3	NA	NA	0.0037 J	0.0063 J	0.0028 J	NA	NA	NA
Pentanal	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA

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Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	VFSP-8 3/6/2007 Investigation VFSP Surface	VFSP-9 3/6/2007 Investigation VFSP Surface	VFSP-1 B 12/18/2001 Investigation VFSP Surface	VFSP-1 B DUP 12/18/2001 Duplicate VFSP Surface	VFSP-2 B 12/18/2001 Investigation VFSP Surface	VFSP-3 B 12/18/2001 Investigation VFSP Surface	VFSP-4 B 12/18/2001 Investigation VFSP Surface	VFSP-5 B 12/18/2001 Investigation VFSP Surface
Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
1,2,4-Trichlorobenzene	120-82-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
1,2-Dichlorobenzene	95-50-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
1,3,5-Trinitrobenzene	99-35-4	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
1,3-Dichlorobenzene	541-73-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
1,4-Dichlorobenzene	106-46-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
1,4-Dioxane	123-91-1	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	130-15-4	NA	NA	< 130	< 24	< 200	< 460	< 110	< 130
1-Naphthalenamine	134-32-7	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
2,2'-oxybis[1-chloropropane]	108-60-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2,3,4,6-Tetrachlorophenol	58-90-2	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
2,4,5-Trichlorophenol	95-95-4	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2,4,6-Trichlorophenol	88-06-2	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2,4-Dichlorophenol	120-83-2	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2,4-Dimethylphenol	105-67-9	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2,4-Dinitrophenol	51-28-5	NA	NA	< 120	< 23	< 200	< 440	< 100	< 120
2,4-Dinitrotoluene	121-14-2	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2,6-Dichlorophenol	87-65-0	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
2,6-Dinitrotoluene	606-20-2	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2-Acetylaminofluorene	53-96-3	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
2-Chloronaphthalene	91-58-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2-Chlorophenol	95-57-8	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2-Methylnaphthalene	91-57-6	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2-Methylphenol	95-48-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2-Naphthalenamine	91-59-8	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
2-Nitroaniline	88-74-4	NA	NA	< 120	< 23 L	< 200	< 440	< 100	< 120
2-Nitrophenol	88-75-5	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
2-Picoline	109-06-8	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
2-sec-Butyl-4,6-dinitrophenol	88-85-7	NA	NA	< 51	< 9.7	< 81	< 180	< 44	< 52
3 & 4 Methylphenol	15831-10-4	NA	NA	< 63	< 4.8 L	< 40	< 90	< 22	< 26
3,3'-Dichlorobenzidine	91-94-1	NA	NA	< 130	< 24 L	< 200	< 460	< 110	< 130
3,3'-Dimethylbenzidine	119-93-7	NA	NA	< 130	< 24	< 200	< 460	< 110	< 130
3-Methylcholanthrene	56-49-5	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
3-Nitroaniline	99-09-2	NA	NA	< 120	< 23 L	< 200	< 440	< 100	< 120
4,6-Dinitro-2-methylphenol	534-52-1	NA	NA	< 120	< 23 L	< 200	< 440	< 100	< 120
4-Aminobiphenyl	92-67-1	NA	NA	< 130	< 24	< 200	< 460	< 110	< 130
4-Bromophenyl phenyl ether	101-55-3	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
4-Chloro-3-methylphenol	59-50-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
4-Chloroaniline	106-47-8	NA	NA	< 25	4.8 R	< 40	< 90	< 22	< 26
4-Chlorophenyl phenyl ether	7005-72-3	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26

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Sample Identification		VFSP-8	VFSP-9	VFSP-1 B	VFSP-1 B DUP	VFSP-2 B	VFSP-3 B	VFSP-4 B	VFSP-5 B
Sample Date		3/6/2007	3/6/2007	12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/18/2001
Sample Type		Investigation	Investigation	Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation
Sample Location		VFSP	VFSP	VFSP	VFSP	VFSP	VFSP	VFSP	VFSP
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**								
4-Nitroaniline	100-01-6	NA	NA	< 120	< 23 L	< 200	< 440	< 100	< 120
4-Nitrophenol	100-02-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
4-Nitroquinoline-1-oxide	56-57-5	NA	NA	< 130	< 24	< 200	< 460	< 110	< 130
5-Nitro-o-toluidine	99-55-8	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
7,12-Dimethylbenz(a)anthracene	57-97-6	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Acenaphthene	83-32-9	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Acenaphthylene	208-96-8	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Acetophenone	98-86-2	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
alpha,alpha-Dimethyl phenethylamine	122-09-8	NA	NA	< 250	< 48	< 400	< 900	< 220	< 260
Aniline	62-53-3	NA	NA	< 25 L	< 4.8 L	< 40 L	< 90 L	< 22 L	< 26 L
Anthracene	120-12-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Aramite, Total	140-57-8	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Benzo[a]anthracene	56-55-3	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Benzo[a]pyrene	50-32-8	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Benzo[b]fluoranthene	205-99-2	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Benzo[g,h,i]perylene	191-24-2	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Benzo[k]fluoranthene	207-08-09	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Benzyl alcohol	100-51-6	NA	NA	< 25 J	< 4.8 L	< 40 J	< 90 J	< 22 J	< 26 J
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Bis(2-chloroethyl)ether	111-44-4	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Bis(2-ethylhexyl) phthalate	117-81-7	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Butyl benzyl phthalate	85-68-7	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Chrysene	218-01-9	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Diallate	2303-16-4	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Dibenzofuran	132-64-9	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Diethyl phthalate	84-66-2	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Dimethoate	60-51-5	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	131-11-3	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Di-n-butyl phthalate	84-74-2	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Di-n-octyl phthalate	117-84-0	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Ethyl methanesulfonate	62-50-0	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Fluoranthene	206-44-0	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Fluorene	86-73-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Hexachlorobenzene	118-74-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Hexachlorobutadiene	87-68-3	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Hexachlorocyclopentadiene	77-47-4	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Hexachloroethane	67-72-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Hexachlorophene	70-30-4	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	1888-71-7	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Indeno[1,2,3-cd]pyrene	193-39-5	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26

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Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-8	VFSP-9	VFSP-1 B	VFSP-1 B DUP	VFSP-2 B	VFSP-3 B	VFSP-4 B	VFSP-5 B
Sample Date		3/6/2007	3/6/2007	12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/18/2001
Sample Type		Investigation	Investigation	Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation
Sample Location		VFSP	VFSP	VFSP	VFSP	VFSP	VFSP	VFSP	VFSP
Surface/Subsurface		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Constituent	CAS No.								
Isophorone	78-59-1	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Isosafrole	120-58-1	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
m-Dinitrobenzene	99-65-0	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Methapyrilene	91-80-5	NA	NA	< 130	< 24	< 200	< 460	< 110	< 130
Methyl methanesulfonate	66-27-3	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Naphthalene	91-20-3	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Nitrobenzene	98-95-3	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
N-Nitrosodiethylamine	55-18-5	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
N-Nitrosodimethylamine	62-75-9	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
N-Nitrosodi-n-butylamine	924-16-3	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
N-Nitrosodi-n-propylamine	621-64-7	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
N-Nitrosodiphenylamine	86-30-6	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
N-Nitrosomethylethylamine	10595-95-6	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
N-Nitrosomorpholine	59-89-2	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
N-Nitrosopiperidine	100-75-4	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
N-Nitrosopyrrolidine	930-55-2	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
o,o',o''-Triethylphosphorothioate	126-68-1	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	95-53-4	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
p-Dimethylamino azobenzene	60-11-7	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Pentachlorobenzene	608-93-5	NA	NA	< 25	< 4.8	< 40	< <	22	< 26
Pentachloronitrobenzene	82-68-8	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Pentachlorophenol	87-86-5	NA	NA	< 120	< 23	< 200	< 440	< 100	< 120
Phenacetin	62-44-2	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Phenanthrene	85-01-8	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Phenol	108-95-2	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
p-Phenylene diamine	106-50-3	NA	NA	< 250	< 48	< 400	< 900	< 220	< 260
Pronamide	23950-58-5	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Pyrene	129-00-0	NA	NA	< 25	< 4.8 L	< 40	< 90	< 22	< 26
Pyridine	110-86-1	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26
Safrole, Total	94-59-7	NA	NA	< 25	< 4.8	< 40	< 90	< 22	< 26

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Sample Identification		VFSP-8		VFSP-9		VFSP-1 B	VFSP-1 B DUP	VFSP-2 B	VFSP-3 B	VFSP-4 B	VFSP-5 B
Sample Date		3/6/2007		3/6/2007		12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/18/2001
Sample Type		Investigation		Investigation		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation
Sample Location		VFSP		VFSP		VFSP	VFSP	VFSP	VFSP	VFSP	VFSP
Surface/Subsurface		Surface		Surface		Surface	Surface	Surface	Surface	Surface	Surface
Constituent	**CAS No.**										
Semi-Volatile Organics (TICs) (mg/kg)											
Ergostanol	6538-02-9	20	R	7.2	JN	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	16	JN	6.4	JN	NA	NA	NA	NA	NA	NA
28-Norolean-17-en-3-one	5912-72-1	NA		NA		NA	NA	NA	NA	NA	NA
2-Pentanone, 4-hydroxy-4-methyl-	123-42-2	NA		NA		NA	NA	NA	NA	NA	NA
2-Pentanone, 4-methoxy-4-methyl-	107-70-0	NA		NA		NA	NA	NA	NA	NA	NA
3-Penten-2-one, 4-methyl-	141-79-7	NA		NA		NA	NA	NA	NA	NA	NA
4,5-Dimethylthiazole S-oxide		NA		NA		NA	NA	NA	NA	NA	NA
alpha-Pinene		NA		NA		NA	NA	NA	NA	NA	NA
Benzene, 1-methyl-4-(1-methylethyl)-	99-87-6	NA		NA		NA	NA	NA	NA	NA	NA
Benzyl cinnamate	103-41-3	NA		NA		NA	NA	NA	NA	NA	NA
Cholest-5-ene, 3-bromo-, (3.beta.)-	516-91-6	NA		NA		NA	NA	NA	NA	NA	NA
Cholesterol	57-88-5	NA		NA		NA	NA	NA	NA	NA	NA
D-Friedoolean-14-ene, 3-methoxy-, (3.bet	14021-23-9	NA		NA		NA	NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	NA		NA		NA	NA	NA	NA	NA	NA
Phenol, 2-(2-propenyl)-	1745-81-9	NA		NA		NA	NA	NA	NA	NA	NA
Propane, 2,2-dimethoxy-	77-76-9	NA		NA		NA	NA	NA	NA	NA	NA
.alpha.-Amyrin	638-95-9	14	JN	5.8	JN	NA	NA	NA	NA	NA	NA
.beta.-Amyrin	559-70-6	12	R	NA		NA	NA	NA	NA	NA	NA
1-Docosanethiol	7773-83-3	NA		NA		NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA		NA		NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	31	JN	NA		NA	NA	NA	NA	NA	NA
9-Hexacosene		11	R	NA		NA	NA	NA	NA	NA	NA
Benzo[b]naphtho[2,3-d]furan	243-42-5	NA		NA		NA	NA	NA	NA	NA	NA
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.	2089-02-3	NA		NA		NA	NA	NA	NA	NA	NA
Cyclooctacosane	297-24-5	NA		1.9	JN	NA	NA	NA	NA	NA	NA
D:C-Friedooleanan-3-one	5945-53-9	NA		NA		NA	NA	NA	NA	NA	NA
Ergost-5-en-3-ol, (3.beta.)-	4651-51-8	NA		NA		NA	NA	NA	NA	NA	NA
Nonadecane	629-92-5	NA		NA		NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	6.4	JN	NA		NA	NA	NA	NA	NA	NA
Pentatriacontane	630-07-9	5.3	JN	NA		NA	NA	NA	NA	NA	NA
Stigmasterol	83-48-7	NA		NA		NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	83-48-7	NA		NA		NA	NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	NA		NA		NA	NA	NA	NA	NA	NA

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-8		VFSP-9		VFSP-1 B		VFSP-1 B DUP		VFSP-2 B		VFSP-3 B		VFSP-4 B		VFSP-5 B	
Sample Date		3/6/2007		3/6/2007		12/18/2001		12/18/2001		12/18/2001		12/18/2001		12/18/2001		12/18/2001	
Sample Type		Investigation		Investigation		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation	
Sample Location		VFSP		VFSP		VFSP		VFSP		VFSP		VFSP		VFSP		VFSP	
Surface/Subsurface		Surface		Surface		Surface		Surface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**																
Acrylamide, Acrylonitrile and Acrolein (mg/kg)																	
Acrylamide	79-06-1	NA		NA		NA		NA		NA		NA		NA		NA	
Alcohols and Glycols (mg/kg)																	
2-Butoxyethanol	111-76-2	< 52		< 16		710	R	680	R	120	R	960	R	610	R	770	R
Allyl alcohol	107-18-6	< 10		< 3.2		NA		NA		NA		NA		NA		NA	
Diethylene glycol	111-46-6	< 52		< 16		3600	R	3400	R	2100	R	4800	R	3000	R	3800	R
Dipropylene glycol	25265-71-8	< 52		< 16		3600	R	3400	R	2100	R	4800	R	3000	R	3800	R
Ethanol	64-17-5	< 10		< 3.2		710	R	680	R	420	R	960	R	610	R	770	R
Ethylene glycol	107-21-1	< 52		< 16		3600	R	3400	R	2100	R	4800	R	3000	R	3800	R
Ethylene glycol monobutyl ether	111-76-2	NA		NA		NA		NA		NA		NA		NA		NA	
Ethylene glycol monopropyl ether	2807-30-9	NA		NA		NA		NA		NA		NA		NA		NA	
Isopropanol	67-63-0	< 10		< 3.2		710	R	680	R	420	R	960	R	610	R	770	R
Methanol	67-56-1	< 10		< 3.2		710	R	680	R	420	R	960	R	610	R	770	R
Propyl cellosolve	2807-30-9	< 52		< 16		710	R	680	R	420	R	960	R	610	R	770	R
Propylene glycol	57-55-6	< 52		< 16		3600	R	3400	R	2100	R	4800	R	3000	R	3800	R
tert-Butyl alcohol	75-65-0	< 10		< 3.2		710	R	680	R	120	R	960	R	610	R	770	R
Inorganics (mg/kg)																	
Aluminum	7429-90-5	NA		NA		9140	K	5060	K	11200	K	20600	K	21100	K	11400	K
Arsenic	7440-38-2	NA		NA		9.6		7.6		7		7.3		8.8		9.1	
Barium	7440-39-3	NA		NA		92.7		94.4		54.8		196		79.9		137	
Beryllium	7440-41-7	NA		NA		0.91		1.2		0.52		2		1.4		0.85	
Cadmium	7440-43-9	NA		NA		3.5		3.6		3.5		5.9		5.7		4	
Calcium	7440-70-2	NA		NA		6610		5810		4750		8570		6240		7600	
Chromium	7440-47-3	NA		NA		187		142		136		104		205		162	
Cobalt	7440-48-4	NA		NA		17.1		11.2		6.9		21.7		25.6		9.3	
Copper	7440-50-8	NA		NA		236		218		208		232		292		233	
Iron	7439-89-6	NA		NA		129000	K	96300	K	65800	K	40500	K	99100	K	69000	K
Lead	7439-92-1	NA		NA		159	J	167	J	98.3	J	161	J	144	J	115	J
Magnesium	7439-95-4	NA		NA		1610		980		1600		1870		1770		1780	
Manganese	7439-96-5	NA		NA		591		392		308		263		424		346	
Mercury	7487-94-7	NA		NA		0.47	K	0.52	K	0.38	K	0.51	K	0.41	K	0.64	K
Nickel	7440-02-0	NA		NA		93.7	K	78.5	K	51.1	K	95.8	K	111	K	69.7	K
Potassium	7440-09-7	NA		NA		364	B	191	B	516		1060		810		527	
Selenium	7782-49-2	NA		NA		2.7		3.4		2.1		< 5.5		< 3.3		< 3.9	
Silver	7440-22-4	NA		NA	<	7.7		< 7.2		< 4.9		< 11		< 6.5		< 7.8	
Sodium	7440-23-5	NA		NA	<	3850		< 3620		< 2440		< 5480		< 3270		< 3910	
Thallium	7440-28-0	NA		NA	<	7.7	L	< 7.2		< 4.9	L	< 11	L	< 6.5	L	< 7.8	L
Vanadium	7440-62-2	NA		NA		38.2	K	28.2	K	38.7	K	104	K	58	K	46.3	K
Zinc	7440-66-6	NA		NA		3640		3740		4920		9240		11200		4440	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface	CAS No.	VFSP-8 3/6/2007 Investigation VFSP Surface	VFSP-9 3/6/2007 Investigation VFSP Surface	VFSP-1 B 12/18/2001 Investigation VFSP Surface	VFSP-1 B DUP 12/18/2001 Duplicate VFSP Surface	VFSP-2 B 12/18/2001 Investigation VFSP Surface	VFSP-3 B 12/18/2001 Investigation VFSP Surface	VFSP-4 B 12/18/2001 Investigation VFSP Surface	VFSP-5 B 12/18/2001 Investigation VFSP Surface
Other Inorganics (mg/kg)										
Chlorides		16887-00-6	NA	NA	63.3 BJ	54.3 BJ	32.4 BJ	105 BJ	46.3 BJ	56.2 BJ
Nitrates 14797-55-8			NA	NA	< 38.5	12.4 B	8.7 B	< 54.8	< 32.7	14.5 B
Nitrites 14797-65-0			NA	NA	NA	NA	NA	NA	NA	NA
Sulfate		14808-79-8	NA	NA	8040 J	11800 J	4490 J	12300 J	7280 J	5390 J
Nitrogen, Kjeldahl		7727-37-9	NA	NA	39200	33300	20400	34200	18500	38200
Total Organic Carbon		7440-44-0	NA	NA	283000	484000	52500	387000	207000	68600

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-6 B		VFSP-7 B		VFSP-8 B		VFSP-9 B	
Sample Date		12/18/2001		12/18/2001		12/18/2001		12/18/2001	
Sample Type		Investigation		Investigation		Investigation		Investigation	
Sample Location		VFSP		VFSP		VFSP		VFSP	
Surface/Subsurface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**								
Volatile Organics (mg/kg)									
1,1,1,2-Tetrachloroethane	630-20-6	< 0.028		< 0.041		< 0.045		< 0.036	
1,1,1-Trichloroethane	71-55-6	< 0.028		< 0.041		< 0.045		< 0.036	
1,1,2,2-Tetrachloroethane	79-34-5	< 0.028		< 0.041		< 0.045		< 0.036	
1,1,2-Trichloroethane	79-00-5	< 0.028		< 0.041		< 0.045		< 0.036	
1,1-Dichloroethane	75-34-3	< 0.028		< 0.041		< 0.045		< 0.036	
1,1-Dichloroethene	75-35-4	< 0.028		< 0.041		< 0.045		< 0.036	
1,2,3-Trichloropropane	96-18-4	< 0.028	J	< 0.041	J	0.045	R	< 0.036	J
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.055	J	< 0.082	J	< 0.09	J	< 0.071	J
1,2-Dibromoethane	106-93-4	< 0.028		< 0.041		< 0.045		< 0.036	
1,2-Dichloroethane	107-06-2	< 0.028		< 0.041		< 0.045		< 0.036	
trans-1,2-Dichloroethene	156-60-5	< 0.028		< 0.041		< 0.045		< 0.036	
1,2-Dichloropropane	78-87-5	< 0.028		< 0.041		< 0.045		< 0.036	
cis-1,3-Dichloropropene	10061-01-5	< 0.028		< 0.041		< 0.045		< 0.036	
trans-1,3-Dichloropropene	10061-02-6	< 0.028		< 0.041		< 0.045		< 0.036	
1,4-Dioxane	123-91-1	2.8	R	4.1	R	4.5	R	3.6	R
2-Butanone (MEK)	78-93-3	0.35		0.42		0.91		0.31	
2-Hexanone	591-78-6	< 0.055		< 0.082		< 0.09		< 0.071	
2-Methyl-1-propanol (Isobutyl Alcohol)	78-83-1	1.1	R	1.6	R	1.8	R	1.4	R
3-Methylhexane	589-34-4	< 0.028		< 0.041		< 0.045		< 0.036	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 0.055		< 0.082		< 0.09		< 0.071	
Acetone	67-64-1	1.1		1.4		2.7		1	
Acetonitrile	75-05-8	0.28	R	0.41	R	0.45	R	0.36	R
Acrolein	107-02-08	0.28	R	0.41	R	0.45	R	0.36	R
Acrylonitrile	107-13-1	< 0.28		< 0.41		< 0.45		< 0.36	
Allyl alcohol	107-18-6	0.72	R	1.1	R	1.2	R	0.93	R
Allyl chloride	107-05-1	< 0.028	L	< 0.041		< 0.045		< 0.036	
Benzene	71-43-2	< 0.028		< 0.041		< 0.045		< 0.036	
Benzyl chloride	100-44-7	< 0.028		< 0.041		< 0.045		< 0.036	
Bromodichloromethane	75-27-4	< 0.028		< 0.041		< 0.045		< 0.036	
Bromoform	75-25-2	< 0.028		< 0.041		< 0.045		< 0.036	
Bromomethane	74-83-9	< 0.055	J	< 0.082	J	< 0.09	J	< 0.071	J
Carbon disulfide	75-15-0	0.014	J	0.016	J	0.031	J	< 0.036	
Carbon tetrachloride	56-23-5	< 0.028		< 0.041		< 0.045		< 0.036	
Chlorobenzene	108-90-7	< 0.028		< 0.041		< 0.045		< 0.036	
Chloroethane	75-00-3	< 0.055		< 0.082		< 0.09		< 0.071	
Chloroform	67-66-3	< 0.028		< 0.041		< 0.045		< 0.036	
Chloromethane	74-87-3	< 0.055	L	< 0.082	L	< 0.09	L	< 0.071	L
Chloroprene	126-99-8	NA		NA		NA		NA	
Dibromochloromethane	124-48-1	< 0.028		< 0.041		< 0.045		< 0.036	
Dibromomethane	74-95-3	< 0.028		< 0.041		< 0.045		< 0.036	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-6 B		VFSP-7 B		VFSP-8 B		VFSP-9 B	
Sample Date		12/18/2001		12/18/2001		12/18/2001		12/18/2001	
Sample Type		Investigation		Investigation		Investigation		Investigation	
Sample Location		VFSP		VFSP		VFSP		VFSP	
Surface/Subsurface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**								
Dichlorodifluoromethane	75-71-8	< 0.028		< 0.041		< 0.045		< 0.036	
Dichlorofluoromethane	75-43-4	< 0.028		< 0.041		< 0.045		< 0.036	
Diethyl ether	60-29-7	NA		NA		NA		NA	
Ethanol	64-17-5	1.1	R	1.6	R	1.8	R	1.4	R
Ethyl methacrylate	97-63-2	< 0.028		< 0.041		< 0.045		< 0.036	
Ethylbenzene	100-41-4	< 0.028		< 0.041		< 0.045		< 0.036	
Ethylene oxide	75-21-8	17	R	25	R	27	R	21	R
Iodomethane	74-88-4	< 0.028		< 0.041		< 0.045		< 0.036	
Methacrylonitrile	126-98-7	< 0.11		< 0.16		< 0.18		< 0.14	
Methyl methacrylate	80-62-6	< 0.028		< 0.041		< 0.045		< 0.036	
Methylene Chloride	75-09-2	< 0.028		< 0.041		< 0.045		< 0.036	
n-Heptane	142-82-5	< 0.028		< 0.041		< 0.045		< 0.036	
Pentachloroethane	76-01-7	NA		NA		NA		NA	
Propionitrile	107-12-0	0.11	R	0.16	R	0.18	R	0.14	R
Propylene oxide	75-56-9	0.55	R	0.82	R	0.9	R	0.71	R
Styrene	100-42-5	< 0.028		< 0.041		< 0.045		< 0.036	
t-Butanol	75-65-0	NA		NA		NA		NA	
Tetrachloroethene	127-18-4	< 0.028		< 0.041		< 0.045		< 0.036	
Toluene	108-88-3	< 0.028		< 0.041		< 0.045		< 0.036	
trans-1,4-Dichloro-2-butene	110-57-6	< 0.028		< 0.041		< 0.045		< 0.036	
Trichloroethylene	79-01-6	< 0.028		< 0.041		< 0.045		< 0.036	
Trichlorofluoromethane	75-69-4	< 0.055		< 0.082		< 0.09		< 0.071	
Vinyl acetate	108-05-4	< 0.055		< 0.082		< 0.09		< 0.071	
Vinyl chloride	75-01-4	< 0.055		< 0.082		< 0.09		< 0.071	
Xylenes, Total	1330-20-7	< 0.028		< 0.041		< 0.045		< 0.036	
Volatile Organics (TICs) (mg/kg)									
4-Isopropyltoluene	99-87-6	NA		NA		NA		NA	
Carbon Dioxide	124-38-9	NA		NA		NA		NA	
1,2,4-Trimethylbenzene	95-63-6	NA		NA		NA		NA	
1,3,5-Trimethylbenzene	108-67-8	0.014	J	0.018	Q	0.033	Q	0.022	J
1,3-Dichlorobenzene	541-73-1	0.015	J	0.072	Q	0.1	Q	NA	
1,4-Dichlorobenzene	106-46-7	NA		0.016	Q	0.015	Q	NA	
3-Ethyltoluene	620-14-4	NA		NA		NA		NA	
Acetaldehyde	75-07-0	NA		NA		NA		NA	
Butanal, 3-methyl-	590-86-3	NA		NA		NA		NA	
Butanal, isomer		NA		NA		NA		NA	
C10H16		NA		NA		NA		NA	
cis-1,2-Dichloroethene	156-59-2	NA		NA		NA		NA	
Heptanal	111-71-7	NA		NA		NA		NA	
Hexanal	66-25-1	NA		NA		NA		NA	
Hexane	110-54-3	0.0038	J	0.0039	Q	0.0081	Q	NA	
Pentanal	110-62-3	NA		NA		NA		NA	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-6 B			VFSP-7 B			VFSP-8 B			VFSP-9 B		
Sample Date		12/18/2001			12/18/2001			12/18/2001			12/18/2001		
Sample Type		Investigation			Investigation			Investigation			Investigation		
Sample Location		VFSP			VFSP			VFSP			VFSP		
Surface/Subsurface		Surface			Surface			Surface			Surface		
Constituent	**CAS No.**												
Semi-Volatile Organics (mg/kg)													
1,2,4,5-Tetrachlorobenzene	95-94-3	<	3.6		<	5.4		<	5.9		<	4.7	
1,2,4-Trichlorobenzene	120-82-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
1,2-Dichlorobenzene	95-50-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
1,3,5-Trinitrobenzene	99-35-4	<	3.6		<	5.4		<	5.9		<	4.7	
1,3-Dichlorobenzene	541-73-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
1,4-Dichlorobenzene	106-46-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
1,4-Dioxane	123-91-1		NA			NA			NA			NA	
1,4-Naphthoquinone	130-15-4	<	18		<	27		<	30		<	24	
1-Naphthalenamine	134-32-7	<	3.6		<	5.4		<	5.9		<	4.7	
2,2'-oxybis[1-chloropropane]	108-60-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2,3,4,6-Tetrachlorophenol	58-90-2	<	3.6		<	5.4		<	5.9		<	4.7	
2,4,5-Trichlorophenol	95-95-4	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2,4,6-Trichlorophenol	88-06-2	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2,4-Dichlorophenol	120-83-2	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2,4-Dimethylphenol	105-67-9	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2,4-Dinitrophenol	51-28-5	<	18		<	26		<	29		<	23	
2,4-Dinitrotoluene	121-14-2	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2,6-Dichlorophenol	87-65-0	<	3.6		<	5.4		<	5.9		<	4.7	
2,6-Dinitrotoluene	606-20-2	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2-Acetylaminofluorene	53-96-3	<	3.6		<	5.4		<	5.9		<	4.7	
2-Chloronaphthalene	91-58-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2-Chlorophenol	95-57-8	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2-Methylnaphthalene	91-57-6	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2-Methylphenol	95-48-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2-Naphthalenamine	91-59-8	<	3.6		<	5.4		<	5.9		<	4.7	
2-Nitroaniline	88-74-4	<	18	L	<	26	L	<	29	L	<	23	L
2-Nitrophenol	88-75-5	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
2-Picoline	109-06-8	<	3.6		<	5.4		<	5.9		<	4.7	
2-sec-Butyl-4,6-dinitrophenol	88-85-7	<	7.4		<	11		<	12		<	9.6	
3 & 4 Methylphenol	15831-10-4	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
3,3'-Dichlorobenzidine	91-94-1	<	18	L	<	27	L	<	30	L	<	24	L
3,3'-Dimethylbenzidine	119-93-7	<	18		<	27		<	30		<	24	
3-Methylcholanthrene	56-49-5	<	3.6		<	5.4		<	5.9		<	4.7	
3-Nitroaniline	99-09-2	<	18	L	<	26	L	<	29	L	<	23	L
4,6-Dinitro-2-methylphenol	534-52-1	<	18	L	<	26	L	<	29	L	<	23	L
4-Aminobiphenyl	92-67-1	<	18		<	27		<	30		<	24	
4-Bromophenyl phenyl ether	101-55-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
4-Chloro-3-methylphenol	59-50-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
4-Chloroaniline	106-47-8		3.6	R		5.4	R		5.9	R		4.7	R
4-Chlorophenyl phenyl ether	7005-72-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-6 B			VFSP-7 B			VFSP-8 B			VFSP-9 B		
Sample Date		12/18/2001			12/18/2001			12/18/2001			12/18/2001		
Sample Type		Investigation			Investigation			Investigation			Investigation		
Sample Location		VFSP			VFSP			VFSP			VFSP		
Surface/Subsurface		Surface			Surface			Surface			Surface		
Constituent	**CAS No.**												
4-Nitroaniline	100-01-6	<	18	L	<	26	L	<	29	L	<	23	L
4-Nitrophenol	100-02-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
4-Nitroquinoline-1-oxide	56-57-5	<	18		<	27		<	30		<	24	
5-Nitro-o-toluidine	99-55-8	<	3.6		<	5.4		<	5.9		<	4.7	
7,12-Dimethylbenz(a)anthracene	57-97-6	<	3.6		<	5.4		<	5.9		<	4.7	
Acenaphthene	83-32-9	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Acenaphthylene	208-96-8	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Acetophenone	98-86-2	<	3.6		<	5.4		<	5.9		<	4.7	
alpha,alpha-Dimethyl phenethylamine	122-09-8	<	36		<	54		<	59		<	47	
Aniline	62-53-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Anthracene	120-12-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Aramite, Total	140-57-8	<	3.6		<	5.4		<	5.9		<	4.7	
Benzo[a]anthracene	56-55-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Benzo[a]pyrene	50-32-8	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Benzo[b]fluoranthene	205-99-2	<	3.6		<	5.4		<	5.9		<	4.7	
Benzo[g,h,i]perylene	191-24-2	<	3.6		<	5.4		<	5.9		<	4.7	
Benzo[k]fluoranthene	207-08-09	<	3.6		<	5.4		<	5.9		<	4.7	
Benzyl alcohol	100-51-6	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Bis(2-chloroethoxy)methane	111-91-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Bis(2-chloroethyl)ether	111-44-4	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Bis(2-ethylhexyl) phthalate	117-81-7	<	3.6		<	5.4		<	5.9			4.4	B
Butyl benzyl phthalate	85-68-7	<	3.6		<	5.4		<	5.9		<	4.7	
Chrysene	218-01-9	<	3.6		<	5.4		<	5.9		<	4.7	
Diallate	2303-16-4		NA			NA			NA			NA	
Dibenz(a,h)anthracene	53-70-3	<	3.6		<	5.4		<	5.9		<	4.7	
Dibenzofuran	132-64-9	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Diethyl phthalate	84-66-2	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Dimethoate	60-51-5		NA			NA			NA			NA	
Dimethyl phthalate	131-11-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Di-n-butyl phthalate	84-74-2	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Di-n-octyl phthalate	117-84-0	<	3.6		<	5.4		<	5.9		<	4.7	
Ethyl methanesulfonate	62-50-0	<	3.6		<	5.4		<	5.9		<	4.7	
Fluoranthene	206-44-0	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Fluorene	86-73-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Hexachlorobenzene	118-74-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Hexachlorobutadiene	87-68-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Hexachlorocyclopentadiene	77-47-4	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Hexachloroethane	67-72-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Hexachlorophene	70-30-4		NA			NA			NA			NA	
Hexachloropropene	1888-71-7	<	3.6		<	5.4		<	5.9		<	4.7	
Indeno[1,2,3-cd]pyrene	193-39-5	<	3.6		<	5.4		<	5.9		<	4.7	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-6 B			VFSP-7 B			VFSP-8 B			VFSP-9 B		
Sample Date		12/18/2001			12/18/2001			12/18/2001			12/18/2001		
Sample Type		Investigation			Investigation			Investigation			Investigation		
Sample Location		VFSP			VFSP			VFSP			VFSP		
Surface/Subsurface		Surface			Surface			Surface			Surface		
Constituent	**CAS No.**												
Isophorone	78-59-1	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Isosafrole	120-58-1	<	3.6		<	5.4		<	5.9		<	4.7	
m-Dinitrobenzene	99-65-0	<	3.6		<	5.4		<	5.9		<	4.7	
Methapyrilene	91-80-5	<	18		<	27		<	30		<	24	
Methyl methanesulfonate	66-27-3	<	3.6		<	5.4		<	5.9		<	4.7	
Naphthalene	91-20-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Nitrobenzene	98-95-3	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
N-Nitrosodiethylamine	55-18-5	<	3.6		<	5.4		<	5.9		<	4.7	
N-Nitrosodimethylamine	62-75-9	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
N-Nitrosodi-n-butylamine	924-16-3	<	3.6		<	5.4		<	5.9		<	4.7	
N-Nitrosodi-n-propylamine	621-64-7	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
N-Nitrosodiphenylamine	86-30-6	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
N-Nitrosomethylethylamine	10595-95-6	<	3.6		<	5.4		<	5.9		<	4.7	
N-Nitrosomorpholine	59-89-2	<	3.6		<	5.4		<	5.9		<	4.7	
N-Nitrosopiperidine	100-75-4	<	3.6		<	5.4		<	5.9		<	4.7	
N-Nitrosopyrrolidine	930-55-2	<	3.6		<	5.4		<	5.9		<	4.7	
o,o',o''-Triethylphosphorothioate	126-68-1		NA			NA			NA			NA	
o-Toluidine	95-53-4	<	3.6		<	5.4		<	5.9		<	4.7	
p-Dimethylamino azobenzene	60-11-7	<	3.6		<	5.4		<	5.9		<	4.7	
Pentachlorobenzene	608-93-5	<	3.6		<	5.4		<	5.9		<	4.7	
Pentachloronitrobenzene	82-68-8	<	3.6		<	5.4		<	5.9		<	4.7	
Pentachlorophenol	87-86-5	<	18		<	26		<	29		<	23	
Phenacetin	62-44-2	<	3.6		<	5.4		<	5.9		<	4.7	
Phenanthrene	85-01-8	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Phenol	108-95-2	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
p-Phenylene diamine	106-50-3	<	36		<	54		<	59		<	47	
Pronamide	23950-58-5	<	3.6		<	5.4		<	5.9		<	4.7	
Pyrene	129-00-0	<	3.6	L	<	5.4	L	<	5.9	L	<	4.7	L
Pyridine	110-86-1	<	3.6		<	5.4		<	5.9		<	4.7	
Safrole, Total	94-59-7	<	3.6		<	5.4		<	5.9		<	4.7	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface	CAS No.	VFSP-6 B 12/18/2001 Investigation VFSP Surface	VFSP-7 B 12/18/2001 Investigation VFSP Surface	VFSP-8 B 12/18/2001 Investigation VFSP Surface	VFSP-9 B 12/18/2001 Investigation VFSP Surface
Semi-Volatile Organics (TICs) (mg/kg)						
Ergostanol		6538-02-9	NA	NA	NA	NA
.gamma.-Sitosterol		83-47-6	NA	NA	NA	NA
28-Norolean-17-en-3-one		5912-72-1	NA	NA	NA	NA
2-Pentanone, 4-hydroxy-4-methyl-		123-42-2	NA	NA	NA	NA
2-Pentanone, 4-methoxy-4-methyl-		107-70-0	NA	NA	NA	NA
3-Penten-2-one, 4-methyl-		141-79-7	NA	NA	NA	NA
4,5-Dimethylthiazole S-oxide			NA	NA	NA	NA
alpha-Pinene			NA	NA	NA	NA
Benzene, 1-methyl-4-(1-methylethyl)-		99-87-6	NA	NA	NA	NA
Benzyl cinnamate		103-41-3	NA	NA	NA	NA
Cholest-5-ene, 3-bromo-, (3.beta.)-		516-91-6	NA	NA	NA	NA
Cholesterol		57-88-5	NA	NA	NA	NA
D-Friedoolean-14-ene, 3-methoxy-, (3.bet		14021-23-9	NA	NA	NA	NA
Methylene Chloride		75-09-2	NA	NA	NA	NA
Phenol, 2-(2-propenyl)-		1745-81-9	NA	NA	NA	NA
Propane, 2,2-dimethoxy-		77-76-9	NA	NA	NA	NA
.alpha.-Amyrin		638-95-9	NA	NA	NA	NA
.beta.-Amyrin		559-70-6	NA	NA	NA	NA
1-Docosanethiol		7773-83-3	NA	NA	NA	NA
1-Dotriacontanol		6624-79-9	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-		6754-66-1	NA	NA	NA	NA
9-Hexacosene			NA	NA	NA	NA
Benzo[b]naphtho[2,3-d]furan		243-42-5	NA	NA	NA	NA
Cholestane, 3-ethoxy-, (3.beta.,5.alpha.		2089-02-3	NA	NA	NA	NA
Cyclooctacosane		297-24-5	NA	NA	NA	NA
D:C-Friedooleanan-3-one		5945-53-9	NA	NA	NA	NA
Ergost-5-en-3-ol, (3.beta.)-		4651-51-8	NA	NA	NA	NA
Nonadecane		629-92-5	NA	NA	NA	NA
Pentacosane		629-99-2	NA	NA	NA	NA
Pentatriacontane		630-07-9	NA	NA	NA	NA
Stigmasterol		83-48-7	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate		83-48-7	NA	NA	NA	NA
4-Chloroaniline		106-47-8	NA	NA	NA	NA

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		VFSP-6 B		VFSP-7 B		VFSP-8 B		VFSP-9 B	
Sample Date		12/18/2001		12/18/2001		12/18/2001		12/18/2001	
Sample Type		Investigation		Investigation		Investigation		Investigation	
Sample Location		VFSP		VFSP		VFSP		VFSP	
Surface/Subsurface		Surface		Surface		Surface		Surface	
Constituent	**CAS No.**								
Acrylamide, Acrylonitrile and Acrolein (mg/kg)									
Acrylamide	79-06-1	NA		NA		NA		NA	
Alcohols and Glycols (mg/kg)									
2-Butoxyethanol	111-76-2	460	R	690	R	760	R	630	R
Allyl alcohol	107-18-6	NA		NA		NA		NA	
Diethylene glycol	111-46-6	2300	R	3500	R	3800	R	3100	R
Dipropylene glycol	25265-71-8	2300	R	3500	R	3800	R	3100	R
Ethanol	64-17-5	460	R	690	R	760	R	630	R
Ethylene glycol	107-21-1	2300	R	3500	R	3800	R	3100	R
Ethylene glycol monobutyl ether	111-76-2	NA		NA		NA		NA	
Ethylene glycol monopropyl ether	2807-30-9	NA		NA		NA		NA	
Isopropanol	67-63-0	460	R	690	R	760	R	630	R
Methanol	67-56-1	460	R	690	R	760	R	630	R
Propyl cellosolve	2807-30-9	460	R	690	R	760	R	630	R
Propylene glycol	57-55-6	2300	R	3500	R	3800	R	3100	R
tert-Butyl alcohol	75-65-0	460	R	690	R	760	R	630	R
Inorganics (mg/kg)									
Aluminum	7429-90-5	3070	K	3740	K	5310	K	14000	K
Arsenic	7440-38-2	3.3		8.7		8.9		6.2	
Barium	7440-39-3	22.1		20.6		57.3		95.3	
Beryllium	7440-41-7	< 2.8		< 4.1		< 4.5		0.82	
Cadmium	7440-43-9	3.9		3.2		2.7		3	
Calcium	7440-70-2	3680		5190		5840		6400	
Chromium	7440-47-3	100		162		172		86.7	
Cobalt	7440-48-4	3.3		5.4		12.7		12.3	
Copper	7440-50-8	139		223		229		159	
Iron	7439-89-6	59700	K	95000	K	106000	K	38200	K
Lead	7439-92-1	77.7	J	101	J	120	J	77.9	J
Magnesium	7439-95-4	1200		1480	B	1380		1290	
Manganese	7439-96-5	283		459		539		211	
Mercury	7487-94-7	0.25	K	0.41	K	0.65	K	0.35	K
Nickel	7440-02-0	35	K	57.3	K	80.5	K	55.8	K
Potassium	7440-09-7	152	B	213	B	305	B	629	
Selenium	7782-49-2	2.1		< 4.1		< 4.5		2.4	
Silver	7440-22-4	< 5.5		< 8.1		< 9		< 7.2	
Sodium	7440-23-5	< 2760		< 4070		< 4500		< 3600	
Thallium	7440-28-0	< 5.5	L	< 8.1	L	< 9	L	< 7.2	L
Vanadium	7440-62-2	19.5	K	27.3	K	41	K	57.4	K
Zinc	7440-66-6	2510		4220		3950		4230	

Table A-1

Soil Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / Surface/Subsurface / CAS No.	VFSP-6 B 12/18/2001 Investigation VFSP Surface		VFSP-7 B 12/18/2001 Investigation VFSP Surface		VFSP-8 B 12/18/2001 Investigation VFSP Surface		VFSP-9 B 12/18/2001 Investigation VFSP Surface	
Other Inorganics (mg/kg)									
Chlorides	16887-00-6	49.8	BJ	97	J	75.6	BJ	86.9	J
Nitrates 14797-55-8		10	B	14.9	B	15.8	B	12.4	B
Nitrites 14797-65-0		NA		NA		NA		NA	
Sulfate	14808-79-8	4420	J	8670	J	7140	J	5940	J
Nitrogen, Kjeldahl	7727-37-9	23800		35900		36200		23800	
Total Organic Carbon	7440-44-0	192000		177000		32900		271000	

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	WWL-1 6/4/2007 Investigation WWL	WWL-2 6/4/2007 Investigation WWL	WWL-3L 6/4/2007 Investigation WWL	WWL-3U 6/4/2007 Investigation WWL	LF-1 6/5/2007 Investigation Old Landfill	LF-2 6/6/2007 Investigation Old Landfill	LF-3 6/5/2007 Investigation Old Landfill
Volatile Organics (ug/L)								
1,1,1,2-Tetrachloroethane	630-20-6	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,1,1-Trichloroethane	71-55-6	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	79-34-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	79-00-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,1-Dichloroethane	75-34-3	< 1	< 1	< 10	< 1	1.1	< 1	< 1
1,1-Dichloroethene	75-35-4	< 1	< 1	< 10	< 1	0.99 J	< 1	< 1
1,2,3-Trichloropropane	96-18-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,2-Dibromo-3-Chloropropane	96-12-8	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,2-Dibromoethane	106-93-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,2-Dichloroethane	107-06-2	< 1	< 1	< 10	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	156-60-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
1,2-Dichloropropane	78-87-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
cis-1,3-Dichloropropene	10061-01-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
trans-1,3-Dichloropropene	10061-02-6	< 1	< 1	< 10	< 1	< 1	< 1	< 1
2-Butanone (MEK)	78-93-3	< 10	< 10	< 100	< 10	< 10	< 10	< 10
2-Hexanone	591-78-6	< 10	< 10	< 100	< 10	< 10	< 10	< 10
2-Methyl-1-propanol	78-83-1	40 R	40 R	400 R	40 R	40 R	40 R	40 R
3-Methylhexane	589-34-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
4-Methyl-2-pentanone (MIBK)	108-10-1	< 10	< 10	< 100	< 10	< 10	< 10	< 10
Acetone	67-64-1	< 25	< 25	< 250	< 25	< 25	< 25	< 25
Acetonitrile	75-05-8	< 40	< 40	< 400	< 40	< 40	< 40	< 40
Acrolein	107-02-8	< 20	< 20	< 200	< 20	< 20	< 20	< 20
Acrylonitrile	107-13-1	< 20	< 20	< 200	< 20	< 20	< 20	< 20
Allyl chloride	107-05-1	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Benzene	71-43-2	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Benzyl chloride	100-44-7	< 1	< 1	< 10	< 100	< 1	< 1	< 1
Bromodichloromethane	75-27-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Bromoform	75-25-2	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Bromomethane	74-83-9	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Carbon disulfide	75-15-0	< 2	< 2	< 20	< 2	< 2	< 2	< 2
Carbon tetrachloride	56-23-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Chlorobenzene	108-90-7	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Chloroethane	75-00-3	< 1	< 1	< 10	< 1	< 1	< 1	< 1

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	WWL-1 6/4/2007 Investigation WWL	WWL-2 6/4/2007 Investigation WWL	WWL-3L 6/4/2007 Investigation WWL	WWL-3U 6/4/2007 Investigation WWL	LF-1 6/5/2007 Investigation Old Landfill	LF-2 6/6/2007 Investigation Old Landfill	LF-3 6/5/2007 Investigation Old Landfill
Chloroform	67-66-3	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Chloromethane	74-87-3	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Chloroprene	126-99-8	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Dibromochloromethane	124-48-1	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Dibromomethane	74-95-3	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Dichlorodifluoromethane	75-71-8	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Dichlorofluoromethane	75-43-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Diethyl ether	60-29-7	93	< 10	8200	2700	200	14	7.4 J
Ethyl methacrylate	97-63-2	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Ethylbenzene	100-41-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Ethylene oxide	75-21-8	< 200	< 200	< 2000	< 200	< 200	200 R	< 200
Iodomethane	74-88-4	< 5	< 5	< 50	< 5	< 5	< 5	< 5
Methacrylonitrile	126-98-7	< 20	< 20	< 200	< 20	< 20	< 20	< 20
Methyl methacrylate	80-62-6	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Methylene Chloride	75-09-2	< 5	< 5	< 50	< 5	< 5	< 5	< 5
n-Heptane	142-82-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Pentachloroethane	76-01-7	< 5	< 5	< 50	< 5	< 5	< 5	< 5
Propionitrile	107-12-0	< 20	< 20	< 200	< 20	< 20	< 20	< 20
Propylene oxide	75-56-9	< 200	< 200	< 2000	< 200	< 200	< 200	< 200
Styrene	100-42-5	< 1	< 1	< 10	< 1	< 1	< 1	< 1
t-Butanol	75-65-0	190	37	< 50	< 5	48	19	680
Tetrachloroethene	127-18-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Toluene	108-88-3	< 1	< 1	< 10	< 1	< 1	< 1	< 1
trans-1,4-Dichloro-2-butene	110-57-6	< 2	< 2	< 20	< 2	< 2	< 2	< 2
Trichloroethylene	79-01-6	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Trichlorofluoromethane	75-69-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Vinyl acetate	108-05-4	< 2	< 2	< 20	< 2	< 2	< 2	< 2
Vinyl chloride	75-01-4	< 1	< 1	< 10	< 1	< 1	< 1	< 1
Xylenes, Total	1330-20-7	< 2	< 2	< 20	< 2	< 2	< 2	< 2
Volatile Organics (TICs) (ug/L)								
1,2-Dichloroethene, Total	540-59-0	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	280 B	650 B	590 B	210 B	81 B	66 B	150 B
Methyl tert-butyl ether	1634-04-4	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446095	NA	NA	NA	880 R	NA	NA	NA

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	WWL-1 6/4/2007 Investigation WWL	WWL-2 6/4/2007 Investigation WWL	WWL-3L 6/4/2007 Investigation WWL	WWL-3U 6/4/2007 Investigation WWL	LF-1 6/5/2007 Investigation Old Landfill	LF-2 6/6/2007 Investigation Old Landfill	LF-3 6/5/2007 Investigation Old Landfill
Semi-Volatile Organics (ug/L)								
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
1,2,4-Trichlorobenzene	120-82-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
1,2-Dichlorobenzene	95-50-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
1,3,5-Trinitrobenzene	99-35-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
1,3-Dichlorobenzene	541-73-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
1,4-Dichlorobenzene	106-46-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
1,4-Dioxane	123-91-1	< 9.7	< 9.4	33	15	2.4 J	< 9.4	24
1,4-Naphthoquinone	130-15-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
1-Naphthalenamine	134-32-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,4,5-Trichlorophenol	95-95-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,4,6-Trichlorophenol	88-06-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,4-Dichlorophenol	120-83-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,4-Dimethylphenol	105-67-9	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,4-Dinitrophenol	51-28-5	< 49	< 47	< 49	< 49	< 48	< 47	< 49
2,4-Dinitrotoluene	121-14-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,6-Dichlorophenol	87-65-0	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2,6-Dinitrotoluene	606-20-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Acetylaminofluorene	53-96-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Chloronaphthalene	91-58-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Chlorophenol	95-57-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Methylnaphthalene	91-57-6	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Methylphenol	95-48-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Naphthalenamine	91-59-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Nitroaniline	88-74-4	< 49	< 47	< 49	< 49	< 48	< 47	< 49
2-Nitrophenol	88-75-5	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-Picoline	109-06-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
3 & 4 Methylphenol	15831-10-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
3,3'-Dichlorobenzidine	91-94-1	< 19	< 19	< 19	< 19	< 19	< 19	< 20
3,3'-Dimethylbenzidine	119-93-7	< 19	< 19	< 19	< 19	< 19	< 19	< 20
3-Methylcholanthrene	56-49-5	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
3-Nitroaniline	99-09-2	< 49	< 47	< 49	< 49	< 48	< 47	< 49
4,6-Dinitro-2-methylphenol	534-52-1	< 49	< 47	< 49	< 49	< 48	< 47	< 49
4-Aminobiphenyl	92-67-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
4-Bromophenyl phenyl ether	101-55-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
4-Chloro-3-methylphenol	59-50-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	WWL-1 6/4/2007 Investigation WWL	WWL-2 6/4/2007 Investigation WWL	WWL-3L 6/4/2007 Investigation WWL	WWL-3U 6/4/2007 Investigation WWL	LF-1 6/5/2007 Investigation Old Landfill	LF-2 6/6/2007 Investigation Old Landfill	LF-3 6/5/2007 Investigation Old Landfill
4-Chloroaniline	106-47-8	< 19	< 19	< 19	< 19	< 19	< 19	< 20
4-Chlorophenyl phenyl ether	7005-72-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
4-Nitroaniline	100-01-6	< 49	< 47	< 49	< 49	< 48	< 47	< 49
4-Nitrophenol	100-02-7	< 49	< 47	< 49	< 49	< 48	< 47	< 49
4-Nitroquinoline-1-oxide	56-57-5	19 R	19 R	19 R	19 R	19 R	19 R	20 R
5-Nitro-o-toluidine	99-55-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
7,12-Dimethylbenz(a)anthracene	57-97-6	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Acenaphthene	83-32-9	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Acenaphthylene	208-96-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Acetophenone	98-86-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 1900	< 1900	< 1900	< 1900	< 1900	< 1900	< 2000
Aniline	62-53-3	< 19	< 19	< 19	< 19	< 19	< 19	< 20
Anthracene	120-12-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Aramite, Total	140-57-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Benzo[a]anthracene	56-55-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Benzo[a]pyrene	50-32-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Benzo[b]fluoranthene	205-99-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Benzo[g,h,i]perylene	191-24-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Benzo[k]fluoranthene	207-08-9	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Benzyl alcohol	100-51-6	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Bis(2-chloroethoxy)methane	111-91-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Bis(2-chloroethyl)ether	111-44-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Bis(2-ethylhexyl) phthalate	117-81-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Butyl benzyl phthalate	85-68-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Chrysene	218-01-9	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Diallate	2303-16-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Dibenz(a,h)anthracene	53-70-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Dibenzofuran	132-64-9	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Diethyl phthalate	84-66-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Dimethoate	60-51-5	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Dimethyl phthalate	131-11-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Di-n-butyl phthalate	84-74-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Di-n-octyl phthalate	117-84-0	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Ethyl methanesulfonate	62-50-0	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Fluoranthene	206-44-0	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Fluorene	86-73-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Hexachlorobenzene	118-74-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Hexachlorobutadiene	87-68-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Hexachlorocyclopentadiene	77-47-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Hexachloroethane	67-72-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification Sample Date Sample Type Sample Location Constituent	CAS No.	WWL-1 6/4/2007 Investigation WWL	WWL-2 6/4/2007 Investigation WWL	WWL-3L 6/4/2007 Investigation WWL	WWL-3U 6/4/2007 Investigation WWL	LF-1 6/5/2007 Investigation Old Landfill	LF-2 6/6/2007 Investigation Old Landfill	LF-3 6/5/2007 Investigation Old Landfill
Hexachlorophene	70-30-4	< 4900	< 4700	< 4900	< 4900	< 4800	4700 R	< 4900
Hexachloropropene	1888-71-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Isophorone	78-59-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Isosafrole	120-58-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
m-Dinitrobenzene	99-65-0	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Methapyrilene	91-80-5	1900 R	1900 R	1900 R	1900 R	< 1900	< 1900	< 2000
Methyl methanesulfonate	66-27-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Naphthalene	91-20-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Nitrobenzene	98-95-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosodiethylamine	55-18-5	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosodimethylamine	62-75-9	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosodi-n-butylamine	924-16-3	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosodi-n-propylamine	621-64-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosodiphenylamine	86-30-6	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosomethylethylamine	10595-95-6	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosomorpholine	59-89-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosopiperidine	100-75-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
N-Nitrosopyrrolidine	930-55-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
o-Toluidine	95-53-4	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
p-Dimethylamino azobenzene	60-11-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Pentachlorobenzene	608-93-5	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Pentachloronitrobenzene	82-68-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Pentachlorophenol	87-86-5	< 49	< 47	< 49	< 49	< 48	< 47	< 49
Phenacetin	62-44-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Phenanthrene	85-01-8	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Phenol	108-95-2	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
p-Phenylene diamine	106-50-3	1900 R	1900 R	1900 R	1900 R	< 1900	< 1900	< 2000
Pronamide	23950-58-5	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Pyrene	129-00-0	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Pyridine	110-86-1	< 49	< 47	< 49	< 49	< 48	< 47	< 49
Safrole, Total	94-59-7	< 9.7	< 9.4	< 9.7	< 9.7	< 9.6	< 9.4	< 9.8
Semi-Volatile Organics (TICs) (ug/L)								
1-Propene, 1,1,2-trichloro-	21400-25-9	NA	NA	NA	NA	NA	NA	6 JN
1-Propene, 1,2,3-trichloro-	96-19-5	NA	NA	NA	NA	NA	NA	NA
2-Butanol, 2,3-dimethyl-	594-60-5	NA	NA	NA	5.4 JN	NA	NA	NA
Diethyltoluamide	134-62-3	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	340 JN	220 JN	NA	NA	220 JN
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]-	112-50-5	NA	NA	NA	54 JN	NA	NA	NA

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WWL-1		WWL-2		WWL-3L		WWL-3U		LF-1		LF-2		LF-3	
Sample Date		6/4/2007		6/4/2007		6/4/2007		6/4/2007		6/5/2007		6/6/2007		6/5/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		WWL		WWL		WWL		WWL		Old Landfill		Old Landfill		Old Landfill	
Constituent	**CAS No.**														
Acrylamide, Acrylonitrile and Acrolein (ug/L)															
Acrylamide	79-06-1	< 100		< 100		< 100		< 100		< 100		< 100		< 100	
Alcohols and Glycols (ug/L)															
Allyl alcohol	107-18-6	< 1000		< 1000		< 1000		< 1000		< 1000		< 1000		< 1000	
Diethylene glycol	111-46-6	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Dipropylene glycol	25265-71-8	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethanol	64-17-5	< 1000		< 1000		9700		3400		< 1000		< 1000		< 1000	
Ethylene glycol	107-21-1	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethylene glycol monobutyl ether	111-76-2	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethylene glycol monopropyl ether	2807-30-9	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Isopropanol	67-63-0	< 1000		< 1000		< 1000		< 1000		< 1000		< 1000		< 1000	
Methanol	67-56-1	1000		1500		1900		1600		< 1000		< 1000		< 1000	
Propylene glycol	57-55-6	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Total Inorganics (ug/L)															
Aluminum	7429-90-5	130		490		50	J	60		300		23	J	340	
Antimony	7440-36-0	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5	
Arsenic	7440-38-2	1.4	J	4.8		1.8	J	1.2	J	< 2.5		0.58	B	0.68	J
Barium	7440-39-3	840		1600		33		34		130		84		150	
Beryllium	7440-41-7	< 0.5		< 2		< 1		< 0.5		0.35	J	< 0.5		< 0.5	
Cadmium	7440-43-9	< 0.5		< 0.5		0.14	J	< 0.5		< 0.5		< 0.5		< 0.5	
Calcium	7440-70-2	190000		830000		250000		250000		150000		110000		54000	
Chromium	7440-47-3	5.1		5.5		12		6.8		2.7	J	0.63	J	3.8	J
Cobalt	7440-48-4	4.8		77		73		79		0.53		0.34	J	5.9	
Copper	7440-50-8	0.7	J	5.5		0.78	J	0.56	J	0.81	B	< 2.5		3.4	
Iron	7439-89-6	110000		14000		180000		79000		10000		4300		4000	
Lead	7439-92-1	< 1.5		< 1.5		< 1.5		< 1.5		< 1.5		< 1.5		0.92	J
Magnesium	7439-95-4	40000		300000		66000		66000		15000		9000		15000	
Manganese	7439-96-5	2800		16000		9700		8900		1600		900		3000	
Mercury	7439-97-6	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	
Nickel	7440-02-0	5		21		22		9.8		1.4		1		7.7	
Potassium	7440097	6300		1100		6500		9300		8800		7600		5300	
Selenium	7782-49-2	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		3	
Silver	7440-22-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Sodium	7440-23-5	300000		510000		310000		280000		84000		54000		250000	
Thallium	7440-28-0	< 1		< 1		< 1		0.31	J	< 1		< 1		< 1	
Vanadium	7440-62-2	< 5		< 5		< 5		< 5		< 5		< 5		3.2	J
Zinc	7440-66-6	15	B	27	B	25	B	28	B	11	J	< 20		30	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	WWL-1 6/4/2007 Investigation WWL	WWL-2 6/4/2007 Investigation WWL	WWL-3L 6/4/2007 Investigation WWL	WWL-3U 6/4/2007 Investigation WWL	LF-1 6/5/2007 Investigation Old Landfill	LF-2 6/6/2007 Investigation Old Landfill	LF-3 6/5/2007 Investigation Old Landfill
Dissolved Inorganics (ug/L)								
Aluminum	7429-90-5D	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0D	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2D	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3D	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-41-7D	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9D	NA	NA	NA	NA	NA	NA	NA
Calcium	7440-70-2D	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3D	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4D	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8D	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6D	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1D	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4D	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5D	NA	NA	NA	NA	NA	NA	NA
Mercury	7439-97-6D	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0D	NA	NA	NA	NA	NA	NA	NA
Potassium	7440097D	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2D	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4D	NA	NA	NA	NA	NA	NA	NA
Sodium	7440-23-5D	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0D	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2D	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6D	NA	NA	NA	NA	NA	NA	NA
Other Inorganics (ug/L)								
Chloride	16887-00-6	510000	2600000	960000	740000	120000	82000	150000
Nitrate as N	14797-55-8	< 50	< 50	< 200	< 50	< 50	< 50	230
Nitrite as N	14797-65-0	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Nitrogen, Kjeldahl	7727-37-9	1300 K	810 K	1200 K	670 K	440	300 B	970
Total Organic Carbon	7440-44-0	260000	32000	4700	4100	< 1000	< 1000	3900
Sulfate	14808-79-8	250000	64000	470000	330000	270000	150000 K	240000

Notes:
NA - Not Analyzed.
B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.
H - Sample prepped beyond holding time.
J - The positive result reported for this analyte is a quanititative estimate.
K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.
Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.
R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	LF-4 6/5/2007 Investigation Old Landfill		LF-5 6/5/2007 Investigation Old Landfill		NAT-1 6/6/2007 Investigation Natrosol Lagoon		NAT-2 6/6/2007 Investigation Natrosol Lagoon		NAT-3 6/6/2007 Investigation Natrosol Lagoon		NAT-3 DUP 6/6/2007 Duplicate Natrosol Lagoon		NAT-4 6/6/2007 Investigation Natrosol Lagoon	
Volatile Organics (ug/L)															
1,1,1,2-Tetrachloroethane	630-20-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,1-Trichloroethane	71-55-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2,2-Tetrachloroethane	79-34-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2-Trichloroethane	79-00-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethane	75-34-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethene	75-35-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2,3-Trichloropropane	96-18-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromo-3-Chloropropane	96-12-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromoethane	106-93-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloroethane	107-06-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,2-Dichloroethene	156-60-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloropropane	78-87-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
cis-1,3-Dichloropropene	10061-01-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,3-Dichloropropene	10061-02-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
2-Butanone (MEK)	78-93-3	< 10		< 10		< 10		< 10		< 10		< 10		< 10	
2-Hexanone	591-78-6	< 10		< 10		< 10		< 10		< 10		< 10		< 10	
2-Methyl-1-propanol	78-83-1	40	R	40	R	40	R	40	R	40	R	40	R	40	R
3-Methylhexane	589-34-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 10		< 10		< 10		< 10		< 10		< 10		< 10	
Acetone	67-64-1	< 25		< 25		< 25		5.9	J	57		58		6.9	J
Acetonitrile	75-05-8	< 40		< 40		< 40		< 40		< 40		< 40		< 40	
Acrolein	107-02-8	< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Acrylonitrile	107-13-1	< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Allyl chloride	107-05-1	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzene	71-43-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzyl chloride	100-44-7	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromodichloromethane	75-27-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromoform	75-25-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromomethane	74-83-9	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Carbon disulfide	75-15-0	< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Carbon tetrachloride	56-23-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chlorobenzene	108-90-7	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroethane	75-00-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	LF-4 6/5/2007 Investigation Old Landfill	LF-5 6/5/2007 Investigation Old Landfill	NAT-1 6/6/2007 Investigation Natrosol Lagoon	NAT-2 6/6/2007 Investigation Natrosol Lagoon	NAT-3 6/6/2007 Investigation Natrosol Lagoon	NAT-3 DUP 6/6/2007 Duplicate Natrosol Lagoon	NAT-4 6/6/2007 Investigation Natrosol Lagoon
Chloroform	67-66-3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloromethane	74-87-3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroprene	126-99-8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	124-48-1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dibromomethane	74-95-3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dichlorodifluoromethane	75-71-8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dichlorofluoromethane	75-43-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Diethyl ether	60-29-7	< 10	24	< 10	< 10	0.49 J	0.5 J	< 10
Ethyl methacrylate	97-63-2	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	100-41-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylene oxide	75-21-8	< 200	< 200	200 R	200 R	200 R	200 R	200 R
Iodomethane	74-88-4	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Methacrylonitrile	126-98-7	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Methyl methacrylate	80-62-6	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methylene Chloride	75-09-2	< 5	< 5	< 5	< 5	< 5	< 5	< 5
n-Heptane	142-82-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pentachloroethane	76-01-7	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Propionitrile	107-12-0	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Propylene oxide	75-56-9	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Styrene	100-42-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1
t-Butanol	75-65-0	< 5	22	< 5	34000	92000	5 R	640
Tetrachloroethene	127-18-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	108-88-3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,4-Dichloro-2-butene	110-57-6	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Trichloroethylene	79-01-6	< 1	< 1	8.4	0.6 J	< 1	< 1	< 1
Trichlorofluoromethane	75-69-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Vinyl acetate	108-05-4	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Vinyl chloride	75-01-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Xylenes, Total	1330-20-7	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Volatile Organics (TICs) (ug/L)								
1,2-Dichloroethene, Total	540-59-0	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	71 B	91 B	130 B	330 B	610 B	620 B	95 B
Methyl tert-butyl ether	1634-04-4	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446095	NA	NA	NA	NA	NA	NA	NA

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	LF-4 6/5/2007 Investigation Old Landfill	LF-5 6/5/2007 Investigation Old Landfill	NAT-1 6/6/2007 Investigation Natrosol Lagoon	NAT-2 6/6/2007 Investigation Natrosol Lagoon	NAT-3 6/6/2007 Investigation Natrosol Lagoon	NAT-3 DUP 6/6/2007 Duplicate Natrosol Lagoon	NAT-4 6/6/2007 Investigation Natrosol Lagoon
Semi-Volatile Organics (ug/L)								
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
1,2,4-Trichlorobenzene	120-82-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
1,2-Dichlorobenzene	95-50-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
1,3,5-Trinitrobenzene	99-35-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
1,3-Dichlorobenzene	541-73-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
1,4-Dichlorobenzene	106-46-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
1,4-Dioxane	123-91-1	< 9.7	< 9.7	< 9.4	3 J	14	12	< 9.8
1,4-Naphthoquinone	130-15-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
1-Naphthalenamine	134-32-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,4,5-Trichlorophenol	95-95-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,4,6-Trichlorophenol	88-06-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,4-Dichlorophenol	120-83-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,4-Dimethylphenol	105-67-9	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,4-Dinitrophenol	51-28-5	< 49	< 49	< 47	< 49	< 49	< 50	< 49
2,4-Dinitrotoluene	121-14-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,6-Dichlorophenol	87-65-0	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2,6-Dinitrotoluene	606-20-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Acetylaminofluorene	53-96-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Chloronaphthalene	91-58-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Chlorophenol	95-57-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Methylnaphthalene	91-57-6	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Methylphenol	95-48-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Naphthalenamine	91-59-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Nitroaniline	88-74-4	< 49	< 49	< 47	< 49	< 49	< 50	< 49
2-Nitrophenol	88-75-5	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-Picoline	109-06-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
3 & 4 Methylphenol	15831-10-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
3,3'-Dichlorobenzidine	91-94-1	< 19	< 19	< 19	< 20	< 20	< 20	< 20
3,3'-Dimethylbenzidine	119-93-7	< 19	< 19	< 19	< 20	< 20	< 20	< 20
3-Methylcholanthrene	56-49-5	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
3-Nitroaniline	99-09-2	< 49	< 49	< 47	< 49	< 49	< 50	< 49
4,6-Dinitro-2-methylphenol	534-52-1	< 49	< 49	< 47	< 49	< 49	< 50	< 49
4-Aminobiphenyl	92-67-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
4-Bromophenyl phenyl ether	101-55-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
4-Chloro-3-methylphenol	59-50-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	LF-4 6/5/2007 Investigation Old Landfill	LF-5 6/5/2007 Investigation Old Landfill	NAT-1 6/6/2007 Investigation Natrosol Lagoon	NAT-2 6/6/2007 Investigation Natrosol Lagoon	NAT-3 6/6/2007 Investigation Natrosol Lagoon	NAT-3 DUP 6/6/2007 Duplicate Natrosol Lagoon	NAT-4 6/6/2007 Investigation Natrosol Lagoon
4-Chloroaniline	106-47-8	< 19	< 19	< 19	< 20	< 20	< 20	< 20
4-Chlorophenyl phenyl ether	7005-72-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
4-Nitroaniline	100-01-6	< 49	< 49	< 47	< 49	< 49	< 50	< 49
4-Nitrophenol	100-02-7	< 49	< 49	< 47	< 49	< 49	< 50	< 49
4-Nitroquinoline-1-oxide	56-57-5	19 R	19 R	19 R	20 R	20 R	20 R	20 R
5-Nitro-o-toluidine	99-55-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
7,12-Dimethylbenz(a)anthracene	57-97-6	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Acenaphthene	83-32-9	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Acenaphthylene	208-96-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Acetophenone	98-86-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 1900	< 1900	< 1900	< 2000	< 2000	< 2000	< 2000
Aniline	62-53-3	< 19	< 19	< 19	< 20	< 20	< 20	< 20
Anthracene	120-12-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Aramite, Total	140-57-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Benzo[a]anthracene	56-55-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Benzo[a]pyrene	50-32-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Benzo[b]fluoranthene	205-99-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Benzo[g,h,i]perylene	191-24-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Benzo[k]fluoranthene	207-08-9	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Benzyl alcohol	100-51-6	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Bis(2-chloroethoxy)methane	111-91-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Bis(2-chloroethyl)ether	111-44-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Bis(2-ethylhexyl) phthalate	117-81-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Butyl benzyl phthalate	85-68-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Chrysene	218-01-9	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Diallate	2303-16-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Dibenz(a,h)anthracene	53-70-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Dibenzofuran	132-64-9	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Diethyl phthalate	84-66-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Dimethoate	60-51-5	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Dimethyl phthalate	131-11-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Di-n-butyl phthalate	84-74-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Di-n-octyl phthalate	117-84-0	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Ethyl methanesulfonate	62-50-0	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Fluoranthene	206-44-0	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Fluorene	86-73-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Hexachlorobenzene	118-74-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Hexachlorobutadiene	87-68-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Hexachlorocyclopentadiene	77-47-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Hexachloroethane	67-72-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	LF-4 6/5/2007 Investigation Old Landfill	LF-5 6/5/2007 Investigation Old Landfill	NAT-1 6/6/2007 Investigation Natrosol Lagoon	NAT-2 6/6/2007 Investigation Natrosol Lagoon	NAT-3 6/6/2007 Investigation Natrosol Lagoon	NAT-3 DUP 6/6/2007 Duplicate Natrosol Lagoon	NAT-4 6/6/2007 Investigation Natrosol Lagoon
Hexachlorophene	70-30-4	< 4900	< 4900	4700 R	4900 R	4900 R	5000 R	4900 R
Hexachloropropene	1888-71-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Isophorone	78-59-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Isosafrole	120-58-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
m-Dinitrobenzene	99-65-0	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Methapyrilene	91-80-5	< 1900	< 1900	< 1900	< 2000	< 2000	< 2000	< 2000
Methyl methanesulfonate	66-27-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Naphthalene	91-20-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Nitrobenzene	98-95-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosodiethylamine	55-18-5	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosodimethylamine	62-75-9	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosodi-n-butylamine	924-16-3	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosodi-n-propylamine	621-64-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosodiphenylamine	86-30-6	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosomethylethylamine	10595-95-6	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosomorpholine	59-89-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosopiperidine	100-75-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
N-Nitrosopyrrolidine	930-55-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
o-Toluidine	95-53-4	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
p-Dimethylamino azobenzene	60-11-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Pentachlorobenzene	608-93-5	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Pentachloronitrobenzene	82-68-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Pentachlorophenol	87-86-5	< 49	< 49	< 47	< 49	< 49	< 50	< 49
Phenacetin	62-44-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Phenanthrene	85-01-8	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Phenol	108-95-2	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
p-Phenylene diamine	106-50-3	< 1900	< 1900	< 1900	< 2000	< 2000	< 2000	< 2000
Pronamide	23950-58-5	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Pyrene	129-00-0	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Pyridine	110-86-1	< 49	< 49	< 47	< 49	< 49	< 50	< 49
Safrole, Total	94-59-7	< 9.7	< 9.7	< 9.4	< 9.8	< 9.8	< 10	< 9.8
Semi-Volatile Organics (TICs) (ug/L)								
1-Propene, 1,1,2-trichloro-	21400-25-9	NA	7.4 JN	NA	NA	NA	NA	NA
1-Propene, 1,2,3-trichloro-	96-19-5	6.7 JN	NA	NA	NA	NA	NA	NA
2-Butanol, 2,3-dimethyl-	594-60-5	NA	NA	NA	NA	NA	NA	NA
Diethyltoluamide	134-62-3	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]-	112-50-5	NA	NA	NA	NA	NA	NA	NA

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	LF-4 6/5/2007 Investigation Old Landfill	LF-5 6/5/2007 Investigation Old Landfill	NAT-1 6/6/2007 Investigation Natrosol Lagoon	NAT-2 6/6/2007 Investigation Natrosol Lagoon	NAT-3 6/6/2007 Investigation Natrosol Lagoon	NAT-3 DUP 6/6/2007 Duplicate Natrosol Lagoon	NAT-4 6/6/2007 Investigation Natrosol Lagoon
Acrylamide, Acrylonitrile and Acrolein (ug/L)								
Acrylamide	79-06-1	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Alcohols and Glycols (ug/L)								
Allyl alcohol	107-18-6	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Diethylene glycol	111-46-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Dipropylene glycol	25265-71-8	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethanol	64-17-5	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Ethylene glycol	107-21-1	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monobutyl ether	111-76-2	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monopropyl ether	2807-30-9	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Isopropanol	67-63-0	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Methanol	67-56-1	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Propylene glycol	57-55-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Total Inorganics (ug/L)								
Aluminum	7429-90-5	100	160	500	1200	410	230	3200
Antimony	7440-36-0	1.1 J	< 2.5	< 2.5	< 2.5	0.56 B	< 2.5	< 2.5
Arsenic	7440-38-2	< 2.5	< 2.5	0.67 B	7	6.4	6.6	2.5 B
Barium	7440-39-3	71	130	80	67	130	120	57
Beryllium	7440-41-7	< 0.5	< 0.5	< 0.5	0.09 J	< 0.5	< 0.5	0.15 J
Cadmium	7440-43-9	< 0.5	< 0.5	0.29 J	< 0.5	< 0.5	< 0.5	< 0.5
Calcium	7440-70-2	49000	170000	66000	23000	61000	59000	5400
Chromium	7440-47-3	< 5	4.2 J	3.5 J	8.8	11	12	19
Cobalt	7440-48-4	0.26 J	1	3.9	6.7	27	27	2.3
Copper	7440-50-8	0.5 B	0.7 B	2.1 J	2.4 J	3	2 J	4.9
Iron	7439-89-6	810	5100	400	5500	3000	2700	9600
Lead	7439-92-1	< 1.5	< 1.5	0.36 J	0.88 J	0.74 J	0.34 J	2.2
Magnesium	7439-95-4	3100	13000	24000	14000	24000	23000	6400
Manganese	7439-96-5	280	1100	690	150	2800	2700	120
Mercury	7439-97-6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel	7440-02-0	0.72 J	3.9	11	8.8	35	34	13
Potassium	7440097	4100	6700	2700	1800	1400	1200	600
Selenium	7782-49-2	< 2.5	< 2.5	< 2.5	< 2.5	1 J	0.78 J	< 2.5
Silver	7440-22-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sodium	7440-23-5	12000	54000	190000	710000	1500000	1400000	150000
Thallium	7440-28-0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Vanadium	7440-62-2	< 5	< 5	5	6.6	9	7.5	14
Zinc	7440-66-6	7.4 J	7.5 J	10 J	11 J	13 J	7.7 J	9.1 J

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	LF-4 6/5/2007 Investigation Old Landfill	LF-5 6/5/2007 Investigation Old Landfill	NAT-1 6/6/2007 Investigation Natrosol Lagoon	NAT-2 6/6/2007 Investigation Natrosol Lagoon	NAT-3 6/6/2007 Investigation Natrosol Lagoon	NAT-3 DUP 6/6/2007 Duplicate Natrosol Lagoon	NAT-4 6/6/2007 Investigation Natrosol Lagoon
Dissolved Inorganics (ug/L)								
Aluminum	7429-90-5D	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0D	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2D	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3D	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-41-7D	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9D	NA	NA	NA	NA	NA	NA	NA
Calcium	7440-70-2D	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3D	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4D	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8D	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6D	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1D	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4D	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5D	NA	NA	NA	NA	NA	NA	NA
Mercury	7439-97-6D	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0D	NA	NA	NA	NA	NA	NA	NA
Potassium	7440097D	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2D	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4D	NA	NA	NA	NA	NA	NA	NA
Sodium	7440-23-5D	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0D	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2D	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6D	NA	NA	NA	NA	NA	NA	NA
Other Inorganics (ug/L)								
Chloride	16887-00-6	9500	140000	68000	120000	260000	260000	12000
Nitrate as N	14797-55-8	< 50	< 50	10000	< 50	< 50	< 50	< 50
Nitrite as N	14797-65-0	< 50	< 50	16 J	< 50	< 50	< 50	< 50
Nitrogen, Kjeldahl	7727-37-9	310	310	540 K	2100 K	2300 K	2300 K	3200 K
Total Organic Carbon	7440-44-0	< 1000	< 1000	1900	31000	100000	100000	10000
Sulfate	14808-79-8	19000	160000	250000 K	100000 K	< 50000	< 5000	63000

Notes:
NA - Not Analyzed.
B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.
H - Sample prepped beyond holding time.
J - The positive result reported for this analyte is a quanititative estimate.
K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.
Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.
R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	RABMW-2 5/31/2007 Investigation RA Basin		RABMW-3 5/30/2007 Investigation RA Basin		RABMW-4 5/31/2007 Investigation RA Basin		SDB-MW1 6/5/2007 Investigation SDB		SDB-MW2 6/5/2007 Investigation SDB		SDB-MW3 6/5/2007 Investigation SDB		VFSP-MW1 6/6/2007 Investigation VFSP	
Volatile Organics (ug/L)															
1,1,1,2-Tetrachloroethane	630-20-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,1-Trichloroethane	71-55-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2,2-Tetrachloroethane	79-34-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2-Trichloroethane	79-00-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethane	75-34-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethene	75-35-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2,3-Trichloropropane	96-18-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromo-3-Chloropropane	96-12-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromoethane	106-93-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloroethane	107-06-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,2-Dichloroethene	156-60-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloropropane	78-87-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
cis-1,3-Dichloropropene	10061-01-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,3-Dichloropropene	10061-02-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
2-Butanone (MEK)	78-93-3	< 10		< 10		< 10		< 10		< 10		< 10		< 10	
2-Hexanone	591-78-6	< 10		< 10		< 10		< 10		< 10		< 10		< 10	
2-Methyl-1-propanol	78-83-1	40	R	40	R	40	R	40	R	40	R	40	R	40	R
3-Methylhexane	589-34-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 10		< 10		< 10		< 10		< 10		< 10		< 10	
Acetone	67-64-1	11	J	< 25		< 25		< 25		< 25		< 25		< 25	
Acetonitrile	75-05-8	< 40		< 40		< 40		< 40		< 40		< 40		< 40	
Acrolein	107-02-8	< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Acrylonitrile	107-13-1	< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Allyl chloride	107-05-1	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzene	71-43-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzyl chloride	100-44-7	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromodichloromethane	75-27-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromoform	75-25-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromomethane	74-83-9	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Carbon disulfide	75-15-0	< 2		< 2		< 2		< 2		< 2		< 2		0.54	J
Carbon tetrachloride	56-23-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chlorobenzene	108-90-7	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroethane	75-00-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification / Sample Date / Sample Type / Sample Location / Constituent	CAS No.	RABMW-2 5/31/2007 Investigation RA Basin		RABMW-3 5/30/2007 Investigation RA Basin		RABMW-4 5/31/2007 Investigation RA Basin		SDB-MW1 6/5/2007 Investigation SDB		SDB-MW2 6/5/2007 Investigation SDB		SDB-MW3 6/5/2007 Investigation SDB		VFSP-MW1 6/6/2007 Investigation VFSP	
Chloroform	67-66-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloromethane	74-87-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroprene	126-99-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dibromochloromethane	124-48-1	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dibromomethane	74-95-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dichlorodifluoromethane	75-71-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dichlorofluoromethane	75-43-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Diethyl ether	60-29-7	4.7	J	2.9	J	11		0.54	J	< 10		< 10		76	
Ethyl methacrylate	97-63-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Ethylbenzene	100-41-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Ethylene oxide	75-21-8	200	R	200	R	200	R	< 200		< 200		< 200		200	R
Iodomethane	74-88-4	< 5		< 5		< 5		< 5		< 5		< 5		< 5	
Methacrylonitrile	126-98-7	< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Methyl methacrylate	80-62-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Methylene Chloride	75-09-2	< 5		< 5		< 5		< 5		< 5		< 5		< 5	
n-Heptane	142-82-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Pentachloroethane	76-01-7	< 5		< 5		< 5		< 5		< 5		< 5		< 5	
Propionitrile	107-12-0	< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Propylene oxide	75-56-9	< 200		< 200		< 200		< 200		< 200		< 200		< 200	
Styrene	100-42-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
t-Butanol	75-65-0	560		60		30		3	J	< 5		3	J	< 5	
Tetrachloroethene	127-18-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Toluene	108-88-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,4-Dichloro-2-butene	110-57-6	< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Trichloroethylene	79-01-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Trichlorofluoromethane	75-69-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Vinyl acetate	108-05-4	< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Vinyl chloride	75-01-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Xylenes, Total	1330-20-7	< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Volatile Organics (TICs) (ug/L)															
1,2-Dichloroethene, Total	540-59-0	NA		NA		NA		NA		NA		NA		NA	
Carbon Dioxide	124-38-9	210	B	270	B	100	B	330	B	230	B	130	B	58	B
Methyl tert-butyl ether	1634-04-4	0.87	J	NA		NA		NA		NA		NA		NA	
Sulfur dioxide	7446095	76	R	NA		NA		NA		NA		NA		NA	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	RABMW-2 5/31/2007 Investigation RA Basin	RABMW-3 5/30/2007 Investigation RA Basin	RABMW-4 5/31/2007 Investigation RA Basin	SDB-MW1 6/5/2007 Investigation SDB	SDB-MW2 6/5/2007 Investigation SDB	SDB-MW3 6/5/2007 Investigation SDB	VFSP-MW1 6/6/2007 Investigation VFSP
Semi-Volatile Organics (ug/L)								
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1,2,4-Trichlorobenzene	120-82-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1,2-Dichlorobenzene	95-50-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1,3,5-Trinitrobenzene	99-35-4	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1,3-Dichlorobenzene	541-73-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1,4-Dichlorobenzene	106-46-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1,4-Dioxane	123-91-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1,4-Naphthoquinone	130-15-4	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
1-Naphthalenamine	134-32-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2,4,5-Trichlorophenol	95-95-4	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
2,4,6-Trichlorophenol	88-06-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
2,4-Dichlorophenol	120-83-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
2,4-Dimethylphenol	105-67-9	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
2,4-Dinitrophenol	51-28-5	< 47	< 49	< 47	< 49	< 49	< 49	< 48
2,4-Dinitrotoluene	121-14-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2,6-Dichlorophenol	87-65-0	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
2,6-Dinitrotoluene	606-20-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-Acetylaminofluorene	53-96-3	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-Chloronaphthalene	91-58-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-Chlorophenol	95-57-8	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-Methylnaphthalene	91-57-6	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-Methylphenol	95-48-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
2-Naphthalenamine	91-59-8	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-Nitroaniline	88-74-4	< 47	< 49	< 47	< 49	< 49	< 49 L	< 48
2-Nitrophenol	88-75-5	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-Picoline	109-06-8	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
3 & 4 Methylphenol	15831-10-4	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8	< 9.6
3,3'-Dichlorobenzidine	91-94-1	< 19	< 19	< 19	< 19	< 20	< 20 L	< 19
3,3'-Dimethylbenzidine	119-93-7	< 19	< 19	< 19	< 19	< 20	< 20 L	< 19
3-Methylcholanthrene	56-49-5	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
3-Nitroaniline	99-09-2	< 47	< 49	< 47	< 49	< 49	< 49 L	< 48
4,6-Dinitro-2-methylphenol	534-52-1	< 47	< 49	< 47	< 49	< 49	< 49 L	< 48
4-Aminobiphenyl	92-67-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
4-Bromophenyl phenyl ether	101-55-3	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
4-Chloro-3-methylphenol	59-50-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification / Sample Date / Sample Type / Sample Location / Constituent	CAS No.	RABMW-2 5/31/2007 Investigation RA Basin		RABMW-3 5/30/2007 Investigation RA Basin		RABMW-4 5/31/2007 Investigation RA Basin		SDB-MW1 6/5/2007 Investigation SDB		SDB-MW2 6/5/2007 Investigation SDB		SDB-MW3 6/5/2007 Investigation SDB		VFSP-MW1 6/6/2007 Investigation VFSP	
4-Chloroaniline	106-47-8	< 19		< 19		< 19		< 19		< 20		< 20	L	< 19	
4-Chlorophenyl phenyl ether	7005-72-3	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8		< 9.6	
4-Nitroaniline	100-01-6	< 47		< 49		< 47		< 49		< 49		< 49	L	< 48	
4-Nitrophenol	100-02-7	< 47		< 49		< 47		< 49		< 49		< 49	L	< 48	
4-Nitroquinoline-1-oxide	56-57-5	19	R	19	R	19	R	19	R	20	R	20	R	19	R
5-Nitro-o-toluidine	99-55-8	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
7,12-Dimethylbenz(a)anthracene	57-97-6	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Acenaphthene	83-32-9	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Acenaphthylene	208-96-8	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Acetophenone	98-86-2	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 1900		< 1900		< 1900		< 1900		< 2000		< 2000	L	< 1900	
Aniline	62-53-3	< 19		< 19		< 19		< 19		< 20		< 20	L	< 19	
Anthracene	120-12-7	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Aramite, Total	140-57-8	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Benzo[a]anthracene	56-55-3	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Benzo[a]pyrene	50-32-8	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Benzo[b]fluoranthene	205-99-2	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Benzo[g,h,i]perylene	191-24-2	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Benzo[k]fluoranthene	207-08-9	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Benzyl alcohol	100-51-6	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Bis(2-chloroethoxy)methane	111-91-1	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Bis(2-chloroethyl)ether	111-44-4	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Bis(2-ethylhexyl) phthalate	117-81-7	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Butyl benzyl phthalate	85-68-7	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Chrysene	218-01-9	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Diallate	2303-16-4	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Dibenz(a,h)anthracene	53-70-3	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Dibenzofuran	132-64-9	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Diethyl phthalate	84-66-2	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Dimethoate	60-51-5	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Dimethyl phthalate	131-11-3	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Di-n-butyl phthalate	84-74-2	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Di-n-octyl phthalate	117-84-0	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Ethyl methanesulfonate	62-50-0	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Fluoranthene	206-44-0	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Fluorene	86-73-7	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Hexachlorobenzene	118-74-1	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Hexachlorobutadiene	87-68-3	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Hexachlorocyclopentadiene	77-47-4	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	
Hexachloroethane	67-72-1	< 9.4		< 9.7		< 9.4		< 9.7		< 9.8		< 9.8	L	< 9.6	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	RABMW-2 5/31/2007 Investigation RA Basin	RABMW-3 5/30/2007 Investigation RA Basin	RABMW-4 5/31/2007 Investigation RA Basin	SDB-MW1 6/5/2007 Investigation SDB	SDB-MW2 6/5/2007 Investigation SDB	SDB-MW3 6/5/2007 Investigation SDB	VFSP-MW1 6/6/2007 Investigation VFSP
Hexachlorophene	70-30-4	< 4700	< 4900	< 4700	< 4900	< 4900	< 4900	4800 R
Hexachloropropene	1888-71-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Isophorone	78-59-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Isosafrole	120-58-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
m-Dinitrobenzene	99-65-0	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Methapyrilene	91-80-5	< 1900	< 1900	< 1900	< 1900	< 2000	< 2000 L	< 1900
Methyl methanesulfonate	66-27-3	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Naphthalene	91-20-3	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Nitrobenzene	98-95-3	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosodiethylamine	55-18-5	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosodimethylamine	62-75-9	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosodi-n-butylamine	924-16-3	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosodi-n-propylamine	621-64-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosodiphenylamine	86-30-6	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosomethylethylamine	10595-95-6	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosomorpholine	59-89-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosopiperidine	100-75-4	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
N-Nitrosopyrrolidine	930-55-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
o-Toluidine	95-53-4	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
p-Dimethylamino azobenzene	60-11-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Pentachlorobenzene	608-93-5	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Pentachloronitrobenzene	82-68-8	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Pentachlorophenol	87-86-5	< 47	< 49	< 47	< 49	< 49	< 49	< 48
Phenacetin	62-44-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Phenanthrene	85-01-8	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Phenol	108-95-2	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
p-Phenylene diamine	106-50-3	< 1900	< 1900	< 1900	< 1900	< 2000	< 2000 L	< 1900
Pronamide	23950-58-5	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Pyrene	129-00-0	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Pyridine	110-86-1	< 47	< 49	< 47	< 49	< 49	< 49 L	< 48
Safrole, Total	94-59-7	< 9.4	< 9.7	< 9.4	< 9.7	< 9.8	< 9.8 L	< 9.6
Semi-Volatile Organics (TICs) (ug/L)								
1-Propene, 1,1,2-trichloro-	21400-25-9	NA	NA	NA	NA	NA	NA	NA
1-Propene, 1,2,3-trichloro-	96-19-5	NA	NA	NA	NA	NA	NA	NA
2-Butanol, 2,3-dimethyl-	594-60-5	NA	NA	NA	NA	NA	NA	NA
Diethyltoluamide	134-62-3	NA	NA	NA	13 JN	11 JN	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]-	112-50-5	NA	NA	NA	NA	NA	NA	NA

Table A-2

Groundwater Analytical Data
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Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	RABMW-2 5/31/2007 Investigation RA Basin	RABMW-3 5/30/2007 Investigation RA Basin	RABMW-4 5/31/2007 Investigation RA Basin	SDB-MW1 6/5/2007 Investigation SDB	SDB-MW2 6/5/2007 Investigation SDB	SDB-MW3 6/5/2007 Investigation SDB	VFSP-MW1 6/6/2007 Investigation VFSP
Acrylamide, Acrylonitrile and Acrolein (ug/L)								
Acrylamide	79-06-1	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Alcohols and Glycols (ug/L)								
Allyl alcohol	107-18-6	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Diethylene glycol	111-46-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Dipropylene glycol	25265-71-8	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethanol	64-17-5	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Ethylene glycol	107-21-1	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monobutyl ether	111-76-2	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monopropyl ether	2807-30-9	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Isopropanol	67-63-0	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Methanol	67-56-1	1100	< 1000	890 J	< 1000	< 1000	< 1000	< 1000
Propylene glycol	57-55-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Total Inorganics (ug/L)								
Aluminum	7429-90-5	20000	680	24000	9800	110	270	270
Antimony	7440-36-0	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Arsenic	7440-38-2	9.3	5.5	5.2	7.3	1.3 J	1 J	1.5 B
Barium	7440-39-3	110	200	130	540	24	17	140
Beryllium	7440-41-7	1.1	< 0.5	1.4	1	< 0.5	< 0.5	< 0.5
Cadmium	7440-43-9	0.2 J	< 0.5	0.47 J	0.28 J	0.38 J	0.34 J	< 0.5
Calcium	7440-70-2	88000	17000	180000	72000	500000	360000	79000
Chromium	7440-47-3	69	4.5 J	79	22	4.2 J	3.3 J	1.4 J
Cobalt	7440-48-4	150	13	12	14	6.3	4.5	2.5
Copper	7440-50-8	29	1.1 J	27	13	2.9	3.2	1.8 J
Iron	7439-89-6	130000	150000	32000	190000	170	250	4300
Lead	7439-92-1	18	0.62 J	17	26	< 1.5	< 1.5	0.22 J
Magnesium	7439-95-4	170000	35000	160000	23000	120000	110000	8000
Manganese	7439-96-5	12000	500	660	2300	1400	1100	750
Mercury	7439-97-6	0.21 J	0.52	0.21 J	< 0.5	< 0.5	< 0.5	< 0.5
Nickel	7440-02-0	100	14	77	10	24	31	2.1
Potassium	7440097	3400	870	7100	12000	3000	2300	5800
Selenium	7782-49-2	0.88 J	1.4 J	1.4 J	1.2 J	0.51 J	9.2	< 2.5
Silver	7440-22-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sodium	7440-23-5	490000	78000	280000	61000	280000	270000	31000
Thallium	7440-28-0	0.42 J	0.46 J	0.41 J	0.46 J	< 1	< 1	< 1
Vanadium	7440-62-2	68	7.4	95	45	< 5	< 5	1.5 J
Zinc	7440-66-6	110	24	80	75	36	25	13 J

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Groundwater Analytical Data
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Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	RABMW-2 5/31/2007 Investigation RA Basin	RABMW-3 5/30/2007 Investigation RA Basin	RABMW-4 5/31/2007 Investigation RA Basin	SDB-MW1 6/5/2007 Investigation SDB	SDB-MW2 6/5/2007 Investigation SDB	SDB-MW3 6/5/2007 Investigation SDB	VFSP-MW1 6/6/2007 Investigation VFSP
Dissolved Inorganics (ug/L)								
Aluminum	7429-90-5D	100	NA	27 J	890	NA	NA	NA
Antimony	7440-36-0D	< 2.5	NA	< 2.5	< 2.5	NA	NA	NA
Arsenic	7440-38-2D	3.5	NA	< 2.5	6.3	NA	NA	NA
Barium	7440-39-3D	39	NA	17	380	NA	NA	NA
Beryllium	7440-41-7D	< 2	NA	< 0.5	< 0.5	NA	NA	NA
Cadmium	7440-43-9D	< 0.5	NA	0.35 J	< 0.5	NA	NA	NA
Calcium	7440-70-2D	81000	NA	160000	71000	NA	NA	NA
Chromium	7440-47-3D	2.4 J	NA	< 5	4.1 J	NA	NA	NA
Cobalt	7440-48-4D	120	NA	1.4	9.8	NA	NA	NA
Copper	7440-50-8D	1.2 J	NA	1.4 J	1.6 B	NA	NA	NA
Iron	7439-89-6D	110000	NA	73 J	170000	NA	NA	NA
Lead	7439-92-1D	< 1.5	NA	< 1.5	1.3 J	NA	NA	NA
Magnesium	7439-95-4D	150000	NA	140000	22000	NA	NA	NA
Manganese	7439-96-5D	11000	NA	260	2200	NA	NA	NA
Mercury	7439-97-6D	< 0.5	NA	< 0.5	< 0.5	NA	NA	NA
Nickel	7440-02-0D	67	NA	39	3	NA	NA	NA
Potassium	7440097D	2000	NA	5400	11000	NA	NA	NA
Selenium	7782-49-2D	0.63 J	NA	< 2.5	0.94 J	NA	NA	NA
Silver	7440-22-4D	< 1	NA	< 1	< 1	NA	NA	NA
Sodium	7440-23-5D	500000	NA	260000	64000	NA	NA	NA
Thallium	7440-28-0D	< 1	NA	< 1	< 1	NA	NA	NA
Vanadium	7440-62-2D	2.6 J	NA	2.6 J	5.2	NA	NA	NA
Zinc	7440-66-6D	28 B	NA	25 B	12 J	NA	NA	NA
Other Inorganics (ug/L)								
Chloride	16887-00-6	480000	76000	300000	46000	140000	300000	42000
Nitrate as N	14797-55-8	< 100	< 50	< 50	< 250	< 50	630	< 50
Nitrite as N	14797-65-0	< 50	< 50	< 50	< 50	< 50	< 50	10 J
Nitrogen, Kjeldahl	7727-37-9	2300	3800	460	17000	1100	470	460 B
Total Organic Carbon	7440-44-0	13000	28000	2000	41000	7000	4100	< 1000
Sulfate	14808-79-8	1200000	33000	850000	< 5000	1400000	1100000	110000 K

Notes:
NA - Not Analyzed.
B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.
H - Sample prepped beyond holding time.
J - The positive result reported for this analyte is a quanititative estimate.
K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.
Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.
R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-1 5/31/2007 Investigation MH Basin	MW-2 5/31/2007 Investigation MH Basin	MW-3 6/1/2007 Investigation MH Basin	MW-4 6/1/2007 Investigation MH Basin	MW-4U 6/1/2007 Investigation MH Basin	MW-5 6/1/2007 Investigation MH Basin	MW-5U 6/1/2007 Investigation MH Basin
Volatile Organics (ug/L)								
1,1,1,2-Tetrachloroethane	630-20-6	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,1,1-Trichloroethane	71-55-6	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	79-34-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	79-00-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	75-34-3	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethene	75-35-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,2,3-Trichloropropane	96-18-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,2-Dibromo-3-Chloropropane	96-12-8	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,2-Dibromoethane	106-93-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	107-06-2	< 10	< 50	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	156-60-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	78-87-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
cis-1,3-Dichloropropene	10061-01-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
trans-1,3-Dichloropropene	10061-02-6	< 10	< 50	< 1	< 1	< 1	< 1	< 1
2-Butanone (MEK)	78-93-3	< 100	< 500	< 10	< 10	< 10	< 10	< 10
2-Hexanone	591-78-6	< 100	< 500	< 10	< 10	< 10	< 10	< 10
2-Methyl-1-propanol	78-83-1	400 R	2000 R	40 R	40 R	40 R	40 R	40 R
3-Methylhexane	589-34-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
4-Methyl-2-pentanone (MIBK)	108-10-1	< 100	< 500	< 10	< 10	< 10	< 10	< 10
Acetone	67-64-1	< 250	< 1300	< 25	< 25	< 25	< 25	< 25
Acetonitrile	75-05-8	< 400	< 2000	< 40	< 40	< 40	< 40	< 40
Acrolein	107-02-8	< 200	< 1000	< 20	< 20	< 20	< 20	< 20
Acrylonitrile	107-13-1	< 200	< 1000	< 20	< 20	< 20	< 20	< 20
Allyl chloride	107-05-1	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Benzene	71-43-2	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Benzyl chloride	100-44-7	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	75-27-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Bromoform	75-25-2	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Bromomethane	74-83-9	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Carbon disulfide	75-15-0	< 20	< 100	< 2	< 2	< 2	< 2	< 2
Carbon tetrachloride	56-23-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	108-90-7	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Chloroethane	75-00-3	< 10	< 50	< 1	< 1	< 1	< 1	< 1

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-1 5/31/2007 Investigation MH Basin	MW-2 5/31/2007 Investigation MH Basin	MW-3 6/1/2007 Investigation MH Basin	MW-4 6/1/2007 Investigation MH Basin	MW-4U 6/1/2007 Investigation MH Basin	MW-5 6/1/2007 Investigation MH Basin	MW-5U 6/1/2007 Investigation MH Basin
Chloroform	67-66-3	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Chloromethane	74-87-3	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Chloroprene	126-99-8	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	124-48-1	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Dibromomethane	74-95-3	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Dichlorodifluoromethane	75-71-8	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Dichlorofluoromethane	75-43-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Diethyl ether	60-29-7	2000 J	11000 J	190 J	1300	1300	280	320
Ethyl methacrylate	97-63-2	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	100-41-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Ethylene oxide	75-21-8	2000 R	10000 R	< 200	< 200	< 200	< 200	< 200
Iodomethane	74-88-4	< 50	< 250	< 5	< 5	< 5	< 5	< 5
Methacrylonitrile	126-98-7	< 200	< 1000	< 20	< 20	< 20	< 20	< 20
Methyl methacrylate	80-62-6	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Methylene Chloride	75-09-2	< 50	< 250	< 5	< 5	< 5	< 5	< 5
n-Heptane	142-82-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Pentachloroethane	76-01-7	< 50	< 250	< 5	< 5	< 5	< 5	< 5
Propionitrile	107-12-0	< 200	< 1000	< 20	< 20	< 20	< 20	< 20
Propylene oxide	75-56-9	< 2000	< 10000	< 200	< 200	< 200	< 200	< 200
Styrene	100-42-5	< 10	< 50	< 1	< 1	< 1	< 1	< 1
t-Butanol	75-65-0	< 50	< 250	710	2700	2800	340	150
Tetrachloroethene	127-18-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Toluene	108-88-3	< 10	< 50	< 1	< 1	< 1	< 1	< 1
trans-1,4-Dichloro-2-butene	110-57-6	< 20	< 100	< 2	< 2	< 2	< 2	< 2
Trichloroethylene	79-01-6	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Trichlorofluoromethane	75-69-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Vinyl acetate	108-05-4	< 20	< 100	< 2	< 2	< 2	< 2	< 2
Vinyl chloride	75-01-4	< 10	< 50	< 1	< 1	< 1	< 1	< 1
Xylenes, Total	1330-20-7	< 20	< 100	< 2	< 2	< 2	< 2	< 2
Volatile Organics (TICs) (ug/L)								
1,2-Dichloroethene, Total	540-59-0	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	430 B	2100 B	100 B	310 B	350 B	210 B	200 B
Methyl tert-butyl ether	1634-04-4	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446095	NA	NA	NA	NA	NA	NA	NA

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-1 5/31/2007 Investigation MH Basin	MW-2 5/31/2007 Investigation MH Basin	MW-3 6/1/2007 Investigation MH Basin	MW-4 6/1/2007 Investigation MH Basin	MW-4U 6/1/2007 Investigation MH Basin	MW-5 6/1/2007 Investigation MH Basin	MW-5U 6/1/2007 Investigation MH Basin
Semi-Volatile Organics (ug/L)								
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
1,2,4-Trichlorobenzene	120-82-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
1,2-Dichlorobenzene	95-50-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
1,3,5-Trinitrobenzene	99-35-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
1,3-Dichlorobenzene	541-73-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
1,4-Dichlorobenzene	106-46-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
1,4-Dioxane	123-91-1	24	24	< 10	5.9 J	5.9 J	< 9.7	< 9.8
1,4-Naphthoquinone	130-15-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
1-Naphthalenamine	134-32-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,4,5-Trichlorophenol	95-95-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,4,6-Trichlorophenol	88-06-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,4-Dichlorophenol	120-83-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,4-Dimethylphenol	105-67-9	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,4-Dinitrophenol	51-28-5	< 47	< 49	< 50	< 49	< 49	< 49	< 49
2,4-Dinitrotoluene	121-14-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,6-Dichlorophenol	87-65-0	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2,6-Dinitrotoluene	606-20-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Acetylaminofluorene	53-96-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Chloronaphthalene	91-58-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Chlorophenol	95-57-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Methylnaphthalene	91-57-6	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Methylphenol	95-48-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Naphthalenamine	91-59-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Nitroaniline	88-74-4	< 47	< 49	< 50	< 49	< 49	< 49	< 49
2-Nitrophenol	88-75-5	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-Picoline	109-06-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
3 & 4 Methylphenol	15831-10-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
3,3'-Dichlorobenzidine	91-94-1	< 19	< 20	< 20	< 19	< 20	< 19	< 20
3,3'-Dimethylbenzidine	119-93-7	< 19	< 20	< 20	< 19	< 20	< 19	< 20
3-Methylcholanthrene	56-49-5	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
3-Nitroaniline	99-09-2	< 47	< 49	< 50	< 49	< 49	< 49	< 49
4,6-Dinitro-2-methylphenol	534-52-1	< 47	< 49	< 50	< 49	< 49	< 49	< 49
4-Aminobiphenyl	92-67-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
4-Bromophenyl phenyl ether	101-55-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
4-Chloro-3-methylphenol	59-50-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-1 5/31/2007 Investigation MH Basin	MW-2 5/31/2007 Investigation MH Basin	MW-3 6/1/2007 Investigation MH Basin	MW-4 6/1/2007 Investigation MH Basin	MW-4U 6/1/2007 Investigation MH Basin	MW-5 6/1/2007 Investigation MH Basin	MW-5U 6/1/2007 Investigation MH Basin
4-Chloroaniline	106-47-8	< 19	< 20	< 20	< 19	< 20	< 19	< 20
4-Chlorophenyl phenyl ether	7005-72-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
4-Nitroaniline	100-01-6	< 47	< 49	< 50	< 49	< 49	< 49	< 49
4-Nitrophenol	100-02-7	< 47	< 49	< 50	< 49	< 49	< 49	< 49
4-Nitroquinoline-1-oxide	56-57-5	19 R	20 R	20 R	19 R	20 R	19 R	20 R
5-Nitro-o-toluidine	99-55-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
7,12-Dimethylbenz(a)anthracene	57-97-6	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Acenaphthene	83-32-9	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Acenaphthylene	208-96-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Acetophenone	98-86-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 1900	< 2000	< 2000	< 1900	< 2000	< 1900	< 2000
Aniline	62-53-3	< 19	< 20	< 20	< 19	< 20	< 19	< 20
Anthracene	120-12-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Aramite, Total	140-57-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Benzo[a]anthracene	56-55-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Benzo[a]pyrene	50-32-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Benzo[b]fluoranthene	205-99-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Benzo[g,h,i]perylene	191-24-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Benzo[k]fluoranthene	207-08-9	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Benzyl alcohol	100-51-6	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Bis(2-chloroethoxy)methane	111-91-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Bis(2-chloroethyl)ether	111-44-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Bis(2-ethylhexyl) phthalate	117-81-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Butyl benzyl phthalate	85-68-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Chrysene	218-01-9	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Diallate	2303-16-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Dibenz(a,h)anthracene	53-70-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Dibenzofuran	132-64-9	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Diethyl phthalate	84-66-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Dimethoate	60-51-5	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Dimethyl phthalate	131-11-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Di-n-butyl phthalate	84-74-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Di-n-octyl phthalate	117-84-0	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Ethyl methanesulfonate	62-50-0	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Fluoranthene	206-44-0	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Fluorene	86-73-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Hexachlorobenzene	118-74-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Hexachlorobutadiene	87-68-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Hexachlorocyclopentadiene	77-47-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Hexachloroethane	67-72-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-1 5/31/2007 Investigation MH Basin	MW-2 5/31/2007 Investigation MH Basin	MW-3 6/1/2007 Investigation MH Basin	MW-4 6/1/2007 Investigation MH Basin	MW-4U 6/1/2007 Investigation MH Basin	MW-5 6/1/2007 Investigation MH Basin	MW-5U 6/1/2007 Investigation MH Basin
Hexachlorophene	70-30-4	< 4700	< 4900	< 5000	< 4900	< 4900	< 4900	< 4900
Hexachloropropene	1888-71-7	< 9.4	< 9.8	10 R	9.7 R	9.8 R	9.7 R	9.8 R
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Isophorone	78-59-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Isosafrole	120-58-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
m-Dinitrobenzene	99-65-0	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Methapyrilene	91-80-5	< 1900	< 2000	< 2000	< 1900	< 2000	< 1900	< 2000
Methyl methanesulfonate	66-27-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Naphthalene	91-20-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Nitrobenzene	98-95-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosodiethylamine	55-18-5	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosodimethylamine	62-75-9	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosodi-n-butylamine	924-16-3	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosodi-n-propylamine	621-64-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosodiphenylamine	86-30-6	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosomethylethylamine	10595-95-6	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosomorpholine	59-89-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosopiperidine	100-75-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
N-Nitrosopyrrolidine	930-55-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
o-Toluidine	95-53-4	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
p-Dimethylamino azobenzene	60-11-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Pentachlorobenzene	608-93-5	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Pentachloronitrobenzene	82-68-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Pentachlorophenol	87-86-5	< 47	< 49	< 50	< 49	< 49	< 49	< 49
Phenacetin	62-44-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Phenanthrene	85-01-8	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Phenol	108-95-2	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
p-Phenylene diamine	106-50-3	< 1900	< 2000	< 2000	< 1900	< 2000	< 1900	< 2000
Pronamide	23950-58-5	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Pyrene	129-00-0	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Pyridine	110-86-1	< 47	< 49	< 50	< 49	< 49	< 49	< 49
Safrole, Total	94-59-7	< 9.4	< 9.8	< 10	< 9.7	< 9.8	< 9.7	< 9.8
Semi-Volatile Organics (TICs) (ug/L)								
1-Propene, 1,1,2-trichloro-	21400-25-9	NA	7 JN	NA	NA	NA	NA	NA
1-Propene, 1,2,3-trichloro-	96-19-5	NA	NA	NA	NA	NA	NA	NA
2-Butanol, 2,3-dimethyl-	594-60-5	NA	NA	NA	NA	NA	NA	NA
Diethyltoluamide	134-62-3	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	560 JN	280 JN	180 JN	520 JN	470 JN	150 JN	180 JN
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]-	112-50-5	NA	NA	NA	NA	NA	NA	NA

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		MW-1		MW-2		MW-3		MW-4		MW-4U		MW-5		MW-5U	
Sample Date		5/31/2007		5/31/2007		6/1/2007		6/1/2007		6/1/2007		6/1/2007		6/1/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin	
Constituent	**CAS No.**														
Acrylamide, Acrylonitrile and Acrolein (ug/L)															
Acrylamide	79-06-1	< 100		< 100		< 100		< 100		< 100		< 100		< 100	
Alcohols and Glycols (ug/L)															
Allyl alcohol	107-18-6	< 1000		< 1000		< 1000		< 1000		< 1000		< 1000		< 1000	
Diethylene glycol	111-46-6	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Dipropylene glycol	25265-71-8	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethanol	64-17-5	2600		11000		450	J	1700		1700		560	J	570	J
Ethylene glycol	107-21-1	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethylene glycol monobutyl ether	111-76-2	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethylene glycol monopropyl ether	2807-30-9	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Isopropanol	67-63-0	< 1000		< 1000		< 1000		< 1000		< 1000		< 1000		< 1000	
Methanol	67-56-1	490	J	960	J	1600		1200		2600		2200		3000	
Propylene glycol	57-55-6	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Total Inorganics (ug/L)															
Aluminum	7429-90-5	25	J	92		62		450		380		1100		250	
Antimony	7440-36-0	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5	
Arsenic	7440-38-2	< 2.5		5.7		1.9	J	4.2		3.3		1.8	J	13	
Barium	7440-39-3	77		120		300		790		1100		970		120	
Beryllium	7440-41-7	< 0.5		< 0.5		< 0.5		0.15	J	0.64		< 2		< 2	
Cadmium	7440-43-9	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		0.44	J
Calcium	7440-70-2	210000		330000		45000		100000		110000		230000		130000	
Chromium	7440-47-3	7.7		2.9	J	2.2	J	6		5.3		26		10	
Cobalt	7440-48-4	2.3		22		0.87		8.1		93		4.5		20	
Copper	7440-50-8	1.6	J	1.2	J	3.3		5.1		4.7		2.4	J	15	
Iron	7439-89-6	12000		160000		13000		56000		73000		55000		4000	
Lead	7439-92-1	< 1.5		< 1.5		< 1.5		0.67	J	< 1.5		0.69	J	0.93	J
Magnesium	7439-95-4	55000		91000		6500		31000		42000		47000		31000	
Manganese	7439-96-5	3500		12000		520		2000		4700		3600		1500	
Mercury	7439-97-6	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		0.65		< 0.5	
Nickel	7440-02-0	4.3		3.9		1.5		4.2		25		20		21	
Potassium	7440097	4600		5500		5100		6900		7100		7400		7100	
Selenium	7782-49-2	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		0.68	J
Silver	7440-22-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Sodium	7440-23-5	290000		440000		110000		420000		390000		1100000		1200000	
Thallium	7440-28-0	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Vanadium	7440-62-2	< 5		< 5		< 5		5.4		5.1		8.5		1700	
Zinc	7440-66-6	16	B	26		20	B	18	B	26	B	27	B	31	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-1 5/31/2007 Investigation MH Basin	MW-2 5/31/2007 Investigation MH Basin	MW-3 6/1/2007 Investigation MH Basin	MW-4 6/1/2007 Investigation MH Basin	MW-4U 6/1/2007 Investigation MH Basin	MW-5 6/1/2007 Investigation MH Basin	MW-5U 6/1/2007 Investigation MH Basin
Dissolved Inorganics (ug/L)								
Aluminum	7429-90-5D	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0D	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2D	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3D	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-41-7D	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9D	NA	NA	NA	NA	NA	NA	NA
Calcium	7440-70-2D	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3D	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4D	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8D	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6D	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1D	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4D	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5D	NA	NA	NA	NA	NA	NA	NA
Mercury	7439-97-6D	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0D	NA	NA	NA	NA	NA	NA	NA
Potassium	7440097D	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2D	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4D	NA	NA	NA	NA	NA	NA	NA
Sodium	7440-23-5D	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0D	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2D	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6D	NA	NA	NA	NA	NA	NA	NA
Other Inorganics (ug/L)								
Chloride	16887-00-6	250000	1100000	82000	490000	560000	1700000	1200000
Nitrate as N	14797-55-8	71	< 100	< 50	< 50	< 50	< 50	39 J
Nitrite as N	14797-65-0	< 50	< 50	< 50	< 100	< 100	< 50	< 50
Nitrogen, Kjeldahl	7727-37-9	320	1200	4000	7000	6600	4200	1800
Total Organic Carbon	7440-44-0	4000	5300	8200	30000	27000	23000	21000
Sulfate	14808-79-8	680000	540000	< 5000	< 5000	< 5000	160000	510000

Notes:
NA - Not Analyzed.
B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.
H - Sample prepped beyond holding time.
J - The positive result reported for this analyte is a quanititative estimate.
K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.
Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.
R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-6 6/1/2007 Investigation MH Basin		MW-7L 6/4/2007 Investigation MH Basin		MW-7U 6/5/2007 Investigation MH Basin		MW-8D 6/4/2007 Investigation MH Basin		MW-8L 7/6/2007 Investigation MH Basin		MW-8U 6/4/2007 Investigation MH Basin		MW-9 6/4/2007 Investigation MH Basin	
Volatile Organics (ug/L)															
1,1,1,2-Tetrachloroethane	630-20-6	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,1,1-Trichloroethane	71-55-6	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,1,2,2-Tetrachloroethane	79-34-5	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,1,2-Trichloroethane	79-00-5	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,1-Dichloroethane	75-34-3	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,1-Dichloroethene	75-35-4	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,2,3-Trichloropropane	96-18-4	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,2-Dibromo-3-Chloropropane	96-12-8	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,2-Dibromoethane	106-93-4	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,2-Dichloroethane	107-06-2	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
trans-1,2-Dichloroethene	156-60-5	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
1,2-Dichloropropane	78-87-5	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
cis-1,3-Dichloropropene	10061-01-5	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
trans-1,3-Dichloropropene	10061-02-6	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
2-Butanone (MEK)	78-93-3	< 10		< 10		< 10		< 10		< 1000		< 10		< 10	
2-Hexanone	591-78-6	< 10		< 10		< 10		< 10		< 1000		< 10		< 10	
2-Methyl-1-propanol	78-83-1	40	R	40	R	40	R	40	R	4000	R	40	R	40	R
3-Methylhexane	589-34-4	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 10		< 10		< 10		< 10		< 1000		< 10		< 10	
Acetone	67-64-1	< 25		< 25		< 25		< 25		< 2500		< 25		< 25	
Acetonitrile	75-05-8	< 40		< 40		< 40		< 40		< 4000		< 40		< 40	
Acrolein	107-02-8	< 20		< 20		< 20		< 20		< 2000		< 20		< 20	
Acrylonitrile	107-13-1	< 20		< 20		< 20		< 20		< 2000		< 20		< 20	
Allyl chloride	107-05-1	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Benzene	71-43-2	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Benzyl chloride	100-44-7	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Bromodichloromethane	75-27-4	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Bromoform	75-25-2	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Bromomethane	74-83-9	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Carbon disulfide	75-15-0	< 2		< 2		< 2		< 2		< 200		< 2		< 2	
Carbon tetrachloride	56-23-5	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Chlorobenzene	108-90-7	< 1		< 1		< 1		< 1		< 100		< 1		< 1	
Chloroethane	75-00-3	< 1		< 1		< 1		< 1		< 100		< 1		< 1	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-6 6/1/2007 Investigation MH Basin	MW-7L 6/4/2007 Investigation MH Basin	MW-7U 6/5/2007 Investigation MH Basin	MW-8D 6/4/2007 Investigation MH Basin	MW-8L 7/6/2007 Investigation MH Basin	MW-8U 6/4/2007 Investigation MH Basin	MW-9 6/4/2007 Investigation MH Basin
Chloroform	67-66-3	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Chloromethane	74-87-3	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Chloroprene	126-99-8	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Dibromochloromethane	124-48-1	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Dibromomethane	74-95-3	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Dichlorodifluoromethane	75-71-8	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Dichlorofluoromethane	75-43-4	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Diethyl ether	60-29-7	740	1 J	74	< 10	3200	2400	1200
Ethyl methacrylate	97-63-2	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Ethylbenzene	100-41-4	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Ethylene oxide	75-21-8	< 200	< 200	< 200	< 200	< 20000	< 200	< 200
Iodomethane	74-88-4	< 5	< 5	< 5	< 5	< 500 J	< 5	< 5
Methacrylonitrile	126-98-7	< 20	< 20	< 20	< 20	< 2000	< 20	< 20
Methyl methacrylate	80-62-6	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Methylene Chloride	75-09-2	< 5	< 5	< 5	< 5	< 500	< 5	< 5
n-Heptane	142-82-5	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Pentachloroethane	76-01-7	< 5	< 5	< 5	< 5	< 500	< 5	< 5
Propionitrile	107-12-0	< 20	< 20	< 20	< 20	< 2000	< 20	< 20
Propylene oxide	75-56-9	< 200	< 200	< 200	< 200	< 20000	< 200	< 200
Styrene	100-42-5	< 1	< 1	< 1	< 1	< 100	< 1	< 1
t-Butanol	75-65-0	1200	< 5	7.7	< 5	5000	1500	87
Tetrachloroethene	127-18-4	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Toluene	108-88-3	< 1	< 1	< 1	< 1	< 100	< 1	< 1
trans-1,4-Dichloro-2-butene	110-57-6	< 2	< 2	< 2	< 2	< 200	< 2	< 2
Trichloroethylene	79-01-6	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Trichlorofluoromethane	75-69-4	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Vinyl acetate	108-05-4	< 2	< 2	< 2	< 2	< 200	< 2	< 2
Vinyl chloride	75-01-4	< 1	< 1	< 1	< 1	< 100	< 1	< 1
Xylenes, Total	1330-20-7	< 2	< 2	< 2	< 2	< 200	< 2	< 2
Volatile Organics (TICs) (ug/L)								
1,2-Dichloroethene, Total	540-59-0	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	124-38-9	300 B	86 B	170 B	70 B	3200 B	280 B	160 B
Methyl tert-butyl ether	1634-04-4	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446095	NA	NA	NA	NA	610 B	NA	NA

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-6 6/1/2007 Investigation MH Basin	MW-7L 6/4/2007 Investigation MH Basin	MW-7U 6/5/2007 Investigation MH Basin	MW-8D 6/4/2007 Investigation MH Basin	MW-8L 7/6/2007 Investigation MH Basin	MW-8U 6/4/2007 Investigation MH Basin	MW-9 6/4/2007 Investigation MH Basin
Semi-Volatile Organics (ug/L)								
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
1,2,4-Trichlorobenzene	120-82-1	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
1,2-Dichlorobenzene	95-50-1	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
1,3,5-Trinitrobenzene	99-35-4	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
1,3-Dichlorobenzene	541-73-1	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
1,4-Dichlorobenzene	106-46-7	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
1,4-Dioxane	123-91-1	< 9.8	< 9.4	< 9.7	< 9.7	23	20	9.4 J
1,4-Naphthoquinone	130-15-4	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
1-Naphthalenamine	134-32-7	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,4,5-Trichlorophenol	95-95-4	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,4,6-Trichlorophenol	88-06-2	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,4-Dichlorophenol	120-83-2	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,4-Dimethylphenol	105-67-9	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,4-Dinitrophenol	51-28-5	< 49	< 47	< 49	< 49	< 49	< 49	< 50
2,4-Dinitrotoluene	121-14-2	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,6-Dichlorophenol	87-65-0	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2,6-Dinitrotoluene	606-20-2	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Acetylaminofluorene	53-96-3	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Chloronaphthalene	91-58-7	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Chlorophenol	95-57-8	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Methylnaphthalene	91-57-6	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Methylphenol	95-48-7	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Naphthalenamine	91-59-8	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Nitroaniline	88-74-4	< 49	< 47	< 49	< 49	< 49	< 49	< 50
2-Nitrophenol	88-75-5	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-Picoline	109-06-8	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
3 & 4 Methylphenol	15831-10-4	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
3,3'-Dichlorobenzidine	91-94-1	< 20	< 19	< 19	< 19	< 19	< 20	< 20
3,3'-Dimethylbenzidine	119-93-7	< 20	< 19	< 19	< 19	< 19	< 20	< 20
3-Methylcholanthrene	56-49-5	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
3-Nitroaniline	99-09-2	< 49	< 47	< 49	< 49	< 49	< 49	< 50
4,6-Dinitro-2-methylphenol	534-52-1	< 49	< 47	< 49	< 49	< 49	< 49	< 50
4-Aminobiphenyl	92-67-1	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
4-Bromophenyl phenyl ether	101-55-3	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10
4-Chloro-3-methylphenol	59-50-7	< 9.8	< 9.4	< 9.7	< 9.7	< 9.7	< 9.8	< 10

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		MW-6		MW-7L		MW-7U		MW-8D		MW-8L		MW-8U		MW-9	
Sample Date		6/1/2007		6/4/2007		6/5/2007		6/4/2007		7/6/2007		6/4/2007		6/4/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin	
Constituent	CAS No.														
4-Chloroaniline	106-47-8	< 20		< 19		< 19		< 19		< 19		< 20		< 20	
4-Chlorophenyl phenyl ether	7005-72-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
4-Nitroaniline	100-01-6	< 49		< 47		< 49		< 49		< 49		< 49		< 50	
4-Nitrophenol	100-02-7	< 49		< 47		< 49		< 49		< 49		< 49		< 50	
4-Nitroquinoline-1-oxide	56-57-5	20	R	19	R	19	R	19	R	19	R	20	R	20	R
5-Nitro-o-toluidine	99-55-8	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
7,12-Dimethylbenz(a)anthracene	57-97-6	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Acenaphthene	83-32-9	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Acenaphthylene	208-96-8	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Acetophenone	98-86-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 2000		< 1900		< 1900		< 1900		< 1900		< 2000		< 2000	
Aniline	62-53-3	< 20		< 19		< 19		< 19		< 19		< 20		< 20	
Anthracene	120-12-7	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Aramite, Total	140-57-8	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Benzo[a]anthracene	56-55-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Benzo[a]pyrene	50-32-8	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Benzo[b]fluoranthene	205-99-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Benzo[g,h,i]perylene	191-24-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Benzo[k]fluoranthene	207-08-9	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Benzyl alcohol	100-51-6	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Bis(2-chloroethoxy)methane	111-91-1	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Bis(2-chloroethyl)ether	111-44-4	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Bis(2-ethylhexyl) phthalate	117-81-7	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Butyl benzyl phthalate	85-68-7	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Chrysene	218-01-9	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Diallate	2303-16-4	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Dibenz(a,h)anthracene	53-70-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Dibenzofuran	132-64-9	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Diethyl phthalate	84-66-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Dimethoate	60-51-5	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Dimethyl phthalate	131-11-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Di-n-butyl phthalate	84-74-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Di-n-octyl phthalate	117-84-0	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Ethyl methanesulfonate	62-50-0	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Fluoranthene	206-44-0	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Fluorene	86-73-7	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Hexachlorobenzene	118-74-1	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Hexachlorobutadiene	87-68-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Hexachlorocyclopentadiene	77-47-4	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Hexachloroethane	67-72-1	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-6 6/1/2007 Investigation MH Basin		MW-7L 6/4/2007 Investigation MH Basin		MW-7U 6/5/2007 Investigation MH Basin		MW-8D 6/4/2007 Investigation MH Basin		MW-8L 7/6/2007 Investigation MH Basin		MW-8U 6/4/2007 Investigation MH Basin		MW-9 6/4/2007 Investigation MH Basin	
Hexachlorophene	70-30-4	< 4900		< 4700		< 4900		< 4900		< 4900		< 4900		< 5000	
Hexachloropropene	1888-71-7	9.8	R	< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Isophorone	78-59-1	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Isosafrole	120-58-1	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
m-Dinitrobenzene	99-65-0	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Methapyrilene	91-80-5	< 2000		1900	R	< 1900		1900	R	< 1900		2000	R	2000	R
Methyl methanesulfonate	66-27-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Naphthalene	91-20-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Nitrobenzene	98-95-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosodiethylamine	55-18-5	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosodimethylamine	62-75-9	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosodi-n-butylamine	924-16-3	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosodi-n-propylamine	621-64-7	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosodiphenylamine	86-30-6	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosomethylethylamine	10595-95-6	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosomorpholine	59-89-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosopiperidine	100-75-4	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
N-Nitrosopyrrolidine	930-55-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
o-Toluidine	95-53-4	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
p-Dimethylamino azobenzene	60-11-7	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Pentachlorobenzene	608-93-5	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Pentachloronitrobenzene	82-68-8	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Pentachlorophenol	87-86-5	< 49		< 47		< 49		< 49		< 49		< 49		< 50	
Phenacetin	62-44-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Phenanthrene	85-01-8	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Phenol	108-95-2	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
p-Phenylene diamine	106-50-3	< 2000		1900	R	< 1900		1900	R	< 1900		2000	R	2000	R
Pronamide	23950-58-5	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Pyrene	129-00-0	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Pyridine	110-86-1	< 49		< 47		< 49		< 49		< 49		< 49		< 50	
Safrole, Total	94-59-7	< 9.8		< 9.4		< 9.7		< 9.7		< 9.7		< 9.8		< 10	
Semi-Volatile Organics (TICs) (ug/L)															
1-Propene, 1,1,2-trichloro-	21400-25-9	NA		4.9	JN	NA		NA		NA		NA		NA	
1-Propene, 1,2,3-trichloro-	96-19-5	NA		NA		NA		NA		NA		NA		5.4	JN
2-Butanol, 2,3-dimethyl-	594-60-5	NA		NA		NA		NA		NA		NA		NA	
Diethyltoluamide	134-62-3	NA		NA		NA		NA		NA		NA		NA	
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	380	JN	NA		NA		NA		NA		550	JN	860	JN
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]-	112-50-5	NA		NA		NA		NA		NA		NA		NA	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		MW-6		MW-7L		MW-7U		MW-8D		MW-8L		MW-8U		MW-9	
Sample Date		6/1/2007		6/4/2007		6/5/2007		6/4/2007		7/6/2007		6/4/2007		6/4/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin		MH Basin	
Constituent	**CAS No.**														
Acrylamide, Acrylonitrile and Acrolein (ug/L)															
Acrylamide	79-06-1	< 100		< 100		< 100		< 100		< 100		< 100		< 100	
Alcohols and Glycols (ug/L)															
Allyl alcohol	107-18-6	< 1000		< 1000		< 1000		< 1000		< 1000		< 1000		< 1000	
Diethylene glycol	111-46-6	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Dipropylene glycol	25265-71-8	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethanol	64-17-5	1200		960	J	< 1000		< 1000		2700		3500		2200	
Ethylene glycol	107-21-1	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethylene glycol monobutyl ether	111-76-2	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Ethylene glycol monopropyl ether	2807-30-9	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Isopropanol	67-63-0	< 1000		< 1000		< 1000		< 1000		< 1000		< 1000		< 1000	
Methanol	67-56-1	1600		890	J	< 1000		1200		< 1000		1900		1600	
Propylene glycol	57-55-6	< 5000		< 5000		< 5000		< 5000		< 5000		< 5000		< 5000	
Total Inorganics (ug/L)															
Aluminum	7429-90-5	1200		470		390		180		110		92		120	
Antimony	7440-36-0	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5	
Arsenic	7440-38-2	2.7		< 2.5		1	J	< 2.5		46		24		1.7	J
Barium	7440-39-3	500		130		84		72		680		470		100	
Beryllium	7440-41-7	0.25	J	< 0.5		1.9		< 0.5		0.1	J	< 1		< 0.5	
Cadmium	7440-43-9	< 0.5		0.14	J	9.6		< 0.5		0.65		< 0.5		< 0.5	
Calcium	7440-70-2	140000		90000		430000		34000		150000		130000		230000	
Chromium	7440-47-3	15		7.7		24		2.3	J	3.8	J	3.8	J	6.6	
Cobalt	7440-48-4	16		3.6		330		0.61		2.5		6.5		4.4	
Copper	7440-50-8	9.5		1.8	J	100		3.6		1.6	J	2.3	J	2.4	J
Iron	7439-89-6	81000		2100		29000		720		34000		29000		38000	
Lead	7439-92-1	1.2	J	< 1.5		1	J	< 1.5		0.22	J	< 1.5		< 1.5	
Magnesium	7439-95-4	35000		6500		230000		3000		38000		36000		65000	
Manganese	7439-96-5	3600		760		32000		220		2100		1200		1200	
Mercury	7439-97-6	< 0.5		< 0.5		1.3		< 0.5		< 0.5		< 0.5		< 0.5	
Nickel	7440-02-0	13		6.3		100		1.9		2.6		3.4		5.2	
Potassium	7440097	4400		5400		4000		4800		34000		38000		10000	
Selenium	7782-49-2	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5	
Silver	7440-22-4	< 1		< 1		3.8		< 1		< 1		< 1		< 1	
Sodium	7440-23-5	370000		18000		200000		10000		900000		570000		310000	
Thallium	7440-28-0	< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Vanadium	7440-62-2	7.3		< 5		< 5		< 5		14		7.5		< 5	
Zinc	7440-66-6	28	B	12	B	70		17	B	< 20		30	B	21	B

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-6 6/1/2007 Investigation MH Basin	MW-7L 6/4/2007 Investigation MH Basin	MW-7U 6/5/2007 Investigation MH Basin	MW-8D 6/4/2007 Investigation MH Basin	MW-8L 7/6/2007 Investigation MH Basin	MW-8U 6/4/2007 Investigation MH Basin	MW-9 6/4/2007 Investigation MH Basin
Dissolved Inorganics (ug/L)								
Aluminum	7429-90-5D	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0D	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2D	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3D	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-41-7D	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9D	NA	NA	NA	NA	NA	NA	NA
Calcium	7440-70-2D	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3D	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4D	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8D	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6D	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1D	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4D	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5D	NA	NA	NA	NA	NA	NA	NA
Mercury	7439-97-6D	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0D	NA	NA	NA	NA	NA	NA	NA
Potassium	7440097D	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2D	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4D	NA	NA	NA	NA	NA	NA	NA
Sodium	7440-23-5D	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0D	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2D	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6D	NA	NA	NA	NA	NA	NA	NA
Other Inorganics (ug/L)								
Chloride	16887-00-6	490000	46000	1400000	3700	840000	580000	520000
Nitrate as N	14797-55-8	< 50	< 50	< 50	< 50	< 50	32 J	90
Nitrite as N	14797-65-0	< 50	< 50	< 50	< 50	< 250	< 50	< 50
Nitrogen, Kjeldahl	7727-37-9	5000	170 K	490	1300 K	31000	21000 K	980 K
Total Organic Carbon	7440-44-0	22000	< 1000	1600	< 1000	24000	16000	7300
Sulfate	14808-79-8	54000	31000	420000	5800	170000	260000	490000

Notes:
NA - Not Analyzed.
B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.
H - Sample prepped beyond holding time.
J - The positive result reported for this analyte is a quanititative estimate.
K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.
Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.
R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.							
		MW-9 DUP / 6/4/2007 / Duplicate / MH Basin			MW-10 / 5/31/2007 / Investigation / MH Basin			
Volatile Organics (ug/L)								
1,1,1,2-Tetrachloroethane	630-20-6	<	1		<	1		
1,1,1-Trichloroethane	71-55-6	<	1		<	1		
1,1,2,2-Tetrachloroethane	79-34-5	<	1			0.96	J	
1,1,2-Trichloroethane	79-00-5	<	1		<	1		
1,1-Dichloroethane	75-34-3	<	1			2.5		
1,1-Dichloroethene	75-35-4	<	1			2.5		
1,2,3-Trichloropropane	96-18-4	<	1		<	1		
1,2-Dibromo-3-Chloropropane	96-12-8	<	1		<	1		
1,2-Dibromoethane	106-93-4	<	1		<	1		
1,2-Dichloroethane	107-06-2	<	1		<	1		
trans-1,2-Dichloroethene	156-60-5	<	1			2.8		
1,2-Dichloropropane	78-87-5	<	1		<	1		
cis-1,3-Dichloropropene	10061-01-5	<	1		<	1		
trans-1,3-Dichloropropene	10061-02-6	<	1		<	1		
2-Butanone (MEK)	78-93-3	<	10		<	10		
2-Hexanone	591-78-6	<	10		<	10		
2-Methyl-1-propanol	78-83-1		40	R		40		R
3-Methylhexane	589-34-4	<	1		<	1		
4-Methyl-2-pentanone (MIBK)	108-10-1	<	10		<	10		
Acetone	67-64-1	<	25		<	25		
Acetonitrile	75-05-8	<	40		<	40		
Acrolein	107-02-8	<	20		<	20		
Acrylonitrile	107-13-1	<	20		<	20		
Allyl chloride	107-05-1	<	1		<	1		
Benzene	71-43-2	<	1		<	1		
Benzyl chloride	100-44-7	<	1		<	1		
Bromodichloromethane	75-27-4	<	1		<	1		
Bromoform	75-25-2	<	1		<	1		
Bromomethane	74-83-9	<	1		<	1		
Carbon disulfide	75-15-0	<	2		<	2		
Carbon tetrachloride	56-23-5	<	1		<	1		
Chlorobenzene	108-90-7	<	1		<	1		
Chloroethane	75-00-3	<	1		<	1		

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.		MW-9 DUP 6/4/2007 Duplicate MH Basin			MW-10 5/31/2007 Investigation MH Basin	
Chloroform	67-66-3	<	1			0.65	J
Chloromethane	74-87-3	<	1		<	1	
Chloroprene	126-99-8	<	1		<	1	
Dibromochloromethane	124-48-1	<	1		<	1	
Dibromomethane	74-95-3	<	1		<	1	
Dichlorodifluoromethane	75-71-8	<	1		<	1	
Dichlorofluoromethane	75-43-4	<	1		<	1	
Diethyl ether	60-29-7		1100			1.6	J
Ethyl methacrylate	97-63-2	<	1		<	1	
Ethylbenzene	100-41-4	<	1		<	1	
Ethylene oxide	75-21-8	<	200			200	R
Iodomethane	74-88-4	<	5		<	5	
Methacrylonitrile	126-98-7	<	20		<	20	
Methyl methacrylate	80-62-6	<	1		<	1	
Methylene Chloride	75-09-2	<	5		<	5	
n-Heptane	142-82-5	<	1		<	1	
Pentachloroethane	76-01-7	<	5		<	5	
Propionitrile	107-12-0	<	20		<	20	
Propylene oxide	75-56-9	<	200		<	200	
Styrene	100-42-5	<	1		<	1	
t-Butanol	75-65-0		73		<	5	
Tetrachloroethene	127-18-4	<	1			22	
Toluene	108-88-3	<	1		<	1	
trans-1,4-Dichloro-2-butene	110-57-6	<	2		<	2	
Trichloroethylene	79-01-6	<	1			3.2	
Trichlorofluoromethane	75-69-4	<	1		<	1	
Vinyl acetate	108-05-4	<	2		<	2	
Vinyl chloride	75-01-4	<	1		<	1	
Xylenes, Total	1330-20-7	<	2		<	2	
Volatile Organics (TICs) (ug/L)							
1,2-Dichloroethene, Total	540-59-0		NA			3.5	
Carbon Dioxide	124-38-9		140	B		82	B
Methyl tert-butyl ether	1634-04-4		NA			NA	
Sulfur dioxide	7446095		NA			NA	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-9 DUP 6/4/2007 Duplicate MH Basin		MW-10 5/31/2007 Investigation MH Basin	
Semi-Volatile Organics (ug/L)					
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.7		< 9.4	
1,2,4-Trichlorobenzene	120-82-1	< 9.7		< 9.4	
1,2-Dichlorobenzene	95-50-1	< 9.7		< 9.4	
1,3,5-Trinitrobenzene	99-35-4	< 9.7		< 9.4	
1,3-Dichlorobenzene	541-73-1	< 9.7		< 9.4	
1,4-Dichlorobenzene	106-46-7	< 9.7		< 9.4	
1,4-Dioxane	123-91-1	9.5	J	18	
1,4-Naphthoquinone	130-15-4	< 9.7		< 9.4	
1-Naphthalenamine	134-32-7	< 9.7		< 9.4	
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.7		< 9.4	
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.7		< 9.4	
2,4,5-Trichlorophenol	95-95-4	< 9.7		< 9.4	
2,4,6-Trichlorophenol	88-06-2	< 9.7		< 9.4	
2,4-Dichlorophenol	120-83-2	< 9.7		< 9.4	
2,4-Dimethylphenol	105-67-9	< 9.7		< 9.4	
2,4-Dinitrophenol	51-28-5	< 49		< 47	
2,4-Dinitrotoluene	121-14-2	< 9.7		< 9.4	
2,6-Dichlorophenol	87-65-0	< 9.7		< 9.4	
2,6-Dinitrotoluene	606-20-2	< 9.7		< 9.4	
2-Acetylaminofluorene	53-96-3	< 9.7		< 9.4	
2-Chloronaphthalene	91-58-7	< 9.7		< 9.4	
2-Chlorophenol	95-57-8	< 9.7		< 9.4	
2-Methylnaphthalene	91-57-6	< 9.7		< 9.4	
2-Methylphenol	95-48-7	< 9.7		< 9.4	
2-Naphthalenamine	91-59-8	< 9.7		< 9.4	
2-Nitroaniline	88-74-4	< 49		< 47	
2-Nitrophenol	88-75-5	< 9.7		< 9.4	
2-Picoline	109-06-8	< 9.7		< 9.4	
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 9.7		< 9.4	
3 & 4 Methylphenol	15831-10-4	< 9.7		< 9.4	
3,3'-Dichlorobenzidine	91-94-1	< 19		< 19	
3,3'-Dimethylbenzidine	119-93-7	< 19		< 19	
3-Methylcholanthrene	56-49-5	< 9.7		< 9.4	
3-Nitroaniline	99-09-2	< 49		< 47	
4,6-Dinitro-2-methylphenol	534-52-1	< 49		< 47	
4-Aminobiphenyl	92-67-1	< 9.7		< 9.4	
4-Bromophenyl phenyl ether	101-55-3	< 9.7		< 9.4	
4-Chloro-3-methylphenol	59-50-7	< 9.7		< 9.4	

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Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.						
		MW-9 DUP 6/4/2007 Duplicate MH Basin			MW-10 5/31/2007 Investigation MH Basin		
4-Chloroaniline	106-47-8	<	19		<	19	
4-Chlorophenyl phenyl ether	7005-72-3	<	9.7		<	9.4	
4-Nitroaniline	100-01-6	<	49		<	47	
4-Nitrophenol	100-02-7	<	49		<	47	
4-Nitroquinoline-1-oxide	56-57-5		19	R		19	R
5-Nitro-o-toluidine	99-55-8	<	9.7		<	9.4	
7,12-Dimethylbenz(a)anthracene	57-97-6	<	9.7		<	9.4	
Acenaphthene	83-32-9	<	9.7		<	9.4	
Acenaphthylene	208-96-8	<	9.7		<	9.4	
Acetophenone	98-86-2	<	9.7		<	9.4	
alpha,alpha-Dimethyl phenethylamine	122-09-8	<	1900		<	1900	
Aniline	62-53-3	<	19		<	19	
Anthracene	120-12-7	<	9.7		<	9.4	
Aramite, Total	140-57-8	<	9.7		<	9.4	
Benzo[a]anthracene	56-55-3	<	9.7		<	9.4	
Benzo[a]pyrene	50-32-8	<	9.7		<	9.4	
Benzo[b]fluoranthene	205-99-2	<	9.7		<	9.4	
Benzo[g,h,i]perylene	191-24-2	<	9.7		<	9.4	
Benzo[k]fluoranthene	207-08-9	<	9.7		<	9.4	
Benzyl alcohol	100-51-6	<	9.7		<	9.4	
Bis(2-chloroethoxy)methane	111-91-1	<	9.7		<	9.4	
Bis(2-chloroethyl)ether	111-44-4	<	9.7		<	9.4	
Bis(2-ethylhexyl) phthalate	117-81-7	<	9.7		<	9.4	
Butyl benzyl phthalate	85-68-7	<	9.7		<	9.4	
Chrysene	218-01-9	<	9.7		<	9.4	
Diallate	2303-16-4	<	9.7		<	9.4	
Dibenz(a,h)anthracene	53-70-3	<	9.7		<	9.4	
Dibenzofuran	132-64-9	<	9.7		<	9.4	
Diethyl phthalate	84-66-2	<	9.7		<	9.4	
Dimethoate	60-51-5	<	9.7		<	9.4	
Dimethyl phthalate	131-11-3	<	9.7		<	9.4	
Di-n-butyl phthalate	84-74-2	<	9.7		<	9.4	
Di-n-octyl phthalate	117-84-0	<	9.7		<	9.4	
Ethyl methanesulfonate	62-50-0	<	9.7		<	9.4	
Fluoranthene	206-44-0	<	9.7		<	9.4	
Fluorene	86-73-7	<	9.7		<	9.4	
Hexachlorobenzene	118-74-1	<	9.7		<	9.4	
Hexachlorobutadiene	87-68-3	<	9.7		<	9.4	
Hexachlorocyclopentadiene	77-47-4	<	9.7		<	9.4	
Hexachloroethane	67-72-1	<	9.7		<	9.4	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-9 DUP 6/4/2007 Duplicate MH Basin		MW-10 5/31/2007 Investigation MH Basin	
Hexachlorophene	70-30-4	< 4900		< 4700	
Hexachloropropene	1888-71-7	< 9.7		< 9.4	
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.7		< 9.4	
Isophorone	78-59-1	< 9.7		< 9.4	
Isosafrole	120-58-1	< 9.7		< 9.4	
m-Dinitrobenzene	99-65-0	< 9.7		< 9.4	
Methapyrilene	91-80-5	1900	R	< 1900	
Methyl methanesulfonate	66-27-3	< 9.7		< 9.4	
Naphthalene	91-20-3	< 9.7		< 9.4	
Nitrobenzene	98-95-3	< 9.7		< 9.4	
N-Nitrosodiethylamine	55-18-5	< 9.7		< 9.4	
N-Nitrosodimethylamine	62-75-9	< 9.7		< 9.4	
N-Nitrosodi-n-butylamine	924-16-3	< 9.7		< 9.4	
N-Nitrosodi-n-propylamine	621-64-7	< 9.7		< 9.4	
N-Nitrosodiphenylamine	86-30-6	< 9.7		< 9.4	
N-Nitrosomethylethylamine	10595-95-6	< 9.7		< 9.4	
N-Nitrosomorpholine	59-89-2	< 9.7		< 9.4	
N-Nitrosopiperidine	100-75-4	< 9.7		< 9.4	
N-Nitrosopyrrolidine	930-55-2	< 9.7		< 9.4	
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.7		< 9.4	
o-Toluidine	95-53-4	< 9.7		< 9.4	
p-Dimethylamino azobenzene	60-11-7	< 9.7		< 9.4	
Pentachlorobenzene	608-93-5	< 9.7		< 9.4	
Pentachloronitrobenzene	82-68-8	< 9.7		< 9.4	
Pentachlorophenol	87-86-5	< 49		< 47	
Phenacetin	62-44-2	< 9.7		< 9.4	
Phenanthrene	85-01-8	< 9.7		< 9.4	
Phenol	108-95-2	< 9.7		< 9.4	
p-Phenylene diamine	106-50-3	1900	R	< 1900	
Pronamide	23950-58-5	< 9.7		< 9.4	
Pyrene	129-00-0	< 9.7		< 9.4	
Pyridine	110-86-1	< 49		< 47	
Safrole, Total	94-59-7	< 9.7		< 9.4	
Semi-Volatile Organics (TICs) (ug/L)					
1-Propene, 1,1,2-trichloro-	21400-25-9	NA		NA	
1-Propene, 1,2,3-trichloro-	96-19-5	NA		NA	
2-Butanol, 2,3-dimethyl-	594-60-5	NA		NA	
Diethyltoluamide	134-62-3	NA		NA	
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	890	JN	NA	
Ethanol, 2-[2-(2-ethoxyethoxy)ethoxy]-	112-50-5	NA		NA	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-9 DUP 6/4/2007 Duplicate MH Basin		MW-10 5/31/2007 Investigation MH Basin	
Acrylamide, Acrylonitrile and Acrolein (ug/L)					
Acrylamide	79-06-1	< 100		< 100	
Alcohols and Glycols (ug/L)					
Allyl alcohol	107-18-6	< 1000		< 1000	
Diethylene glycol	111-46-6	< 5000		< 5000	
Dipropylene glycol	25265-71-8	< 5000		< 5000	
Ethanol	64-17-5	1500		< 1000	
Ethylene glycol	107-21-1	< 5000		< 5000	
Ethylene glycol monobutyl ether	111-76-2	< 5000		< 5000	
Ethylene glycol monopropyl ether	2807-30-9	< 5000		< 5000	
Isopropanol	67-63-0	< 1000		< 1000	
Methanol	67-56-1	1700		680	J
Propylene glycol	57-55-6	< 5000		< 5000	
Total Inorganics (ug/L)					
Aluminum	7429-90-5	130		370	
Antimony	7440-36-0	< 2.5		< 2.5	
Arsenic	7440-38-2	1.9	J	0.86	J
Barium	7440-39-3	94		16	
Beryllium	7440-41-7	< 0.5		0.19	J
Cadmium	7440-43-9	< 0.5		4.6	
Calcium	7440-70-2	220000		160000	
Chromium	7440-47-3	6.5		5.5	
Cobalt	7440-48-4	4.2		87	
Copper	7440-50-8	1.9	J	24	
Iron	7439-89-6	37000		330	
Lead	7439-92-1	< 1.5		0.65	J
Magnesium	7439-95-4	61000		44000	
Manganese	7439-96-5	1200		5400	
Mercury	7439-97-6	< 0.5		< 0.5	
Nickel	7440-02-0	5.1		87	
Potassium	7440097	9200		5400	
Selenium	7782-49-2	< 2.5		0.57	J
Silver	7440-22-4	< 1		< 1	
Sodium	7440-23-5	290000		240000	
Thallium	7440-28-0	< 1		< 1	
Vanadium	7440-62-2	< 5		2.5	J
Zinc	7440-66-6	25	B	65	

Table A-2

Groundwater Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Sample Identification / Sample Date / Sample Type / Sample Location / CAS No.	MW-9 DUP 6/4/2007 Duplicate MH Basin		MW-10 5/31/2007 Investigation MH Basin	
Dissolved Inorganics (ug/L)					
Aluminum	7429-90-5D	NA		NA	
Antimony	7440-36-0D	NA		NA	
Arsenic	7440-38-2D	NA		NA	
Barium	7440-39-3D	NA		NA	
Beryllium	7440-41-7D	NA		NA	
Cadmium	7440-43-9D	NA		NA	
Calcium	7440-70-2D	NA		NA	
Chromium	7440-47-3D	NA		NA	
Cobalt	7440-48-4D	NA		NA	
Copper	7440-50-8D	NA		NA	
Iron	7439-89-6D	NA		NA	
Lead	7439-92-1D	NA		NA	
Magnesium	7439-95-4D	NA		NA	
Manganese	7439-96-5D	NA		NA	
Mercury	7439-97-6D	NA		NA	
Nickel	7440-02-0D	NA		NA	
Potassium	7440097D	NA		NA	
Selenium	7782-49-2D	NA		NA	
Silver	7440-22-4D	NA		NA	
Sodium	7440-23-5D	NA		NA	
Thallium	7440-28-0D	NA		NA	
Vanadium	7440-62-2D	NA		NA	
Zinc	7440-66-6D	NA		NA	
Other Inorganics (ug/L)					
Chloride	16887-00-6	520000		250000	
Nitrate as N	14797-55-8	130		210	J
Nitrite as N	14797-65-0	< 50		< 50	
Nitrogen, Kjeldahl	7727-37-9	1000	K	260	
Total Organic Carbon	7440-44-0	7300		910	J
Sulfate	14808-79-8	470000		550000	

Notes:
NA - Not Analyzed.
B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.
H - Sample prepped beyond holding time.
J - The positive result reported for this analyte is a quanititative estimate.
K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.
Q - Result is estimated. Result was quantitated against the response factor of a calibration standard.
R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-1A		ELSS-1B		ELSS-2A		ELSS-2B		ELSS-3A		ELSS-3B		ELSS-4A		ELSS-4B	
Sample Date		5/9/2007		5/9/2007		5/9/2007		5/9/2007		5/10/2007		5/10/2007		5/9/2007		5/9/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		EWL		EWL		EWL		EWL		EWL		EWL	
Constituent	**CAS No.**																
Volatile Organics (mg/kg)																	
1,1,1,2-Tetrachloroethane	630-20-6	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
1,1,1-Trichloroethane	71-55-6	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
1,1,2,2-Tetrachloroethane	79-34-5	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
1,1,2-Trichloroethane	79-00-5	< 0.022	L	< 0.0083	L	< 0.031	L	< 0.0092	L	< 0.049	L	< 0.007	L	< 0.049	L	< 0.011	L
1,1-Dichloroethane	75-34-3	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
1,1-Dichloroethene	75-35-4	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
1,2,3-Trichloropropane	96-18-4	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.043		< 0.017		< 0.063		< 0.018		< 0.098		< 0.014		< 0.098		< 0.023	
1,2-Dibromoethane	106-93-4	< 0.022	L	< 0.0083	L	< 0.031	L	< 0.0092	L	< 0.049	L	< 0.007	L	< 0.049	L	< 0.011	L
1,2-Dichloroethane	107-06-2	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
trans-1,2-Dichloroethene	156-60-5	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
1,2-Dichloropropane	78-87-5	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
cis-1,3-Dichloropropene	10061-01-5	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
trans-1,3-Dichloropropene	10061-02-6	< 0.022	L	< 0.0083	L	< 0.031	L	< 0.0092	L	< 0.049	L	< 0.007	L	< 0.049	L	< 0.011	L
2-Butanone (MEK)	78-93-3	0.081	J	< 0.041		0.11	J	< 0.046		< 0.24		< 0.035		< 0.24		< 0.056	
2-Hexanone	591-78-6	< 0.11		< 0.041		< 0.16		< 0.046		< 0.24		< 0.035		< 0.24		< 0.056	
2-Methyl-1-propanol	78-83-1	0.86	R	0.33	R	1.3	R	0.37	R	< 2		< 0.28		2	R	0.45	R
3-Methylhexane	589-34-4	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 0.11		< 0.041		< 0.16		< 0.046		< 0.24		< 0.035		< 0.24		< 0.056	
Acetone	67-64-1	0.43		0.095		0.5		0.056	J	0.36	J	0.045	J	0.45	J	0.056	J
Acetonitrile	75-05-8	< 0.86		< 0.33		< 1.3		< 0.37		< 2		< 0.28		< 2		< 0.45	
Acrolein	107-02-8	< 0.43		< 0.17		< 0.63		< 0.18		< 0.98		< 0.14		< 0.98		< 0.23	
Acrylonitrile	107-13-1	< 0.43		< 0.17		< 0.63		< 0.18		< 0.98		< 0.14		< 0.98		< 0.23	
Allyl chloride	107-05-1	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Benzene	71-43-2	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Benzyl chloride	100-44-7	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Bromodichloromethane	75-27-4	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Bromoform	75-25-2	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Bromomethane	74-83-9	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Carbon Dioxide	124-38-9	NA		NA		NA		NA		NA		NA		NA		NA	
Carbon disulfide	75-15-0	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Carbon tetrachloride	56-23-5	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Chlorobenzene	108-90-7	< 0.022	L	< 0.0083	L	< 0.031	L	< 0.0092	L	< 0.049	L	< 0.007	L	< 0.049	L	< 0.011	L
Chloroethane	75-00-3	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Chloroform	67-66-3	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Chloromethane	74-87-3	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Chloroprene	126-99-8	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Dibromochloromethane	124-48-1	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Dibromomethane	74-95-3	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Dichlorodifluoromethane	75-71-8	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Dichlorofluoromethane	75-43-4	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Diethyl ether	60-29-7	< 0.043		< 0.017		< 0.063		< 0.018		< 0.098		< 0.014		< 0.098		< 0.023	
Ethyl methacrylate	97-63-2	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	
Ethylbenzene	100-41-4	< 0.022		< 0.0083		< 0.031		< 0.0092		< 0.049		< 0.007		< 0.049		< 0.011	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-1A	ELSS-1B	ELSS-2A	ELSS-2B	ELSS-3A	ELSS-3B	ELSS-4A	ELSS-4B
Sample Date		5/9/2007	5/9/2007	5/9/2007	5/9/2007	5/10/2007	5/10/2007	5/9/2007	5/9/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	EWL	EWL	EWL	EWL	EWL	EWL
Constituent	**CAS No.**								
Ethylene oxide	75-21-8	< 0.43	< 0.17	< 0.63	< 0.18	< 0.98	< 0.14	< 0.98	< 0.23
Iodomethane	74-88-4	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
Methacrylonitrile	126-98-7	< 0.43	< 0.17	< 0.63	< 0.18	< 0.98	< 0.14	< 0.98	< 0.23
Methyl methacrylate	80-62-6	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
Methylene Chloride	75-09-2	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
n-Heptane	142-82-5	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
Pentachloroethane	76-01-7	< 0.11	< 0.041	< 0.16	< 0.046	< 0.24 J	< 0.035 J	< 0.24	< 0.056
Propionitrile	107-12-0	< 0.43	< 0.17	< 0.63	< 0.18	< 0.98	< 0.14	< 0.98	< 0.23
Propylene oxide	75-56-9	< 0.43	< 0.17	< 0.63	< 0.18	< 0.98	< 0.14	< 0.98	< 0.23
Styrene	100-42-5	< 0.022 L	< 0.0083 L	< 0.031 L	< 0.0092 L	< 0.049 L	< 0.007 L	< 0.049 L	< 0.011 L
t-Butanol	75-65-0	0.13	0.22	< 0.031	0.053	0.28 J	0.047 J	0.2	0.37
Tetrachloroethene	127-18-4	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
Toluene	108-88-3	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
trans-1,4-Dichloro-2-butene	110-57-6	< 0.043	< 0.017	< 0.063	< 0.018	< 0.098	< 0.014	< 0.098	< 0.023
Trichloroethylene	79-01-6	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
Trichlorofluoromethane	75-69-4	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
Vinyl acetate	108-05-4	< 0.043	< 0.017	< 0.063	< 0.018	< 0.098	< 0.014	< 0.098	< 0.023
Vinyl chloride	75-01-4	< 0.022	< 0.0083	< 0.031	< 0.0092	< 0.049	< 0.007	< 0.049	< 0.011
Xylenes, Total	1330-20-7	< 0.043	< 0.017	< 0.063	< 0.018	< 0.098	< 0.014	< 0.098	< 0.023
Volatile Organics (TICs) (mg/kg)									
Carbon Dioxide	124-38-9	9.2 B	5.5 B	17 B	2.3 B	38 B	1.5 B	28 B	2.7 B
Methylcyclohexane	108-87-2	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1,2,4-Trichlorobenzene	120-82-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1,2-Dichlorobenzene	95-50-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1,3,5-Trinitrobenzene	99-35-4	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1,3-Dichlorobenzene	541-73-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1,4-Dichlorobenzene	106-46-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1,4-Dioxane	123-91-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1,4-Naphthoquinone	130-15-4	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
1-Naphthalenamine	134-32-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,2'-oxybis[1-chloropropane]	108-60-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,3,4,6-Tetrachlorophenol	58-90-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,4,5-Trichlorophenol	95-95-4	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,4,6-Trichlorophenol	88-06-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,4-Dichlorophenol	120-83-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,4-Dimethylphenol	105-67-9	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,4-Dinitrophenol	51-28-5	< 7.2	< 2	< 11	< 2.3	< 17	< 2.8	< 17	< 2.3
2,4-Dinitrotoluene	121-14-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,6-Dichlorophenol	87-65-0	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2,6-Dinitrotoluene	606-20-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2-Acetylaminofluorene	53-96-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
2-Chloronaphthalene	91-58-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-1A		ELSS-1B		ELSS-2A		ELSS-2B		ELSS-3A		ELSS-3B		ELSS-4A		ELSS-4B	
Sample Date		5/9/2007		5/9/2007		5/9/2007		5/9/2007		5/10/2007		5/10/2007		5/9/2007		5/9/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		EWL		EWL		EWL		EWL		EWL		EWL	
Constituent	CAS No.																
2-Chlorophenol	95-57-8	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
2-Methylnaphthalene	91-57-6	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
2-Methylphenol	95-48-7	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
2-Naphthalenamine	91-59-8	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
2-Nitroaniline	88-74-4	< 7.2		< 2		< 11		< 2.3		< 17		< 2.8		< 17		< 2.3	
2-Nitrophenol	88-75-5	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
2-Picoline	109-06-8	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
3 & 4 Methylphenol	15831-10-4	< 1.4		0.063	J	< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
3,3'-Dichlorobenzidine	91-94-1	< 2.8		< 0.78		< 4.4		< 0.9		< 6.7	J	< 1.1		< 6.5		< 0.91	
3,3'-Dimethylbenzidine	119-93-7	< 7.2		< 2		< 11		< 2.3		< 17		< 2.8		< 17		< 2.3	
3-Methylcholanthrene	56-49-5	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
3-Nitroaniline	99-09-2	< 7.2		< 2		< 11		< 2.3		< 17		< 2.8		< 17		< 2.3	
4,6-Dinitro-2-methylphenol	534-52-1	< 7.2		< 2		< 11		< 2.3		< 17	J	< 2.8		< 17		< 2.3	
4-Aminobiphenyl	92-67-1	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
4-Bromophenyl phenyl ether	101-55-3	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
4-Chloro-3-methylphenol	59-50-7	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
4-Chloroaniline	106-47-8	< 2.8		< 0.78		< 4.4		< 0.9		< 6.7		< 1.1		< 6.5		< 0.91	
4-Chlorophenyl phenyl ether	7005-72-3	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
4-Nitroaniline	100-01-6	< 7.2		< 2		< 11		< 2.3		< 17		< 2.8		< 17		< 2.3	
4-Nitrophenol	100-02-7	< 7.2		< 2		< 11		< 2.3		< 17		< 2.8		< 17		< 2.3	
4-Nitroquinoline-1-oxide	56-57-5	14	R	3.9	R	22	R	4.5	R	33	R	5.4	R	33	R	4.6	R
5-Nitro-o-toluidine	99-55-8	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
7,12-Dimethylbenz(a)anthracene	57-97-6	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Acenaphthene	83-32-9	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Acenaphthylene	208-96-8	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Acetophenone	98-86-2	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 280		< 80		< 440		< 91		< 680		< 110		< 660		< 93	
Aniline	62-53-3	< 2.8		< 0.78		< 4.4		< 0.9		< 6.7		< 1.1		< 6.5		< 0.91	
Anthracene	120-12-7	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Aramite, Total	140-57-8	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Benzo[a]anthracene	56-55-3	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Benzo[a]pyrene	50-32-8	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Benzo[b]fluoranthene	205-99-2	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Benzo[g,h,i]perylene	191-24-2	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Benzo[k]fluoranthene	207-08-9	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Benzyl alcohol	100-51-6	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Bis(2-chloroethoxy)methane	111-91-1	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Bis(2-chloroethyl)ether	111-44-4	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Bis(2-ethylhexyl) phthalate	117-81-7	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Butyl benzyl phthalate	85-68-7	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Chrysene	218-01-9	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	
Diallate	2303-16-4	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3		< 0.54		< 3.3		< 0.46	
Dibenz(a,h)anthracene	53-70-3	< 1.4		< 0.39		< 2.2		< 0.45		< 3.3	J	< 0.54		< 3.3		< 0.46	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-1A	ELSS-1B	ELSS-2A	ELSS-2B	ELSS-3A	ELSS-3B	ELSS-4A	ELSS-4B
Sample Date		5/9/2007	5/9/2007	5/9/2007	5/9/2007	5/10/2007	5/10/2007	5/9/2007	5/9/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	EWL	EWL	EWL	EWL	EWL	EWL
Constituent	CAS No.								
Dibenzofuran	132-64-9	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Diethyl phthalate	84-66-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Dimethoate	60-51-5	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Dimethyl phthalate	131-11-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Di-n-butyl phthalate	84-74-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3 J	< 0.54	< 3.3	< 0.46
Di-n-octyl phthalate	117-84-0	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3 J	< 0.54	< 3.3	< 0.46
Ethyl methanesulfonate	62-50-0	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Fluoranthene	206-44-0	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3 J	< 0.54	< 3.3	< 0.46
Fluorene	86-73-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Hexachlorobenzene	118-74-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3 J	< 0.54	< 3.3	< 0.46
Hexachlorobutadiene	87-68-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Hexachlorocyclopentadiene	77-47-4	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Hexachloroethane	67-72-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Hexachlorophene	70-30-4	< 720	< 200	< 1100	< 230	1700 R	< 280	< 1700	< 230
Hexachloropropene	1888-71-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Indeno[1,2,3-cd]pyrene	193-39-5	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Isophorone	78-59-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Isosafrole	120-58-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
m-Dinitrobenzene	99-65-0	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Methapyrilene	91-80-5	< 280	< 80	< 440	< 91	< 680	< 110	< 660	< 93
Methyl methanesulfonate	66-27-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Methyl phenols, Total	1319-77-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Nitrobenzene	98-95-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosodiethylamine	55-18-5	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosodimethylamine	62-75-9	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosodi-n-butylamine	924-16-3	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosodi-n-propylamine	621-64-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosodiphenylamine	86-30-6	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3 J	< 0.54	< 3.3	< 0.46
N-Nitrosomethylethylamine	10595-95-6	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosomorpholine	59-89-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosopiperidine	100-75-4	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
N-Nitrosopyrrolidine	930-55-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
o,o',o''-Triethylphosphorothioate	126-68-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
o-Toluidine	95-53-4	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
p-Dimethylamino azobenzene	60-11-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Pentachlorobenzene	608-93-5	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Pentachloronitrobenzene	82-68-8	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Pentachlorophenol	87-86-5	< 7.2	< 2	< 11	< 2.3	< 17 J	< 2.8	< 17	< 2.3
Phenacetin	62-44-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Phenanthrene	85-01-8	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3 J	< 0.54	< 3.3	< 0.46
Phenol	108-95-2	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
p-Phenylene diamine	106-50-3	< 7.2	< 2	< 11	< 2.3	< 17	< 2.8	< 17	< 2.3
Pronamide	23950-58-5	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Pyrene	129-00-0	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3 J	< 0.54	< 3.3	< 0.46

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-1A	ELSS-1B	ELSS-2A	ELSS-2B	ELSS-3A	ELSS-3B	ELSS-4A	ELSS-4B
Sample Date		5/9/2007	5/9/2007	5/9/2007	5/9/2007	5/10/2007	5/10/2007	5/9/2007	5/9/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	EWL	EWL	EWL	EWL	EWL	EWL
Constituent	**CAS No.**								
Pyridine	110-86-1	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Safrole, Total	94-59-7	< 1.4	< 0.39	< 2.2	< 0.45	< 3.3	< 0.54	< 3.3	< 0.46
Semi-Volatile Organics (TICs) (mg/kg)									
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	38380-01-7	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	39485-83-1	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	37680-73-2	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	56558-17-9	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, pentachloro-	25429-29-2	NA	NA	NA	NA	NA	NA	NA	NA
17-Pentatriacontene	6971-40-0	NA	NA	NA	NA	NA	NA	NA	NA
1-Decene	872-05-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Docosene	1599-67-3	NA	NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenepropanol, .alpha.-ethenylde	596-85-0	NA	NA	NA	NA	NA	NA	NA	NA
2-Heptacosanone		NA	NA	NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA	NA	NA	NA	NA	NA
Bacchotricuneatin c	66563-30-2	NA	NA	NA	NA	NA	NA	NA	NA
Cholestanol	80-97-7	NA	NA	NA	NA	NA	NA	NA	NA
Cyclodecane	293-96-9	NA	NA	NA	NA	NA	NA	NA	NA
Cyclododecane	294-62-2	NA	NA	NA	NA	NA	NA	NA	NA
Cyclopropane, nonyl-	74663-85-7	NA	NA	NA	NA	NA	NA	NA	NA
Eicosane	112-95-8	NA	NA	NA	NA	NA	NA	NA	NA
Ergostanol	6538-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1,2,2-tetrachloro-	79-34-5	NA	NA	NA	NA	NA	0.26 T	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptacosane	593-49-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane	629-78-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 2,6,10,15-tetramethyl-	54833-48-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 9-octyl-	7225-64-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexacosane	630-01-3	NA	NA	NA	NA	NA	NA	NA	NA
Hexadecane	544-76-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	483-76-1	NA	NA	NA	NA	NA	NA	NA	NA
Olean-12-ene	471-68-1	NA	NA	NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA	NA	NA	NA	NA	NA
Tricosane	638-67-5	NA	NA	NA	NA	NA	NA	NA	NA
Vitamin E	59-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (mg/kg)									
Acrylamide	79-06-1	< 4	< 1.1	< 6.1	< 1.3	< 9.8	< 1.6	< 9.6	< 1.4
Alcohols and Glycols (mg/kg)									
Allyl alcohol	107-18-6	< 4.2	< 1.2	< 6.7	< 1.3	< 10	< 1.6	< 9.9	< 1.4
Diethylene glycol	111-46-6	< 21	< 6	< 33	< 6.6	< 51	< 8.2	< 50	< 7
Dipropylene glycol	25265-71-8	< 21	< 6	< 33	< 6.6	< 51	< 8.2	< 50	< 7
Ethanol	64-17-5	< 4.2	< 1.2	< 6.7	< 1.3	< 10	< 1.6	< 9.9	< 1.4

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-1A	ELSS-1B	ELSS-2A	ELSS-2B	ELSS-3A	ELSS-3B	ELSS-4A	ELSS-4B
Sample Date		5/9/2007	5/9/2007	5/9/2007	5/9/2007	5/10/2007	5/10/2007	5/9/2007	5/9/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	EWL	EWL	EWL	EWL	EWL	EWL
Constituent	**CAS No.**								
Ethylene glycol	107-21-1	< 21	< 6	< 33	< 6.6	< 51	< 8.2	< 50	< 7
Ethylene glycol monobutyl ether	111-76-2	< 21	< 6	< 33	< 6.6	< 51	< 8.2	< 50	< 7
Ethylene glycol monopropyl ether	2807-30-9	< 21	< 6	< 33	< 6.6	< 51	< 8.2	< 50	< 7
Isopropanol	67-63-0	< 4.2	< 1.2	< 6.7	< 1.3	< 10	< 1.6	< 9.9	< 1.4
Methanol	67-56-1	< 4.2	1.6	< 6.7	< 1.3	< 10	< 1.6	< 9.9	< 1.4
Propylene glycol	57-55-6	< 21	< 6	< 33	< 6.6	< 51	< 8.2	< 50	< 7
Polychlorinated Biphenyls (PCBs) (mg/kg)									
PCB-1016	12674-11-2	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1221	11104-28-2	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1232	11141-16-5	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1242	53469-21-9	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1248	12672-29-6	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1254	11097-69-1	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1260	11096-82-5	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides and PCBs (mg/kg)									
1,1'-Biphenyl, heptachloro-	28655-71-2	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, hexachloro-	26601-64-9	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, nonachloro-	53742-07-7	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, octachloro-	55722-26-4	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobiphenyl	27323-18-8	NA	NA	NA	NA	NA	NA	NA	NA
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorobiphenyl	25512-42-9	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobiphenyl	25429-29-2	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachlorobiphenyl	26914-33-0	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorobiphenyl	25323-68-6	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (mg/kg)									
Aluminum	7429-90-5	12000	11000	27000	15000	32000 J	26000 J	8300	24000
Antimony	7440-36-0	1.4 J	< 0.55	1.7 J	< 0.61	2.3 J	< 0.7	2.6 J	< 0.63
Arsenic	7440-38-2	3.3	1.2	5.6	2.7	6.2	2.8	5.7	2.1
Barium	7440-39-3	79	42	110	61	130	400	93	81
Beryllium	7440-41-7	0.63	0.35	1.1	1.1	1.1	1.8	0.36 J	1.5
Cadmium	7440-43-9	0.52	< 0.11	0.92	< 0.12	0.99	0.056 J	1.3	< 0.13
Calcium	7440-70-2	3100	490	4700	690	5500	740	14000	720
Chromium	7440-47-3	28	19	55	33	61	57	50	55
Cobalt	7440-48-4	4.2	2.4	7.2	8	7.5	18	2.7	9.1
Copper	7440-50-8	67	4.7	110	14	120	32	200	25
Iron	7439-89-6	14000	7900	20000	15000	22000 J	24000 J	11000	19000
Lead	7439-92-1	43	12	57	14	61	25	54	26
Magnesium	7439-95-4	1000	460	1600	920	1900	1700	1900	1500
Manganese	7439-96-5	92	30	120	69	140	380	150	56
Mercury	7439-97-6	< 0.38	< 0.11	< 0.62	< 0.12	< 0.93	< 0.14	< 0.88	0.062 J
Nickel	7440-02-0	22	3.5	35	11	39	26	37	18
Potassium	7440-09-7	860	380	1500	860	1700	2400	710	1700
Selenium	7782-49-2	0.65 J	0.32 J	1.3 J	0.4 J	1.4 J	0.59 J	1.2 J	0.56 J

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	Sample Date	Sample Type	Sample Location
		ELSS-1A	5/9/2007	Investigation	EWL
		ELSS-1B	5/9/2007	Investigation	EWL
		ELSS-2A	5/9/2007	Investigation	EWL
		ELSS-2B	5/9/2007	Investigation	EWL
		ELSS-3A	5/10/2007	Investigation	EWL
		ELSS-3B	5/10/2007	Investigation	EWL
		ELSS-4A	5/9/2007	Investigation	EWL
		ELSS-4B	5/9/2007	Investigation	EWL
Silver	7440-22-4	0.22 J	< 0.22	0.55 J	< 0.24	0.65 J	0.072 J	0.69 J	< 0.25
Sodium	7440-23-5	3400	5000	4000	4000	4000	8500	3500	5700
Thallium	7440-28-0	0.21 J	0.22 J	0.44 J	0.23 J	0.5 J	0.48	< 1.8	0.42
Vanadium	7440-62-2	46	31	93	50	99	100	48	83
Zinc	7440-66-6	470	13	1400	34	1600	71	1400	59
Other Inorganics (mg/kg)									
Chloride	16887-00-6	1900	5900	3400	3700	3800	9400	1500	4900
Nitrate as N	14797-55-8	< 21	< 6	< 33	< 6.8	47 J	8.2	< 50	< 7
Nitrite as N	14797-65-0	< 4.2	< 1.2	< 6.6	< 1.4	< 10	< 1.7	< 9.9	0.88 J
TKN		4500	250	11000	630	13000	1600	20000	910
TOC	7440-44-0	68000	3800	110000	4200	110000	1800	290000	5300
Sulfate	14808-79-8	1500	1400	1100	570	1600 K	2500 K	< 990	940

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-5A		ELSS-5B		WLSS-1A		WLSS-1B		WLSS-2A		WLSS-2B		WLSS-3A		WLSS-3B	
Sample Date		5/9/2007		5/9/2007		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/11/2007		5/11/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		WWL		WWL		WWL		WWL		WWL		WWL	
Constituent	**CAS No.**																
Volatile Organics (mg/kg)																	
1,1,1,2-Tetrachloroethane	630-20-6	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
1,1,1-Trichloroethane	71-55-6	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
1,1,2,2-Tetrachloroethane	79-34-5	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
1,1,2-Trichloroethane	79-00-5	< 0.056	L	< 0.0093	L	< 0.069	L	< 0.0059	L	< 0.081	L	< 0.0051	L	< 0.059		< 0.0056	
1,1-Dichloroethane	75-34-3	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
1,1-Dichloroethene	75-35-4	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
1,2,3-Trichloropropane	96-18-4	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.11		< 0.019		< 0.14		< 0.012		< 0.16		< 0.01		< 0.12		< 0.011	
1,2-Dibromoethane	106-93-4	< 0.056	L	< 0.0093	L	< 0.069	L	< 0.0059	L	< 0.081	L	< 0.0051	L	< 0.059		< 0.0056	
1,2-Dichloroethane	107-06-2	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
trans-1,2-Dichloroethene	156-60-5	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
1,2-Dichloropropane	78-87-5	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
cis-1,3-Dichloropropene	10061-01-5	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
trans-1,3-Dichloropropene	10061-02-6	< 0.056	L	< 0.0093	L	< 0.069	L	< 0.0059	L	< 0.081	L	< 0.0051	L	< 0.059		< 0.0056	
2-Butanone (MEK)	78-93-3	< 0.28		< 0.047		< 0.34		< 0.03		< 0.4		< 0.026		< 0.3		< 0.028	
2-Hexanone	591-78-6	< 0.28		< 0.047		< 0.34		< 0.03		< 0.4		< 0.026		< 0.3		< 0.028	
2-Methyl-1-propanol	78-83-1	2.2	R	0.37	R	< 2.7		< 0.24		< 3.2		< 0.2		2.4	R	0.22	R
3-Methylhexane	589-34-4	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 0.28		< 0.047		< 0.34		< 0.03		< 0.4		< 0.026		< 0.3		< 0.028	
Acetone	67-64-1	0.71		0.062	J	0.49	J	0.042	J	0.64	J	0.071		0.6		0.074	
Acetonitrile	75-05-8	< 2.2		< 0.37		< 2.7		< 0.24		< 3.2		< 0.2		< 2.4		< 0.22	
Acrolein	107-02-8	< 1.1		< 0.19		< 1.4		< 0.12		< 1.6		< 0.1		< 1.2	J	< 0.11	J
Acrylonitrile	107-13-1	< 1.1		< 0.19		< 1.4		< 0.12		< 1.6		< 0.1		< 1.2	J	< 0.11	J
Allyl chloride	107-05-1	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Benzene	71-43-2	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Benzyl chloride	100-44-7	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Bromodichloromethane	75-27-4	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Bromoform	75-25-2	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Bromomethane	74-83-9	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Carbon Dioxide	124-38-9	NA		NA		NA		NA		530	R	51	R	NA		NA	
Carbon disulfide	75-15-0	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Carbon tetrachloride	56-23-5	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Chlorobenzene	108-90-7	< 0.056	L	< 0.0093	L	< 0.069	L	< 0.0059	L	< 0.081	L	< 0.0051	L	< 0.059	L	< 0.0056	L
Chloroethane	75-00-3	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Chloroform	67-66-3	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Chloromethane	74-87-3	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Chloroprene	126-99-8	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Dibromochloromethane	124-48-1	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Dibromomethane	74-95-3	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Dichlorodifluoromethane	75-71-8	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Dichlorofluoromethane	75-43-4	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Diethyl ether	60-29-7	< 0.11		< 0.019		< 0.14		< 0.012		0.28		0.17	J	< 0.12		< 0.011	
Ethyl methacrylate	97-63-2	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	
Ethylbenzene	100-41-4	< 0.056		< 0.0093		< 0.069		< 0.0059		< 0.081		< 0.0051		< 0.059		< 0.0056	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-5A	ELSS-5B	WLSS-1A	WLSS-1B	WLSS-2A	WLSS-2B	WLSS-3A	WLSS-3B
Sample Date		5/9/2007	5/9/2007	5/11/2007	5/11/2007	5/11/2007	5/10/2007	5/11/2007	5/11/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	WWL	WWL	WWL	WWL	WWL	WWL
Constituent	**CAS No.**								
Ethylene oxide	75-21-8	< 1.1	< 0.19	< 1.4	< 0.12	< 1.6	< 0.1	< 1.2	< 0.11
Iodomethane	74-88-4	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
Methacrylonitrile	126-98-7	< 1.1	< 0.19	< 1.4	< 0.12	< 1.6	< 0.1	< 1.2	< 0.11
Methyl methacrylate	80-62-6	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
Methylene Chloride	75-09-2	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
n-Heptane	142-82-5	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
Pentachloroethane	76-01-7	< 0.28	< 0.047	< 0.34 J	< 0.03 J	< 0.4 J	< 0.026 J	< 0.3	< 0.028
Propionitrile	107-12-0	< 1.1	< 0.19	< 1.4	< 0.12	< 1.6	< 0.1	< 1.2	< 0.11
Propylene oxide	75-56-9	< 1.1	< 0.19	< 1.4	< 0.12	< 1.6	< 0.1	< 1.2	< 0.11
Styrene	100-42-5	< 0.056 L	< 0.0093 L	< 0.069 L	< 0.0059 L	< 0.081 L	< 0.0051 L	< 0.059 L	< 0.0056 L
t-Butanol	75-65-0	0.13	0.036	< 0.069 J	0.0059 J	4.3	4.8	0.15	< 0.0056
Tetrachloroethene	127-18-4	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
Toluene	108-88-3	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
trans-1,4-Dichloro-2-butene	110-57-6	< 0.11	< 0.019	< 0.14	< 0.012	< 0.16	< 0.01	< 0.12	< 0.011
Trichloroethylene	79-01-6	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
Trichlorofluoromethane	75-69-4	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
Vinyl acetate	108-05-4	< 0.11	< 0.019	< 0.14	< 0.012	< 0.16	< 0.01	< 0.12	< 0.011
Vinyl chloride	75-01-4	< 0.056	< 0.0093	< 0.069	< 0.0059	< 0.081	< 0.0051	< 0.059	< 0.0056
Xylenes, Total	1330-20-7	< 0.11	< 0.019	< 0.14	< 0.012	< 0.16	< 0.01	< 0.12	< 0.011
Volatile Organics (TICs) (mg/kg)									
Carbon Dioxide	124-38-9	42 B	1.7 B	54 B	0.49 B	61 B	1.2 B	42 B	0.37 B
Methylcyclohexane	108-87-2	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1,2,4-Trichlorobenzene	120-82-1	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1,2-Dichlorobenzene	95-50-1	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1,3,5-Trinitrobenzene	99-35-4	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1,3-Dichlorobenzene	541-73-1	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1,4-Dichlorobenzene	106-46-7	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1,4-Dioxane	123-91-1	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1,4-Naphthoquinone	130-15-4	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
1-Naphthalenamine	134-32-7	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,2'-oxybis[1-chloropropane]	108-60-1	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,3,4,6-Tetrachlorophenol	58-90-2	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,4,5-Trichlorophenol	95-95-4	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,4,6-Trichlorophenol	88-06-2	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,4-Dichlorophenol	120-83-2	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,4-Dimethylphenol	105-67-9	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,4-Dinitrophenol	51-28-5	< 19	< 2.5	< 23	< 2.5	< 27	< 2.2	< 21 L	< 2.4
2,4-Dinitrotoluene	121-14-2	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,6-Dichlorophenol	87-65-0	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2,6-Dinitrotoluene	606-20-2	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2-Acetylaminofluorene	53-96-3	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
2-Chloronaphthalene	91-58-7	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-5A		ELSS-5B		WLSS-1A		WLSS-1B		WLSS-2A		WLSS-2B		WLSS-3A		WLSS-3B	
Sample Date		5/9/2007		5/9/2007		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/11/2007		5/11/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		WWL		WWL		WWL		WWL		WWL		WWL	
Constituent	CAS No.																
2-Chlorophenol	95-57-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
2-Methylnaphthalene	91-57-6	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
2-Methylphenol	95-48-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
2-Naphthalenamine	91-59-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
2-Nitroaniline	88-74-4	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
2-Nitrophenol	88-75-5	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
2-Picoline	109-06-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
3 & 4 Methylphenol	15831-10-4	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
3,3'-Dichlorobenzidine	91-94-1	< 7.3		< 0.96		< 9		< 0.96		< 11		< 0.86		< 8.2	L	< 0.92	
3,3'-Dimethylbenzidine	119-93-7	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
3-Methylcholanthrene	56-49-5	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
3-Nitroaniline	99-09-2	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
4,6-Dinitro-2-methylphenol	534-52-1	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
4-Aminobiphenyl	92-67-1	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
4-Bromophenyl phenyl ether	101-55-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
4-Chloro-3-methylphenol	59-50-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
4-Chloroaniline	106-47-8	< 7.3		< 0.96		< 9		< 0.96		< 11		< 0.86		< 8.2	L	< 0.92	
4-Chlorophenyl phenyl ether	7005-72-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
4-Nitroaniline	100-01-6	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
4-Nitrophenol	100-02-7	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
4-Nitroquinoline-1-oxide	56-57-5	37	R	4.8	R	45	R	4.8	R	53	R	4.3	R	41	R	4.6	R
5-Nitro-o-toluidine	99-55-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
7,12-Dimethylbenz(a)anthracene	57-97-6	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Acenaphthene	83-32-9	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Acenaphthylene	208-96-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Acetophenone	98-86-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 740		< 98		< 920		< 97		< 1100		< 87		< 830	L	< 93	
Aniline	62-53-3	< 7.3		< 0.96		< 9		< 0.96		< 11		< 0.86		< 8.2	L	< 0.92	
Anthracene	120-12-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Aramite, Total	140-57-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Benzo[a]anthracene	56-55-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Benzo[a]pyrene	50-32-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Benzo[b]fluoranthene	205-99-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Benzo[g,h,i]perylene	191-24-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Benzo[k]fluoranthene	207-08-9	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Benzyl alcohol	100-51-6	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Bis(2-chloroethoxy)methane	111-91-1	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Bis(2-chloroethyl)ether	111-44-4	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Bis(2-ethylhexyl) phthalate	117-81-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Butyl benzyl phthalate	85-68-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Chrysene	218-01-9	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Diallate	2303-16-4	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Dibenz(a,h)anthracene	53-70-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-5A		ELSS-5B		WLSS-1A		WLSS-1B		WLSS-2A		WLSS-2B		WLSS-3A		WLSS-3B	
Sample Date		5/9/2007		5/9/2007		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/11/2007		5/11/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		WWL		WWL		WWL		WWL		WWL		WWL	
Constituent	CAS No.																
Dibenzofuran	132-64-9	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Diethyl phthalate	84-66-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Dimethoate	60-51-5	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Dimethyl phthalate	131-11-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Di-n-butyl phthalate	84-74-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Di-n-octyl phthalate	117-84-0	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	L
Ethyl methanesulfonate	62-50-0	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Fluoranthene	206-44-0	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Fluorene	86-73-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Hexachlorobenzene	118-74-1	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Hexachlorobutadiene	87-68-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Hexachlorocyclopentadiene	77-47-4	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Hexachloroethane	67-72-1	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Hexachlorophene	70-30-4	< 1900		< 250		< 2300		< 250		2700	R	< 220		< 2100	L	< 240	
Hexachloropropene	1888-71-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Indeno[1,2,3-cd]pyrene	193-39-5	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Isophorone	78-59-1	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Isosafrole	120-58-1	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
m-Dinitrobenzene	99-65-0	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Methapyrilene	91-80-5	< 740		< 98		< 920		< 97		< 1100		< 87		830	R	93	R
Methyl methanesulfonate	66-27-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Methyl phenols, Total	1319-77-3	NA		NA		NA		NA		NA		NA		NA		NA	
Naphthalene	91-20-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Nitrobenzene	98-95-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosodiethylamine	55-18-5	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosodimethylamine	62-75-9	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosodi-n-butylamine	924-16-3	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosodi-n-propylamine	621-64-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosodiphenylamine	86-30-6	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosomethylethylamine	10595-95-6	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosomorpholine	59-89-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosopiperidine	100-75-4	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
N-Nitrosopyrrolidine	930-55-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
o,o',o''-Triethylphosphorothioate	126-68-1	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
o-Toluidine	95-53-4	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
p-Dimethylamino azobenzene	60-11-7	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Pentachlorobenzene	608-93-5	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Pentachloronitrobenzene	82-68-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Pentachlorophenol	87-86-5	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
Phenacetin	62-44-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Phenanthrene	85-01-8	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Phenol	108-95-2	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
p-Phenylene diamine	106-50-3	< 19		< 2.5		< 23		< 2.5		< 27		< 2.2		< 21	L	< 2.4	
Pronamide	23950-58-5	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	
Pyrene	129-00-0	< 3.7		< 0.48		< 4.5		< 0.48		< 5.3		< 0.43		< 4.1	L	< 0.46	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-5A	ELSS-5B	WLSS-1A	WLSS-1B	WLSS-2A	WLSS-2B	WLSS-3A	WLSS-3B
Sample Date		5/9/2007	5/9/2007	5/11/2007	5/11/2007	5/11/2007	5/10/2007	5/11/2007	5/11/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	WWL	WWL	WWL	WWL	WWL	WWL
Constituent	**CAS No.**								
Pyridine	110-86-1	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
Safrole, Total	94-59-7	< 3.7	< 0.48	< 4.5	< 0.48	< 5.3	< 0.43	< 4.1 L	< 0.46
Semi-Volatile Organics (TICs) (mg/kg)									
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	38380-01-7	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	39485-83-1	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	37680-73-2	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	56558-17-9	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, pentachloro-	25429-29-2	NA	NA	NA	NA	NA	NA	NA	NA
17-Pentatriacontene	6971-40-0	NA	NA	NA	NA	NA	NA	NA	NA
1-Decene	872-05-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Docosene	1599-67-3	NA	NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenepropanol, .alpha.-ethenylde	596-85-0	NA	NA	NA	NA	NA	NA	NA	NA
2-Heptacosanone		NA	NA	NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA	NA	NA	NA	NA	NA
Bacchotricuneatin c	66563-30-2	NA	NA	NA	NA	NA	NA	NA	NA
Cholestanol	80-97-7	NA	NA	NA	NA	NA	NA	NA	NA
Cyclodecane	293-96-9	NA	NA	NA	NA	NA	NA	NA	NA
Cyclododecane	294-62-2	NA	NA	NA	NA	NA	NA	1.9 JN	NA
Cyclopropane, nonyl-	74663-85-7	NA	NA	NA	NA	NA	NA	3.9 JN	NA
Eicosane	112-95-8	NA	NA	NA	NA	NA	NA	NA	NA
Ergostanol	6538-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1,2,2-tetrachloro-	79-34-5	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA	NA	2.8 JN	NA	NA	NA	NA	NA
Heptacosane	593-49-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane	629-78-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 2,6,10,15-tetramethyl-	54833-48-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 9-octyl-	7225-64-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexacosane	630-01-3	NA	NA	NA	NA	NA	NA	NA	NA
Hexadecane	544-76-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	483-76-1	NA	NA	NA	NA	NA	NA	NA	NA
Olean-12-ene	471-68-1	NA	NA	NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA	NA	NA	NA	NA	NA
Tricosane	638-67-5	NA	NA	NA	NA	NA	NA	NA	NA
Vitamin E	59-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (mg/kg)									
Acrylamide	79-06-1	< 10	< 1.3	< 14	< 1.4	< 15	< 1.2	< 12	< 1.2
Alcohols and Glycols (mg/kg)									
Allyl alcohol	107-18-6	< 11	< 1.5	< 14	< 1.5	< 16	< 1.3	< 13	< 1.4
Diethylene glycol	111-46-6	< 56	< 7.3	< 69	< 7.3	< 81	< 6.5	< 63	< 7
Dipropylene glycol	25265-71-8	< 56	< 7.3	< 69	< 7.3	< 81	< 6.5	< 63	< 7
Ethanol	64-17-5	< 11	< 1.5	< 14	< 1.5	< 16	< 1.3	< 13	< 1.4

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-5A		ELSS-5B		WLSS-1A		WLSS-1B		WLSS-2A		WLSS-2B		WLSS-3A		WLSS-3B	
Sample Date		5/9/2007		5/9/2007		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/11/2007		5/11/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		WWL		WWL		WWL		WWL		WWL		WWL	
Constituent	**CAS No.**																
Ethylene glycol	107-21-1	< 56		< 7.3		< 69		< 7.3		< 81		< 6.5		< 63		< 7	
Ethylene glycol monobutyl ether	111-76-2	< 56		< 7.3		< 69		< 7.3		< 81		< 6.5		< 63		< 7	
Ethylene glycol monopropyl ether	2807-30-9	< 56		< 7.3		< 69		< 7.3		< 81		< 6.5		< 63		< 7	
Isopropanol	67-63-0	< 11		< 1.5		< 14		< 1.5		< 16		< 1.3		< 13		< 1.4	
Methanol	67-56-1	< 11		< 1.5		< 14		< 1.5		< 16		< 1.3		< 13		< 1.4	
Propylene glycol	57-55-6	< 56		< 7.3		< 69		< 7.3		< 81		< 6.5		< 63		< 7	
Polychlorinated Biphenyls (PCBs) (mg/kg)																	
PCB-1016	12674-11-2	NA		NA		NA		NA		NA		NA		NA		NA	
PCB-1221	11104-28-2	NA		NA		NA		NA		NA		NA		NA		NA	
PCB-1232	11141-16-5	NA		NA		NA		NA		NA		NA		NA		NA	
PCB-1242	53469-21-9	NA		NA		NA		NA		NA		NA		NA		NA	
PCB-1248	12672-29-6	NA		NA		NA		NA		NA		NA		NA		NA	
PCB-1254	11097-69-1	NA		NA		NA		NA		NA		NA		NA		NA	
PCB-1260	11096-82-5	NA		NA		NA		NA		NA		NA		NA		NA	
Pesticides and PCBs (mg/kg)																	
1,1'-Biphenyl, heptachloro-	28655-71-2	NA		NA		NA		NA		NA		NA		NA		NA	
1,1'-Biphenyl, hexachloro-	26601-64-9	NA		NA		NA		NA		NA		NA		NA		NA	
1,1'-Biphenyl, nonachloro-	53742-07-7	NA		NA		NA		NA		NA		NA		NA		NA	
1,1'-Biphenyl, octachloro-	55722-26-4	NA		NA		NA		NA		NA		NA		NA		NA	
Chlorobiphenyl	27323-18-8	NA		NA		NA		NA		NA		NA		NA		NA	
Decachlorobiphenyl	2051-24-3	NA		NA		NA		NA		NA		NA		NA		NA	
Dichlorobiphenyl	25512-42-9	NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorobiphenyl	25429-29-2	NA		NA		NA		NA		NA		NA		NA		NA	
Tetrachlorobiphenyl	26914-33-0	NA		NA		NA		NA		NA		NA		NA		NA	
Trichlorobiphenyl	25323-68-6	NA		NA		NA		NA		NA		NA		NA		NA	
Inorganics (mg/kg)																	
Aluminum	7429-90-5	12000		19000		23000	J	11000	J	13000	J	7400	J	11000		9200	
Antimony	7440-36-0	2.4	J	< 0.69		< 6.2		< 0.7		3.4	J	< 0.59		2.7	J	< 0.64	
Arsenic	7440-38-2	6.5		2.5		4.9	J	1.7		6.5	J	0.99		5.7		1.2	
Barium	7440-39-3	110		63		100		46		84		25		89	L	41	L
Beryllium	7440-41-7	0.6	J	1		0.85	J	0.56		0.5	J	0.21		< 1.1		0.29	
Cadmium	7440-43-9	1.9		0.09	J	1.4		0.03	J	1.4		< 0.12		1.7		< 0.13	
Calcium	7440-70-2	12000		810		8500		870		8900		410		11000	J	460	J
Chromium	7440-47-3	78		38		52		24		46		12		41		14	
Cobalt	7440-48-4	4.4		5.2		8.1		4.9		5		2		3.8		3.1	
Copper	7440-50-8	250		20		160		11		280		2.8		300	L	4	L
Iron	7439-89-6	14000		17000		19000	J	10000	J	13000	J	4200	J	12000	J	6300	J
Lead	7439-92-1	76		20		57		13		74		9.2		68		13	
Magnesium	7439-95-4	1700		1100		2300		1000		1900		350		2000		460	
Manganese	7439-96-5	180		39		170		40		140		29		130		33	
Mercury	7439-97-6	< 0.98		< 0.14		< 1.2		< 0.14		< 1.4		< 0.12		< 1.1		< 0.13	
Nickel	7440-02-0	72		12		40		6.9		51		2.6		42		3.1	
Potassium	7440-09-7	1000		1300		1200		730		1200		380		950		360	
Selenium	7782-49-2	1.3	J	0.35	J	< 6.2		0.26	J	< 7		0.19	J	1.2	J	0.18	J

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSS-5A		ELSS-5B		WLSS-1A		WLSS-1B		WLSS-2A		WLSS-2B		WLSS-3A		WLSS-3B	
Sample Date		5/9/2007		5/9/2007		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/11/2007		5/11/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		WWL		WWL		WWL		WWL		WWL		WWL	
Constituent	**CAS No.**																
Silver	7440-22-4	1.6	J	< 0.28		0.7	J	< 0.28		1	J	< 0.24		0.92	J	< 0.26	
Sodium	7440-23-5	2400		4600		860		210		2100		530		1400		260	
Thallium	7440-28-0	< 2		0.49		< 2.5		0.17	J	< 2.8		0.12	J	< 2.2		0.23	J
Vanadium	7440-62-2	76		52		76		37		64		18		59		22	
Zinc	7440-66-6	3700		51		1200		26		1300		9.1		1200		10	
Other Inorganics (mg/kg)																	
Chloride	16887-00-6	1500		2800		680		110		960		220		630		130	
Nitrate as N	14797-55-8	< 56		< 7.3		73		16		280		4.1	J	36	J	7	
Nitrite as N	14797-65-0	22		0.88	J	< 14		< 1.5		< 16		< 1.3		< 13	L	< 1.4	L
TKN		24000		790		16000		600		22000		530		30000		810	
TOC	7440-44-0	300000		1700		250000		2400		310000		8000		330000		9800	
Sulfate	14808-79-8	< 1100		650		< 1400		370	K	< 1600		210	K	< 1300		570	

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	Sample Date	Sample Type	Sample Location
		WLSS-4A	5/11/2007	Investigation	WWL
		WLSS-4A DUP	5/11/2007	Duplicate	WWL
		WLSS-4B	5/11/2007	Investigation	WWL
		WLSS-5A	5/10/2007	Investigation	WWL
		WLSS-5B	5/10/2007	Investigation	WWL
		WL PCB-1	5/11/2007	Investigation	WWL
		NLSS-1A	5/8/2007	Investigation	Natrosol Lagoon
		NLSS-1B	5/8/2007	Investigation	Natrosol Lagoon
Volatile Organics (mg/kg)					
1,1,1,2-Tetrachloroethane	630-20-6	< 0.046	< 0.058	< 0.0085	< 0.055
1,1,1-Trichloroethane	71-55-6	< 0.046	< 0.058	< 0.0085	< 0.055
1,1,2,2-Tetrachloroethane	79-34-5	< 0.046	< 0.058	< 0.0085	< 0.055
1,1,2-Trichloroethane	79-00-5	< 0.046	< 0.058	< 0.0085	< 0.055 L
1,1-Dichloroethane	75-34-3	< 0.046	< 0.058	< 0.0085	< 0.055
1,1-Dichloroethene	75-35-4	< 0.046	< 0.058	< 0.0085	< 0.055
1,2,3-Trichloropropane	96-18-4	< 0.046	< 0.058	< 0.0085	< 0.055
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.093	< 0.12	< 0.017	< 0.11
1,2-Dibromoethane	106-93-4	< 0.046	< 0.058	< 0.0085	< 0.055 L
1,2-Dichloroethane	107-06-2	< 0.046	< 0.058	< 0.0085	< 0.055
trans-1,2-Dichloroethene	156-60-5	< 0.046	< 0.058	< 0.0085	< 0.055
1,2-Dichloropropane	78-87-5	< 0.046	< 0.058	< 0.0085	< 0.055
cis-1,3-Dichloropropene	10061-01-5	< 0.046	< 0.058	< 0.0085	< 0.055
trans-1,3-Dichloropropene	10061-02-6	< 0.046	< 0.058	< 0.0085	< 0.055 L
2-Butanone (MEK)	78-93-3	< 0.23	< 0.29	0.033 J	< 0.27
2-Hexanone	591-78-6	< 0.23	< 0.29	< 0.043	< 0.27
2-Methyl-1-propanol	78-83-1	1.9 R	2.3 R	0.34 R	< 2.2
3-Methylhexane	589-34-4	< 0.046	< 0.058	< 0.0085	< 0.055
4-Methyl-2-pentanone (MIBK)	108-10-1	< 0.23	< 0.29	< 0.043	< 0.27
Acetone	67-64-1	0.43 J	0.55 J	0.19	0.21 J
Acetonitrile	75-05-8	< 1.9	< 2.3	< 0.34	< 2.2
Acrolein	107-02-8	< 0.93 J	< 1.2 J	< 0.17 J	< 1.1
Acrylonitrile	107-13-1	< 0.93 J	< 1.2 J	< 0.17 J	< 1.1
Allyl chloride	107-05-1	< 0.046	< 0.058	< 0.0085	< 0.055
Benzene	71-43-2	< 0.046	< 0.058	< 0.0085	< 0.055
Benzyl chloride	100-44-7	< 0.046	< 0.058	< 0.0085	< 0.055
Bromodichloromethane	75-27-4	< 0.046	< 0.058	< 0.0085	< 0.055
Bromoform	75-25-2	< 0.046	< 0.058	< 0.0085	< 0.055
Bromomethane	74-83-9	< 0.046	< 0.058	< 0.0085	< 0.055
Carbon Dioxide	124-38-9	NA	NA	NA	NA
Carbon disulfide	75-15-0	< 0.046	< 0.058	0.033	< 0.055
Carbon tetrachloride	56-23-5	< 0.046	< 0.058	< 0.0085	< 0.055
Chlorobenzene	108-90-7	< 0.046 L	< 0.058 L	< 0.0085 L	< 0.055 L
Chloroethane	75-00-3	< 0.046	< 0.058	< 0.0085	< 0.055
Chloroform	67-66-3	< 0.046	< 0.058	< 0.0085	< 0.055
Chloromethane	74-87-3	< 0.046	< 0.058	< 0.0085	< 0.055
Chloroprene	126-99-8	< 0.046	< 0.058	< 0.0085	< 0.055
Dibromochloromethane	124-48-1	< 0.046	< 0.058	< 0.0085	< 0.055
Dibromomethane	74-95-3	< 0.046	< 0.058	< 0.0085	< 0.055
Dichlorodifluoromethane	75-71-8	< 0.046	< 0.058	< 0.0085	< 0.055
Dichlorofluoromethane	75-43-4	< 0.046	< 0.058	< 0.0085	< 0.055
Diethyl ether	60-29-7	< 0.093	< 0.12	< 0.017	< 0.11
Ethyl methacrylate	97-63-2	< 0.046	< 0.058	< 0.0085	< 0.055
Ethylbenzene	100-41-4	< 0.046	< 0.058	< 0.0085	< 0.055

Constituent	CAS No.	WLSS-5B	WL PCB-1	NLSS-1A	NLSS-1B
		5/10/2007	5/11/2007	5/8/2007	5/8/2007
		Investigation	Investigation	Investigation	Investigation
		WWL	WWL	Natrosol Lagoon	Natrosol Lagoon
Volatile Organics (mg/kg)					
1,1,1,2-Tetrachloroethane	630-20-6	< 0.0049	NA	< 0.0079	< 0.0078
1,1,1-Trichloroethane	71-55-6	< 0.0049	NA	< 0.0079	< 0.0078
1,1,2,2-Tetrachloroethane	79-34-5	< 0.0049	NA	< 0.0079	< 0.0078
1,1,2-Trichloroethane	79-00-5	< 0.0049 L	NA	< 0.0079	< 0.0078
1,1-Dichloroethane	75-34-3	< 0.0049	NA	< 0.0079	< 0.0078
1,1-Dichloroethene	75-35-4	< 0.0049	NA	< 0.0079	< 0.0078
1,2,3-Trichloropropane	96-18-4	< 0.0049	NA	< 0.0079	< 0.0078
1,2-Dibromo-3-Chloropropane	96-12-8	< 0.0097	NA	< 0.016	< 0.016
1,2-Dibromoethane	106-93-4	< 0.0049 L	NA	< 0.0079	< 0.0078
1,2-Dichloroethane	107-06-2	< 0.0049	NA	< 0.0079	< 0.0078
trans-1,2-Dichloroethene	156-60-5	< 0.0049	NA	< 0.0079	< 0.0078
1,2-Dichloropropane	78-87-5	< 0.0049	NA	< 0.0079	< 0.0078
cis-1,3-Dichloropropene	10061-01-5	< 0.0049	NA	< 0.0079	< 0.0078
trans-1,3-Dichloropropene	10061-02-6	< 0.0049 L	NA	< 0.0079	< 0.0078
2-Butanone (MEK)	78-93-3	< 0.024	NA	< 0.04	< 0.039
2-Hexanone	591-78-6	< 0.024	NA	< 0.04	< 0.039
2-Methyl-1-propanol	78-83-1	< 0.19	NA	0.32 R	0.31 R
3-Methylhexane	589-34-4	< 0.0049	NA	< 0.0079	< 0.0078
4-Methyl-2-pentanone (MIBK)	108-10-1	< 0.024	NA	< 0.04	< 0.039
Acetone	67-64-1	0.026 J	NA	0.076 J	0.16
Acetonitrile	75-05-8	< 0.19	NA	< 0.32	< 0.31
Acrolein	107-02-8	< 0.097	NA	< 0.16	< 0.16
Acrylonitrile	107-13-1	< 0.097	NA	< 0.16	< 0.16
Allyl chloride	107-05-1	< 0.0049	NA	< 0.0079	< 0.0078
Benzene	71-43-2	< 0.0049	NA	< 0.0079	< 0.0078
Benzyl chloride	100-44-7	< 0.0049	NA	< 0.0079	< 0.0078
Bromodichloromethane	75-27-4	< 0.0049	NA	< 0.0079	< 0.0078
Bromoform	75-25-2	< 0.0049	NA	< 0.0079	< 0.0078
Bromomethane	74-83-9	< 0.0049	NA	< 0.0079	< 0.0078
Carbon Dioxide	124-38-9	27 R	NA	NA	NA
Carbon disulfide	75-15-0	< 0.0049	NA	< 0.0079	< 0.0078
Carbon tetrachloride	56-23-5	< 0.0049	NA	< 0.0079	< 0.0078
Chlorobenzene	108-90-7	< 0.0049 L	NA	< 0.0079	< 0.0078
Chloroethane	75-00-3	< 0.0049	NA	< 0.0079	< 0.0078
Chloroform	67-66-3	< 0.0049	NA	< 0.0079	< 0.0078
Chloromethane	74-87-3	< 0.0049	NA	< 0.0079	< 0.0078
Chloroprene	126-99-8	< 0.0049	NA	< 0.0079	< 0.0078
Dibromochloromethane	124-48-1	< 0.0049	NA	< 0.0079	< 0.0078
Dibromomethane	74-95-3	< 0.0049	NA	< 0.0079	< 0.0078
Dichlorodifluoromethane	75-71-8	< 0.0049	NA	< 0.0079	< 0.0078
Dichlorofluoromethane	75-43-4	< 0.0049	NA	< 0.0079	< 0.0078
Diethyl ether	60-29-7	< 0.0097	NA	< 0.016	< 0.016
Ethyl methacrylate	97-63-2	< 0.0049	NA	< 0.0079	< 0.0078
Ethylbenzene	100-41-4	< 0.0049	NA	< 0.0079	< 0.0078

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WLSS-4A		WLSS-4A DUP		WLSS-4B		WLSS-5A		WLSS-5B		WL PCB-1	NLSS-1A	NLSS-1B
Sample Date		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/10/2007		5/11/2007	5/8/2007	5/8/2007
Sample Type		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation	Investigation	Investigation
Sample Location		WWL		WWL		WWL		WWL		WWL		WWL	Natrosol Lagoon	Natrosol Lagoon
Constituent	**CAS No.**													
Ethylene oxide	75-21-8	< 0.93		< 1.2		< 0.17		< 1.1		< 0.097		NA	< 0.16	< 0.16
Iodomethane	74-88-4	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
Methacrylonitrile	126-98-7	< 0.93		< 1.2		< 0.17		< 1.1		< 0.097		NA	< 0.16	< 0.16
Methyl methacrylate	80-62-6	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
Methylene Chloride	75-09-2	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
n-Heptane	142-82-5	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
Pentachloroethane	76-01-7	< 0.23		< 0.29		< 0.043		< 0.27	J	< 0.024	J	NA	< 0.04	< 0.039
Propionitrile	107-12-0	< 0.93		< 1.2		< 0.17		< 1.1		< 0.097		NA	< 0.16	< 0.16
Propylene oxide	75-56-9	< 0.93		< 1.2		< 0.17		< 1.1		< 0.097		NA	< 0.16	< 0.16
Styrene	100-42-5	< 0.046	L	< 0.058	L	< 0.0085	L	< 0.055	L	< 0.0049	L	NA	< 0.0079	< 0.0078
t-Butanol	75-65-0	0.1		0.11		< 0.0085		0.84	J	0.34		NA	1.1	0.26
Tetrachloroethene	127-18-4	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
Toluene	108-88-3	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
trans-1,4-Dichloro-2-butene	110-57-6	< 0.093		< 0.12		< 0.017		< 0.11		< 0.0097		NA	< 0.016	< 0.016
Trichloroethylene	79-01-6	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
Trichlorofluoromethane	75-69-4	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
Vinyl acetate	108-05-4	< 0.093		< 0.12		< 0.017		< 0.11		< 0.0097		NA	< 0.016	< 0.016
Vinyl chloride	75-01-4	< 0.046		< 0.058		< 0.0085		< 0.055		< 0.0049		NA	< 0.0079	< 0.0078
Xylenes, Total	1330-20-7	< 0.093		< 0.12		< 0.017		< 0.11		< 0.0097		NA	< 0.016	< 0.016
Volatile Organics (TICs) (mg/kg)														
Carbon Dioxide	124-38-9	36	B	47	B	0.86	B	11	B	0.41	B	NA	0.55	B	1.1	B
Methylcyclohexane	108-87-2	NA		NA		NA		NA		NA		NA	NA		0.0041	J
Semi-Volatile Organics (mg/kg)														
1,2,4,5-Tetrachlorobenzene	95-94-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1,2,4-Trichlorobenzene	120-82-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1,2-Dichlorobenzene	95-50-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1,3,5-Trinitrobenzene	99-35-4	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1,3-Dichlorobenzene	541-73-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1,4-Dichlorobenzene	106-46-7	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1,4-Dioxane	123-91-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1,4-Naphthoquinone	130-15-4	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
1-Naphthalenamine	134-32-7	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,2'-oxybis[1-chloropropane]	108-60-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,3,4,6-Tetrachlorophenol	58-90-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,4,5-Trichlorophenol	95-95-4	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,4,6-Trichlorophenol	88-06-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,4-Dichlorophenol	120-83-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,4-Dimethylphenol	105-67-9	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,4-Dinitrophenol	51-28-5	< 16	L	< 21	L	< 3		< 18		< 2.2		NA	< 2.3	< 2.1
2,4-Dinitrotoluene	121-14-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,6-Dichlorophenol	87-65-0	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2,6-Dinitrotoluene	606-20-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2-Acetylaminofluorene	53-96-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
2-Chloronaphthalene	91-58-7	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WLSS-4A	WLSS-4A DUP	WLSS-4B	WLSS-5A	WLSS-5B	WL PCB-1	NLSS-1A	NLSS-1B
Sample Date		5/11/2007	5/11/2007	5/11/2007	5/10/2007	5/10/2007	5/11/2007	5/8/2007	5/8/2007
Sample Type		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		WWL	WWL	WWL	WWL	WWL	WWL	Natrosol Lagoon	Natrosol Lagoon
Constituent	CAS No.								
2-Chlorophenol	95-57-8	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
2-Methylnaphthalene	91-57-6	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
2-Methylphenol	95-48-7	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
2-Naphthalenamine	91-59-8	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
2-Nitroaniline	88-74-4	< 16 L	< 21 L	< 3	< 18	< 2.2	NA	< 2.3	< 2.1
2-Nitrophenol	88-75-5	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
2-Picoline	109-06-8	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
3 & 4 Methylphenol	15831-10-4	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
3,3'-Dichlorobenzidine	91-94-1	< 6.3 L	< 8 L	< 1.1	< 7.2	< 0.86	NA	< 0.9	< 0.8
3,3'-Dimethylbenzidine	119-93-7	< 16 L	< 21 L	< 3	< 18	< 2.2	NA	< 2.3	< 2.1
3-Methylcholanthrene	56-49-5	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
3-Nitroaniline	99-09-2	< 16 L	< 21 L	< 3	< 18	< 2.2	NA	< 2.3	< 2.1
4,6-Dinitro-2-methylphenol	534-52-1	< 16 L	< 21 L	< 3	< 18	< 2.2	NA	< 2.3	< 2.1
4-Aminobiphenyl	92-67-1	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
4-Bromophenyl phenyl ether	101-55-3	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
4-Chloro-3-methylphenol	59-50-7	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
4-Chloroaniline	106-47-8	< 6.3 L	< 8 L	< 1.1	< 7.2	< 0.86	NA	< 0.9	< 0.8
4-Chlorophenyl phenyl ether	7005-72-3	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
4-Nitroaniline	100-01-6	< 16 L	< 21 L	< 3	< 18	< 2.2	NA	< 2.3	< 2.1
4-Nitrophenol	100-02-7	< 16 L	< 21 L	< 3	< 18	< 2.2	NA	< 2.3	< 2.1
4-Nitroquinoline-1-oxide	56-57-5	32 R	40 R	5.7 R	36 R	4.3 R	NA	4.5 R	4 R
5-Nitro-o-toluidine	99-55-8	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
7,12-Dimethylbenz(a)anthracene	57-97-6	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Acenaphthene	83-32-9	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Acenaphthylene	208-96-8	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Acetophenone	98-86-2	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 640 L	< 820 L	< 120	< 730	< 87	NA	< 91	< 81
Aniline	62-53-3	< 6.3 L	< 8 L	< 1.1	< 7.2	< 0.86	NA	< 0.9	< 0.8
Anthracene	120-12-7	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Aramite, Total	140-57-8	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Benzo[a]anthracene	56-55-3	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Benzo[a]pyrene	50-32-8	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Benzo[b]fluoranthene	205-99-2	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Benzo[g,h,i]perylene	191-24-2	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Benzo[k]fluoranthene	207-08-9	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Benzyl alcohol	100-51-6	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Bis(2-chloroethoxy)methane	111-91-1	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Bis(2-chloroethyl)ether	111-44-4	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Bis(2-ethylhexyl) phthalate	117-81-7	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Butyl benzyl phthalate	85-68-7	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Chrysene	218-01-9	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Diallate	2303-16-4	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Dibenz(a,h)anthracene	53-70-3	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WLSS-4A		WLSS-4A DUP		WLSS-4B		WLSS-5A		WLSS-5B		WL PCB-1	NLSS-1A	NLSS-1B
Sample Date		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/10/2007		5/11/2007	5/8/2007	5/8/2007
Sample Type		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation	Investigation	Investigation
Sample Location		WWL		WWL		WWL		WWL		WWL		WWL	Natrosol Lagoon	Natrosol Lagoon
Constituent	CAS No.													
Dibenzofuran	132-64-9	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Diethyl phthalate	84-66-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Dimethoate	60-51-5	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Dimethyl phthalate	131-11-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Di-n-butyl phthalate	84-74-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Di-n-octyl phthalate	117-84-0	< 3.2	L	< 4	L	< 0.57	L	< 3.6		< 0.43		NA	< 0.45	< 0.4
Ethyl methanesulfonate	62-50-0	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Fluoranthene	206-44-0	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Fluorene	86-73-7	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Hexachlorobenzene	118-74-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Hexachlorobutadiene	87-68-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Hexachlorocyclopentadiene	77-47-4	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Hexachloroethane	67-72-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Hexachlorophene	70-30-4	< 1600	L	< 2100	L	< 300		1800	R	< 220		NA	< 230	< 210
Hexachloropropene	1888-71-7	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Indeno[1,2,3-cd]pyrene	193-39-5	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Isophorone	78-59-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Isosafrole	120-58-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
m-Dinitrobenzene	99-65-0	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Methapyrilene	91-80-5	640	R	820	R	120	R	< 730		< 87		NA	< 91	< 81
Methyl methanesulfonate	66-27-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Methyl phenols, Total	1319-77-3	NA		NA		NA		NA		NA		NA	NA	NA
Naphthalene	91-20-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Nitrobenzene	98-95-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosodiethylamine	55-18-5	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosodimethylamine	62-75-9	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosodi-n-butylamine	924-16-3	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosodi-n-propylamine	621-64-7	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosodiphenylamine	86-30-6	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosomethylethylamine	10595-95-6	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosomorpholine	59-89-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosopiperidine	100-75-4	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
N-Nitrosopyrrolidine	930-55-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
o,o',o''-Triethylphosphorothioate	126-68-1	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
o-Toluidine	95-53-4	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
p-Dimethylamino azobenzene	60-11-7	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Pentachlorobenzene	608-93-5	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Pentachloronitrobenzene	82-68-8	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Pentachlorophenol	87-86-5	< 16	L	< 21	L	< 3		< 18		< 2.2		NA	< 2.3	< 2.1
Phenacetin	62-44-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Phenanthrene	85-01-8	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Phenol	108-95-2	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
p-Phenylene diamine	106-50-3	< 16	L	< 21	L	< 3		< 18		< 2.2		NA	< 2.3	< 2.1
Pronamide	23950-58-5	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4
Pyrene	129-00-0	< 3.2	L	< 4	L	< 0.57		< 3.6		< 0.43		NA	< 0.45	< 0.4

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WLSS-4A	WLSS-4A DUP	WLSS-4B	WLSS-5A	WLSS-5B	WL PCB-1	NLSS-1A	NLSS-1B
Sample Date		5/11/2007	5/11/2007	5/11/2007	5/10/2007	5/10/2007	5/11/2007	5/8/2007	5/8/2007
Sample Type		Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		WWL	WWL	WWL	WWL	WWL	WWL	Natrosol Lagoon	Natrosol Lagoon
Constituent	**CAS No.**								
Pyridine	110-86-1	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Safrole, Total	94-59-7	< 3.2 L	< 4 L	< 0.57	< 3.6	< 0.43	NA	< 0.45	< 0.4
Semi-Volatile Organics (TICs) (mg/kg)									
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	38380-01-7	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	39485-83-1	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	37680-73-2	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	56558-17-9	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, pentachloro-	25429-29-2	NA	NA	NA	NA	NA	NA	NA	NA
17-Pentatriacontene	6971-40-0	NA	NA	NA	NA	NA	NA	NA	NA
1-Decene	872-05-9	2.2 JN	4.2 JN	NA	NA	NA	NA	NA	NA
1-Docosene	1599-67-3	NA	NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenepropanol, .alpha.-ethenylde	596-85-0	NA	NA	NA	NA	NA	NA	NA	NA
2-Heptacosanone		NA	NA	NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA	NA	NA	NA	NA	NA
Bacchotricuneatin c	66563-30-2	NA	NA	NA	NA	NA	NA	NA	NA
Cholestanol	80-97-7	NA	NA	NA	NA	NA	NA	NA	NA
Cyclodecane	293-96-9	NA	NA	NA	NA	NA	NA	NA	NA
Cyclododecane	294-62-2	NA	1.8 JN	NA	NA	NA	NA	NA	NA
Cyclopropane, nonyl-	74663-85-7	NA	NA	NA	NA	NA	NA	NA	NA
Eicosane	112-95-8	NA	NA	NA	NA	NA	NA	NA	NA
Ergostanol	6538-02-9	NA	NA	NA	NA	NA	NA	NA	0.35 JN
Ethane, 1,1,2,2-tetrachloro-	79-34-5	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptacosane	593-49-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane	629-78-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 2,6,10,15-tetramethyl-	54833-48-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 9-octyl-	7225-64-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexacosane	630-01-3	NA	NA	NA	NA	NA	NA	NA	NA
Hexadecane	544-76-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	483-76-1	NA	NA	NA	NA	NA	NA	NA	NA
Olean-12-ene	471-68-1	NA	NA	NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA	NA	NA	NA	NA	NA
Tricosane	638-67-5	NA	NA	NA	NA	NA	NA	NA	NA
Vitamin E	59-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (mg/kg)									
Acrylamide	79-06-1	< 9.4	< 12	< 1.6	< 11	< 1.3	NA	< 1.3	< 1.1
Alcohols and Glycols (mg/kg)									
Allyl alcohol	107-18-6	< 9.6	< 12	< 1.7	< 11	< 1.3	NA	< 1.4	< 1.2
Diethylene glycol	111-46-6	< 48	< 61	< 8.7	< 55	< 6.5	NA	< 6.8	< 6.1
Dipropylene glycol	25265-71-8	< 48	< 61	< 8.7	< 55	< 6.5	NA	< 6.8	< 6.1
Ethanol	64-17-5	< 9.6	< 12	< 1.7	< 11	< 1.3	NA	< 1.4	< 1.2

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WLSS-4A		WLSS-4A DUP		WLSS-4B		WLSS-5A		WLSS-5B		WL PCB-1		NLSS-1A		NLSS-1B	
Sample Date		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/10/2007		5/11/2007		5/8/2007		5/8/2007	
Sample Type		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		WWL		WWL		WWL		WWL		WWL		WWL		Natrosol Lagoon		Natrosol Lagoon	
Constituent	**CAS No.**																
Ethylene glycol	107-21-1	< 48		< 61		< 8.7		< 55		< 6.5		NA		< 6.8		< 6.1	
Ethylene glycol monobutyl ether	111-76-2	< 48		< 61		< 8.7		< 55		< 6.5		NA		< 6.8		< 6.1	
Ethylene glycol monopropyl ether	2807-30-9	< 48		< 61		< 8.7		< 55		< 6.5		NA		< 6.8		< 6.1	
Isopropanol	67-63-0	< 9.6		< 12		< 1.7		< 11		< 1.3		NA		< 1.4		< 1.2	
Methanol	67-56-1	< 9.6		< 12		< 1.7		14		< 1.3		NA		0.64	J	< 1.2	
Propylene glycol	57-55-6	< 48		< 61		< 8.7		< 55		< 6.5		NA		< 6.8		< 6.1	
Polychlorinated Biphenyls (PCBs) (mg/kg)																	
PCB-1016	12674-11-2	NA		NA		NA		NA		NA		< 0.042		NA		NA	
PCB-1221	11104-28-2	NA		NA		NA		NA		NA		< 0.086		NA		NA	
PCB-1232	11141-16-5	NA		NA		NA		NA		NA		< 0.042		NA		NA	
PCB-1242	53469-21-9	NA		NA		NA		NA		NA		< 0.042		NA		NA	
PCB-1248	12672-29-6	NA		NA		NA		NA		NA		< 0.042		NA		NA	
PCB-1254	11097-69-1	NA		NA		NA		NA		NA		< 0.042		NA		NA	
PCB-1260	11096-82-5	NA		NA		NA		NA		NA		< 0.042		NA		NA	
Pesticides and PCBs (mg/kg)																	
1,1'-Biphenyl, heptachloro-	28655-71-2	NA		NA		NA		NA		NA		< 0.013		NA		NA	
1,1'-Biphenyl, hexachloro-	26601-64-9	NA		NA		NA		NA		NA		< 0.0086		NA		NA	
1,1'-Biphenyl, nonachloro-	53742-07-7	NA		NA		NA		NA		NA		< 0.022		NA		NA	
1,1'-Biphenyl, octachloro-	55722-26-4	NA		NA		NA		NA		NA		< 0.013		NA		NA	
Chlorobiphenyl	27323-18-8	NA		NA		NA		NA		NA		< 0.0043		NA		NA	
Decachlorobiphenyl	2051-24-3	NA		NA		NA		NA		NA		< 0.022		NA		NA	
Dichlorobiphenyl	25512-42-9	NA		NA		NA		NA		NA		< 0.0043		NA		NA	
Pentachlorobiphenyl	25429-29-2	NA		NA		NA		NA		NA		< 0.0086		NA		NA	
Tetrachlorobiphenyl	26914-33-0	NA		NA		NA		NA		NA		< 0.0086		NA		NA	
Trichlorobiphenyl	25323-68-6	NA		NA		NA		NA		NA		< 0.0043		NA		NA	
Inorganics (mg/kg)																	
Aluminum	7429-90-5	5900		6600		20000		7100	J	3000	J	NA		5600		11000	
Antimony	7440-36-0	2.4	J	2.9	J	< 0.83		2.2	J	< 0.61		NA		< 0.62		< 0.54	
Arsenic	7440-38-2	4	J	5.1	J	2.8		4.2	J	0.44	J	NA		1.4		1.5	
Barium	7440-39-3	97	L	74	L	100	L	73		16		NA		34		64	
Beryllium	7440-41-7	< 0.87		< 1.2		1.1		0.32	J	0.16		NA		0.32		0.57	
Cadmium	7440-43-9	1.6		1.2	J	< 0.17		1.1		0.028	J	NA		0.03	J	0.046	J
Calcium	7440-70-2	14000	J	12000	J	980	J	12000		570		NA		530		1400	
Chromium	7440-47-3	29		29		36		26		7.3		NA		18		33	
Cobalt	7440-48-4	2.4		2.5		13		2.4		1.7		NA		2.7		5.1	
Copper	7440-50-8	280	L	220	L	20	L	210		2.3		NA		8.4		17	
Iron	7439-89-6	9600	J	9600	J	25000	J	9100	J	2800	J	NA		6700		12000	
Lead	7439-92-1	56		49		17		47		3.3		NA		7.7		13	
Magnesium	7439-95-4	2300		1800		1200		1700		360		NA		590		1000	
Manganese	7439-96-5	120		120		62		130		29		NA		30		61	
Mercury	7439-97-6	< 0.87		< 1.2		< 0.17		< 0.95		< 0.12		NA		< 0.12		< 0.11	
Nickel	7440-02-0	34		37		14		32		1.9		NA		4.7		9.4	
Potassium	7440-09-7	620		720		1200		650		320		NA		520		660	
Selenium	7782-49-2	0.96	J	1.2	J	0.23	J	1	J	< 0.61		NA		0.3	J	0.18	J

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WLSS-4A		WLSS-4A DUP		WLSS-4B		WLSS-5A		WLSS-5B		WL PCB-1	NLSS-1A	NLSS-1B
Sample Date		5/11/2007		5/11/2007		5/11/2007		5/10/2007		5/10/2007		5/11/2007	5/8/2007	5/8/2007
Sample Type		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation	Investigation	Investigation
Sample Location		WWL		WWL		WWL		WWL		WWL		WWL	Natrosol Lagoon	Natrosol Lagoon
Constituent	**CAS No.**													
Silver	7440-22-4	1.4	J	0.77	J	< 0.33		0.67	J	< 0.24		NA	< 0.25	< 0.22
Sodium	7440-23-5	1600		1400		630		1200		200		NA	150	810
Thallium	7440-28-0	< 1.7		< 2.3		0.31	J	< 1.9		< 0.24		NA	0.077	J 0.13 J
Vanadium	7440-62-2	41		50		56		45		11		NA	19	33
Zinc	7440-66-6	950		800		32		700		6.3		NA	18	33
Other Inorganics (mg/kg)														
Chloride	16887-00-6	310		670		1700		500		140		NA	56	1000
Nitrate as N	14797-55-8	26	J	< 60		< 8.4		33	J	8.9		NA	< 6.8	< 6.1
Nitrite as N	14797-65-0	< 9.7	L	< 12	L	< 1.7	L	< 11		< 1.3		NA	< 1.4	0.8 J
TKN		21000		15000		1800		29000		520		NA	180	310
TOC	7440-44-0	370000		360000		14000		410000		1100		NA	2400	4700
Sulfate	14808-79-8	< 970		< 1200		830		< 1100		490	K	NA	2800000	1400

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	NLSS-2A	NLSS-2B	NLSS-3A	NLSS-3B	EBSED-1	EBSED-2	EBSED-3	EB PCB-1
		Sample Date	5/8/2007	5/8/2007	5/8/2007	5/8/2007	5/22/2007	5/23/2007	5/22/2007	5/23/2007
		Sample Type	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
		Sample Location	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	East Bear Creek	East Bear Creek	East Bear Creek	East Bear Creek
Volatile Organics (mg/kg)										
1,1,1,2-Tetrachloroethane	630-20-6		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,1,1-Trichloroethane	71-55-6		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,1,2,2-Tetrachloroethane	79-34-5		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,1,2-Trichloroethane	79-00-5		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,1-Dichloroethane	75-34-3		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,1-Dichloroethene	75-35-4		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,2,3-Trichloropropane	96-18-4		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,2-Dibromo-3-Chloropropane	96-12-8		< 0.015	< 0.016	< 0.014	< 0.014	< 0.0099	< 0.018	< 0.034	NA
1,2-Dibromoethane	106-93-4		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,2-Dichloroethane	107-06-2		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
trans-1,2-Dichloroethene	156-60-5		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
1,2-Dichloropropane	78-87-5		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
cis-1,3-Dichloropropene	10061-01-5		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
trans-1,3-Dichloropropene	10061-02-6		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
2-Butanone (MEK)	78-93-3		< 0.038	< 0.039	< 0.036	< 0.035	0.0052 J	0.021 J	0.03 J	NA
2-Hexanone	591-78-6		< 0.038	< 0.039	< 0.036	< 0.035	< 0.025	< 0.044	< 0.085	NA
2-Methyl-1-propanol	78-83-1		0.3 R	0.32 R	0.29 R	0.28 R	0.2 R	0.35 R	0.68 R	NA
3-Methylhexane	589-34-4		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
4-Methyl-2-pentanone (MIBK)	108-10-1		< 0.038	< 0.039	< 0.036	< 0.035	< 0.025	< 0.044	< 0.085	NA
Acetone	67-64-1		0.053 J	0.11	0.17	0.15	0.04 J	0.26	0.23	NA
Acetonitrile	75-05-8		< 0.3	< 0.32	< 0.29	< 0.28	< 0.2	< 0.35	< 0.68	NA
Acrolein	107-02-8		< 0.15	< 0.16	< 0.14	< 0.14	< 0.099	< 0.18	< 0.34	NA
Acrylonitrile	107-13-1		< 0.15	< 0.16	< 0.14	< 0.14	< 0.099	< 0.18	< 0.34	NA
Allyl chloride	107-05-1		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Benzene	71-43-2		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Benzyl chloride	100-44-7		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Bromodichloromethane	75-27-4		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Bromoform	75-25-2		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Bromomethane	74-83-9		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Carbon Dioxide	124-38-9		NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	75-15-0		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	0.023	0.013 J	NA
Carbon tetrachloride	56-23-5		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Chlorobenzene	108-90-7		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Chloroethane	75-00-3		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Chloroform	67-66-3		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Chloromethane	74-87-3		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Chloroprene	126-99-8		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Dibromochloromethane	124-48-1		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Dibromomethane	74-95-3		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Dichlorodifluoromethane	75-71-8		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Dichlorofluoromethane	75-43-4		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Diethyl ether	60-29-7		< 0.015	< 0.016	< 0.014	< 0.014	< 0.0099	0.0028 J	0.031 J	NA
Ethyl methacrylate	97-63-2		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Ethylbenzene	100-41-4		< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		NLSS-2A	NLSS-2B	NLSS-3A	NLSS-3B	EBSED-1	EBSED-2	EBSED-3	EB PCB-1
Sample Date		5/8/2007	5/8/2007	5/8/2007	5/8/2007	5/22/2007	5/23/2007	5/22/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	East Bear Creek	East Bear Creek	East Bear Creek	East Bear Creek
Constituent	**CAS No.**								
Ethylene oxide	75-21-8	< 0.15	< 0.16	< 0.14	< 0.14	< 0.099	< 0.18	< 0.34	NA
Iodomethane	74-88-4	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Methacrylonitrile	126-98-7	< 0.15	< 0.16	< 0.14	< 0.14	< 0.099	< 0.18	< 0.34	NA
Methyl methacrylate	80-62-6	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Methylene Chloride	75-09-2	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
n-Heptane	142-82-5	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Pentachloroethane	76-01-7	< 0.038	< 0.039	< 0.036	< 0.035	< 0.025	< 0.044	< 0.085	NA
Propionitrile	107-12-0	< 0.15	< 0.16	< 0.14	< 0.14	< 0.099	< 0.18	< 0.34	NA
Propylene oxide	75-56-9	< 0.15	< 0.16	< 0.14	< 0.14	< 0.099	< 0.18	< 0.34	NA
Styrene	100-42-5	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
t-Butanol	75-65-0	0.28 J	1.2	3.1	13	0.021	1.6	0.57	NA
Tetrachloroethene	127-18-4	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Toluene	108-88-3	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
trans-1,4-Dichloro-2-butene	110-57-6	< 0.015	< 0.016	< 0.014	< 0.014	< 0.0099	< 0.018	< 0.034	NA
Trichloroethylene	79-01-6	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Trichlorofluoromethane	75-69-4	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Vinyl acetate	108-05-4	< 0.015	< 0.016	< 0.014	< 0.014	< 0.0099	< 0.018	< 0.034	NA
Vinyl chloride	75-01-4	< 0.0076	< 0.0079	< 0.0072	< 0.0071	< 0.0049	< 0.0089	< 0.017	NA
Xylenes, Total	1330-20-7	< 0.015	< 0.016	< 0.014	< 0.014	< 0.0099	< 0.018	< 0.034	NA
Volatile Organics (TICs) (mg/kg)									
Carbon Dioxide	124-38-9	0.57 B	1.5 B	3 B	0.88 B	0.67 B	3.8 B	3.3 B	NA
Methylcyclohexane	108-87-2	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1,2,4-Trichlorobenzene	120-82-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1,2-Dichlorobenzene	95-50-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1,3,5-Trinitrobenzene	99-35-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1,3-Dichlorobenzene	541-73-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1,4-Dichlorobenzene	106-46-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1,4-Dioxane	123-91-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1,4-Naphthoquinone	130-15-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
1-Naphthalenamine	134-32-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,2'-oxybis[1-chloropropane]	108-60-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,3,4,6-Tetrachlorophenol	58-90-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,4,5-Trichlorophenol	95-95-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,4,6-Trichlorophenol	88-06-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,4-Dichlorophenol	120-83-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,4-Dimethylphenol	105-67-9	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,4-Dinitrophenol	51-28-5	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
2,4-Dinitrotoluene	121-14-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,6-Dichlorophenol	87-65-0	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2,6-Dinitrotoluene	606-20-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-Acetylaminofluorene	53-96-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-Chloronaphthalene	91-58-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		NLSS-2A	NLSS-2B	NLSS-3A	NLSS-3B	EBSED-1	EBSED-2	EBSED-3	EB PCB-1
Sample Date		5/8/2007	5/8/2007	5/8/2007	5/8/2007	5/22/2007	5/23/2007	5/22/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	East Bear Creek	East Bear Creek	East Bear Creek	East Bear Creek
Constituent	CAS No.								
2-Chlorophenol	95-57-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-Methylnaphthalene	91-57-6	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-Methylphenol	95-48-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-Naphthalenamine	91-59-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-Nitroaniline	88-74-4	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
2-Nitrophenol	88-75-5	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-Picoline	109-06-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
3 & 4 Methylphenol	15831-10-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
3,3'-Dichlorobenzidine	91-94-1	< 0.88	< 0.92	< 0.86	< 0.82	< 1.1	< 1.2	< 1.2 L	NA
3,3'-Dimethylbenzidine	119-93-7	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
3-Methylcholanthrene	56-49-5	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
3-Nitroaniline	99-09-2	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
4,6-Dinitro-2-methylphenol	534-52-1	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
4-Aminobiphenyl	92-67-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
4-Bromophenyl phenyl ether	101-55-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
4-Chloro-3-methylphenol	59-50-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
4-Chloroaniline	106-47-8	< 0.88	< 0.92	< 0.86	< 0.82	< 1.1	< 1.2	< 1.2 L	NA
4-Chlorophenyl phenyl ether	7005-72-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
4-Nitroaniline	100-01-6	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
4-Nitrophenol	100-02-7	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
4-Nitroquinoline-1-oxide	56-57-5	4.4 R	4.6 R	4.3 R	4.1 R	5.4 R	6.2 R	5.8 R	NA
5-Nitro-o-toluidine	99-55-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
7,12-Dimethylbenz(a)anthracene	57-97-6	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Acenaphthene	83-32-9	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Acenaphthylene	208-96-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Acetophenone	98-86-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 89	< 93	< 87	< 83	< 110	< 130	< 120 L	NA
Aniline	62-53-3	< 0.88	< 0.92	< 0.86	< 0.82	< 1.1	< 1.2	< 1.2 L	NA
Anthracene	120-12-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Aramite, Total	140-57-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Benzo[a]anthracene	56-55-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Benzo[a]pyrene	50-32-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Benzo[b]fluoranthene	205-99-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Benzo[g,h,i]perylene	191-24-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Benzo[k]fluoranthene	207-08-9	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Benzyl alcohol	100-51-6	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Bis(2-chloroethoxy)methane	111-91-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Bis(2-chloroethyl)ether	111-44-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Bis(2-ethylhexyl) phthalate	117-81-7	< 0.44	< 0.46	< 0.43	0.13 J	< 0.54	< 0.62	< 0.58 L	NA
Butyl benzyl phthalate	85-68-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Chrysene	218-01-9	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Diallate	2303-16-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Dibenz(a,h)anthracene	53-70-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		NLSS-2A	NLSS-2B	NLSS-3A	NLSS-3B	EBSED-1	EBSED-2	EBSED-3	EB PCB-1
Sample Date		5/8/2007	5/8/2007	5/8/2007	5/8/2007	5/22/2007	5/23/2007	5/22/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	East Bear Creek	East Bear Creek	East Bear Creek	East Bear Creek
Constituent	CAS No.								
Dibenzofuran	132-64-9	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Diethyl phthalate	84-66-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Dimethoate	60-51-5	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Dimethyl phthalate	131-11-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Di-n-butyl phthalate	84-74-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Di-n-octyl phthalate	117-84-0	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Ethyl methanesulfonate	62-50-0	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Fluoranthene	206-44-0	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Fluorene	86-73-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Hexachlorobenzene	118-74-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Hexachlorobutadiene	87-68-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Hexachlorocyclopentadiene	77-47-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Hexachloroethane	67-72-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Hexachlorophene	70-30-4	< 230	< 240	< 220	< 210	< 280	< 320	< 300 L	NA
Hexachloropropene	1888-71-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Indeno[1,2,3-cd]pyrene	193-39-5	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Isophorone	78-59-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Isosafrole	120-58-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
m-Dinitrobenzene	99-65-0	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Methapyrilene	91-80-5	< 89	< 93	< 87	< 83	< 110	< 130	< 120 L	NA
Methyl methanesulfonate	66-27-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Methyl phenols, Total	1319-77-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Nitrobenzene	98-95-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosodiethylamine	55-18-5	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosodimethylamine	62-75-9	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosodi-n-butylamine	924-16-3	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosodi-n-propylamine	621-64-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosodiphenylamine	86-30-6	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosomethylethylamine	10595-95-6	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosomorpholine	59-89-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosopiperidine	100-75-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
N-Nitrosopyrrolidine	930-55-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
o,o',o''-Triethylphosphorothioate	126-68-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
o-Toluidine	95-53-4	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
p-Dimethylamino azobenzene	60-11-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Pentachlorobenzene	608-93-5	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Pentachloronitrobenzene	82-68-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Pentachlorophenol	87-86-5	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
Phenacetin	62-44-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Phenanthrene	85-01-8	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	0.065 L	NA
Phenol	108-95-2	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
p-Phenylene diamine	106-50-3	< 2.3	< 2.4	< 2.2	< 2.1	< 2.8	< 3.2	< 3 L	NA
Pronamide	23950-58-5	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Pyrene	129-00-0	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		NLSS-2A	NLSS-2B	NLSS-3A	NLSS-3B	EBSED-1	EBSED-2	EBSED-3	EB PCB-1
Sample Date		5/8/2007	5/8/2007	5/8/2007	5/8/2007	5/22/2007	5/23/2007	5/22/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	East Bear Creek	East Bear Creek	East Bear Creek	East Bear Creek
Constituent	**CAS No.**								
Pyridine	110-86-1	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Safrole, Total	94-59-7	< 0.44	< 0.46	< 0.43	< 0.41	< 0.54	< 0.62	< 0.58 L	NA
Semi-Volatile Organics (TICs) (mg/kg)									
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	38380-01-7	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	39485-83-1	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	37680-73-2	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	56558-17-9	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, pentachloro-	25429-29-2	NA	NA	NA	NA	NA	NA	NA	NA
17-Pentatriacontene	6971-40-0	NA	NA	NA	NA	NA	NA	NA	NA
1-Decene	872-05-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Docosene	1599-67-3	NA	NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenepropanol, .alpha.-ethenylde	596-85-0	NA	NA	NA	NA	NA	NA	NA	NA
2-Heptacosanone		NA	NA	NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA	NA	NA	NA	NA	NA
Bacchotricuneatin c	66563-30-2	NA	NA	NA	NA	NA	NA	NA	NA
Cholestanol	80-97-7	NA	NA	NA	NA	NA	NA	NA	NA
Cyclodecane	293-96-9	NA	NA	NA	NA	NA	NA	NA	NA
Cyclododecane	294-62-2	NA	NA	NA	NA	NA	NA	NA	NA
Cyclopropane, nonyl-	74663-85-7	NA	NA	NA	NA	NA	NA	NA	NA
Eicosane	112-95-8	NA	NA	NA	NA	NA	NA	NA	NA
Ergostanol	6538-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1,2,2-tetrachloro-	79-34-5	NA	NA	NA	0.17 T	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptacosane	593-49-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane	629-78-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 2,6,10,15-tetramethyl-	54833-48-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 9-octyl-	7225-64-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexacosane	630-01-3	NA	NA	NA	NA	NA	NA	NA	NA
Hexadecane	544-76-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	483-76-1	NA	NA	NA	0.17 JN	NA	NA	NA	NA
Olean-12-ene	471-68-1	NA	NA	NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA	NA	NA	NA	NA	NA
Tricosane	638-67-5	NA	NA	NA	NA	NA	NA	NA	NA
Vitamin E	59-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (mg/kg)									
Acrylamide	79-06-1	< 1.2	< 1.2	< 1.2	< 1.2	< 1.5	< 1.7	< 1.7	NA
Alcohols and Glycols (mg/kg)									
Allyl alcohol	107-18-6	< 1.3	< 1.4	< 1.3	< 1.2	< 1.6	< 1.9	< 1.8	NA
Diethylene glycol	111-46-6	< 6.7	< 7	< 6.5	< 6.2	< 8.1	< 9.4	< 8.8	NA
Dipropylene glycol	25265-71-8	< 6.7	< 7	< 6.5	< 6.2	< 8.1	< 9.4	< 8.8	NA
Ethanol	64-17-5	< 1.3	< 1.4	< 1.3	< 1.2	< 1.6	< 1.9	< 1.8	NA

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		NLSS-2A		NLSS-2B		NLSS-3A		NLSS-3B		EBSED-1		EBSED-2		EBSED-3		EB PCB-1
Sample Date		5/8/2007		5/8/2007		5/8/2007		5/8/2007		5/22/2007		5/23/2007		5/22/2007		5/23/2007
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation
Sample Location		Natrosol Lagoon		Natrosol Lagoon		Natrosol Lagoon		Natrosol Lagoon		East Bear Creek		East Bear Creek		East Bear Creek		East Bear Creek
Constituent	**CAS No.**															
Ethylene glycol	107-21-1	< 6.7		< 7		< 6.5		< 6.2		< 8.1		< 9.4		< 8.8		NA
Ethylene glycol monobutyl ether	111-76-2	< 6.7		< 7		< 6.5		< 6.2		< 8.1		< 9.4		< 8.8		NA
Ethylene glycol monopropyl ether	2807-30-9	< 6.7		< 7		< 6.5		< 6.2		< 8.1		< 9.4		< 8.8		NA
Isopropanol	67-63-0	< 1.3		< 1.4		< 1.3		< 1.2		< 1.6		< 1.9		< 1.8		NA
Methanol	67-56-1	0.86	J	1.3	J	0.62	J	0.52	J	2		< 1.9		4		NA
Propylene glycol	57-55-6	< 6.7		< 7		< 6.5		< 6.2		< 8.1		< 9.4		< 8.8		NA
Polychlorinated Biphenyls (PCBs) (mg/kg)																
PCB-1016	12674-11-2	NA		NA		NA		NA		NA		NA		NA		< 0.074
PCB-1221	11104-28-2	NA		NA		NA		NA		NA		NA		NA		< 0.15
PCB-1232	11141-16-5	NA		NA		NA		NA		NA		NA		NA		< 0.074
PCB-1242	53469-21-9	NA		NA		NA		NA		NA		NA		NA		< 0.074
PCB-1248	12672-29-6	NA		NA		NA		NA		NA		NA		NA		< 0.074
PCB-1254	11097-69-1	NA		NA		NA		NA		NA		NA		NA		0.48
PCB-1260	11096-82-5	NA		NA		NA		NA		NA		NA		NA		0.17
Pesticides and PCBs (mg/kg)																
1,1'-Biphenyl, heptachloro-	28655-71-2	NA		NA		NA		NA		NA		NA		NA		< 0.22
1,1'-Biphenyl, hexachloro-	26601-64-9	NA		NA		NA		NA		NA		NA		NA		< 0.15
1,1'-Biphenyl, nonachloro-	53742-07-7	NA		NA		NA		NA		NA		NA		NA		< 0.38
1,1'-Biphenyl, octachloro-	55722-26-4	NA		NA		NA		NA		NA		NA		NA		< 0.22
Chlorobiphenyl	27323-18-8	NA		NA		NA		NA		NA		NA		NA		< 0.073
Decachlorobiphenyl	2051-24-3	NA		NA		NA		NA		NA		NA		NA		< 0.38
Dichlorobiphenyl	25512-42-9	NA		NA		NA		NA		NA		NA		NA		< 0.073
Pentachlorobiphenyl	25429-29-2	NA		NA		NA		NA		NA		NA		NA		< 0.15
Tetrachlorobiphenyl	26914-33-0	NA		NA		NA		NA		NA		NA		NA		< 0.15
Trichlorobiphenyl	25323-68-6	NA		NA		NA		NA		NA		NA		NA		< 0.073
Inorganics (mg/kg)																
Aluminum	7429-90-5	15000		20000		18000		11000		25000	J	21000	J	38000	J	NA
Antimony	7440-36-0	0.25	J	< 0.64		< 0.62		< 0.59		< 0.75		1.7		0.9		NA
Arsenic	7440-38-2	5		1.6		2.7		1.5		3.3		4.9		12		NA
Barium	7440-39-3	73		78		74		55		110		110		150		NA
Beryllium	7440-41-7	0.66		0.62		0.67		0.51		1.3		1.7		1.4		NA
Cadmium	7440-43-9	0.088	J	< 0.13		< 0.12		< 0.12		0.05	J	1		0.53		NA
Calcium	7440-70-2	960		710		420		640		2000	J	4200		3000	J	NA
Chromium	7440-47-3	28		33		39		24		43	J	33	K	71	J	NA
Cobalt	7440-48-4	5.7		5.8		5.7		4.5		7.9		8.7		9.9		NA
Copper	7440-50-8	17		12		12		8		21		56	K	49		NA
Iron	7439-89-6	16000		11000		24000		15000		20000	J	21000	J	24000	J	NA
Lead	7439-92-1	31		14		13		9.9		22		41		110		NA
Magnesium	7439-95-4	910		970		1300		1300		2000	J	2200		1700	J	NA
Manganese	7439-96-5	58		32		52		48		97		330	K	190		NA
Mercury	7439-97-6	0.051	J	< 0.13		< 0.12		< 0.12		< 0.15		< 0.17		0.24		NA
Nickel	7440-02-0	10		8.8		9.9		7.4		13		17	K	21		NA
Potassium	7440-09-7	780		680		920		780		1400		1400		1100		NA
Selenium	7782-49-2	0.45	J	0.14	J	0.32	J	< 0.59		0.35	J	0.55	J	0.79	J	NA

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	NLSS-2A	NLSS-2B	NLSS-3A	NLSS-3B	EBSED-1	EBSED-2	EBSED-3	EB PCB-1
		Sample Date	5/8/2007	5/8/2007	5/8/2007	5/8/2007	5/22/2007	5/23/2007	5/22/2007	5/23/2007
		Sample Type	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
		Sample Location	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	Natrosol Lagoon	East Bear Creek	East Bear Creek	East Bear Creek	East Bear Creek
Silver	7440-22-4		0.069 J	< 0.26	< 0.25	< 0.23	< 0.3	0.18 J	0.27 J	NA
Sodium	7440-23-5		230	2100	3400	1900	110	740	320	NA
Thallium	7440-28-0		0.28	0.32	0.26	0.16 J	0.46	0.31 J	0.72	NA
Vanadium	7440-62-2		43	49	66	41	72	340 K	83	NA
Zinc	7440-66-6		34	24	35	25	56 K	360 J	220 K	NA
Other Inorganics (mg/kg)										
Chloride	16887-00-6		620	900	1700	840	360	130	110	NA
Nitrate as N	14797-55-8		< 6.7	< 7	< 6.5	< 6.2	< 16	5.9 B	7.4 B	NA
Nitrite as N	14797-65-0		< 1.3	< 1.4	1 J	< 1.2	< 1.6	< 1.9	< 1.8	NA
TKN			330	390	390	40 J	810	2100	2500	NA
TOC	7440-44-0		3900	2600	1700	< 1000	6500	23000	100000	NA
Sulfate	14808-79-8		820	1600	2800	720	180	1800	2300	NA

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	WBSED-1	WBSED-2	WBSED-3	WB PCB-1	WB PCB-1 DUP	UTSED-1	UTSED-2	UTSED-3
		Sample Date	5/22/2007	5/22/2007	5/24/2007	5/14/2007	5/14/2007	5/25/2007	5/24/2007	5/23/2007
		Sample Type	Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation	Investigation	Investigation
		Sample Location	West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	Unnamed Tributary	Unnamed Tributary	Unnamed Tributary
Volatile Organics (mg/kg)										
1,1,1,2-Tetrachloroethane	630-20-6		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,1,1-Trichloroethane	71-55-6		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,1,2,2-Tetrachloroethane	79-34-5		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,1,2-Trichloroethane	79-00-5		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,1-Dichloroethane	75-34-3		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,1-Dichloroethene	75-35-4		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,2,3-Trichloropropane	96-18-4		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,2-Dibromo-3-Chloropropane	96-12-8		< 0.019	< 0.013	< 0.077	NA	NA	< 0.024	< 0.026	< 0.012
1,2-Dibromoethane	106-93-4		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,2-Dichloroethane	107-06-2		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
trans-1,2-Dichloroethene	156-60-5		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
1,2-Dichloropropane	78-87-5		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
cis-1,3-Dichloropropene	10061-01-5		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
trans-1,3-Dichloropropene	10061-02-6		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
2-Butanone (MEK)	78-93-3		0.014 J	0.0066 J	0.2	NA	NA	0.031 J	0.03 J	< 0.03
2-Hexanone	591-78-6		< 0.047	< 0.032	< 0.19	NA	NA	< 0.06	< 0.065	< 0.03
2-Methyl-1-propanol	78-83-1		0.38 R	0.25 R	1.5 R	NA	NA	0.48 R	0.52 R	0.24 R
3-Methylhexane	589-34-4		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
4-Methyl-2-pentanone (MIBK)	108-10-1		< 0.047	< 0.032	< 0.19	NA	NA	< 0.06	< 0.065	< 0.03
Acetone	67-64-1		0.2	0.26	0.99	NA	NA	0.24	0.22	0.042 J
Acetonitrile	75-05-8		< 0.38	< 0.25	< 1.5	NA	NA	< 0.48	< 0.52	< 0.24
Acrolein	107-02-8		< 0.19	< 0.13	< 0.77 J	NA	NA	< 0.24	< 0.26	< 0.12
Acrylonitrile	107-13-1		< 0.19	< 0.13	< 0.77 J	NA	NA	< 0.24	< 0.26	< 0.12
Allyl chloride	107-05-1		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Benzene	71-43-2		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Benzyl chloride	100-44-7		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Bromodichloromethane	75-27-4		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Bromoform	75-25-2		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Bromomethane	74-83-9		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Carbon Dioxide	124-38-9		NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	75-15-0		0.024	< 0.0064	< 0.038	NA	NA	0.0069 J	< 0.013	< 0.006
Carbon tetrachloride	56-23-5		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Chlorobenzene	108-90-7		< 0.0094	< 0.0064	< 0.038 L	NA	NA	< 0.012	< 0.013	< 0.006
Chloroethane	75-00-3		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Chloroform	67-66-3		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Chloromethane	74-87-3		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Chloroprene	126-99-8		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Dibromochloromethane	124-48-1		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Dibromomethane	74-95-3		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Dichlorodifluoromethane	75-71-8		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Dichlorofluoromethane	75-43-4		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Diethyl ether	60-29-7		0.14	0.038	0.3	NA	NA	< 0.024	< 0.026	< 0.012
Ethyl methacrylate	97-63-2		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Ethylbenzene	100-41-4		< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSED-1	WBSED-2	WBSED-3	WB PCB-1	WB PCB-1 DUP	UTSED-1	UTSED-2	UTSED-3
Sample Date		5/22/2007	5/22/2007	5/24/2007	5/14/2007	5/14/2007	5/25/2007	5/24/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation	Investigation	Investigation
Sample Location		West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	Unnamed Tributary	Unnamed Tributary	Unnamed Tributary
Constituent	**CAS No.**								
Ethylene oxide	75-21-8	< 0.19	< 0.13	< 0.77	NA	NA	< 0.24	< 0.26	< 0.12
Iodomethane	74-88-4	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Methacrylonitrile	126-98-7	< 0.19	< 0.13	< 0.77	NA	NA	< 0.24	< 0.26	< 0.12
Methyl methacrylate	80-62-6	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Methylene Chloride	75-09-2	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
n-Heptane	142-82-5	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Pentachloroethane	76-01-7	< 0.047	< 0.032	< 0.19	NA	NA	< 0.06	< 0.065	< 0.03
Propionitrile	107-12-0	< 0.19	< 0.13	< 0.77	NA	NA	< 0.24	< 0.26	< 0.12
Propylene oxide	75-56-9	< 0.19	< 0.13	< 0.77	NA	NA	< 0.24	< 0.26	< 0.12
Styrene	100-42-5	< 0.0094	< 0.0064	< 0.038 L	NA	NA	< 0.012	< 0.013	< 0.006
t-Butanol	75-65-0	0.2	0.19	0.7	NA	NA	< 0.012 J	0.053	0.19
Tetrachloroethene	127-18-4	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Toluene	108-88-3	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
trans-1,4-Dichloro-2-butene	110-57-6	< 0.019	< 0.013	< 0.077	NA	NA	< 0.024	< 0.026	< 0.012
Trichloroethylene	79-01-6	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Trichlorofluoromethane	75-69-4	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Vinyl acetate	108-05-4	< 0.019	< 0.013	< 0.077	NA	NA	< 0.024	< 0.026	< 0.012
Vinyl chloride	75-01-4	< 0.0094	< 0.0064	< 0.038	NA	NA	< 0.012	< 0.013	< 0.006
Xylenes, Total	1330-20-7	< 0.019	< 0.013	< 0.077	NA	NA	< 0.024	< 0.026	< 0.012
Volatile Organics (TICs) (mg/kg)									
Carbon Dioxide	124-38-9	0.65 B	0.73 B	12 B	NA	NA	1.8 B	9.6 B	1.5 B
Methylcyclohexane	108-87-2	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics (mg/kg)									
1,2,4,5-Tetrachlorobenzene	95-94-3	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1,2,4-Trichlorobenzene	120-82-1	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1,2-Dichlorobenzene	95-50-1	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1,3,5-Trinitrobenzene	99-35-4	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1,3-Dichlorobenzene	541-73-1	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1,4-Dichlorobenzene	106-46-7	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1,4-Dioxane	123-91-1	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1,4-Naphthoquinone	130-15-4	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
1-Naphthalenamine	134-32-7	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,2'-oxybis[1-chloropropane]	108-60-1	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,3,4,6-Tetrachlorophenol	58-90-2	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,4,5-Trichlorophenol	95-95-4	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,4,6-Trichlorophenol	88-06-2	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,4-Dichlorophenol	120-83-2	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,4-Dimethylphenol	105-67-9	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,4-Dinitrophenol	51-28-5	< 2.8 J	< 2.3	< 4.4	NA	NA	< 3.7	< 2.4	< 2.1
2,4-Dinitrotoluene	121-14-2	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,6-Dichlorophenol	87-65-0	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2,6-Dinitrotoluene	606-20-2	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2-Acetylaminofluorene	53-96-3	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
2-Chloronaphthalene	91-58-7	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSED-1			WBSED-2			WBSED-3			WB PCB-1	WB PCB-1 DUP	UTSED-1			UTSED-2			UTSED-3		
Sample Date		5/22/2007			5/22/2007			5/24/2007			5/14/2007	5/14/2007	5/25/2007			5/24/2007			5/23/2007		
Sample Type		Investigation			Investigation			Investigation			Investigation	Duplicate	Investigation			Investigation			Investigation		
Sample Location		West Bear Creek			West Bear Creek			West Bear Creek			West Bear Creek	West Bear Creek	Unnamed Tributary			Unnamed Tributary			Unnamed Tributary		
Constituent	CAS No.																				
2-Chlorophenol	95-57-8	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
2-Methylnaphthalene	91-57-6	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
2-Methylphenol	95-48-7	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
2-Naphthalenamine	91-59-8	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
2-Nitroaniline	88-74-4	< 2.8	J		< 2.3			< 4.4			NA	NA	< 3.7			< 2.4			< 2.1		
2-Nitrophenol	88-75-5	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
2-Picoline	109-06-8	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
2-sec-Butyl-4,6-dinitrophenol	88-85-7	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
3 & 4 Methylphenol	15831-10-4	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
3,3'-Dichlorobenzidine	91-94-1	< 1.1	J		< 0.91			< 1.7			NA	NA	< 1.4			< 0.95			< 0.81		
3,3'-Dimethylbenzidine	119-93-7	< 2.8			< 2.3			< 4.4			NA	NA	< 3.7			< 2.4			< 2.1		
3-Methylcholanthrene	56-49-5	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
3-Nitroaniline	99-09-2	< 2.8	J		< 2.3			< 4.4			NA	NA	< 3.7			< 2.4			< 2.1		
4,6-Dinitro-2-methylphenol	534-52-1	< 2.8			< 2.3			< 4.4			NA	NA	< 3.7			< 2.4			< 2.1		
4-Aminobiphenyl	92-67-1	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
4-Bromophenyl phenyl ether	101-55-3	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
4-Chloro-3-methylphenol	59-50-7	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
4-Chloroaniline	106-47-8	< 1.1			< 0.91			< 1.7			NA	NA	< 1.4			< 0.95			< 0.81		
4-Chlorophenyl phenyl ether	7005-72-3	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
4-Nitroaniline	100-01-6	< 2.8	J		< 2.3			< 4.4			NA	NA	< 3.7			< 2.4			< 2.1		
4-Nitrophenol	100-02-7	< 2.8	J		< 2.3			< 4.4			NA	NA	< 3.7			< 2.4			< 2.1		
4-Nitroquinoline-1-oxide	56-57-5	5.5	R		4.6	R		8.6	R		NA	NA	7.2	R		4.8	R		4	R	
5-Nitro-o-toluidine	99-55-8	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
7,12-Dimethylbenz(a)anthracene	57-97-6	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Acenaphthene	83-32-9	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Acenaphthylene	208-96-8	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Acetophenone	98-86-2	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 110			< 93			< 170			NA	NA	< 150			< 97			< 82		
Aniline	62-53-3	< 1.1	J		< 0.91			< 1.7			NA	NA	< 1.4			< 0.95			< 0.81		
Anthracene	120-12-7	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Aramite, Total	140-57-8	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Benzo[a]anthracene	56-55-3	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			0.09	J		< 0.4		
Benzo[a]pyrene	50-32-8	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			0.087	J		< 0.4		
Benzo[b]fluoranthene	205-99-2	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			0.15	J		< 0.4		
Benzo[g,h,i]perylene	191-24-2	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			0.072	J		< 0.4		
Benzo[k]fluoranthene	207-08-9	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			0.074	J		< 0.4		
Benzyl alcohol	100-51-6	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Bis(2-chloroethoxy)methane	111-91-1	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Bis(2-chloroethyl)ether	111-44-4	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Bis(2-ethylhexyl) phthalate	117-81-7	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			0.15	J		< 0.4		
Butyl benzyl phthalate	85-68-7	< 0.55	J		< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Chrysene	218-01-9	< 0.55	J		< 0.46			0.076	J		NA	NA	< 0.72			0.16	J		< 0.4		
Diallate	2303-16-4	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		
Dibenz(a,h)anthracene	53-70-3	< 0.55			< 0.46			< 0.86			NA	NA	< 0.72			< 0.48			< 0.4		

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSED-1		WBSED-2		WBSED-3		WB PCB-1	WB PCB-1 DUP	UTSED-1		UTSED-2		UTSED-3	
Sample Date		5/22/2007		5/22/2007		5/24/2007		5/14/2007	5/14/2007	5/25/2007		5/24/2007		5/23/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation	Duplicate	Investigation		Investigation		Investigation	
Sample Location		West Bear Creek		West Bear Creek		West Bear Creek		West Bear Creek	West Bear Creek	Unnamed Tributary		Unnamed Tributary		Unnamed Tributary	
Constituent	CAS No.														
Dibenzofuran	132-64-9	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Diethyl phthalate	84-66-2	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Dimethoate	60-51-5	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Dimethyl phthalate	131-11-3	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Di-n-butyl phthalate	84-74-2	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Di-n-octyl phthalate	117-84-0	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Ethyl methanesulfonate	62-50-0	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Fluoranthene	206-44-0	< 0.55		< 0.46		0.097	J	NA	NA	< 0.72		0.2	J	< 0.4	
Fluorene	86-73-7	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Hexachlorobenzene	118-74-1	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Hexachlorobutadiene	87-68-3	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Hexachlorocyclopentadiene	77-47-4	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Hexachloroethane	67-72-1	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Hexachlorophene	70-30-4	< 280		< 230		< 440		NA	NA	< 370		< 240		< 210	
Hexachloropropene	1888-71-7	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Indeno[1,2,3-cd]pyrene	193-39-5	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		0.057	J	< 0.4	
Isophorone	78-59-1	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Isosafrole	120-58-1	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
m-Dinitrobenzene	99-65-0	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Methapyrilene	91-80-5	< 110		< 93		170	R	NA	NA	< 150		< 97		< 82	
Methyl methanesulfonate	66-27-3	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Methyl phenols, Total	1319-77-3	NA		NA		NA		NA	NA	NA		NA		NA	
Naphthalene	91-20-3	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Nitrobenzene	98-95-3	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosodiethylamine	55-18-5	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosodimethylamine	62-75-9	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosodi-n-butylamine	924-16-3	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosodi-n-propylamine	621-64-7	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosodiphenylamine	86-30-6	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosomethylethylamine	10595-95-6	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosomorpholine	59-89-2	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosopiperidine	100-75-4	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
N-Nitrosopyrrolidine	930-55-2	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
o,o',o''-Triethylphosphorothioate	126-68-1	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
o-Toluidine	95-53-4	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
p-Dimethylamino azobenzene	60-11-7	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Pentachlorobenzene	608-93-5	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Pentachloronitrobenzene	82-68-8	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Pentachlorophenol	87-86-5	< 2.8		< 2.3		< 4.4		NA	NA	< 3.7		< 2.4		< 2.1	
Phenacetin	62-44-2	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Phenanthrene	85-01-8	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		0.12	J	< 0.4	
Phenol	108-95-2	< 0.55	J	< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
p-Phenylene diamine	106-50-3	< 2.8		< 2.3		< 4.4		NA	NA	< 3.7		< 2.4		< 2.1	
Pronamide	23950-58-5	< 0.55		< 0.46		< 0.86		NA	NA	< 0.72		< 0.48		< 0.4	
Pyrene	129-00-0	< 0.55	J	0.031	J	0.076	J	NA	NA	< 0.72		0.18	J	< 0.4	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSED-1	WBSED-2	WBSED-3	WB PCB-1	WB PCB-1 DUP	UTSED-1	UTSED-2	UTSED-3
Sample Date		5/22/2007	5/22/2007	5/24/2007	5/14/2007	5/14/2007	5/25/2007	5/24/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation	Investigation	Investigation
Sample Location		West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	Unnamed Tributary	Unnamed Tributary	Unnamed Tributary
Constituent	**CAS No.**								
Pyridine	110-86-1	< 0.55 J	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
Safrole, Total	94-59-7	< 0.55	< 0.46	< 0.86	NA	NA	< 0.72	< 0.48	< 0.4
Semi-Volatile Organics (TICs) (mg/kg)									
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	38380-01-7	NA	0.25 JN	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	39485-83-1	NA	NA	NA	NA	NA	NA	0.4 JN	NA
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	37680-73-2	NA	0.26 JN	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	38380-08-4	NA	0.22 JN	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	56558-17-9	NA	0.25 JN	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, pentachloro-	25429-29-2	NA	NA	NA	NA	NA	NA	0.68 JN	NA
17-Pentatriacontene	6971-40-0	NA	NA	NA	NA	NA	NA	0.39 JN	NA
1-Decene	872-05-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Docosene	1599-67-3	NA	NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthalenepropanol, .alpha.-ethenylde	596-85-0	NA	NA	NA	NA	NA	NA	NA	NA
2-Heptacosanone		NA	NA	NA	NA	NA	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA	NA	NA	NA	NA	NA
Bacchotricuneatin c	66563-30-2	NA	NA	NA	NA	NA	NA	NA	NA
Cholestanol	80-97-7	NA	NA	NA	NA	NA	NA	NA	NA
Cyclodecane	293-96-9	NA	NA	NA	NA	NA	NA	NA	NA
Cyclododecane	294-62-2	NA	NA	NA	NA	NA	NA	NA	NA
Cyclopropane, nonyl-	74663-85-7	NA	NA	NA	NA	NA	NA	NA	NA
Eicosane	112-95-8	NA	NA	1.1 JN	NA	NA	NA	NA	NA
Ergostanol	6538-02-9	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1,2,2-tetrachloro-	79-34-5	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA	NA
.gamma.-Sitosterol	83-47-6	NA	NA	3.1 JN	NA	NA	NA	NA	0.21 JN
Heptacosane	593-49-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane	629-78-7	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 2,6,10,15-tetramethyl-	54833-48-6	NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane, 9-octyl-	7225-64-1	NA	NA	NA	NA	NA	NA	NA	NA
Hexacosane	630-01-3	NA	NA	2.3 JN	NA	NA	NA	NA	NA
Hexadecane	544-76-3	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	483-76-1	NA	NA	NA	NA	NA	NA	NA	NA
Olean-12-ene	471-68-1	NA	NA	1.2 JN	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA	NA	NA	NA	NA	NA
Tricosane	638-67-5	NA	NA	NA	NA	NA	NA	NA	NA
Vitamin E	59-02-9	NA	NA	2.1 JN	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (mg/kg)									
Acrylamide	79-06-1	< 1.5	< 1.2	< 2.5	NA	NA	< 2.1	< 1.4	< 1.2
Alcohols and Glycols (mg/kg)									
Allyl alcohol	107-18-6	< 1.7	< 1.4	< 2.6	NA	NA	< 2.2	< 1.4	< 1.2
Diethylene glycol	111-46-6	< 8.5	< 7	< 13	NA	NA	< 11	< 7.2	< 6.2
Dipropylene glycol	25265-71-8	< 8.5	< 7	< 13	NA	NA	< 11	< 7.2	< 6.2
Ethanol	64-17-5	< 1.7	< 1.4	< 2.6	NA	NA	< 2.2	< 1.4	< 1.2

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSED-1	WBSED-2	WBSED-3	WB PCB-1	WB PCB-1 DUP	UTSED-1	UTSED-2	UTSED-3
Sample Date		5/22/2007	5/22/2007	5/24/2007	5/14/2007	5/14/2007	5/25/2007	5/24/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation	Investigation	Investigation
Sample Location		West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	West Bear Creek	Unnamed Tributary	Unnamed Tributary	Unnamed Tributary
Constituent	**CAS No.**								
Ethylene glycol	107-21-1	< 8.5	< 7	< 13	NA	NA	< 11	< 7.2	< 6.2
Ethylene glycol monobutyl ether	111-76-2	< 8.5	< 7	< 13	NA	NA	< 11	< 7.2	< 6.2
Ethylene glycol monopropyl ether	2807-30-9	< 8.5	< 7	< 13	NA	NA	< 11	< 7.2	< 6.2
Isopropanol	67-63-0	< 1.7	< 1.4	< 2.6	NA	NA	< 2.2	< 1.4	< 1.2
Methanol	67-56-1	< 1.7	< 1.4	< 2.6	NA	NA	1.8 J	5	< 1.2
Propylene glycol	57-55-6	< 8.5	< 7	< 13	NA	NA	< 11	< 7.2	< 6.2
Polychlorinated Biphenyls (PCBs) (mg/kg)									
PCB-1016	12674-11-2	NA	NA	NA	< 0.078	< 0.083	NA	NA	NA
PCB-1221	11104-28-2	NA	NA	NA	< 0.16	< 0.17	NA	NA	NA
PCB-1232	11141-16-5	NA	NA	NA	< 0.078	< 0.083	NA	NA	NA
PCB-1242	53469-21-9	NA	NA	NA	< 0.078	< 0.083	NA	NA	NA
PCB-1248	12672-29-6	NA	NA	NA	< 0.078	< 0.083	NA	NA	NA
PCB-1254	11097-69-1	NA	NA	NA	0.93	1.7	NA	NA	NA
PCB-1260	11096-82-5	NA	NA	NA	0.14 J	0.69	NA	NA	NA
Pesticides and PCBs (mg/kg)									
1,1'-Biphenyl, heptachloro-	28655-71-2	NA	NA	NA	< 0.24	< 0.25	NA	NA	NA
1,1'-Biphenyl, hexachloro-	26601-64-9	NA	NA	NA	0.064 J	0.13 J	NA	NA	NA
1,1'-Biphenyl, nonachloro-	53742-07-7	NA	NA	NA	< 0.4	< 0.43	NA	NA	NA
1,1'-Biphenyl, octachloro-	55722-26-4	NA	NA	NA	< 0.24	< 0.25	NA	NA	NA
Chlorobiphenyl	27323-18-8	NA	NA	NA	< 0.078	< 0.083	NA	NA	NA
Decachlorobiphenyl	2051-24-3	NA	NA	NA	< 0.4	< 0.43	NA	NA	NA
Dichlorobiphenyl	25512-42-9	NA	NA	NA	< 0.078	< 0.083	NA	NA	NA
Pentachlorobiphenyl	25429-29-2	NA	NA	NA	0.13 J	0.11 J	NA	NA	NA
Tetrachlorobiphenyl	26914-33-0	NA	NA	NA	< 0.16	< 0.17	NA	NA	NA
Trichlorobiphenyl	25323-68-6	NA	NA	NA	< 0.078	< 0.083	NA	NA	NA
Inorganics (mg/kg)									
Aluminum	7429-90-5	20000 J	12000 J	17000	NA	NA	21000 J	10000 J	3700 J
Antimony	7440-36-0	0.46 J	1.2	0.78 J	NA	NA	3.6	1.5	< 0.54
Arsenic	7440-38-2	4.3	5.6	7.3	NA	NA	12	8.7	1.3
Barium	7440-39-3	140	100	170	NA	NA	270	91	25
Beryllium	7440-41-7	1.1	0.62	0.97	NA	NA	0.93	0.66	0.3
Cadmium	7440-43-9	0.24	0.28	1.3	NA	NA	1.5	0.83	0.052 J
Calcium	7440-70-2	3100	1500	6700	NA	NA	19000 J	11000 J	1900 J
Chromium	7440-47-3	32 K	27 K	35	NA	NA	46 J	40 J	4.4 J
Cobalt	7440-48-4	11	4.4	17	NA	NA	9.3	7.6	2.2
Copper	7440-50-8	25 K	45 K	53	NA	NA	220	64	4.5
Iron	7439-89-6	26000 J	13000 J	26000	NA	NA	29000 J	16000 J	7200 J
Lead	7439-92-1	55	54	68	NA	NA	120	130	4.4
Magnesium	7439-95-4	2000	920	1900	NA	NA	11000 J	1900 J	1400 J
Manganese	7439-96-5	290 K	210 K	600	NA	NA	520	360	190
Mercury	7439-97-6	0.086 J	0.66	0.45	NA	NA	0.47	0.44	< 0.11
Nickel	7440-02-0	15 K	18 K	31	NA	NA	62	53	2.7
Potassium	7440-09-7	1500	820	1300	NA	NA	2800	700	1200
Selenium	7782-49-2	0.34 J	0.31 J	0.61 J	NA	NA	1.2	0.66 J	< 0.54

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSED-1		WBSED-2		WBSED-3		WB PCB-1	WB PCB-1 DUP	UTSED-1		UTSED-2		UTSED-3	
Sample Date		5/22/2007		5/22/2007		5/24/2007		5/14/2007	5/14/2007	5/25/2007		5/24/2007		5/23/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation	Duplicate	Investigation		Investigation		Investigation	
Sample Location		West Bear Creek		West Bear Creek		West Bear Creek		West Bear Creek	West Bear Creek	Unnamed Tributary		Unnamed Tributary		Unnamed Tributary	
Constituent	**CAS No.**														
Silver	7440-22-4	< 0.3		0.35		0.32	J	NA	NA	0.58		0.41		< 0.22	
Sodium	7440-23-5	380		170		370		NA	NA	380		170		84	
Thallium	7440-28-0	0.27	J	0.19	J	0.32	J	NA	NA	0.33	J	0.27		0.12	J
Vanadium	7440-62-2	92	K	58	K	120		NA	NA	160		130		14	
Zinc	7440-66-6	120	J	140	J	420		NA	NA	930	K	230	K	55	K
Other Inorganics (mg/kg)															
Chloride	16887-00-6	130		200		380		NA	NA	75	B	93	B	17	J
Nitrate as N	14797-55-8	< 8.3		4	B	8.9	B	NA	NA	7.4	B	3.9	B	< 6	
Nitrite as N	14797-65-0	< 1.7		< 1.4		< 2.6		NA	NA	< 2.2		< 1.4		< 1.2	
TKN		850		900		2900		NA	NA	2300		230		300	
TOC	7440-44-0	11000		27000		78000		NA	NA	42000		54000		2400	
Sulfate	14808-79-8	240		480		1600		NA	NA	1100		790		140	

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	SD1 PCB-1	UT PCB-2	CCSED-1	CCSED-2	CCSED-3	CCSED-3 DUP	BCSED-1
Sample Identification		SD1 PCB-1	UT PCB-2	CCSED-1	CCSED-2	CCSED-3	CCSED-3 DUP	BCSED-1
Sample Date		5/25/2007	5/23/2007	5/25/2007	5/14/2007	5/21/2007	5/21/2007	5/24/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation
Sample Location		Unnamed Tributary	Unnamed Tributary	Cattail Creek	Cattail Creek	Cattail Creek	Cattail Creek	Bailey Creek
Volatile Organics (mg/kg)								
1,1,1,2-Tetrachloroethane	630-20-6	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,1,1-Trichloroethane	71-55-6	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,1,2-Trichloroethane	79-00-5	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,1-Dichloroethane	75-34-3	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,1-Dichloroethene	75-35-4	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,2,3-Trichloropropane	96-18-4	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,2-Dibromo-3-Chloropropane	96-12-8	NA	NA	< 0.03	< 0.03	< 0.02	< 0.018	< 0.031
1,2-Dibromoethane	106-93-4	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,2-Dichloroethane	107-06-2	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
trans-1,2-Dichloroethene	156-60-5	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
1,2-Dichloropropane	78-87-5	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
cis-1,3-Dichloropropene	10061-01-5	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
trans-1,3-Dichloropropene	10061-02-6	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
2-Butanone (MEK)	78-93-3	NA	NA	0.077	0.053 J	0.026 J	0.016 J	0.068 J
2-Hexanone	591-78-6	NA	NA	< 0.075	< 0.075	< 0.05	< 0.044	< 0.078
2-Methyl-1-propanol	78-83-1	NA	NA	0.6 R	0.6 R	0.4 R	0.35 R	0.63 R
3-Methylhexane	589-34-4	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
4-Methyl-2-pentanone (MIBK)	108-10-1	NA	NA	< 0.075	< 0.075	< 0.05	< 0.044	< 0.078
Acetone	67-64-1	NA	NA	0.42	0.28	0.31	0.8	0.4
Acetonitrile	75-05-8	NA	NA	< 0.6	< 0.6	< 0.4	< 0.35	< 0.63
Acrolein	107-02-8	NA	NA	< 0.3	< 0.3 J	< 0.2	< 0.18	< 0.31
Acrylonitrile	107-13-1	NA	NA	< 0.3	< 0.3 J	< 0.2	< 0.18	< 0.31
Allyl chloride	107-05-1	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Benzene	71-43-2	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Benzyl chloride	100-44-7	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Bromodichloromethane	75-27-4	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Bromoform	75-25-2	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Bromomethane	74-83-9	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Carbon Dioxide	124-38-9	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	75-15-0	NA	NA	< 0.015	< 0.015	0.01	0.008 J	0.0098 J
Carbon tetrachloride	56-23-5	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Chlorobenzene	108-90-7	NA	NA	< 0.015	< 0.015 L	< 0.01	< 0.0089	< 0.016
Chloroethane	75-00-3	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Chloroform	67-66-3	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Chloromethane	74-87-3	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Chloroprene	126-99-8	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Dibromochloromethane	124-48-1	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Dibromomethane	74-95-3	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Dichlorodifluoromethane	75-71-8	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Dichlorofluoromethane	75-43-4	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Diethyl ether	60-29-7	NA	NA	< 0.03	< 0.03	0.0044 J	0.022	< 0.031
Ethyl methacrylate	97-63-2	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016
Ethylbenzene	100-41-4	NA	NA	< 0.015	< 0.015	< 0.01	< 0.0089	< 0.016

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SD1 PCB-1	UT PCB-2	CCSED-1		CCSED-2		CCSED-3		CCSED-3 DUP		BCSED-1	
Sample Date		5/25/2007	5/23/2007	5/25/2007		5/14/2007		5/21/2007		5/21/2007		5/24/2007	
Sample Type		Investigation	Investigation	Investigation		Investigation		Investigation		Duplicate		Investigation	
Sample Location		Unnamed Tributary	Unnamed Tributary	Cattail Creek		Cattail Creek		Cattail Creek		Cattail Creek		Bailey Creek	
Constituent	**CAS No.**												
Ethylene oxide	75-21-8	NA	NA	< 0.3		< 0.3		< 0.2		< 0.18		< 0.31	
Iodomethane	74-88-4	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
Methacrylonitrile	126-98-7	NA	NA	< 0.3		< 0.3		< 0.2		< 0.18		< 0.31	
Methyl methacrylate	80-62-6	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
Methylene Chloride	75-09-2	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
n-Heptane	142-82-5	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
Pentachloroethane	76-01-7	NA	NA	< 0.075		< 0.075		< 0.05		< 0.044		< 0.078	
Propionitrile	107-12-0	NA	NA	< 0.3		< 0.3		< 0.2		< 0.18		< 0.31	
Propylene oxide	75-56-9	NA	NA	< 0.3		< 0.3		< 0.2		< 0.18		< 0.31	
Styrene	100-42-5	NA	NA	< 0.015		< 0.015	L	< 0.01		< 0.0089		< 0.016	
t-Butanol	75-65-0	NA	NA	< 0.015	J	< 0.015		0.026		0.12		< 0.016	
Tetrachloroethene	127-18-4	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
Toluene	108-88-3	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
trans-1,4-Dichloro-2-butene	110-57-6	NA	NA	< 0.03		< 0.03		< 0.02		< 0.018		< 0.031	
Trichloroethylene	79-01-6	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
Trichlorofluoromethane	75-69-4	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
Vinyl acetate	108-05-4	NA	NA	< 0.03		< 0.03		< 0.02		< 0.018		< 0.031	
Vinyl chloride	75-01-4	NA	NA	< 0.015		< 0.015		< 0.01		< 0.0089		< 0.016	
Xylenes, Total	1330-20-7	NA	NA	< 0.03		< 0.03		< 0.02		< 0.018		< 0.031	
Volatile Organics (TICs) (mg/kg)													
Carbon Dioxide	124-38-9	NA	NA	1.7	B	1.8	B	1.3	B	2.3	B	5.3	B
Methylcyclohexane	108-87-2	NA	NA	NA		NA		NA		NA		NA	
Semi-Volatile Organics (mg/kg)													
1,2,4,5-Tetrachlorobenzene	95-94-3	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1,2,4-Trichlorobenzene	120-82-1	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1,2-Dichlorobenzene	95-50-1	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1,3,5-Trinitrobenzene	99-35-4	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1,3-Dichlorobenzene	541-73-1	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1,4-Dichlorobenzene	106-46-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1,4-Dioxane	123-91-1	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1,4-Naphthoquinone	130-15-4	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
1-Naphthalenamine	134-32-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,2'-oxybis[1-chloropropane]	108-60-1	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,3,4,6-Tetrachlorophenol	58-90-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,4,5-Trichlorophenol	95-95-4	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,4,6-Trichlorophenol	88-06-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,4-Dichlorophenol	120-83-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,4-Dimethylphenol	105-67-9	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,4-Dinitrophenol	51-28-5	NA	NA	< 4.7		< 3.5		< 3.2	L	< 3.3	L	< 2.9	
2,4-Dinitrotoluene	121-14-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,6-Dichlorophenol	87-65-0	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2,6-Dinitrotoluene	606-20-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-Acetylaminofluorene	53-96-3	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-Chloronaphthalene	91-58-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SD1 PCB-1	UT PCB-2	CCSED-1		CCSED-2		CCSED-3		CCSED-3 DUP		BCSED-1	
Sample Date		5/25/2007	5/23/2007	5/25/2007		5/14/2007		5/21/2007		5/21/2007		5/24/2007	
Sample Type		Investigation	Investigation	Investigation		Investigation		Investigation		Duplicate		Investigation	
Sample Location		Unnamed Tributary	Unnamed Tributary	Cattail Creek		Cattail Creek		Cattail Creek		Cattail Creek		Bailey Creek	
Constituent	CAS No.												
2-Chlorophenol	95-57-8	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-Methylnaphthalene	91-57-6	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-Methylphenol	95-48-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-Naphthalenamine	91-59-8	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-Nitroaniline	88-74-4	NA	NA	< 4.7		< 3.5		< 3.2	L	< 3.3	L	< 2.9	
2-Nitrophenol	88-75-5	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-Picoline	109-06-8	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
2-sec-Butyl-4,6-dinitrophenol	88-85-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
3 & 4 Methylphenol	15831-10-4	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
3,3'-Dichlorobenzidine	91-94-1	NA	NA	< 1.8		< 1.4		< 1.2	L	< 1.3	L	< 1.1	
3,3'-Dimethylbenzidine	119-93-7	NA	NA	< 4.7		< 3.5		< 3.2	L	< 3.3	L	< 2.9	
3-Methylcholanthrene	56-49-5	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
3-Nitroaniline	99-09-2	NA	NA	< 4.7		< 3.5		< 3.2	L	< 3.3	L	< 2.9	
4,6-Dinitro-2-methylphenol	534-52-1	NA	NA	< 4.7		< 3.5		< 3.2	L	< 3.3	L	< 2.9	
4-Aminobiphenyl	92-67-1	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
4-Bromophenyl phenyl ether	101-55-3	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
4-Chloro-3-methylphenol	59-50-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
4-Chloroaniline	106-47-8	NA	NA	< 1.8		< 1.4		< 1.2	L	< 1.3	L	< 1.1	
4-Chlorophenyl phenyl ether	7005-72-3	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
4-Nitroaniline	100-01-6	NA	NA	< 4.7		< 3.5		< 3.2	L	< 3.3	L	< 2.9	
4-Nitrophenol	100-02-7	NA	NA	< 4.7		< 3.5		< 3.2	L	< 3.3	L	< 2.9	
4-Nitroquinoline-1-oxide	56-57-5	NA	NA	9	R	6.8	R	6.2	R	6.4	R	5.5	R
5-Nitro-o-toluidine	99-55-8	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
7,12-Dimethylbenz(a)anthracene	57-97-6	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Acenaphthene	83-32-9	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Acenaphthylene	208-96-8	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Acetophenone	98-86-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
alpha,alpha-Dimethyl phenethylamine	122-09-8	NA	NA	< 180		< 140		< 130	L	< 130	L	< 110	
Aniline	62-53-3	NA	NA	< 1.8		< 1.4		< 1.2	L	< 1.3	L	< 1.1	
Anthracene	120-12-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Aramite, Total	140-57-8	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Benzo[a]anthracene	56-55-3	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Benzo[a]pyrene	50-32-8	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Benzo[b]fluoranthene	205-99-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Benzo[g,h,i]perylene	191-24-2	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Benzo[k]fluoranthene	207-08-9	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Benzyl alcohol	100-51-6	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Bis(2-chloroethyl)ether	111-44-4	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Bis(2-ethylhexyl) phthalate	117-81-7	NA	NA	< 0.9		< 0.68		0.12	L	0.13	L	< 0.55	
Butyl benzyl phthalate	85-68-7	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Chrysene	218-01-9	NA	NA	< 0.9		< 0.68		0.05	L	< 0.64	L	< 0.55	
Diallate	2303-16-4	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	
Dibenz(a,h)anthracene	53-70-3	NA	NA	< 0.9		< 0.68		< 0.62	L	< 0.64	L	< 0.55	

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification	SD1 PCB-1	UT PCB-2	CCSED-1	CCSED-2	CCSED-3	CCSED-3 DUP	BCSED-1
Sample Date	5/25/2007	5/23/2007	5/25/2007	5/14/2007	5/21/2007	5/21/2007	5/24/2007
Sample Type	Investigation	Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation
Sample Location	Unnamed Tributary	Unnamed Tributary	Cattail Creek	Cattail Creek	Cattail Creek	Cattail Creek	Bailey Creek
Constituent / CAS No.							
Dibenzofuran 132-64-9	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Diethyl phthalate 84-66-2	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Dimethoate 60-51-5	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Dimethyl phthalate 131-11-3	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Di-n-butyl phthalate 84-74-2	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Di-n-octyl phthalate 117-84-0	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Ethyl methanesulfonate 62-50-0	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Fluoranthene 206-44-0	NA	NA	< 0.9	< 0.68	0.056 L	0.051 L	< 0.55
Fluorene 86-73-7	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Hexachlorobenzene 118-74-1	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Hexachlorobutadiene 87-68-3	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Hexachlorocyclopentadiene 77-47-4	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Hexachloroethane 67-72-1	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Hexachlorophene 70-30-4	NA	NA	< 470	< 350	320 R	330 R	< 290
Hexachloropropene 1888-71-7	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Indeno[1,2,3-cd]pyrene 193-39-5	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Isophorone 78-59-1	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Isosafrole 120-58-1	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
m-Dinitrobenzene 99-65-0	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Methapyrilene 91-80-5	NA	NA	< 180	140 R	< 130 L	< 130 L	< 110
Methyl methanesulfonate 66-27-3	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Methyl phenols, Total 1319-77-3	NA	NA	NA	NA	NA	NA	NA
Naphthalene 91-20-3	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Nitrobenzene 98-95-3	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosodiethylamine 55-18-5	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosodimethylamine 62-75-9	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosodi-n-butylamine 924-16-3	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosodi-n-propylamine 621-64-7	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosodiphenylamine 86-30-6	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosomethylethylamine 10595-95-6	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosomorpholine 59-89-2	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosopiperidine 100-75-4	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
N-Nitrosopyrrolidine 930-55-2	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
o,o',o''-Triethylphosphorothioate 126-68-1	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
o-Toluidine 95-53-4	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
p-Dimethylamino azobenzene 60-11-7	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Pentachlorobenzene 608-93-5	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Pentachloronitrobenzene 82-68-8	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Pentachlorophenol 87-86-5	NA	NA	< 4.7	< 3.5	< 3.2 L	< 3.3 L	< 2.9
Phenacetin 62-44-2	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Phenanthrene 85-01-8	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Phenol 108-95-2	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
p-Phenylene diamine 106-50-3	NA	NA	< 4.7	< 3.5	< 3.2 L	< 3.3 L	< 2.9
Pronamide 23950-58-5	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Pyrene 129-00-0	NA	NA	< 0.9	< 0.68	0.052 L	0.042 L	< 0.55

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SD1 PCB-1	UT PCB-2	CCSED-1	CCSED-2	CCSED-3	CCSED-3 DUP	BCSED-1
Sample Date		5/25/2007	5/23/2007	5/25/2007	5/14/2007	5/21/2007	5/21/2007	5/24/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation
Sample Location		Unnamed Tributary	Unnamed Tributary	Cattail Creek	Cattail Creek	Cattail Creek	Cattail Creek	Bailey Creek
Constituent	**CAS No.**							
Pyridine	110-86-1	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Safrole, Total	94-59-7	NA	NA	< 0.9	< 0.68	< 0.62 L	< 0.64 L	< 0.55
Semi-Volatile Organics (TICs) (mg/kg)								
1,1'-Biphenyl, 2,2',4,4',5-pentachloro-	38380-01-7	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,4',6-Pentachloro-	39485-83-1	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,2',4,5,5'-pentachloro-	37680-73-2	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3,3',4,4',5-hexachloro-	38380-08-4	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, 2,3',4,4',6-Pentachloro-	56558-17-9	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl, pentachloro-	25429-29-2	NA	NA	NA	NA	NA	NA	NA
17-Pentatriacontene	6971-40-0	NA	NA	NA	NA	NA	NA	NA
1-Decene	872-05-9	NA	NA	NA	NA	0.26 R	0.47 R	NA
1-Docosene	1599-67-3	NA	NA	NA	NA	NA	NA	NA
1-Dotriacontanol	6624-79-9	NA	NA	NA	NA	NA	NA	1.3 JN
1-Naphthalenepropanol, .alpha.-ethenylde	596-85-0	NA	NA	NA	NA	0.41 JN	NA	NA
2-Heptacosanone		NA	NA	NA	0.48 JN	NA	NA	NA
5(1H)-Azulenone, 2,4,6,7,8,8a-hexahydro-	6754-66-1	NA	NA	NA	NA	NA	NA	0.94 JN
Bacchotricuneatin c	66563-30-2	NA	NA	NA	NA	0.39 JN	NA	NA
Cholestanol	80-97-7	NA	NA	NA	0.66 JN	NA	NA	NA
Cyclodecane	293-96-9	NA	NA	NA	NA	NA	1 R	NA
Cyclododecane	294-62-2	NA	NA	NA	NA	NA	NA	NA
Cyclopropane, nonyl-	74663-85-7	NA	NA	NA	NA	1 JN	0.96 JN	NA
Eicosane	112-95-8	NA	NA	NA	NA	0.48 JN	NA	NA
Ergostanol	6538-02-9	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1,2,2-tetrachloro-	79-34-5	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	3 R	NA
.gamma.-Sitosterol	83-47-6	NA	NA	NA	2.1 JN	NA	NA	NA
Heptacosane	593-49-7	NA	NA	NA	0.59 JN	NA	NA	NA
Heptadecane	629-78-7	NA	NA	NA	NA	NA	NA	1.2 JN
Heptadecane, 2,6,10,15-tetramethyl-	54833-48-6	NA	NA	NA	NA	0.31 R	0.4 JN	NA
Heptadecane, 9-octyl-	7225-64-1	NA	NA	NA	NA	NA	NA	1.1 JN
Hexacosane	630-01-3	NA	NA	NA	NA	NA	NA	NA
Hexadecane	544-76-3	NA	NA	NA	NA	NA	480 JN	NA
Naphthalene, 1,2,3,5,6,8a-hexahydro-4,7-	483-76-1	NA	NA	NA	NA	NA	NA	NA
Olean-12-ene	471-68-1	NA	NA	NA	NA	NA	NA	NA
Pentacosane	629-99-2	NA	NA	NA	0.86 JN	NA	NA	NA
Tricosane	638-67-5	NA	NA	NA	NA	0.31 R	0.4 R	NA
Vitamin E	59-02-9	NA	NA	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (mg/kg)								
Acrylamide	79-06-1	NA	NA	< 2.6	< 2	< 1.9	< 1.7	< 1.5
Alcohols and Glycols (mg/kg)								
Allyl alcohol	107-18-6	NA	NA	< 2.7	< 2.1	< 1.9	< 2	< 1.7
Diethylene glycol	111-46-6	NA	NA	< 14	< 10	< 9.5	< 9.8	< 8.4
Dipropylene glycol	25265-71-8	NA	NA	< 14	< 10	< 9.5	< 9.8	< 8.4
Ethanol	64-17-5	NA	NA	< 2.7	< 2.1	< 1.9	< 2	< 1.7

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SD1 PCB-1	UT PCB-2	CCSED-1	CCSED-2	CCSED-3	CCSED-3 DUP	BCSED-1
Sample Date		5/25/2007	5/23/2007	5/25/2007	5/14/2007	5/21/2007	5/21/2007	5/24/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation
Sample Location		Unnamed Tributary	Unnamed Tributary	Cattail Creek	Cattail Creek	Cattail Creek	Cattail Creek	Bailey Creek
Constituent	**CAS No.**							
Ethylene glycol	107-21-1	NA	NA	< 14	< 10	< 9.5	< 9.8	< 8.4
Ethylene glycol monobutyl ether	111-76-2	NA	NA	< 14	< 10	< 9.5	< 9.8	< 8.4
Ethylene glycol monopropyl ether	2807-30-9	NA	NA	< 14	< 10	< 9.5	< 9.8	< 8.4
Isopropanol	67-63-0	NA	NA	< 2.7	< 2.1	< 1.9	< 2	< 1.7
Methanol	67-56-1	NA	NA	< 2.7	< 2.1	< 1.9	< 2	< 1.7
Propylene glycol	57-55-6	NA	NA	< 14	< 10	< 9.5	< 9.8	< 8.4
Polychlorinated Biphenyls (PCBs) (mg/kg)								
PCB-1016	12674-11-2	< 0.037	< 0.042	NA	NA	NA	NA	NA
PCB-1221	11104-28-2	< 0.075	< 0.086	NA	NA	NA	NA	NA
PCB-1232	11141-16-5	< 0.037	< 0.042	NA	NA	NA	NA	NA
PCB-1242	53469-21-9	< 0.037	< 0.042	NA	NA	NA	NA	NA
PCB-1248	12672-29-6	< 0.037	< 0.042	NA	NA	NA	NA	NA
PCB-1254	11097-69-1	3.6	0.2	NA	NA	NA	NA	NA
PCB-1260	11096-82-5	< 0.037	0.12	NA	NA	NA	NA	NA
Pesticides and PCBs (mg/kg)								
1,1'-Biphenyl, heptachloro-	28655-71-2	< 0.11	< 0.13	NA	NA	NA	NA	NA
1,1'-Biphenyl, hexachloro-	26601-64-9	0.08	< 0.085	NA	NA	NA	NA	NA
1,1'-Biphenyl, nonachloro-	53742-07-7	< 0.19	< 0.22	NA	NA	NA	NA	NA
1,1'-Biphenyl, octachloro-	55722-26-4	< 0.11	< 0.13	NA	NA	NA	NA	NA
Chlorobiphenyl	27323-18-8	< 0.037	< 0.042	NA	NA	NA	NA	NA
Decachlorobiphenyl	2051-24-3	< 0.19	< 0.22	NA	NA	NA	NA	NA
Dichlorobiphenyl	25512-42-9	< 0.037	< 0.042	NA	NA	NA	NA	NA
Pentachlorobiphenyl	25429-29-2	0.23	0.013 J	NA	NA	NA	NA	NA
Tetrachlorobiphenyl	26914-33-0	0.037 J	< 0.085	NA	NA	NA	NA	NA
Trichlorobiphenyl	25323-68-6	< 0.037	< 0.042	NA	NA	NA	NA	NA
Inorganics (mg/kg)								
Aluminum	7429-90-5	NA	NA	20000 J	18000	20000 J	16000 J	22000 J
Antimony	7440-36-0	NA	NA	0.56 B	2.4	1.4	1.6	< 0.75
Arsenic	7440-38-2	NA	NA	24	75	13	12	4.8
Barium	7440-39-3	NA	NA	140	180	110	120	170
Beryllium	7440-41-7	NA	NA	1.5	0.59	0.97	0.81	1.3
Cadmium	7440-43-9	NA	NA	0.26	0.37	1	0.9	0.19
Calcium	7440-70-2	NA	NA	3400 J	2300	3000	3700	1400 J
Chromium	7440-47-3	NA	NA	31 J	32	40 K	39 K	34 J
Cobalt	7440-48-4	NA	NA	7.7	6.8	11	8.6	12
Copper	7440-50-8	NA	NA	11	21	43 K	44 K	12
Iron	7439-89-6	NA	NA	13000 J	35000	19000 J	16000 J	16000 J
Lead	7439-92-1	NA	NA	20	90	100	87	21
Magnesium	7439-95-4	NA	NA	1300 J	1100	1500	1500	1800 J
Manganese	7439-96-5	NA	NA	190	210	220 K	240 K	190
Mercury	7439-97-6	NA	NA	< 0.25	0.69	0.34	0.39	< 0.15
Nickel	7440-02-0	NA	NA	10	16	18 K	17 K	13
Potassium	7440-09-7	NA	NA	1400	1100	1100	960	1800
Selenium	7782-49-2	NA	NA	0.74 J	2	0.92	0.87 J	0.51 J

Table A-3

Sediment Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	CAS No.	Sample Identification	SD1 PCB-1	UT PCB-2	CCSED-1	CCSED-2	CCSED-3	CCSED-3 DUP	BCSED-1
		Sample Date	5/25/2007	5/23/2007	5/25/2007	5/14/2007	5/21/2007	5/21/2007	5/24/2007
		Sample Type	Investigation	Investigation	Investigation	Investigation	Investigation	Duplicate	Investigation
		Sample Location	Unnamed Tributary	Unnamed Tributary	Cattail Creek	Cattail Creek	Cattail Creek	Cattail Creek	Bailey Creek
Silver	7440-22-4		NA	NA	< 0.5	0.11 J	0.37	0.47	< 0.3
Sodium	7440-23-5		NA	NA	180	730	1000	1800	240
Thallium	7440-28-0		NA	NA	0.39 J	0.51	0.38	0.36 J	0.39
Vanadium	7440-62-2		NA	NA	40	40	64 K	66 K	51
Zinc	7440-66-6		NA	NA	43 K	53	250 J	220 J	46 K
Other Inorganics (mg/kg)									
Chloride	16887-00-6		NA	NA	44 B	410	410 B	240 B	96 B
Nitrate as N	14797-55-8		NA	NA	< 13	8.6 B	< 19	5.1 B	4.1 B
Nitrite as N	14797-65-0		NA	NA	< 2.7	< 2	< 1.9 L	2 L	< 1.7
TKN			NA	NA	3000	2400	1300 L	1700 L	1500
TOC	7440-44-0		NA	NA	18000	23000	24000	16000	25000
Sulfate	14808-79-8		NA	NA	2000	900	660 K	1100 K	850

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

H - Sample prepped beyond holding time.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSW-1		ELSW-2		ELSW-3		WLSW-1		WLSW-2		WLSW-3		NLSW-1		NLSW-2	
Sample Date		5/9/2007		5/9/2007		5/10/2007		5/10/2007		5/10/2007		5/11/2007		5/8/2007		5/8/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		EWL		WWL		WWL		WWL		Natrosol Lagoon		Natrosol Lagoon	
Constituent	**CAS No.**																
Volatile Organics (ug/L)																	
1,1,1,2-Tetrachloroethane	630-20-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,1-Trichloroethane	71-55-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2,2-Tetrachloroethane	79-34-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2-Trichloroethane	79-00-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethane	75-34-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethene	75-35-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2,3-Trichloropropane	96-18-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromo-3-Chloropropane	96-12-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromoethane	106-93-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloroethane	107-06-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,2-Dichloroethene	156-60-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloropropane	78-87-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
cis-1,3-Dichloropropene	10061-01-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,3-Dichloropropene	10061-02-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
2-Butanone (MEK)	78-93-3	< 10		< 10		< 10		< 10		< 10		< 10		1.6	J	1.8	J
2-Hexanone	591-78-6	< 10		< 10		< 10		< 10		< 10		< 10		< 10		< 10	
2-Methyl-1-propanol	78-83-1	40	R	40	R	40	R	40	R	40	R	40	R	40	R	40	R
3-Methylhexane	589-34-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 10		< 10		< 10		< 10		< 10		< 10		< 10		< 10	
Acetone	67-64-1	9.3	J	7.8	J	< 25		13	J	27		35		< 25		< 25	
Acetonitrile	75-05-8	< 40		< 40		< 40		< 40		< 40		< 40		< 40		< 40	
Acrolein	107-02-8	< 20		< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Acrylonitrile	107-13-1	< 20		< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Allyl chloride	107-05-1	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzene	71-43-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzyl chloride	100-44-7	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromodichloromethane	75-27-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromoform	75-25-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromomethane	74-83-9	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Carbon Dioxide	124-38-9	NA		NA		NA		NA		NA		NA		NA		NA	
Carbon disulfide	75-15-0	< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Carbon tetrachloride	56-23-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chlorobenzene	108-90-7	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroethane	75-00-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroform	67-66-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloromethane	74-87-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroprene	126-99-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dibromochloromethane	124-48-1	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dibromomethane	74-95-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dichlorodifluoromethane	75-71-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dichlorofluoromethane	75-43-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Diethyl ether	60-29-7	< 10		< 10		< 10		< 10		< 10		< 10		< 10		< 10	
Ethyl methacrylate	97-63-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Ethylbenzene	100-41-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Ethylene oxide	75-21-8	< 200		< 200		< 200		< 200		< 200		< 200		< 200		< 200	
Iodomethane	74-88-4	< 5		< 5		< 5		< 5		< 5		< 5		< 5		< 5	
Methacrylonitrile	126-98-7	< 20		< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Methyl methacrylate	80-62-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Methylene Chloride	75-09-2	< 5		< 5		< 5		< 5		< 5		< 5		< 5		< 5	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSW-1	ELSW-2	ELSW-3	WLSW-1	WLSW-2	WLSW-3	NLSW-1	NLSW-2
Sample Date		5/9/2007	5/9/2007	5/10/2007	5/10/2007	5/10/2007	5/11/2007	5/8/2007	5/8/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	EWL	WWL	WWL	WWL	Natrosol Lagoon	Natrosol Lagoon
Constituent	**CAS No.**								
n-Heptane	142-82-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pentachloroethane	76-01-7	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Propionitrile	107-12-0	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Propylene oxide	75-56-9	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Styrene	100-42-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
t-Butanol	75-65-0	< 5	2.9 J	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	127-18-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	108-88-3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,4-Dichloro-2-btene	110-57-6	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Trichloroethylene	79-01-6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichlorofluoromethane	75-69-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Vinyl acetate	108-05-4	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Vinyl chloride	75-01-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Xylenes, Total	1330-20-7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Volatile Organics (TICs) (ug/L)									
Carbon Dioxide	124-38-9	13 B	14 B	19 B	17 B	25 B	29 B	15 B	12 B
Semi-Volatile Organics (ug/L)									
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1,2,4-Trichlorobenzene	120-82-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1,2-Dichlorobenzene	95-50-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1,3,5-Trinitrobenzene	99-35-4	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1,3-Dichlorobenzene	541-73-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1,4-Dichlorobenzene	106-46-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1,4-Dioxane	123-91-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1,4-Naphthoqinone	130-15-4	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
1-Naphthalenamine	134-32-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,4,5-Trichlorophenol	95-95-4	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,4,6-Trichlorophenol	88-06-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,4-Dichlorophenol	120-83-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,4-Dimethylphenol	105-67-9	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,4-Dinitrophenol	51-28-5	< 48	< 50	< 49	< 49	< 49	< 49	< 47	< 47
2,4-Dinitrotoluene	121-14-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,6-Dichlorophenol	87-65-0	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2,6-Dinitrotoluene	606-20-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Acetylaminoflorene	53-96-3	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Chloronaphthalene	91-58-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Chlorophenol	95-57-8	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Methylnaphthalene	91-57-6	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Methylphenol	95-48-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Naphthalenamine	91-59-8	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Nitroaniline	88-74-4	< 48	< 50	< 49	< 49	< 49	< 49	< 47	< 47
2-Nitrophenol	88-75-5	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-Picoline	109-06-8	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
2-sec-Btyl-4,6-dinitrophenol	88-85-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
3 & 4 Methylphenol	15831-10-4	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
3,3'-Dichlorobenzidine	91-94-1	< 19	< 20	< 19	< 19	< 19	< 19	< 19	< 19

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSW-1		ELSW-2		ELSW-3		WLSW-1		WLSW-2		WLSW-3		NLSW-1		NLSW-2	
Sample Date		5/9/2007		5/9/2007		5/10/2007		5/10/2007		5/10/2007		5/11/2007		5/8/2007		5/8/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		EWL		WWL		WWL		WWL		Natrosol Lagoon		Natrosol Lagoon	
Constituent	CAS No.																
3,3'-Dimethylbenzidine	119-93-7	< 19		< 20		< 19		< 19		< 19		< 19		< 19		< 19	
3-Methylcholanthrene	56-49-5	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
3-Nitroaniline	99-09-2	< 48		< 50		< 49		< 49		< 49		< 49		< 47		< 47	
4,6-Dinitro-2-methylphenol	534-52-1	< 48		< 50		< 49		< 49		< 49		< 49		< 47		< 47	
4-Aminobiphenyl	92-67-1	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
4-Bromophenyl phenyl ether	101-55-3	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
4-Chloro-3-methylphenol	59-50-7	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
4-Chloroaniline	106-47-8	< 19		< 20		< 19		< 19		< 19		< 19		< 19		< 19	
4-Chlorophenyl phenyl ether	7005-72-3	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
4-Nitroaniline	100-01-6	< 48		< 50		< 49		< 49		< 49		< 49		< 47		< 47	
4-Nitrophenol	100-02-7	< 48		< 50		< 49		< 49		< 49		< 49		< 47		< 47	
4-Nitroqinoline-1-oxide	56-57-5	19	R	20	R	19	R	19	R	19	R	19	R	19	R	19	R
5-Nitro-o-tolidine	99-55-8	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
7,12-Dimethylbenz(a)anthracene	57-97-6	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
9-Hexadecenoic acid	2091-29-4	NA		NA		NA		NA		NA		NA		NA		NA	
Acenaphthene	83-32-9	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Acenaphthylene	208-96-8	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Acetophenone	98-86-2	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 1900		< 2000		< 1900		< 1900		< 1900		< 1900		< 1900		< 1900	
Aniline	62-53-3	< 19		< 20		< 19		< 19		< 19		< 19		< 19		< 19	
Anthracene	120-12-7	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Aramite, Total	140-57-8	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Benzo[a]anthracene	56-55-3	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Benzo[a]pyrene	50-32-8	< 9.6		1	J	< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Benzo[b]fluoranthene	205-99-2	< 9.6		1.7	J	< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Benzo[g,h,i]perylene	191-24-2	< 9.6		1.1	J	< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Benzo[k]floranthene	207-08-9	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Benzyl alcohol	100-51-6	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Bis(2-chloroethoxy)methane	111-91-1	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Bis(2-chloroethyl)ether	111-44-4	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Bis(2-ethylhexyl) phthalate	117-81-7	< 9.6		< 10		< 9.7		1.1	J	1.5	J	< 9.7		< 9.4		< 9.4	
Butyl benzyl phthalate	85-68-7	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Chrysene	218-01-9	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Diallate	2303-16-4	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Dibenz(a,h)anthracene	53-70-3	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Dibenzofuran	132-64-9	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Diethyl phthalate	84-66-2	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Dimethoate	60-51-5	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Dimethyl phthalate	131-11-3	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Di-n-butyl phthalate	84-74-2	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Di-n-octyl phthalate	117-84-0	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Ethyl methaneslfonate	62-50-0	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Fluoranthene	206-44-0	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Fluorene	86-73-7	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Hexachlorobenzene	118-74-1	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Hexachlorobutadiene	87-68-3	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Hexachlorocyclopentadiene	77-47-4	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Hexachloroethane	67-72-1	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	
Hexachlorophene	70-30-4	< 4800		< 5000		4900	R	4900	R	4900	R	< 4900		4700	R	4700	R
Hexachloropropene	1888-71-7	< 9.6		< 10		< 9.7		< 9.7		< 9.7		< 9.7		< 9.4		< 9.4	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSW-1	ELSW-2	ELSW-3	WLSW-1	WLSW-2	WLSW-3	NLSW-1	NLSW-2
Sample Date		5/9/2007	5/9/2007	5/10/2007	5/10/2007	5/10/2007	5/11/2007	5/8/2007	5/8/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		EWL	EWL	EWL	WWL	WWL	WWL	Natrosol Lagoon	Natrosol Lagoon
Constituent	CAS No.								
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.6	0.86 J	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Isophorone	78-59-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Isosafrole	120-58-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
m-Dinitrobenzene	99-65-0	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Methapyrilene	91-80-5	< 1900	< 2000 J	< 1900	< 1900	< 1900	< 1900	< 1900	< 1900
Methyl methaneslfonate	66-27-3	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Naphthalene	91-20-3	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Nitrobenzene	98-95-3	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosodiethylamine	55-18-5	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosodimethylamine	62-75-9	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosodi-n-butylamine	924-16-3	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosodi-n-propylamine	621-64-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosodiphenylamine	86-30-6	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosomethylethylamine	10595-95-6	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosomorpholine	59-89-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosopiperidine	100-75-4	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
N-Nitrosopyrrolidine	930-55-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
o-Toluidine	95-53-4	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
p-Dimethylamino azobenzene	60-11-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Pentachlorobenzene	608-93-5	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Pentachloronitrobenzene	82-68-8	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Pentachlorophenol	87-86-5	< 48	< 50	< 49	< 49	< 49	< 49	< 47	< 47
Phenacetin	62-44-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Phenanthrene	85-01-8	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Phenol	108-95-2	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
p-Phenylene diamine	106-50-3	< 1900	< 2000	< 1900	< 1900	< 1900	< 1900	< 1900	< 1900
Pronamide	23950-58-5	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Pyrene	129-00-0	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Pyridine	110-86-1	< 48	< 50	< 49	< 49	< 49	< 49	< 47	< 47
Safrole, Total	94-59-7	< 9.6	< 10	< 9.7	< 9.7	< 9.7	< 9.7	< 9.4	< 9.4
Triphenylphosphine oxide	791-28-6	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics (TICs) (ug/L)									
9,12,15-Octadecatrienal	26537-71-3	NA	11 JN	NA	NA	NA	NA	NA	NA
Bromacil	314-40-9	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	120 JN	77 JN	NA	NA
Hexadecanoic acid	57-10-3	NA	NA	5.2 JN	NA	41 JN	27 JN	NA	NA
Oleic Acid	112-80-1	NA	NA	NA	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (ug/L)									
Acrylamide	79-06-1	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Alcohols and Glycols (ug/L)									
Allyl alcohol	107-18-6	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Diethylene glycol	111-46-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Dipropylene glycol	25265-71-8	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethanol	64-17-5	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Ethylene glycol	107-21-1	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monobutyl ether	111-76-2	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monopropyl ether	2807-30-9	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Isopropanol	67-63-0	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Methanol	67-56-1	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Propylene glycol	57-55-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		ELSW-1		ELSW-2		ELSW-3		WLSW-1		WLSW-2		WLSW-3		NLSW-1		NLSW-2	
Sample Date		5/9/2007		5/9/2007		5/10/2007		5/10/2007		5/10/2007		5/11/2007		5/8/2007		5/8/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		EWL		EWL		EWL		WWL		WWL		WWL		Natrosol Lagoon		Natrosol Lagoon	
Constituent	**CAS No.**																
Total Inorganics (ug/L)																	
Aluminum	7429-90-5	560		510		300		1700		95		110		320		1200	
Antimony	7440-36-0	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5	
Arsenic	7440-38-2	1.1	J	0.99	J	1.2	J	1.5	J	0.73	J	1	J	1	J	1.4	J
Barium	7440-39-3	15		16		10		16		7.4		11		14		17	
Beryllium	7440-41-7	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	
Cadmium	7440-43-9	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	
Calcium	7440-70-2	8300		9600		9100		4200		8200		9600		3300		3400	
Chromium	7440-47-3	< 5		< 5		< 5		3.8	J	< 5		< 5		< 5		1.7	J
Cobalt	7440-48-4	0.23	J	0.22	J	0.27	J	0.71		0.16	J	0.25	J	0.13	J	0.4	J
Copper	7440-50-8	3.8		3.3		3.2		6.4		2.3	J	3		2.6		3.9	
Iron	7439-89-6	580		660		550		2500		730		870		550		1500	
Lead	7439-92-1	1.8		1.6		1.6		2.9		0.56	J	0.76	J	< 1.5		1.6	
Magnesium	7439-95-4	1800		1900		1700		1500		2100		2600		2200		2200	
Manganese	7439-96-5	25		76		84		35		35		47		8.9		13	
Mercury	7439-97-6	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	
Nickel	7440-02-0	1.7		1.6		1.7		5.1		2.2		2.5		1		2	
Potassium	2023695	2000		2400		2500		1600		2800		3200		1900		1900	
Selenium	7782-49-2	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		< 2.5	
Silver	7440-22-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Sodium	7440-23-5	51000		58000		55000		31000		51000		59000		22000		21000	
Thallium	7440-28-0	< 1		< 1		0.26	J	< 1		< 1		< 1		< 1		< 1	
Vanadium	7440-62-2	4.8	J	4.3	J	3.9	J	10		< 5		< 5		< 5		3.2	J
Zinc	7440-66-6	36		28		30		33		11	J	18	J	7.1	J	11	J
Other Inorganics (ug/L)																	
Chloride	16887-00-6	58000		62000		59000	L	11000	L	25000	L	25000		5400		5500	
Nitrate as N	14797-55-8	120		< 50		< 50		50	R	< 50		< 50		< 50		< 50	
Nitrite as N	14797-65-0	< 50		< 50		< 50		110	L	< 50		< 50		< 50		< 50	
Nitrogen, Kjeldahl	7727-37-9	1600		1900		2300		4800		3900		3900		1300		1200	
Total Organic Carbon	7440-44-0	7100		7900		7300		30000		29000		29000		9900		9800	
Sulfate	14808-79-8	23000		18000		3700000		< 5000		< 5000		< 5000		20000		19000	

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-SW-1			SDB-SW-2			SDB-SW-3			SDB-SW-3 DUP			VFSP-SW-1			EBSW-1			EBSW-2			EBSW-3		
Sample Date		3/17/2009			3/17/2009			3/18/2009			3/18/2009			3/17/2009			5/23/2007			5/22/2007			5/23/2007		
Sample Type		Investigation			Investigation			Investigation			Duplicate			Investigation			Investigation			Investigation			Investigation		
Sample Location		SDB			SDB			SDB			SDB			VFSP			East Bear Creek			East Bear Creek			East Bear Creek		
Constituent	**CAS No.**																								
Volatile Organics (ug/L)																									
1,1,1,2-Tetrachloroethane	630-20-6	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,1,1-Trichloroethane	71-55-6	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,1,2,2-Tetrachloroethane	79-34-5		10	JN		8.9	JN	<	1		<	1			12	JN	<	1		<	1		<	1	
1,1,2-Trichloroethane	79-00-5	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,1-Dichloroethane	75-34-3	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,1-Dichloroethene	75-35-4	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,2,3-Trichloropropane	96-18-4	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,2-Dibromo-3-Chloropropane	96-12-8	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,2-Dibromoethane	106-93-4	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,2-Dichloroethane	107-06-2	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
trans-1,2-Dichloroethene	156-60-5	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
1,2-Dichloropropane	78-87-5	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
cis-1,3-Dichloropropene	10061-01-5	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
trans-1,3-Dichloropropene	10061-02-6	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
2-Butanone (MEK)	78-93-3	<	10			1.8	J		1.2	J	<	10		<	10		<	10		<	10		<	10	
2-Hexanone	591-78-6	<	10		<	10		<	10		<	10		<	10		<	10		<	10		<	10	
2-Methyl-1-propanol	78-83-1		40	R		40	R		40	R		40	R		40	R		40	R	<	40			40	R
3-Methylhexane	589-34-4	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
4-Methyl-2-pentanone (MIBK)	108-10-1	<	10		<	10		<	10		<	10		<	10		<	10		<	10		<	10	
Acetone	67-64-1	<	25			13	J		5.2	J	<	25		<	25			20	J	<	25		<	25	
Acetonitrile	75-05-8	<	40		<	40		<	40		<	40		<	40		<	40		<	40		<	40	
Acrolein	107-02-8	<	20		<	20		<	20		<	20		<	20		<	20		<	20		<	20	
Acrylonitrile	107-13-1	<	20		<	20		<	20		<	20		<	20		<	20		<	20		<	20	
Allyl chloride	107-05-1	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Benzene	71-43-2	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Benzyl chloride	100-44-7	<	1	J	<	1	J	<	1	J	<	1	J	<	1	J	<	1		<	1		<	1	
Bromodichloromethane	75-27-4	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Bromoform	75-25-2	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Bromomethane	74-83-9	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Carbon Dioxide	124-38-9		44	B		34	B		27	B		28	B		38	B		43	B		NA			36	B
Carbon disulfide	75-15-0	<	2		<	2		<	2		<	2		<	2		<	2		<	2		<	2	
Carbon tetrachloride	56-23-5	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Chlorobenzene	108-90-7	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Chloroethane	75-00-3	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Chloroform	67-66-3	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Chloromethane	74-87-3	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Chloroprene	126-99-8	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Dibromochloromethane	124-48-1	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Dibromomethane	74-95-3	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Dichlorodifluoromethane	75-71-8	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Dichlorofluoromethane	75-43-4	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Diethyl ether	60-29-7	<	10		<	10		<	10		<	10		<	10		<	10		<	10		<	10	
Ethyl methacrylate	97-63-2	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Ethylbenzene	100-41-4	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Ethylene oxide	75-21-8	<	200		<	200		<	200		<	200		<	200		<	200		<	200		<	200	
Iodomethane	74-88-4	<	5		<	5		<	5		<	5		<	5		<	5		<	5		<	5	
Methacrylonitrile	126-98-7	<	20		<	20		<	20		<	20		<	20		<	20		<	20		<	20	
Methyl methacrylate	80-62-6	<	1		<	1		<	1		<	1		<	1		<	1		<	1		<	1	
Methylene Chloride	75-09-2	<	5		<	5		<	5		<	5		<	5		<	5		<	5		<	5	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-SW-1		SDB-SW-2		SDB-SW-3		SDB-SW-3 DUP		VFSP-SW-1		EBSW-1		EBSW-2		EBSW-3	
Sample Date		3/17/2009		3/17/2009		3/18/2009		3/18/2009		3/17/2009		5/23/2007		5/22/2007		5/23/2007	
Sample Type		Investigation		Investigation		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB		SDB		SDB		SDB		VFSP		East Bear Creek		East Bear Creek		East Bear Creek	
Constituent	**CAS No.**																
n-Heptane	142-82-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Pentachloroethane	76-01-7	< 5	J	< 5	J	< 5	J	< 5	J	< 5	J	< 5		< 5		< 5	
Propionitrile	107-12-0	< 20		< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Propylene oxide	75-56-9	< 200		< 200		< 200		< 200		< 200		< 200		< 200		< 200	
Styrene	100-42-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
t-Butanol	75-65-0	< 5		11		< 5		< 5		4.9	J	< 5		30		43	
Tetrachloroethene	127-18-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Toluene	108-88-3	< 1		0.51	J	< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,4-Dichloro-2-btene	110-57-6	< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Trichloroethylene	79-01-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Trichlorofluoromethane	75-69-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Vinyl acetate	108-05-4	< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Vinyl chloride	75-01-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Xylenes, Total	1330-20-7	< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Volatile Organics (TICs) (ug/L)																	
Carbon Dioxide	124-38-9	NA		NA		NA		NA		NA		NA		140	B	NA	
Semi-Volatile Organics (ug/L)																	
1,1,2,2-Tetrachloroethane	79-34-5	10	JN	8.9	JN	NA		NA		12	JN	NA		NA		NA	
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1,2,4-Trichlorobenzene	120-82-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1,2-Dichlorobenzene	95-50-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1,3,5-Trinitrobenzene	99-35-4	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1,3-Dichlorobenzene	541-73-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1,4-Dichlorobenzene	106-46-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1,4-Dioxane	123-91-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1,4-Naphthoqinone	130-15-4	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
1-Naphthalenamine	134-32-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,4,5-Trichlorophenol	95-95-4	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,4,6-Trichlorophenol	88-06-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,4-Dichlorophenol	120-83-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,4-Dimethylphenol	105-67-9	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		9.7	L	< 9.7	
2,4-Dinitrophenol	51-28-5	< 47		< 49		< 47		< 47		< 47		< 49		< 49		< 49	
2,4-Dinitrotoluene	121-14-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,6-Dichlorophenol	87-65-0	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2,6-Dinitrotoluene	606-20-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Acetylaminoflorene	53-96-3	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Chloronaphthalene	91-58-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Chlorophenol	95-57-8	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Methylnaphthalene	91-57-6	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Methylphenol	95-48-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Naphthalenamine	91-59-8	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Nitroaniline	88-74-4	< 47		< 49		< 47		< 47		< 47		< 49		< 49		< 49	
2-Nitrophenol	88-75-5	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-Picoline	109-06-8	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
2-sec-Btyl-4,6-dinitrophenol	88-85-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
3 & 4 Methylphenol	15831-10-4	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
3,3'-Dichlorobenzidine	91-94-1	< 19		< 19		< 19		< 19		< 19		< 20		< 19		< 19	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-SW-1		SDB-SW-2		SDB-SW-3		SDB-SW-3 DUP		VFSP-SW-1		EBSW-1		EBSW-2		EBSW-3	
Sample Date		3/17/2009		3/17/2009		3/18/2009		3/18/2009		3/17/2009		5/23/2007		5/22/2007		5/23/2007	
Sample Type		Investigation		Investigation		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB		SDB		SDB		SDB		VFSP		East Bear Creek		East Bear Creek		East Bear Creek	
Constituent	CAS No.																
3,3'-Dimethylbenzidine	119-93-7	< 19		< 19		< 19		< 19		< 19		< 20		< 19		< 19	
3-Methylcholanthrene	56-49-5	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
3-Nitroaniline	99-09-2	< 47		< 49		< 47		< 47		< 47		< 49		< 49		< 49	
4,6-Dinitro-2-methylphenol	534-52-1	< 47		< 49		< 47		< 47		< 47		< 49		< 49		< 49	
4-Aminobiphenyl	92-67-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
4-Bromophenyl phenyl ether	101-55-3	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
4-Chloro-3-methylphenol	59-50-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
4-Chloroaniline	106-47-8	< 19		< 19		< 19		< 19		< 19		< 20		< 19		< 19	
4-Chlorophenyl phenyl ether	7005-72-3	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
4-Nitroaniline	100-01-6	< 47		< 49		< 47		< 47		< 47		< 49		< 49		< 49	
4-Nitrophenol	100-02-7	< 47		< 49		< 47		< 47		< 47		< 49		< 49		< 49	
4-Nitroqinoline-1-oxide	56-57-5	19	R	19	R	19	R	19	R	19	R	20	R	19	R	19	R
5-Nitro-o-tolidine	99-55-8	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
7,12-Dimethylbenz(a)anthracene	57-97-6	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
9-Hexadecenoic acid	2091-29-4	NA		4.2	JN	NA		NA		NA		NA		NA		NA	
Acenaphthene	83-32-9	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Acenaphthylene	208-96-8	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Acetophenone	98-86-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
alpha,alpha-Dimethyl phenethylamine	122-09-8	< 1900		< 1900		< 1900		< 1900		< 1900		< 2000		1900	R	< 1900	
Aniline	62-53-3	< 19		< 19		< 19		< 19		< 19		< 20		< 19		< 19	
Anthracene	120-12-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Aramite, Total	140-57-8	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Benzo[a]anthracene	56-55-3	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Benzo[a]pyrene	50-32-8	0.66	J	< 9.7		< 9.4		< 9.4		0.96	J	< 9.8		< 9.7		< 9.7	
Benzo[b]fluoranthene	205-99-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Benzo[g,h,i]perylene	191-24-2	1.2	J	0.71	J	< 9.4		< 9.4		1.5	J	< 9.8		< 9.7		< 9.7	
Benzo[k]floranthene	207-08-9	< 9.4		< 9.7		< 9.4		< 9.4		0.58	J	< 9.8		< 9.7		< 9.7	
Benzyl alcohol	100-51-6	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Bis(2-chloroethoxy)methane	111-91-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Bis(2-chloroethyl)ether	111-44-4	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Bis(2-ethylhexyl) phthalate	117-81-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Butyl benzyl phthalate	85-68-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Chrysene	218-01-9	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Diallate	2303-16-4	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Dibenz(a,h)anthracene	53-70-3	1.3	J	0.64	J	< 9.4		< 9.4		2.6	J	< 9.8		< 9.7		< 9.7	
Dibenzofuran	132-64-9	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Diethyl phthalate	84-66-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Dimethoate	60-51-5	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Dimethyl phthalate	131-11-3	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Di-n-butyl phthalate	84-74-2	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		1	J	< 9.7		< 9.7	
Di-n-octyl phthalate	117-84-0	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Ethyl methaneslfonate	62-50-0	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Fluoranthene	206-44-0	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Fluorene	86-73-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Hexachlorobenzene	118-74-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Hexachlorobutadiene	87-68-3	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Hexachlorocyclopentadiene	77-47-4	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Hexachloroethane	67-72-1	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	
Hexachlorophene	70-30-4	< 4700		< 4900		< 4700		< 4700		< 4700		< 4900		4900	R	< 4900	
Hexachloropropene	1888-71-7	< 9.4		< 9.7		< 9.4		< 9.4		< 9.4		< 9.8		< 9.7		< 9.7	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-SW-1	SDB-SW-2	SDB-SW-3	SDB-SW-3 DUP	VFSP-SW-1	EBSW-1	EBSW-2	EBSW-3
Sample Date		3/17/2009	3/17/2009	3/18/2009	3/18/2009	3/17/2009	5/23/2007	5/22/2007	5/23/2007
Sample Type		Investigation	Investigation	Investigation	Duplicate	Investigation	Investigation	Investigation	Investigation
Sample Location		SDB	SDB	SDB	SDB	VFSP	East Bear Creek	East Bear Creek	East Bear Creek
Constituent	**CAS No.**								
Indeno[1,2,3-cd]pyrene	193-39-5	1.3 J	< 9.7	< 9.4	< 9.4	1.7 J	< 9.8	< 9.7	< 9.7
Isophorone	78-59-1	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Isosafrole	120-58-1	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
m-Dinitrobenzene	99-65-0	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Methapyrilene	91-80-5	< 1900	< 1900	< 1900	< 1900	< 1900	< 2000	1900 R	< 1900
Methyl methaneslfonate	66-27-3	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Naphthalene	91-20-3	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Nitrobenzene	98-95-3	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosodiethylamine	55-18-5	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosodimethylamine	62-75-9	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosodi-n-butylamine	924-16-3	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosodi-n-propylamine	621-64-7	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosodiphenylamine	86-30-6	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosomethylethylamine	10595-95-6	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosomorpholine	59-89-2	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosopiperidine	100-75-4	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
N-Nitrosopyrrolidine	930-55-2	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
o-Toluidine	95-53-4	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
p-Dimethylamino azobenzene	60-11-7	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Pentachlorobenzene	608-93-5	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Pentachloronitrobenzene	82-68-8	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Pentachlorophenol	87-86-5	< 47	< 49	< 47	< 47	< 47	< 49	< 49	< 49
Phenacetin	62-44-2	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Phenanthrene	85-01-8	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Phenol	108-95-2	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
p-Phenylene diamine	106-50-3	< 1900 J	< 1900 J	< 1900	< 1900	< 1900 J	< 2000	< 1900	< 1900
Pronamide	23950-58-5	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Pyrene	129-00-0	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Pyridine	110-86-1	< 47	< 49	< 47	< 47	< 47	< 49	< 49	< 49
Safrole, Total	94-59-7	< 9.4	< 9.7	< 9.4	< 9.4	< 9.4	< 9.8	< 9.7	< 9.7
Triphenylphosphine oxide	791-28-6	NA	NA	6.9 B	12 B	NA	NA	NA	NA
Semi-Volatile Organics (TICs) (ug/L)									
9,12,15-Octadecatrienal	26537-71-3	NA	NA	NA	NA	NA	NA	NA	NA
Bromacil	314-40-9	NA	NA	NA	NA	NA	NA	NA	11 JN
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	NA	NA	NA
Hexadecanoic acid	57-10-3	NA	NA	NA	NA	NA	NA	NA	NA
Oleic Acid	112-80-1	NA	NA	NA	NA	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (ug/L)									
Acrylamide	79-06-1	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Alcohols and Glycols (ug/L)									
Allyl alcohol	107-18-6	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Diethylene glycol	111-46-6	< 5000	< 5000	< 5000	< 5000	1000 J	< 5000	< 5000	< 5000
Dipropylene glycol	25265-71-8	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethanol	64-17-5	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Ethylene glycol	107-21-1	3500 J	5100	3400 J	4100 J	1000 J	< 5000	< 5000	< 5000
Ethylene glycol monobutyl ether	111-76-2	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monopropyl ether	2807-30-9	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Isopropanol	67-63-0	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Methanol	67-56-1	< 1000	< 1000	< 1000	< 1000	< 1000	890 J	< 1000	790 J
Propylene glycol	57-55-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		SDB-SW-1		SDB-SW-2		SDB-SW-3		SDB-SW-3 DUP		VFSP-SW-1		EBSW-1		EBSW-2		EBSW-3	
Sample Date		3/17/2009		3/17/2009		3/18/2009		3/18/2009		3/17/2009		5/23/2007		5/22/2007		5/23/2007	
Sample Type		Investigation		Investigation		Investigation		Duplicate		Investigation		Investigation		Investigation		Investigation	
Sample Location		SDB		SDB		SDB		SDB		VFSP		East Bear Creek		East Bear Creek		East Bear Creek	
Constituent	**CAS No.**																
Total Inorganics (ug/L)																	
Aluminum	7429-90-5	320		540		1100		950		830		65000	J	760	K	670	J
Antimony	7440-36-0	< 2.5		< 2.5		< 2.5		< 2.5		0.52	J	< 2.5		< 2.5		< 2.5	
Arsenic	7440-38-2	0.95	J	0.68	J	0.75	J	0.6	J	1.2	J	28		1.3	J	1	J
Barium	7440-39-3	9.9		7.1		42		23		41		340		87		73	
Beryllium	7440-41-7	< 0.5		< 0.5		0.2	B	0.09	B	0.1	B	3.5		< 0.5		0.36	J
Cadmium	7440-43-9	< 0.5		< 0.5		0.15	B	< 0.5		< 0.5		0.37	J	< 0.5		1.4	
Calcium	7440-70-2	2900		3500		4500		3600		3300		15000		41000		60000	
Chromium	7440-47-3	1.8	B	1.9	B	2.5	J	1.9	J	4.2	B	120		< 5		< 5	
Cobalt	7440-48-4	0.47	J	0.27	J	2.2		0.85		1.2		20		1.1		19	
Copper	7440-50-8	< 5		1.6	B	6.7		4.1	J	7.7		81		2.9		12	B
Iron	7439-89-6	5400		2500		2100		1100		7000		67000		2000		800	
Lead	7439-92-1	1	J	0.49	J	2		0.59	J	5.2		46		1.5	J	1.7	
Magnesium	7439-95-4	1500		1600		2100		1900		940		7400		12000		11000	
Manganese	7439-96-5	49		67		350	L	120	L	25		410		500	J	1300	
Mercury	7439-97-6	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		0.27	J	< 0.5		< 0.5	
Nickel	7440-02-0	1.4	B	1.3	B	4.1		3.1		3.8		41		2.1		19	
Potassium	2023695	4900		4100		3800		4000		2700		6000		2500		7500	
Selenium	7782-49-2	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5		1.9	J	< 2.5		1.2	J
Silver	7440-22-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Sodium	7440-23-5	3500		4100		4000		3900		3600		11000		200000	J	52000	
Thallium	7440-28-0	< 1		< 1		< 1		< 1		< 1		1.8		< 1		0.33	J
Vanadium	7440-62-2	3.1	B	2.6	B	5.3		3	J	5.4	B	140		44	J	< 5	
Zinc	7440-66-6	8.1	J	13	J	58		34		120		170		19	J	380	
Other Inorganics (ug/L)																	
Chloride	16887-00-6	6100		5100		3300		3700		2800		7900		48000		28000	
Nitrate as N	14797-55-8	< 250		< 250		71		140		380		< 50		64	B	17000	
Nitrite as N	14797-65-0	< 50		< 50		< 50		< 50		15	B	< 50		26	J	220	
Nitrogen, Kjeldahl	7727-37-9	1000	L	1600	B	1200	L	1100	L	870	L	4600		1300		9400	
Total Organic Carbon	7440-44-0	12000		13000		21000		19000		6000		10000		13000		200000	
Sulfate	14808-79-8	9300		7300		14000		14000		17000		17000		< 5000		200000	

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSW-1		WBSW-2		WBSW-3		UTSW-1		UTSW-2		UTSW-3		CCSW-1		CCSW-2	
Sample Date		5/22/2007		5/22/2007		5/14/2007		5/25/2007		5/24/2007		5/23/2007		5/25/2007		5/14/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		West Bear Creek		West Bear Creek		West Bear Creek		Unnamed Tributary		Unnamed Tributary		Unnamed Tributary		Cattail Creek		Cattail Creek	
Constituent	CAS No.																
Volatile Organics (ug/L)																	
1,1,1,2-Tetrachloroethane	630-20-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,1-Trichloroethane	71-55-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2,2-Tetrachloroethane	79-34-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1,2-Trichloroethane	79-00-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethane	75-34-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,1-Dichloroethene	75-35-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2,3-Trichloropropane	96-18-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromo-3-Chloropropane	96-12-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dibromoethane	106-93-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloroethane	107-06-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,2-Dichloroethene	156-60-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
1,2-Dichloropropane	78-87-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
cis-1,3-Dichloropropene	10061-01-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
trans-1,3-Dichloropropene	10061-02-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
2-Butanone (MEK)	78-93-3	< 10		< 10		< 10		< 10		< 10		< 10		< 10		< 10	
2-Hexanone	591-78-6	< 10		< 10		< 10		< 10		< 10		< 10		< 10		< 10	
2-Methyl-1-propanol	78-83-1	40	R	40	R	40	R	40	R	40	R	40	R	40	R	40	R
3-Methylhexane	589-34-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
4-Methyl-2-pentanone (MIBK)	108-10-1	< 10		< 10		< 10		< 10		< 10		< 10		< 10		< 10	
Acetone	67-64-1	< 25		< 25		< 25		< 25		< 25		< 25		< 25		< 25	
Acetonitrile	75-05-8	< 40		< 40		< 40		< 40		< 40		< 40		< 40		< 40	
Acrolein	107-02-8	< 20		< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Acrylonitrile	107-13-1	< 20		< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Allyl chloride	107-05-1	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzene	71-43-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Benzyl chloride	100-44-7	< 1		< 1		< 1		< 1	J	< 1		< 1		< 1	J	< 1	
Bromodichloromethane	75-27-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromoform	75-25-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Bromomethane	74-83-9	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Carbon Dioxide	124-38-9	NA		NA		NA		NA		100	B	85	B	NA		NA	
Carbon disulfide	75-15-0	< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Carbon tetrachloride	56-23-5	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chlorobenzene	108-90-7	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroethane	75-00-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroform	67-66-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloromethane	74-87-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Chloroprene	126-99-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dibromochloromethane	124-48-1	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dibromomethane	74-95-3	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dichlorodifluoromethane	75-71-8	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Dichlorofluoromethane	75-43-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Diethyl ether	60-29-7	16		12		9.2	J	< 10		< 10		1.3	J	< 10		< 10	
Ethyl methacrylate	97-63-2	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Ethylbenzene	100-41-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Ethylene oxide	75-21-8	< 200		< 200		< 200		< 200		< 200		< 200		< 200		< 200	
Iodomethane	74-88-4	< 5		< 5		< 5		< 5		< 5		< 5		< 5		< 5	
Methacrylonitrile	126-98-7	< 20		< 20		< 20		< 20		< 20		< 20		< 20		< 20	
Methyl methacrylate	80-62-6	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Methylene Chloride	75-09-2	< 5		< 5		< 5		< 5		< 5		< 5		< 5		< 5	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSW-1	WBSW-2	WBSW-3	UTSW-1	UTSW-2	UTSW-3	CCSW-1	CCSW-2
Sample Date		5/22/2007	5/22/2007	5/14/2007	5/25/2007	5/24/2007	5/23/2007	5/25/2007	5/14/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		West Bear Creek	West Bear Creek	West Bear Creek	Unnamed Tributary	Unnamed Tributary	Unnamed Tributary	Cattail Creek	Cattail Creek
Constituent	**CAS No.**								
n-Heptane	142-82-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pentachloroethane	76-01-7	< 5	< 5	< 5 J	5 R	< 5	< 5	5 R	< 5 J
Propionitrile	107-12-0	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Propylene oxide	75-56-9	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Styrene	100-42-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
t-Butanol	75-65-0	< 5	< 5	< 5	< 5	< 5	51	< 5	< 5
Tetrachloroethene	127-18-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	108-88-3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,4-Dichloro-2-btene	110-57-6	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Trichloroethylene	79-01-6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichlorofluoromethane	75-69-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Vinyl acetate	108-05-4	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Vinyl chloride	75-01-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Xylenes, Total	1330-20-7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Volatile Organics (TICs) (ug/L)									
Carbon Dioxide	124-38-9	56 B	54 B	42 B	51 B	NA	NA	39 B	32 B
Semi-Volatile Organics (ug/L)									
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	95-94-3	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
1,2,4-Trichlorobenzene	120-82-1	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
1,2-Dichlorobenzene	95-50-1	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
1,3,5-Trinitrobenzene	99-35-4	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
1,3-Dichlorobenzene	541-73-1	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
1,4-Dichlorobenzene	106-46-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
1,4-Dioxane	123-91-1	< 10	< 9.7	2.6 J	< 9.6	< 10	< 10	< 10	< 9.6
1,4-Naphthoqinone	130-15-4	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
1-Naphthalenamine	134-32-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,2'-oxybis[1-chloropropane]	108-60-1	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,3,4,6-Tetrachlorophenol	58-90-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,4,5-Trichlorophenol	95-95-4	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,4,6-Trichlorophenol	88-06-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,4-Dichlorophenol	120-83-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,4-Dimethylphenol	105-67-9	10 L	9.7 L	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,4-Dinitrophenol	51-28-5	< 50	< 49	< 50	< 48	< 50	< 50	< 50	< 48
2,4-Dinitrotoluene	121-14-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,6-Dichlorophenol	87-65-0	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2,6-Dinitrotoluene	606-20-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Acetylaminoflorene	53-96-3	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Chloronaphthalene	91-58-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Chlorophenol	95-57-8	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Methylnaphthalene	91-57-6	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Methylphenol	95-48-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Naphthalenamine	91-59-8	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Nitroaniline	88-74-4	< 50	< 49	< 50	< 48	< 50	< 50	< 50	< 48
2-Nitrophenol	88-75-5	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-Picoline	109-06-8	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
2-sec-Btyl-4,6-dinitrophenol	88-85-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
3 & 4 Methylphenol	15831-10-4	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
3,3'-Dichlorobenzidine	91-94-1	< 20	< 19	20 R	< 19	< 20	< 20	< 20	19 R

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSW-1		WBSW-2		WBSW-3		UTSW-1		UTSW-2		UTSW-3		CCSW-1		CCSW-2	
Sample Date		5/22/2007		5/22/2007		5/14/2007		5/25/2007		5/24/2007		5/23/2007		5/25/2007		5/14/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		West Bear Creek		West Bear Creek		West Bear Creek		Unnamed Tributary		Unnamed Tributary		Unnamed Tributary		Cattail Creek		Cattail Creek	
Constituent	CAS No.																
3,3'-Dimethylbenzidine	119-93-7	< 20		< 19		< 20		< 19		< 20		< 20		< 20		< 19	
3-Methylcholanthrene	56-49-5	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
3-Nitroaniline	99-09-2	< 50		< 49		< 50	L	< 48		< 50		< 50		< 50		< 48	L
4,6-Dinitro-2-methylphenol	534-52-1	< 50		< 49		< 50		< 48		< 50		< 50		< 50		< 48	
4-Aminobiphenyl	92-67-1	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
4-Bromophenyl phenyl ether	101-55-3	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
4-Chloro-3-methylphenol	59-50-7	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
4-Chloroaniline	106-47-8	< 20		< 19		< 20		< 19		< 20		< 20		< 20		< 19	
4-Chlorophenyl phenyl ether	7005-72-3	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
4-Nitroaniline	100-01-6	< 50		< 49		< 50		< 48		< 50		< 50		< 50		< 48	
4-Nitrophenol	100-02-7	< 50		< 49		< 50		< 48		< 50		< 50		< 50		< 48	
4-Nitroqinoline-1-oxide	56-57-5	20	R	19	R	20	R	19	R	20	R	20	R	20	R	19	R
5-Nitro-o-tolidine	99-55-8	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
7,12-Dimethylbenz(a)anthracene	57-97-6	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
9-Hexadecenoic acid	2091-29-4	NA		NA		NA		NA		NA		NA		NA		NA	
Acenaphthene	83-32-9	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Acenaphthylene	208-96-8	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Acetophenone	98-86-2	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
alpha,alpha-Dimethyl phenethylamine	122-09-8	2000	R	1900	R	< 2000		< 1900		< 2000		< 2000		< 2000		< 1900	
Aniline	62-53-3	< 20		< 19		< 20		< 19		< 20		< 20		< 20		< 19	
Anthracene	120-12-7	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Aramite, Total	140-57-8	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Benzo[a]anthracene	56-55-3	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Benzo[a]pyrene	50-32-8	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Benzo[b]fluoranthene	205-99-2	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Benzo[g,h,i]perylene	191-24-2	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Benzo[k]floranthene	207-08-9	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Benzyl alcohol	100-51-6	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Bis(2-chloroethoxy)methane	111-91-1	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Bis(2-chloroethyl)ether	111-44-4	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Bis(2-ethylhexyl) phthalate	117-81-7	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Butyl benzyl phthalate	85-68-7	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Chrysene	218-01-9	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Diallate	2303-16-4	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Dibenz(a,h)anthracene	53-70-3	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Dibenzofuran	132-64-9	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Diethyl phthalate	84-66-2	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Dimethoate	60-51-5	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Dimethyl phthalate	131-11-3	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Di-n-butyl phthalate	84-74-2	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Di-n-octyl phthalate	117-84-0	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Ethyl methaneslfonate	62-50-0	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Fluoranthene	206-44-0	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Fluorene	86-73-7	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Hexachlorobenzene	118-74-1	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Hexachlorobutadiene	87-68-3	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Hexachlorocyclopentadiene	77-47-4	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Hexachloroethane	67-72-1	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	
Hexachlorophene	70-30-4	5000	R	4900	R	5000	R	< 4800		5000	R	< 5000		< 5000		4800	R
Hexachloropropene	1888-71-7	< 10		< 9.7		< 10		< 9.6		< 10		< 10		< 10		< 9.6	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSW-1	WBSW-2	WBSW-3	UTSW-1	UTSW-2	UTSW-3	CCSW-1	CCSW-2
Sample Date		5/22/2007	5/22/2007	5/14/2007	5/25/2007	5/24/2007	5/23/2007	5/25/2007	5/14/2007
Sample Type		Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample Location		West Bear Creek	West Bear Creek	West Bear Creek	Unnamed Tributary	Unnamed Tributary	Unnamed Tributary	Cattail Creek	Cattail Creek
Constituent	**CAS No.**								
Indeno[1,2,3-cd]pyrene	193-39-5	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Isophorone	78-59-1	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Isosafrole	120-58-1	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
m-Dinitrobenzene	99-65-0	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Methapyrilene	91-80-5	2000 R	1900 R	2000 R	< 1900	< 2000	< 2000	< 2000	1900 R
Methyl methaneslfonate	66-27-3	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Naphthalene	91-20-3	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Nitrobenzene	98-95-3	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosodiethylamine	55-18-5	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosodimethylamine	62-75-9	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosodi-n-butylamine	924-16-3	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosodi-n-propylamine	621-64-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosodiphenylamine	86-30-6	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosomethylethylamine	10595-95-6	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosomorpholine	59-89-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosopiperidine	100-75-4	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
N-Nitrosopyrrolidine	930-55-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
o,o',o''-Triethylphosphorothioate	126-68-1	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
o-Toluidine	95-53-4	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
p-Dimethylamino azobenzene	60-11-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Pentachlorobenzene	608-93-5	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Pentachloronitrobenzene	82-68-8	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Pentachlorophenol	87-86-5	< 50	< 49	< 50	< 48	< 50	< 50	< 50	< 48
Phenacetin	62-44-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Phenanthrene	85-01-8	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Phenol	108-95-2	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
p-Phenylene diamine	106-50-3	< 2000	< 1900	< 2000	< 1900	< 2000	< 2000	< 2000	< 1900
Pronamide	23950-58-5	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Pyrene	129-00-0	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Pyridine	110-86-1	< 50	< 49	< 50	< 48	< 50	< 50	< 50	< 48
Safrole, Total	94-59-7	< 10	< 9.7	< 10	< 9.6	< 10	< 10	< 10	< 9.6
Triphenylphosphine oxide	791-28-6	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics (TICs) (ug/L)									
9,12,15-Octadecatrienal	26537-71-3	NA	NA	NA	NA	NA	NA	NA	NA
Bromacil	314-40-9	NA	NA	NA	NA	NA	NA	NA	NA
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA	NA	NA	NA	NA	120 JN	NA	NA
Hexadecanoic acid	57-10-3	NA	NA	NA	NA	NA	NA	NA	NA
Oleic Acid	112-80-1	NA	NA	NA	6.4 JN	NA	NA	NA	NA
Acrylamide, Acrylonitrile and Acrolein (ug/L)									
Acrylamide	79-06-1	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Alcohols and Glycols (ug/L)									
Allyl alcohol	107-18-6	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Diethylene glycol	111-46-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Dipropylene glycol	25265-71-8	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethanol	64-17-5	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Ethylene glycol	107-21-1	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monobutyl ether	111-76-2	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Ethylene glycol monopropyl ether	2807-30-9	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Isopropanol	67-63-0	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Methanol	67-56-1	< 1000	< 1000	< 1000	< 1000	< 1000	640 J	< 1000	< 1000
Propylene glycol	57-55-6	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		WBSW-1		WBSW-2		WBSW-3		UTSW-1		UTSW-2		UTSW-3		CCSW-1		CCSW-2	
Sample Date		5/22/2007		5/22/2007		5/14/2007		5/25/2007		5/24/2007		5/23/2007		5/25/2007		5/14/2007	
Sample Type		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation		Investigation	
Sample Location		West Bear Creek		West Bear Creek		West Bear Creek		Unnamed Tributary		Unnamed Tributary		Unnamed Tributary		Cattail Creek		Cattail Creek	
Constituent	**CAS No.**																
Total Inorganics (ug/L)																	
Aluminum	7429-90-5	1600	K	4000	K	1100		68		1400	J	4800	J	940		1700	
Antimony	7440-36-0	1.5	B	1.8	B	1.5	J	< 2.5		< 2.5		< 2.5		< 2.5		< 2.5	
Arsenic	7440-38-2	2.5		2.9		1.6	J	3.5		2.1	J	4.5		4.8		5.9	
Barium	7440-39-3	68		90		71		58		140		170		77		73	
Beryllium	7440-41-7	< 0.5		0.15	J	< 0.5		< 0.5		< 0.5		0.3	J	< 0.5		< 0.5	
Cadmium	7440-43-9	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		0.31	J	< 0.5		0.12	J
Calcium	7440-70-2	51000		59000		46000		55000		120000		83000		46000		33000	
Chromium	7440-47-3	3.4	J	6.5		1.6	J	< 5		2.6	J	8		2.5	J	3.7	J
Cobalt	7440-48-4	0.74		1.7		2.7		0.62		0.64		3.9		2.3		2.6	
Copper	7440-50-8	4.5		7.3		5.3		2.1	B	3.8		12	B	4.3		10	
Iron	7439-89-6	2000		4400		1900		1000		2100		20000		3100		4900	
Lead	7439-92-1	5.5		8.9		3.9		< 1.5		4.9		17		5.5		6.8	
Magnesium	7439-95-4	7100		8500		7500		9000		13000		15000		7700		6200	
Manganese	7439-96-5	320	J	360	J	580		110		100		900		570		560	
Mercury	7439-97-6	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	
Nickel	7440-02-0	2.9		4.2		5.6		3.2		3.2		10		4.2		5.8	
Potassium	2023695	6600		7700		5800		9600		11000		6200		6400		5000	
Selenium	7782-49-2	0.78	J	0.97	J	0.6	J	< 2.5		< 2.5		0.66	J	< 2.5		< 2.5	
Silver	7440-22-4	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	
Sodium	7440-23-5	49000	J	56000	J	51000		26000		37000		81000		43000		39000	
Thallium	7440-28-0	0.4	J	0.34	J	< 1		< 1		< 1		< 1		< 1		< 1	
Vanadium	7440-62-2	200	J	210	J	71		4.6	J	13		66		3.1	J	6.8	
Zinc	7440-66-6	36		43		29		8.6	B	41		300		40		61	
Other Inorganics (ug/L)																	
Chloride	16887-00-6	33000		33000		74000		7400		22000		53000		24000		18000	
Nitrate as N	14797-55-8	770		770		720		33	B	110		310		710		520	
Nitrite as N	14797-65-0	< 50		< 50		34	J	< 50		< 50		< 50		54		32	J
Nitrogen, Kjeldahl	7727-37-9	220		520		1100		1900		580		960		1300		2300	
Total Organic Carbon	7440-44-0	1100		1300		4500		8400		2800		4900		7100		9800	
Sulfate	14808-79-8	80000		77000		82000		30000		120000		130000		130000		63000	

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		CCSW-3			CCSW-3 DUP			BCSW-1		
Sample Date		5/21/2007			5/21/2007			5/24/2007		
Sample Type		Investigation			Duplicate			Investigation		
Sample Location		Cattail Creek			Cattail Creek			Bailey Creek		
Constituent	**CAS No.**									
Volatile Organics (ug/L)										
1,1,1,2-Tetrachloroethane	630-20-6	<	1		<	1		<	1	
1,1,1-Trichloroethane	71-55-6	<	1		<	1		<	1	
1,1,2,2-Tetrachloroethane	79-34-5	<	1		<	1		<	1	
1,1,2-Trichloroethane	79-00-5	<	1		<	1		<	1	
1,1-Dichloroethane	75-34-3	<	1		<	1		<	1	
1,1-Dichloroethene	75-35-4	<	1		<	1		<	1	
1,2,3-Trichloropropane	96-18-4	<	1		<	1		<	1	
1,2-Dibromo-3-Chloropropane	96-12-8	<	1		<	1		<	1	
1,2-Dibromoethane	106-93-4	<	1		<	1		<	1	
1,2-Dichloroethane	107-06-2	<	1		<	1		<	1	
trans-1,2-Dichloroethene	156-60-5	<	1		<	1		<	1	
1,2-Dichloropropane	78-87-5	<	1		<	1		<	1	
cis-1,3-Dichloropropene	10061-01-5	<	1		<	1		<	1	
trans-1,3-Dichloropropene	10061-02-6	<	1		<	1		<	1	
2-Butanone (MEK)	78-93-3	<	10		<	10		<	10	
2-Hexanone	591-78-6	<	10		<	10		<	10	
2-Methyl-1-propanol	78-83-1		40	R		40	R		40	R
3-Methylhexane	589-34-4	<	1		<	1		<	1	
4-Methyl-2-pentanone (MIBK)	108-10-1	<	10		<	10		<	10	
Acetone	67-64-1	<	25			10	J	<	25	
Acetonitrile	75-05-8	<	40		<	40		<	40	
Acrolein	107-02-8	<	20		<	20		<	20	
Acrylonitrile	107-13-1	<	20		<	20		<	20	
Allyl chloride	107-05-1	<	1		<	1		<	1	
Benzene	71-43-2	<	1		<	1		<	1	
Benzyl chloride	100-44-7	<	1		<	1		<	1	
Bromodichloromethane	75-27-4	<	1		<	1		<	1	
Bromoform	75-25-2	<	1		<	1		<	1	
Bromomethane	74-83-9	<	1		<	1		<	1	
Carbon Dioxide	124-38-9		NA			NA			27	B
Carbon disulfide	75-15-0	<	2		<	2		<	2	
Carbon tetrachloride	56-23-5	<	1		<	1		<	1	
Chlorobenzene	108-90-7	<	1		<	1		<	1	
Chloroethane	75-00-3	<	1		<	1		<	1	
Chloroform	67-66-3	<	1		<	1		<	1	
Chloromethane	74-87-3	<	1		<	1		<	1	
Chloroprene	126-99-8	<	1		<	1		<	1	
Dibromochloromethane	124-48-1	<	1		<	1		<	1	
Dibromomethane	74-95-3	<	1		<	1		<	1	
Dichlorodifluoromethane	75-71-8	<	1		<	1		<	1	
Dichlorofluoromethane	75-43-4	<	1		<	1		<	1	
Diethyl ether	60-29-7		0.77	J		0.81	J		0.45	J
Ethyl methacrylate	97-63-2	<	1		<	1		<	1	
Ethylbenzene	100-41-4	<	1		<	1		<	1	
Ethylene oxide	75-21-8	<	200		<	200		<	200	
Iodomethane	74-88-4	<	5		<	5		<	5	
Methacrylonitrile	126-98-7	<	20		<	20		<	20	
Methyl methacrylate	80-62-6	<	1		<	1		<	1	
Methylene Chloride	75-09-2	<	5		<	5		<	5	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		CCSW-3		CCSW-3 DUP		BCSW-1	
Sample Date		5/21/2007		5/21/2007		5/24/2007	
Sample Type		Investigation		Duplicate		Investigation	
Sample Location		Cattail Creek		Cattail Creek		Bailey Creek	
Constituent	**CAS No.**						
n-Heptane	142-82-5	< 1		< 1		< 1	
Pentachloroethane	76-01-7	< 5		< 5		< 5	
Propionitrile	107-12-0	< 20		< 20		< 20	
Propylene oxide	75-56-9	< 200		< 200		< 200	
Styrene	100-42-5	< 1		< 1		< 1	
t-Butanol	75-65-0	< 5		5.1		< 5	
Tetrachloroethene	127-18-4	< 1		< 1		< 1	
Toluene	108-88-3	< 1		< 1		< 1	
trans-1,4-Dichloro-2-btene	110-57-6	< 2		< 2		< 2	
Trichloroethylene	79-01-6	< 1		< 1		< 1	
Trichlorofluoromethane	75-69-4	< 1		< 1		< 1	
Vinyl acetate	108-05-4	< 2		< 2		< 2	
Vinyl chloride	75-01-4	< 1		< 1		< 1	
Xylenes, Total	1330-20-7	< 2		< 2		< 2	
Volatile Organics (TICs) (ug/L)							
Carbon Dioxide	124-38-9	39	B	43	B	NA	
Semi-Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	79-34-5	NA		NA		NA	
1,2,4,5-Tetrachlorobenzene	95-94-3	< 9.7		< 10		< 10	
1,2,4-Trichlorobenzene	120-82-1	< 9.7		< 10		< 10	
1,2-Dichlorobenzene	95-50-1	< 9.7		< 10		< 10	
1,3,5-Trinitrobenzene	99-35-4	< 9.7		< 10		< 10	
1,3-Dichlorobenzene	541-73-1	< 9.7		< 10		< 10	
1,4-Dichlorobenzene	106-46-7	< 9.7		< 10		< 10	
1,4-Dioxane	123-91-1	< 9.7		< 10		< 10	
1,4-Naphthoqinone	130-15-4	< 9.7		< 10		< 10	
1-Naphthalenamine	134-32-7	< 9.7		< 10		< 10	
2,2'-oxybis[1-chloropropane]	108-60-1	< 9.7		< 10		< 10	
2,3,4,6-Tetrachlorophenol	58-90-2	< 9.7		< 10		< 10	
2,4,5-Trichlorophenol	95-95-4	< 9.7		< 10		< 10	
2,4,6-Trichlorophenol	88-06-2	< 9.7		< 10		< 10	
2,4-Dichlorophenol	120-83-2	< 9.7		< 10		< 10	
2,4-Dimethylphenol	105-67-9	< 9.7	L	< 10	L	< 10	
2,4-Dinitrophenol	51-28-5	< 49		< 50		< 50	
2,4-Dinitrotoluene	121-14-2	< 9.7		< 10		< 10	
2,6-Dichlorophenol	87-65-0	< 9.7		< 10		< 10	
2,6-Dinitrotoluene	606-20-2	< 9.7		< 10		< 10	
2-Acetylaminoflorene	53-96-3	< 9.7		< 10		< 10	
2-Chloronaphthalene	91-58-7	< 9.7		< 10		< 10	
2-Chlorophenol	95-57-8	< 9.7		< 10		< 10	
2-Methylnaphthalene	91-57-6	< 9.7		< 10		< 10	
2-Methylphenol	95-48-7	< 9.7		< 10		< 10	
2-Naphthalenamine	91-59-8	< 9.7		< 10		< 10	
2-Nitroaniline	88-74-4	< 49		< 50		< 50	
2-Nitrophenol	88-75-5	< 9.7		< 10		< 10	
2-Picoline	109-06-8	< 9.7		< 10		< 10	
2-sec-Btyl-4,6-dinitrophenol	88-85-7	< 9.7		< 10		< 10	
3 & 4 Methylphenol	15831-10-4	< 9.7		< 10		< 10	
3,3'-Dichlorobenzidine	91-94-1	< 19		< 20		< 20	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		CCSW-3			CCSW-3 DUP			BCSW-1		
Sample Date		5/21/2007			5/21/2007			5/24/2007		
Sample Type		Investigation			Duplicate			Investigation		
Sample Location		Cattail Creek			Cattail Creek			Bailey Creek		
Constituent	CAS No.									
3,3'-Dimethylbenzidine	119-93-7	<	19		<	20		<	20	
3-Methylcholanthrene	56-49-5	<	9.7		<	10		<	10	
3-Nitroaniline	99-09-2	<	49		<	50		<	50	
4,6-Dinitro-2-methylphenol	534-52-1	<	49		<	50		<	50	
4-Aminobiphenyl	92-67-1	<	9.7		<	10		<	10	
4-Bromophenyl phenyl ether	101-55-3	<	9.7		<	10		<	10	
4-Chloro-3-methylphenol	59-50-7	<	9.7		<	10		<	10	
4-Chloroaniline	106-47-8	<	19		<	20		<	20	
4-Chlorophenyl phenyl ether	7005-72-3	<	9.7		<	10		<	10	
4-Nitroaniline	100-01-6	<	49		<	50		<	50	
4-Nitrophenol	100-02-7	<	49		<	50		<	50	
4-Nitroqinoline-1-oxide	56-57-5		19	R		20	R		20	R
5-Nitro-o-tolidine	99-55-8	<	9.7		<	10		<	10	
7,12-Dimethylbenz(a)anthracene	57-97-6	<	9.7		<	10		<	10	
9-Hexadecenoic acid	2091-29-4		NA			NA			NA	
Acenaphthene	83-32-9	<	9.7		<	10		<	10	
Acenaphthylene	208-96-8	<	9.7		<	10		<	10	
Acetophenone	98-86-2	<	9.7		<	10		<	10	
alpha,alpha-Dimethyl phenethylamine	122-09-8	<	1900		<	2000		<	2000	
Aniline	62-53-3	<	19		<	20		<	20	
Anthracene	120-12-7	<	9.7		<	10		<	10	
Aramite, Total	140-57-8	<	9.7		<	10		<	10	
Benzo[a]anthracene	56-55-3	<	9.7		<	10		<	10	
Benzo[a]pyrene	50-32-8	<	9.7		<	10		<	10	
Benzo[b]fluoranthene	205-99-2	<	9.7		<	10		<	10	
Benzo[g,h,i]perylene	191-24-2	<	9.7		<	10		<	10	
Benzo[k]floranthene	207-08-9	<	9.7		<	10		<	10	
Benzyl alcohol	100-51-6	<	9.7		<	10		<	10	
Bis(2-chloroethoxy)methane	111-91-1	<	9.7		<	10		<	10	
Bis(2-chloroethyl)ether	111-44-4	<	9.7		<	10		<	10	
Bis(2-ethylhexyl) phthalate	117-81-7	<	9.7		<	10		<	10	
Butyl benzyl phthalate	85-68-7	<	9.7		<	10		<	10	
Chrysene	218-01-9	<	9.7		<	10		<	10	
Diallate	2303-16-4	<	9.7		<	10		<	10	
Dibenz(a,h)anthracene	53-70-3	<	9.7		<	10		<	10	
Dibenzofuran	132-64-9	<	9.7		<	10		<	10	
Diethyl phthalate	84-66-2	<	9.7		<	10		<	10	
Dimethoate	60-51-5	<	9.7		<	10		<	10	
Dimethyl phthalate	131-11-3	<	9.7		<	10		<	10	
Di-n-butyl phthalate	84-74-2	<	9.7		<	10		<	10	
Di-n-octyl phthalate	117-84-0	<	9.7		<	10		<	10	
Ethyl methaneslfonate	62-50-0	<	9.7		<	10		<	10	
Fluoranthene	206-44-0	<	9.7		<	10		<	10	
Fluorene	86-73-7	<	9.7		<	10		<	10	
Hexachlorobenzene	118-74-1	<	9.7		<	10		<	10	
Hexachlorobutadiene	87-68-3	<	9.7		<	10		<	10	
Hexachlorocyclopentadiene	77-47-4	<	9.7		<	10		<	10	
Hexachloroethane	67-72-1	<	9.7		<	10		<	10	
Hexachlorophene	70-30-4		4900	R		5000	R		5000	R
Hexachloropropene	1888-71-7	<	9.7		<	10		<	10	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		CCSW-3		CCSW-3 DUP		BCSW-1	
Sample Date		5/21/2007		5/21/2007		5/24/2007	
Sample Type		Investigation		Duplicate		Investigation	
Sample Location		Cattail Creek		Cattail Creek		Bailey Creek	
Constituent	**CAS No.**						
Indeno[1,2,3-cd]pyrene	193-39-5	< 9.7		< 10		< 10	
Isophorone	78-59-1	< 9.7		< 10		< 10	
Isosafrole	120-58-1	< 9.7		< 10		< 10	
m-Dinitrobenzene	99-65-0	< 9.7		< 10		< 10	
Methapyrilene	91-80-5	< 1900		< 2000		< 2000	
Methyl methaneslfonate	66-27-3	< 9.7		< 10		< 10	
Naphthalene	91-20-3	< 9.7		< 10		< 10	
Nitrobenzene	98-95-3	< 9.7		< 10		< 10	
N-Nitrosodiethylamine	55-18-5	< 9.7		< 10		< 10	
N-Nitrosodimethylamine	62-75-9	< 9.7		< 10		< 10	
N-Nitrosodi-n-butylamine	924-16-3	< 9.7		< 10		< 10	
N-Nitrosodi-n-propylamine	621-64-7	< 9.7		< 10		< 10	
N-Nitrosodiphenylamine	86-30-6	< 9.7		< 10		< 10	
N-Nitrosomethylethylamine	10595-95-6	< 9.7		< 10		< 10	
N-Nitrosomorpholine	59-89-2	< 9.7		< 10		< 10	
N-Nitrosopiperidine	100-75-4	< 9.7		< 10		< 10	
N-Nitrosopyrrolidine	930-55-2	< 9.7		< 10		< 10	
o,o',o''-Triethylphosphorothioate	126-68-1	< 9.7		< 10		< 10	
o-Toluidine	95-53-4	< 9.7		< 10		< 10	
p-Dimethylamino azobenzene	60-11-7	< 9.7		< 10		< 10	
Pentachlorobenzene	608-93-5	< 9.7		< 10		< 10	
Pentachloronitrobenzene	82-68-8	< 9.7		< 10		< 10	
Pentachlorophenol	87-86-5	< 49		< 50		< 50	
Phenacetin	62-44-2	< 9.7		< 10		< 10	
Phenanthrene	85-01-8	< 9.7		< 10		< 10	
Phenol	108-95-2	< 9.7		< 10		< 10	
p-Phenylene diamine	106-50-3	< 1900		< 2000		< 2000	
Pronamide	23950-58-5	< 9.7		< 10		< 10	
Pyrene	129-00-0	< 9.7		< 10		< 10	
Pyridine	110-86-1	< 49		< 50		< 50	
Safrole, Total	94-59-7	< 9.7		< 10		< 10	
Triphenylphosphine oxide	791-28-6	NA		NA		NA	
Semi-Volatile Organics (TICs) (ug/L)							
9,12,15-Octadecatrienal	26537-71-3	NA		NA		NA	
Bromacil	314-40-9	NA		NA		NA	
Ethane, 1,1'-oxybis[2-ethoxy-]	112-36-7	NA		11	JN	NA	
Hexadecanoic acid	57-10-3	NA		NA		NA	
Oleic Acid	112-80-1	NA		NA		NA	
Acrylamide, Acrylonitrile and Acrolein (ug/L)							
Acrylamide	79-06-1	< 100	L	< 100	L	< 100	
Alcohols and Glycols (ug/L)							
Allyl alcohol	107-18-6	< 1000		< 1000		< 1000	
Diethylene glycol	111-46-6	< 5000		< 5000		< 5000	
Dipropylene glycol	25265-71-8	< 5000		< 5000		< 5000	
Ethanol	64-17-5	< 1000		< 1000		< 1000	
Ethylene glycol	107-21-1	< 5000		< 5000		< 5000	
Ethylene glycol monobutyl ether	111-76-2	< 5000		< 5000		< 5000	
Ethylene glycol monopropyl ether	2807-30-9	< 5000		< 5000		< 5000	
Isopropanol	67-63-0	< 1000		< 1000		< 1000	
Methanol	67-56-1	< 1000		< 1000		< 1000	
Propylene glycol	57-55-6	< 5000		< 5000		< 5000	

Table A-4

Surface Water Analytical Data
Hercules Incorporated Facility - Hopewell, Virginia

Sample Identification		CCSW-3		CCSW-3 DUP		BCSW-1	
Sample Date		5/21/2007		5/21/2007		5/24/2007	
Sample Type		Investigation		Duplicate		Investigation	
Sample Location		Cattail Creek		Cattail Creek		Bailey Creek	
Constituent	**CAS No.**						
Total Inorganics (ug/L)							
Aluminum	7429-90-5	1300		890		510	J
Antimony	7440-36-0	< 2.5		< 2.5		< 2.5	
Arsenic	7440-38-2	4.3		3.8		1.5	J
Barium	7440-39-3	69		68		52	
Beryllium	7440-41-7	< 0.5		< 0.5		< 0.5	
Cadmium	7440-43-9	0.11	J	< 0.5		< 0.5	
Calcium	7440-70-2	37000		36000		12000	
Chromium	7440-47-3	2.7	J	1.8	J	< 5	
Cobalt	7440-48-4	2.6		2.4		0.92	
Copper	7440-50-8	6.1		4.7		1.7	B
Iron	7439-89-6	3900		3600		3300	
Lead	7439-92-1	5.7		3.8		2	
Magnesium	7439-95-4	7100		6800		1900	
Manganese	7439-96-5	520		490		160	
Mercury	7439-97-6	< 0.5		< 0.5		< 0.5	
Nickel	7440-02-0	4.7		4		1.8	
Potassium	2023695	5400		5000		2000	
Selenium	7782-49-2	< 2.5		< 2.5		< 2.5	
Silver	7440-22-4	< 1		< 1		< 1	
Sodium	7440-23-5	37000		39000		7800	
Thallium	7440-28-0	0.26	J	< 1		< 1	
Vanadium	7440-62-2	6.2		5.5		2.5	J
Zinc	7440-66-6	37		32		9.5	B
Other Inorganics (ug/L)							
Chloride	16887-00-6	19000		21000		10000	
Nitrate as N	14797-55-8	1100		1200		430	
Nitrite as N	14797-65-0	67		65		< 50	
Nitrogen, Kjeldahl	7727-37-9	1400	K	1600	K	850	
Total Organic Carbon	7440-44-0	9300		11000		6000	
Sulfate	14808-79-8	100000		100000		11000	

Notes:

NA - Not Analyzed.

B - The compound/analyte was not detected substantially above the level of the associated method blank/preparation or field blank.

J - The positive result reported for this analyte is a quanititative estimate.

K - The positive result reported for this analyte is a biased high quantitative estimate. The actual result may be lower than reported.

L - The positive result reported for this analyte is a biased low quantitative estimate. The actual result may be higher than reported.

R - The result for this compound/analyte is unusable. The analyte may or may not be present.

APPENDIX B

ANALYTICAL DATA

UNKNOWN TENTATIVELY INDENTIFIED COMPOUND

TABLE B-1
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SOIL
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Landfill Areas	OLF-1	8260B-TIC	Unknown	5.8 J	1.23	0	No library search match produced; not retained for further analysis.	- -
	OLF-1	8260B-TIC	Unknown	800 J	7.63	74	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
	OLF-1	8270C-TIC	Unknown	360 J	12.05	0	No library search match produced; not retained for further analysis.	- -
	OLF-1	8270C-TIC	Unknown[1]	200 JN	12.46	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
	OLF-1	8270C-TIC	Unknown[1]	180 JN	12.56	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
	OLF-1	8270C-TIC	Unknown	330 J	12.85	0	No library search match produced; not retained for further analysis.	- -
	OLF-1	8270C-TIC	Unknown[1]	170 JN	13.86	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
Landfill Areas	OLF-1DUP	8260B-TIC	Unknown	8.3 J	1.01	0	No library search match produced; not retained for further analysis.	- -
Blind Dup ID:	OLF-1DUP	8260B-TIC	Unknown	7.3 J	7.63	91	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
BD-5	OLF-1DUP	8270C-TIC	Unknown	450 J	14.33	0	No library search match produced; not retained for further analysis.	- -
Landfill Areas	OLF-2	8260B-TIC	Unknown	19 J	1.01	38	Probable TIC Chemical Class.	Chemical Class: fluorinated VOC
	OLF-2	8260B-TIC	Unknown	25 J	1.18	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
	OLF-2	8260B-TIC	Unknown	440 J	7.63	83	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
Landfill Areas	OLF-3	8260B-TIC	Unknown	9.6 J	1.01	0	No library search match produced; not retained for further analysis.	- -
	OLF-3	8260B-TIC	Unknown	6.4 J	1.18	0	No library search match produced; not retained for further analysis.	- -
	OLF-3	8260B-TIC	Unknown	120 J	7.63	94	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
	OLF-3	8270C-TIC	Unknown[1]	190 JN	13.65	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
Landfill Areas	OLF-4	8260B-TIC	Unknown	4.8 J	1.18	0	No library search match produced; not retained for further analysis.	- -
	OLF-4	8260B-TIC	Unknown	53 J	7.63	91	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
	OLF-4	8270C-TIC	Unknown	1000 J	1.83	0	No library search match produced; not retained for further analysis.	- -
	OLF-4	8270C-TIC	Unknown[1]	210 JN	13.87	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
Landfill Areas	OLF-5	8260B-TIC	Unknown Alkane	53 J	5.47	95	Probable TIC Chemical Class.	Chemical Class: alkane ring
	OLF-5	8260B-TIC	Unknown Alkene	31 J	7.50	94	Probable TIC Chemical Class; possible lab artifact; peak appeared in raw data for associated method blank.	Chemical Class: dichlorobenzene
	OLF-5	8260B-TIC	Unknown	29 J	7.63	94	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
	OLF-5	8270C-TIC	Unknown	1100 J	1.83	0	No library search match produced; not retained for further analysis.	- -

TABLE B-1
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SOIL
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Landfill Areas	OLF-6	8260B-TIC	Unknown	20 J	1.02	45	Probable TIC Chemical Class.	Chemical Class: fluorinated VOC
	OLF-6	8260B-TIC	Unknown	82 J	7.63	95	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
	OLF-6	8270C-TIC	Unknown	1700 J	1.83	0	No library search match produced; not retained for further analysis.	- -
	OLF-6	8270C-TIC	Unknown	260 J	9.14	0	No library search match produced; not retained for further analysis.	- -
	OLF-6	8270C-TIC	Unknown[1]	420 J	9.26	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
	OLF-6	8270C-TIC	Unknown Alkane [1]	470 J	11.74	95	Probable TIC Chemical Class.	Chemical Class: alkane
	OLF-6	8270C-TIC	Unknown Alkane [1]	790 J	12.49	95	Probable TIC Chemical Class.	Chemical Class: alkane
	OLF-6	8270C-TIC	Unknown	270 J	13.69	0	No library search match produced; not retained for further analysis.	- -
	OLF-6	8270C-TIC	Unknown[1]	280 J	13.86	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
Landfill Areas	OLF-7	8260B-TIC	Unknown	11 J	7.63	94	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
	OLF-8	8260B-TIC	Unknown	15 J	7.63	94	Probable TIC Identity; SVOA target analyte, but not reported from SVOA fraction possibly due to low concentration.	phenol
	OLF-8	8270C-TIC	Unknown Alkane [1]	250 J	11.75	80	Probable TIC Chemical Class.	Chemical Class: alkane
	OLF-8	8270C-TIC	Unknown Alkane [1]	320 J	12.51	95	Probable TIC Chemical Class.	Chemical Class: alkane
	OLF-8	8270C-TIC	Unknown	180 J	13.56	0	No library search match produced; not retained for further analysis.	- -
SDB	SDB-1	8270C-TIC	Unknown Aldol Condensate	8300 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-1	8270C-TIC	Unknown Alkane	380 J	15.66	45	Low quality due to differing mass intensities; not retained for further analysis.	- -
SDB	SDB-2	8270C-TIC	Unknown Aldol Condensate	8600 B	3.71	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-2	8270C-TIC	Unknown	300 J	10.42	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-2	8270C-TIC	Unknown	330 J	10.73	0	No library search match produced; not retained for further analysis.	- -
	SDB-2	8270C-TIC	Unknown	260 J	10.76	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-2	8270C-TIC	Unknown	800 J	10.80	48	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-2	8270C-TIC	Unknown	380 J	10.98	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-2	8270C-TIC	Unknown	1700 J	15.61	58	Low quality due to differing mass intensities; not retained for further analysis.	- -
SDB	SDB-2DUP	8270C-TIC	Unknown Aldol Condensate	8900 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-2DUP	8270C-TIC	Unknown	270 J	15.66	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
SDB	SDB-3	8270C-TIC	Unknown Aldol Condensate	8400 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
SDB	SDB-4	8270C-TIC	Unknown Aldol Condensate	11000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-4	8270C-TIC	Unknown	210 J	10.86	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-4	8270C-TIC	Unknown	190 J	15.46	0	No library search match produced; not retained for further analysis.	- -
	SDB-4	8270C-TIC	Unknown	630 J	15.66	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-4	8270C-TIC	Unknown	190 J	15.92	46	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-4	8270C-TIC	Unknown	280 J	16.91	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-4	8270C-TIC	Unknown	490 J	17.30	25	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-1
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SOIL
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
SDB	SDB-5	8270C-TIC	Unknown Aldol Condensate	10000 B	3.71	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-5	8270C-TIC	Unknown	200 J	10.42	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-5	8270C-TIC	Unknown	490 J	10.98	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-5	8270C-TIC	Unknown	330 J	16.20	49	Probable TIC Chemical Class.	Chemical Class: sitosterol
SDB	SDB-6	8270C-TIC	Unknown Aldol Condensate	6200 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
SDB	SDB-7	8270C-TIC	Unknown Aldol Condensate	8700 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-7	8270C-TIC	Unknown	490 J	10.54	45	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-7	8270C-TIC	Unknown	310 J	10.85	0	No library search match produced; not retained for further analysis.	- -
SDB	SDB-8	8270C-TIC	Unknown Aldol Condensate	7400 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-8	8270C-TIC	Unknown	300 J	11.10	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-8	8270C-TIC	Unknown	2500 J	15.65	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
SDB	SDB-9	8270C-TIC	Unknown Aldol Condensate	7400 B	3.70	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-9	8270C-TIC	Unknown	480 J	15.62	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-1	8270C-TIC	Unknown Aldol Condensate	79000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	7900 J	14.02	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	23000 J	14.43	0	No library search match produced; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	8800 J	15.92	70	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	27000 J	16.39	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	24000 J	16.58	70	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	8700 J	16.81	30	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	16000 J	16.91	52	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-1	8270C-TIC	Unknown	38000 J	17.12	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-2	8270C-TIC	Unknown Aldol Condensate	11000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-2	8270C-TIC	Unknown	2500 J	15.92	45	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-2	8270C-TIC	Unknown	3700 J	16.25	53	Probable TIC Chemical Class.	Chemical Class: sitosterol
	VFSP-2	8270C-TIC	Unknown	1900 J	16.32	0	No library search match produced; not retained for further analysis.	- -
	VFSP-2	8270C-TIC	Unknown	2700 J	16.39	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-2	8270C-TIC	Unknown	1000 J	16.59	58	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-2	8270C-TIC	Unknown	1400 J	16.81	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-2	8270C-TIC	Unknown	2400 J	16.92	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-2	8270C-TIC	Unknown	1600 J	17.18	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-3	8270C-TIC	Unknown Aldol Condensate	47000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-3	8270C-TIC	Unknown	8800 J	14.43	0	No library search match produced; not retained for further analysis.	- -
	VFSP-3	8270C-TIC	Unknown	12000 J	16.92	55	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-1
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SOIL
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
VFSP	VFSP-4	8270C-TIC	Unknown Aldol Condensate	38000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-4	8270C-TIC	Unknown	5100 J	14.11	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-4	8270C-TIC	Unknown	4200 J	14.17	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-4	8270C-TIC	Unknown	28000 J	14.42	0	No library search match produced; not retained for further analysis.	- -
	VFSP-4	8270C-TIC	Unknown	15000 J	16.58	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-4	8270C-TIC	Unknown	26000 J	17.12	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-5	8270C-TIC	Unknown Aldol Condensate	33000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-5	8270C-TIC	Unknown	3700 J	10.85	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-5	8270C-TIC	Unknown	6700 J	15.91	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-5	8270C-TIC	Unknown	5400 J	16.31	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-5	8270C-TIC	Unknown	6500 J	16.59	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-5	8270C-TIC	Unknown	4800 J	16.81	30	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-6	8270C-TIC	Unknown Aldol Condensate	23000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-6	8270C-TIC	Unknown	13000 J	14.42	0	No library search match produced; not retained for further analysis.	- -
	VFSP-6	8270C-TIC	Unknown	16000 J	15.91	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-6	8270C-TIC	Unknown	8100 J	16.31	0	No library search match produced; not retained for further analysis.	- -
	VFSP-6	8270C-TIC	Unknown	35000 J	16.39	60	Probable TIC Chemical Class.	Chemical Class: sitosterol
	VFSP-6	8270C-TIC	Unknown	27000 J	16.59	45	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-6	8270C-TIC	Unknown	8900 J	16.81	30	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-6	8270C-TIC	Unknown	43000 J	17.12	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-7	8270C-TIC	Unknown Aldol Condensate	41000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-7	8270C-TIC	Unknown	16000 J	10.85	49	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-7	8270C-TIC	Unknown	17000 J	10.88	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-7	8270C-TIC	Unknown	18000 J	14.43	0	No library search match produced; not retained for further analysis.	- -
	VFSP-7	8270C-TIC	Unknown	29000 J	16.59	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-7	8270C-TIC	Unknown	53000 J	17.13	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-8	8270C-TIC	Unknown Aldol Condensate	37000 B	3.71	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-8	8270C-TIC	Unknown	11000 J	14.40	0	No library search match produced; not retained for further analysis.	- -
	VFSP-8	8270C-TIC	Unknown[1]	16000 J	15.88	80	Probable TIC Chemical Class.	Chemical Class: alkyl aromatic
	VFSP-8	8270C-TIC	Unknown[1]	23000 J	16.35	94	Probable TIC Chemical Class.	Chemical Class: sitosterol
	VFSP-8	8270C-TIC	Unknown[1]	18000 J	16.55	96	Missing major ions of library search results; not retained for further analysis.	- -

TABLE B-1
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SOIL
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
VFSP	VFSP-9	8270C-TIC	Unknown Aldol Condensate	17000 B	3.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	VFSP-9	8270C-TIC	Unknown	3300 J	14.42	0	No library search match produced; not retained for further analysis.	- -
	VFSP-9	8270C-TIC	Unknown	2800 J	15.92	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-9	8270C-TIC	Unknown	8000 J	16.59	60	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-9	8270C-TIC	Unknown	1900 J	16.80	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	VFSP-9	8270C-TIC	Unknown	13000 J	17.12	64	Low quality due to differing mass intensities; not retained for further analysis.	- -

Notes:

ug/Kg - micrograms per kilogram

TIC - Tentatively Identified Compound

SDB - Sludge Drying Beds

VFSP - Vacuum Filter Sludge Pile

B - The compound / analyte was not detected substantially above the level of the associated method blank / preparation or field blank.

J - The positive result for this analyte is a quantitative estimate.

N - This flag indicates the presumptive evidence of a compound.

[1] The compound/analyte was identified during laboratory processes but determined unknown by a data validator.

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
WW Lagoons	WWL-1	8260B-TIC	Unknown	9.5 J	2.23	0	No library search match produced; not retained for further analysis.	- -
	WWL-1	8260B-TIC	Unknown	5.1 J	4.05	78	Probable TIC Identity.	silanol, trimethyl-
	WWL-1	8260B-TIC	Unknown	34 J	6.51	87	Probable TIC Identity.	ethane, 1,2-diethoxy-
	WWL-1	8270C-TIC	Unknown	5300 J	5.10	40	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	WWL-1	8270C-TIC	Unknown	9300 J	6.58	40	Probable TIC Chemical Class.	Chemical Class: alkyl silicon
	WWL-1	8270C-TIC	Unknown	930 J	6.60	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-1	8270C-TIC	Unknown	10000 J	7.71	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-1	8270C-TIC	Unknown	900 J	7.75	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-1	8270C-TIC	Unknown	460 J	7.86	0	No library search match produced; not retained for further analysis.	- -
	WWL-1	8270C-TIC	Unknown	570 J	7.88	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-1	8270C-TIC	Unknown	7800 J	8.66	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-1	8270C-TIC	Unknown	4000 J	9.44	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-1	8270C-TIC	Unknown	1100 J	10.14	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
WW Lagoons	WWL-2	8260B-TIC	Unknown	6.9 J	1.66	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8260B-TIC	Unknown	5.2 J	1.91	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8260B-TIC	Unknown	5.1 J	1.97	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8260B-TIC	Unknown	14 J	2.16	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	52 J	4.29	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	230 J	5.71	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	330 J	6.07	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	190 J	6.54	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	110 J	7.13	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	110 J	7.19	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	200 J	7.60	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	76 J	7.94	0	No library search match produced; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	100 J	8.05	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-2	8270C-TIC	Unknown	170 J	8.67	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
WW Lagoons	WWL-3U	8260B-TIC	Unknown	13 B	2.20	- -	NA-Blank Negated; not retained for further analysis.	- -
	WWL-3U	8260B-TIC	Unknown	6.4 J	6.51	87	Probable TIC Identity.	ethane, 1,2-diethoxy-
	WWL-3U	8270C-TIC	Unknown Aldol Condensate	56 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
	WWL-3U	8270C-TIC	Unknown	5.1 J	4.04	33	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-3U	8270C-TIC	Unknown	6.3 J	4.25	33	Probable TIC Chemical Class.	Chemical Class: chlorinated VOC

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
WW Lagoons	WWL-3L	8260B-TIC	Unknown	77 J	2.15	72	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-3L	8260B-TIC	Unknown	95 J	2.24	0	No library search match produced; not retained for further analysis.	- -
	WWL-3L	8270C-TIC	Unknown Aldol Condensate	49 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
	WWL-3L	8270C-TIC	Unknown	8.8 J	3.87	36	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-3L	8270C-TIC	Unknown	17 J	4.05	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-3L	8270C-TIC	Unknown	8 J	4.25	56	Probable TIC Chemical Class.	Chemical Class: chlorinated VOC
	WWL-3L	8270C-TIC	Unknown	12 J	4.59	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	WWL-3L	8270C-TIC	Unknown	4.7 J	5.98	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-3L	8270C-TIC	Unknown	140 J	6.46	40	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	WWL-3L	8270C-TIC	Unknown	62 J	7.60	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WWL-3L	8270C-TIC	Unknown	18 J	8.55	46	Low quality due to differing mass intensities; not retained for further analysis.	- -
Landfill Areas	LF-1	8270C-TIC	Unknown Aldol Condensate	69 B	3.39	- -	NA-Blank Negated; not retained for further analysis.	- -
	LF-1	8270C-TIC	Unknown	6.2 J	4.23	58	Low quality due to differing mass intensities; not retained for further analysis.	- -
Landfill Areas	LF-2	8260B-TIC	Unknown	9.6 J	2.13	0	No library search match produced; not retained for further analysis.	- -
	LF-2	8270C-TIC	Unknown Aldol Condensate	62 B	3.39	- -	NA-Blank Negated; not retained for further analysis.	- -
Landfill Areas	LF-3	8260B-TIC	Unknown	5.4 J	2.13	0	No library search match produced; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown Aldol Condensate	59 B	3.39	- -	NA-Blank Negated; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown	440 J	6.44	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown	320 J	7.58	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown	20 J	7.79	49	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown	31 J	7.80	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown	150 J	8.53	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown	35 J	9.36	52	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-3	8270C-TIC	Unknown	11 J	10.90	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
Landfill Areas	LF-4	8260B-TIC	Unknown	9 J	2.25	0	No library search match produced; not retained for further analysis.	- -
	LF-4	8260B-TIC	Unknown	7.3 J	4.05	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-4	8270C-TIC	Unknown Aldol Condensate	74 B	3.40	- -	NA-Blank Negated; not retained for further analysis.	- -
Landfill Areas	LF-5	8260B-TIC	Unknown	5.5 J	2.24	0	No library search match produced; not retained for further analysis.	- -
	LF-5	8260B-TIC	Unknown	5.3 J	4.05	83	Low quality due to differing mass intensities; not retained for further analysis.	- -
	LF-5	8270C-TIC	Unknown Aldol Condensate	88 B	3.40	- -	NA-Blank Negated; not retained for further analysis.	- -
Natrosol Lagoon	NAT-1	8260B-TIC	Unknown	7.4 J	2.21	25	Low quality due to differing mass intensities; not retained for further analysis. -	-
	NAT-1	8260B-TIC	Unknown Aldol Condensate	65 B	3.39	- -	NA-Blank Negated; not retained for further analysis.	- -

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Natrosol Lagoon	NAT-2	8260B-TIC	Unknown	18 J	1.96	86	Probable TIC Chemical Class.	Chemical Class: alkene
	NAT-2	8260B-TIC	Unknown	7.2 J	2.21	0	No library search match produced; not retained for further analysis.	- -
	NAT-2	8260B-TIC	Unknown	1600 J	3.29	78	Probable TIC Chemical Class.	Chemical Class: alcohol
	NAT-2	8270C-TIC	Unknown	24 J	6.16	0	No library search match produced; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	22 J	6.17	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	39 J	6.22	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	26 J	6.36	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	37 J	6.44	52	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	55 J	7.57	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	32 J	7.59	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	20 J	7.62	33	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	74 J	7.65	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-2	8270C-TIC	Unknown	17 J	8.60	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
Natrosol Lagoon	NAT-3	8260B-TIC	Unknown	30 J	1.94	90	Probable TIC Identity.	2-methyl-1-propene
	NAT-3	8260B-TIC	Unknown	6.6 J	2.03	0	No library search match produced; not retained for further analysis.	- -
	NAT-3	8260B-TIC	Unknown	6.8 J	2.22	0	No library search match produced; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	120 J	4.27	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	350 J	4.34	78	Probable TIC Chemical Class.	Chemical Class: alcohol
	NAT-3	8270C-TIC	Unknown	1100 J	4.80	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	130 J	6.24	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	88 J	6.44	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	130 J	7.58	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	100 J	7.63	33	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	350 J	7.66	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	120 J	8.15	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3	8270C-TIC	Unknown	100 J	8.60	53	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Natrosol Lagoon	NAT-3DUP	8260B-TIC	Unknown Alkene	38 J	1.95	90	Probable TIC Chemical Class.	Chemical Class: alkene
	NAT-3DUP	8260B-TIC	Unknown	6.3 J	2.03	0	No library search match produced; not retained for further analysis.	- -
Blind Dup ID:	NAT-3DUP	8260B-TIC	Unknown	7.5 J	2.13	0	No library search match produced; not retained for further analysis.	- -
BD-3	NAT-3DUP	8260B-TIC	Unknown	6.1 J	4.05	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8260B-TIC	Unknown	9.5 J	4.43	78	Probable TIC Chemical Class.	Chemical Class: acid
	NAT-3DUP	8270C-TIC	Unknown	130 J	4.27	0	No library search match produced; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	270 J	4.34	72	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	1000 J	4.79	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	120 J	6.23	45	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	80 J	6.44	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	110 J	7.57	28	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	89 J	7.63	0	No library search match produced; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	300 J	7.66	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	110 J	8.16	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-3DUP	8270C-TIC	Unknown	93 J	8.60	39	Low quality due to differing mass intensities; not retained for further analysis.	- -
Natrosol Lagoon	NAT-4	8260B-TIC	Unknown	5.3 J	2.17	0	No library search match produced; not retained for further analysis.	- -
	NAT-4	8260B-TIC	Unknown	8.5 J	4.05	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	13 J	4.67	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	8.4 J	11.23	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	8.8 J	11.66	0	No library search match produced; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	7.9 J	12.75	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	6.6 J	12.94	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	9.9 J	13.02	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	18 J	13.46	42	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	6.3 J	13.75	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	10 J	14.09	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NAT-4	8270C-TIC	Unknown	6.2 J	14.56	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
Reten Aqualon	RABMW-2	8260B-TIC	Unknown	6.9 J	1.99	0	No library search match produced; not retained for further analysis.	- -
Basin	RABMW-2	8260B-TIC	Unknown	8 J	2.14	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-2	8260B-TIC	Unknown	5.8 J	2.29	0	No library search match produced; not retained for further analysis.	- -
	RABMW-2	8270C-TIC	Unknown Aldol Condensate	63 A	3.43	- -	Should not have been reported; not retained for further analysis.	- -
	RABMW-2	8270C-TIC	Unknown	18 J	4.26	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-2	8270C-TIC	Unknown	12 J	4.71	59	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-2	8270C-TIC	Unknown	12 J	5.04	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-2	8270C-TIC	Unknown	5.6 J	6.21	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-2	8270C-TIC	Unknown	7.6 J	6.47	78	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Reten Aqualon	RABMW-3	8270C-TIC	Unknown Aldol Condensate	69 B	3.42	- -	NA-Blank Negated; not retained for further analysis.	- -
Basin	RABMW-3	8270C-TIC	Unknown	19 J	5.04	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-3	8270C-TIC	Unknown	12 J	6.47	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-3	8270C-TIC	Unknown	5.8 J	7.61	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
Reten Aqualon	RABMW-4	8260B-TIC	Unknown	5.2 J	2.05	72	Low quality due to differing mass intensities; not retained for further analysis. -	-
Basin	RABMW-4	8270C-TIC	Unknown Aldol Condensate	54 A	3.43	- -	Should not have been reported; not retained for further analysis.	- -
	RABMW-4	8270C-TIC	Unknown	33 J	4.27	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-4	8270C-TIC	Unknown	19 J	4.71	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-4	8270C-TIC	Unknown	9.9 J	5.04	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	RABMW-4	8270C-TIC	Unknown	5.6 J	6.47	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
SDB	SDB-MW1	8270C-TIC	Unknown Aldol Condensate	59 B	3.40	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-MW1	8270C-TIC	Unknown	4.2 J	8.82	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
SDB	SDB-MW2	8260B-TIC	Unknown	6.6 J	2.20	36	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-MW2	8270C-TIC	Unknown Aldol Condensate	76 B	3.39	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-MW2	8270C-TIC	Unknown	12 J	9.87	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
SDB	SDB-MW3	8260B-TIC	Unknown	5.8 J	2.21	0	No library search match produced; not retained for further analysis.	- -
	SDB-MW3	8260B-TIC	Unknown	6.8 J	4.05	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	SDB-MW3	8270C-TIC	Unknown Aldol Condensate	57 B	3.40	- -	NA-Blank Negated; not retained for further analysis.	- -
	SDB-MW3	8270C-TIC	Unknown	4.3 J	4.23	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
VFSP	VFSP-MW1	8270C-TIC	Unknown Aldol Condensate	59 B	3.39	- -	NA-Blank Negated; not retained for further analysis.	- -
Main Holding	MW-1	8260B-TIC	Unknown	57 J	2.00	0	No library search match produced; not retained for further analysis.	- -
Basin	MW-1	8270C-TIC	Unknown Aldol Condensate	49 A	3.43	- -	Should not have been reported; not retained for further analysis.	- -
	MW-1	8270C-TIC	Unknown	94 J	6.47	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-1	8270C-TIC	Unknown	8.7 J	7.61	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
Main Holding	MW-2	8270C-TIC	Unknown Aldol Condensate	46 A	3.43	- -	Should not have been reported; not retained for further analysis.	- -
Basin	MW-2	8270C-TIC	Unknown	5.8 J	3.88	39	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-2	8270C-TIC	Unknown	20 J	4.06	0	No library search match produced; not retained for further analysis.	- -
	MW-2	8270C-TIC	Unknown	14 J	4.60	64	Probable TIC Chemical Class.	Chemical Class: chlorinated VOC
	MW-2	8270C-TIC	Unknown	6 J	5.99	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-2	8270C-TIC	Unknown	120 J	6.48	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-2	8270C-TIC	Unknown	65 J	7.61	74	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-2	8270C-TIC	Unknown	18 J	8.56	56	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Main Holding	MW-3	8260B-TIC	Unknown	5 B	2.21	- -	NA-Blank Negated; not retained for further analysis.	- -
Basin	MW-3	8270C-TIC	Unknown Aldol Condensate	60 B	3.42	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-3	8270C-TIC	Unknown	5.3 J	3.56	53	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-3	8270C-TIC	Unknown	11 J	6.39	59	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-3	8270C-TIC	Unknown	110 J	6.46	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-3	8270C-TIC	Unknown	7.9 J	7.52	0	No library search match produced; not retained for further analysis.	- -
	MW-3	8270C-TIC	Unknown	11 J	7.54	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-3	8270C-TIC	Unknown	89 J	7.60	56	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-3	8270C-TIC	Unknown	16 J	7.68	36	Probable TIC Chemical Class.	Chemical Class: acid
	MW-3	8270C-TIC	Unknown	20 J	8.55	56	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
Main Holding	MW-4	8260B-TIC	Unknown	9.3 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
Basin	MW-4	8260B-TIC	Unknown	6.5 J	2.28	0	Spectra missing major ions; no library search match produced.	- -
	MW-4	8260B-TIC	Unknown	5.2 J	4.05	78	Probable TIC Chemical Class.	Chemical Class: alkyl silicon
	MW-4	8270C-TIC	Unknown Aldol Condensate	56 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-4	8270C-TIC	Unknown	48 J	6.39	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-4	8270C-TIC	Unknown	370 J	6.47	78	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-4	8270C-TIC	Unknown	32 J	7.52	38	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-4	8270C-TIC	Unknown	37 J	7.54	83	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-4	8270C-TIC	Unknown	260 J	7.60	78	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-4	8270C-TIC	Unknown	24 J	7.68	43	Probable TIC Chemical Class.	Chemical Class: acid
	MW-4	8270C-TIC	Unknown	82 J	8.55	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-4	8270C-TIC	Unknown	22 J	9.38	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
Main Holding	MW-4U	8260B-TIC	Unknown	5.4 J	1.95	0	No library search match produced; not retained for further analysis.	- -
Basin	MW-4U	8270C-TIC	Unknown Aldol Condensate	44 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-4U	8270C-TIC	Unknown	15 J	5.61	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-4U	8270C-TIC	Unknown	44 J	6.40	59	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-4U	8270C-TIC	Unknown	330 J	6.47	39	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-4U	8270C-TIC	Unknown	21 J	7.52	45	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-4U	8270C-TIC	Unknown	30 J	7.54	78	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-4U	8270C-TIC	Unknown	240 J	7.60	78	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-4U	8270C-TIC	Unknown	25 J	7.68	43	Probable TIC Chemical Class.	Chemical Class: acid
	MW-4U	8270C-TIC	Unknown	74 J	8.55	72	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Main Holding	MW-5	8260B-TIC	Unknown	5.5 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
Basin	MW-5	8270C-TIC	Unknown	170 J	4.11	0	No library search match produced; not retained for further analysis.	- -
	MW-5	8270C-TIC	Unknown	180 J	4.65	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-5	8270C-TIC	Unknown	230 J	5.68	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-5	8270C-TIC	Unknown	260 J	6.03	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-5	8270C-TIC	Unknown	170 J	6.47	40	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-5	8270C-TIC	Unknown	210 J	7.60	46	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-5	8270C-TIC	Unknown	180 J	7.85	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-5	8270C-TIC	Unknown	150 J	7.95	0	No library search match produced; not retained for further analysis.	- -
	MW-5	8270C-TIC	Unknown	140 J	8.00	0	No library search match produced; not retained for further analysis.	- -
Main Holding	MW-5U	8270C-TIC	Unknown Aldol Condensate	48 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
Basin	MW-5U	8270C-TIC	Unknown	54 J	4.61	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-5U	8270C-TIC	Unknown	100 J	5.67	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-5U	8270C-TIC	Unknown	110 J	6.01	42	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-5U	8270C-TIC	Unknown	160 J	6.46	74	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-5U	8270C-TIC	Unknown	120 J	7.60	53	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-5U	8270C-TIC	Unknown	79 J	7.84	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-5U	8270C-TIC	Unknown	83 J	7.94	0	No library search match produced; not retained for further analysis.	- -
	MW-5U	8270C-TIC	Unknown	85 J	7.99	0	No library search match produced; not retained for further analysis.	- -
Main Holding	MW-6	8260B-TIC	Unknown	5.4 B	2.05	- -	NA-Blank Negated; not retained for further analysis.	- -
Basin	MW-6	8270C-TIC	Unknown Aldol Condensate	55 B	3.42	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-6	8270C-TIC	Unknown	27 J	4.05	0	No library search match produced; not retained for further analysis.	- -
	MW-6	8270C-TIC	Unknown	70 J	4.28	47	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-6	8270C-TIC	Unknown	33 J	4.60	40	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-6	8270C-TIC	Unknown	23 J	5.67	0	No library search match produced; not retained for further analysis.	- -
	MW-6	8270C-TIC	Unknown	25 J	6.00	42	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-6	8270C-TIC	Unknown	260 J	6.47	40	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-6	8270C-TIC	Unknown	150 J	7.60	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-6	8270C-TIC	Unknown	52 J	8.55	56	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
Main Holding	MW-7L	8260B-TIC	Unknown	11 J	2.14	0	No library search match produced; not retained for further analysis.	- -
Basin	MW-7L	8270C-TIC	Unknown Aldol Condensate	52 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-7L	8270C-TIC	Unknown	8.3 J	6.46	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-7L	8270C-TIC	Unknown	25 J	7.60	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-7L	8270C-TIC	Unknown	18 J	8.55	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Main Holding	MW-7U	8260B-TIC	Unknown	5.9 J	2.12	0	No library search match produced; not retained for further analysis.	- -
Basin	MW-7U	8270C-TIC	Unknown Aldol Condensate	69 B	3.40	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-7U	8270C-TIC	Unknown	4.1 B	4.24	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-7U	8270C-TIC	Unknown	4.1 J	4.56	45	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-7U	8270C-TIC	Unknown	210 J	5.01	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-7U	8270C-TIC	Unknown	28 J	7.57	40	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
Main Holding	MW-8D	8270C-TIC	Unknown Aldol Condensate	68 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
Basin	MW-8D	8270C-TIC	Unknown	4.4 B	4.25	- -	NA-Blank Negated; not retained for further analysis.	- -
Main Holding	MW-8L	8260B-TIC	Unknown	600 J	2.11	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
Basin	MW-8L	8260B-TIC	Unknown	660 J	2.23	0	No library search match produced; not retained for further analysis.	- -
	MW-8L	8270C-TIC	Unknown	50 A	4.48	- -	Should not have been reported; not retained for further analysis.	- -
	MW-8L	8270C-TIC	Unknown	1400 J	4.90	83	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8L	8270C-TIC	Unknown	33 J	6.06	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-8L	8270C-TIC	Unknown	48 J	6.25	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8L	8270C-TIC	Unknown	890 J	6.33	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8L	8270C-TIC	Unknown	570 J	7.47	78	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8L	8270C-TIC	Unknown	49 J	7.52	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-8L	8270C-TIC	Unknown	170 J	7.55	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-8L	8270C-TIC	Unknown	150 J	8.42	43	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8L	8270C-TIC	Unknown	34 J	8.51	52	Low quality due to differing mass intensities; not retained for further analysis.	- -
Main Holding	MW-8U	8260B-TIC	Unknown	7.1 J	2.13	0	No library search match produced; not retained for further analysis.	- -
Basin	MW-8U	8260B-TIC	Unknown	6.6 J	2.27	0	No library search match produced; not retained for further analysis.	- -
	MW-8U	8260B-TIC	Unknown	11 J	4.05	78	Probable TIC Chemical Class.	Chemical Class: alkyl silicon
	MW-8U	8260B-TIC	Unknown	12 J	6.51	87	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8U	8270C-TIC	Unknown Aldol Condensate	50 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-8U	8270C-TIC	Unknown	16 J	4.60	43	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8U	8270C-TIC	Unknown	18 J	5.61	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-8U	8270C-TIC	Unknown	17 J	6.39	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-8U	8270C-TIC	Unknown	280 J	6.46	40	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8U	8270C-TIC	Unknown	170 J	7.60	56	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-8U	8270C-TIC	Unknown	20 J	7.65	30	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-8U	8270C-TIC	Unknown	62 J	7.68	47	Probable TIC Chemical Class.	Chemical Class: acid
	MW-8U	8270C-TIC	Unknown	49 J	8.55	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative

TABLE B-2
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDWATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Main Holding	MW-9	8260B-TIC	Unknown	5.6 J	1.96	0	No library search match produced; not retained for further analysis.	- -
Basin	MW-9	8260B-TIC	Unknown	13 J	2.12	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-9	8260B-TIC	Unknown	15 J	4.05	91	Probable TIC Identity.	silanol, trimethyl-
	MW-9	8260B-TIC	Unknown	14 J	6.51	87	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9	8270C-TIC	Unknown Aldol Condensate	59 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
	MW-9	8270C-TIC	Unknown	7.7 J	3.86	50	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9	8270C-TIC	Unknown	9.6 J	4.56	78	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9	8270C-TIC	Unknown	4.4 J	4.96	0	No library search match produced; not retained for further analysis.	- -
	MW-9	8270C-TIC	Unknown	16 J	5.61	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-9	8270C-TIC	Unknown	230 J	6.46	53	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9	8270C-TIC	Unknown	35 J	7.59	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9	8270C-TIC	Unknown	7.4 J	8.55	72	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
Main Holding	MW-9DUP	8260B-TIC	Unknown	7.2 J	2.14	0	No library search match produced; not retained for further analysis.	- -
Basin	MW-9DUP	8260B-TIC	Unknown	11 J	4.05	78	Probable TIC Chemical Class.	Chemical Class: alkyl silicon
	MW-9DUP	8260B-TIC	Unknown	11 J	6.51	87	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
Blind Dup ID:	MW-9DUP	8270C-TIC	Unknown Aldol Condensate	54 B	3.41	- -	NA-Blank Negated; not retained for further analysis.	- -
BD-2	MW-9DUP	8270C-TIC	Unknown	6.4 J	3.86	59	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9DUP	8270C-TIC	Unknown	4.7 J	4.25	78	Probable TIC Chemical Class.	Chemical Class: chlorinated VOC
	MW-9DUP	8270C-TIC	Unknown	6.5 J	4.57	83	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9DUP	8270C-TIC	Unknown	4.2 J	4.96	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
	MW-9DUP	8270C-TIC	Unknown	12 J	5.61	53	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9DUP	8270C-TIC	Unknown	240 J	6.46	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9DUP	8270C-TIC	Unknown	37 J	7.59	64	Probable TIC Chemical Class.	Chemical Class: glycol ether derivative
	MW-9DUP	8270C-TIC	Unknown	7.2 J	8.55	40	Low quality due to differing mass intensities; not retained for further analysis.	- -
Main Holding	MW-10	8270C-TIC	Unknown Aldol Condensate	54 A	3.42	- -	Should not have been reported; not retained for further analysis.	- -
Basin	MW-10	8270C-TIC	Unknown	7.5 J	4.26	40	Probable TIC Chemical Class.	Chemical Class: chlorinated VOC

Notes:
ug/L - micrograms per liter
TIC - Tentatively Identified Compound
SDB - Sludge Drying Beds
VFSP - Vacuum Filter Sludge Pile
WW - White Water
A - The tentatively identified compound is a suspected aldol-condensation product.
B - The compound / analyte was not detected substantially above the level of the associated method blank / preparation or field blank.
J - The positive result for this analyte is a quantitative estimate.

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Eastern WW Lagoon	ELSS-1A	8260B-TIC	Unknown	60 J	1.17	56	Not scanning for major ions 28 and 29; not retained for further analysis.	- -
	ELSS-1A	8260B-TIC	Unknown	290 J	1.35	74	Preservative artifact; not retained for further analysis.	- -
	ELSS-1A	8260B-TIC	Unknown	53 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	ELSS-1A	8260B-TIC	Unknown	57 J	1.58	0	No library search match produced; not retained for further analysis.	- -
	ELSS-1A	8260B-TIC	Unknown	110 J	1.67	56	Extraneous ions present; not retained for further analysis.	- -
	ELSS-1A	8260B-TIC	Unknown	28 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-1A	8260B-TIC	Unknown Alkene	130 J	8.06	96	Probable TIC Chemical Class; possible lab artifact; peak appeared in raw data for associated method blank.	Chemical Class: alkene
	ELSS-1A	8270C-TIC	Unknown Aldol Condensate	5300 A	2.77	- -	Should not have been reported; not retained for further analysis.	- -
Eastern WW Lagoon	ELSS-1B	8260B-TIC	Unknown	1000 J	1.15	0	No library search match produced; not retained for further analysis.	- -
	ELSS-1B	8260B-TIC	Unknown	64 J	1.38	90	Preservative artifact; not retained for further analysis.	- -
	ELSS-1B	8260B-TIC	Unknown	18 J	1.51	64	Probable TIC Identity.	acetaldehyde
	ELSS-1B	8260B-TIC	Unknown	13 J	1.58	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-1B	8260B-TIC	Unknown	37 B	1.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	ELSS-1B	8260B-TIC	Unknown	9.9 J	2.30	74	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-1B	8260B-TIC	Unknown	9.1 J	2.45	0	No library search match produced; not retained for further analysis.	- -
	ELSS-1B	8260B-TIC	Unknown Alkene	14 J	4.93	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-1B	8270C-TIC	Unknown Aldol Condensate	1400 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
Eastern WW Lagoon	ELSS-2A	8260B-TIC	Unknown	36 J	1.04	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2A	8260B-TIC	Unknown	85 J	1.17	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-2A	8260B-TIC	Unknown	69 J	1.38	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2A	8260B-TIC	Unknown	72 J	1.43	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2A	8260B-TIC	Unknown	91 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2A	8260B-TIC	Unknown	32 J	1.61	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2A	8260B-TIC	Unknown	38 J	1.73	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2A	8260B-TIC	Unknown	32 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-2A	8270C-TIC	Unknown Aldol Condensate	5200 A	2.77	- -	Should not have been reported; not retained for further analysis.	- -
	ELSS-2A	8270C-TIC	Unknown Alcohol	2400 J	15.28	70	Probable TIC Identity.	cholestan-3-ol, 6-methyl-, (3.beta.,5.alpha.,6.alpha)-
	ELSS-2A	8270C-TIC	Unknown Ketone	2100 J	16.21	55	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-2A	8270C-TIC	Unknown Alkene	3000 J	16.26	28	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Eastern WW Lagoon	ELSS-2B	8260B-TIC	Unknown	19 J	1.50	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8260B-TIC	Unknown	17 J	1.66	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8260B-TIC	Unknown	15 J	1.70	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8260B-TIC	Unknown	16 J	1.87	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8260B-TIC	Unknown	16 J	2.03	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8260B-TIC	Unknown	15 J	2.18	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8260B-TIC	Unknown	15 J	2.31	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8260B-TIC	Unknown	18 J	2.46	0	No library search match produced; not retained for further analysis.	- -
	ELSS-2B	8270C-TIC	Unknown Aldol Condensate	1100 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
	ELSS-2B	8270C-TIC	Unknown Aldol Condensate	280 A	2.82	- -	Should not have been reported; not retained for further analysis.	- -
Eastern WW Lagoon	ELSS-3A	8260B-TIC	Unknown	62 J	1.04	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3A	8260B-TIC	Unknown	1300 J	1.35	90	Preservative artifact; not retained for further analysis.	- -
	ELSS-3A	8260B-TIC	Unknown	170 J	1.63	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3A	8260B-TIC	Unknown	240 J	1.73	74	Previous peak already identified as sulfur dioxide	- -
	ELSS-3A	8260B-TIC	Unknown	140 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-3A	8260B-TIC	Unknown	180 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3A	8260B-TIC	Unknown	200 B	2.47	- -	NA-Blank Negated; not retained for further analysis.	- -
	ELSS-3A	8270C-TIC	Unknown Aldol Condensate	8900 A	2.77	- -	Should not have been reported; not retained for further analysis.	- -
	ELSS-3A	8270C-TIC	Unknown Aldol Condensate	3300 A	2.80	- -	Should not have been reported; not retained for further analysis.	- -
	ELSS-3A	8270C-TIC	Unknown	1800 J	15.28	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3A	8270C-TIC	Unknown	1800 J	16.20	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3A	8270C-TIC	Unknown	1400 J	16.27	0	No library search match produced; not retained for further analysis.	- -
Eastern WW Lagoon	ELSS-3B	8260B-TIC	Unknown	560 J	1.17	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3B	8260B-TIC	Unknown	32 J	1.33	74	Preservative artifact; not retained for further analysis.	- -
	ELSS-3B	8260B-TIC	Unknown	120 J	1.36	74	Previous peak already identified as sulfur dioxide	- -
	ELSS-3B	8260B-TIC	Unknown	40 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3B	8260B-TIC	Unknown	25 J	1.58	0	No library search match produced; not retained for further analysis.	- -
	ELSS-3B	8260B-TIC	Unknown	87 B	1.72	- -	NA-Blank Negated; not retained for further analysis.	- -
	ELSS-3B	8270C-TIC	Unknown Aldol Condensate	2000 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Eastern WW Lagoon	ELSS-4A	8260B-TIC	Unknown	86 J	1.04	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4A	8260B-TIC	Unknown	200 J	1.17	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4A	8260B-TIC	Unknown	52 J	1.39	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4A	8260B-TIC	Unknown	52 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4A	8260B-TIC	Unknown	84 J	2.01	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4A	8260B-TIC	Unknown	53 J	2.13	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4A	8260B-TIC	Unknown	140 J	2.30	74	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-4A	8260B-TIC	Unknown	61 J	2.44	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown Aldol Condensate	7100 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown Amine	3400 J	5.45	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown	2800 J	9.68	41	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown	2900 J	9.80	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown Alkane	11000 J	9.92	32	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown PAH	4500 J	10.92	64	Probable TIC Chemical Class.	Chemical Class: PAH
	ELSS-4A	8270C-TIC	Unknown Alkene	2700 J	14.26	87	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown	2600 J	14.58	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown Ketone	2500 J	16.31	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-4A	8270C-TIC	Unknown Alkene	3000 J	16.47	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
Eastern WW Lagoon	ELSS-4B	8260B-TIC	Unknown	13 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4B	8260B-TIC	Unknown	31 J	1.50	90	Probable TIC Identity.	acetaldehyde
	ELSS-4B	8260B-TIC	Unknown	13 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-4B	8260B-TIC	Unknown	23 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	ELSS-4B	8270C-TIC	Unknown Aldol Condensate	1400 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
Eastern WW Lagoon	ELSS-5A	8260B-TIC	Unknown	220 J	1.17	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5A	8260B-TIC	Unknown	410 J	1.39	64	Preservative artifact; not retained for further analysis.	- -
	ELSS-5A	8260B-TIC	Unknown	78 J	1.51	0	Probable TIC Identity.	acetaldehyde
	ELSS-5A	8260B-TIC	Unknown	91 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5A	8260B-TIC	Unknown	100 J	2.00	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5A	8260B-TIC	Unknown	70 J	2.18	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5A	8260B-TIC	Unknown	120 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-5A	8260B-TIC	Unknown	130 B	2.47	- -	NA-Blank Negated; not retained for further analysis.	- -
	ELSS-5A	8270C-TIC	Unknown Aldol Condensate	7800 A	2.77	- -	Should not have been reported; not retained for further analysis.	- -
	ELSS-5A	8270C-TIC	Unknown Amine	7200 J	5.44	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-5A	8270C-TIC	Unknown PAH	3300 J	9.92	30	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-5A	8270C-TIC	Unknown	2400 J	16.46	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSS-5A	8270C-TIC	Unknown Alkene	1600 J	16.75	60	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Eastern WW Lagoon	ELSS-5B	8260B-TIC	Unknown	9.8 J	1.04	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5B	8260B-TIC	Unknown	67 J	1.39	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5B	8260B-TIC	Unknown	29 J	1.51	56	Probable TIC Identity.	acetaldehyde
	ELSS-5B	8260B-TIC	Unknown	12 J	1.56	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5B	8260B-TIC	Unknown	31 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	ELSS-5B	8260B-TIC	Unknown	10 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	ELSS-5B	8260B-TIC	Unknown	14 B	2.47	- -	NA-Blank Negated; not retained for further analysis.	- -
	ELSS-5B	8270C-TIC	Unknown Aldol Condensate	1500 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
Western WW Lagoon	WLSS-1A	8260B-TIC	Unknown	780 J	1.37	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1A	8260B-TIC	Unknown	150 J	1.51	42	Probable TIC Identity.	acetaldehyde
	WLSS-1A	8260B-TIC	Unknown	240 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1A	8260B-TIC	Unknown	130 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	WLSS-1A	8260B-TIC	Unknown	150 J	2.36	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1A	8260B-TIC	Unknown	140 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1A	8260B-TIC	Unknown	260 B	2.47	- -	NA-Blank Negated; not retained for further analysis.	- -
	WLSS-1A	8260B-TIC	Unknown	120 J	2.57	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1A	8270C-TIC	Unknown Aldol Condensate	12000 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-1A	8270C-TIC	Unknown Amine	2300 J	5.45	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
Western WW Lagoon	WLSS-1B	8260B-TIC	Unknown	70 J	1.36	90	Preservative artifact; not retained for further analysis.	- -
	WLSS-1B	8260B-TIC	Unknown	36 J	1.51	90	Probable TIC Identity.	acetaldehyde
	WLSS-1B	8260B-TIC	Unknown	17 J	1.55	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1B	8260B-TIC	Unknown	39 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1B	8260B-TIC	Unknown	14 J	2.06	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1B	8260B-TIC	Unknown	17 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1B	8260B-TIC	Unknown	22 B	2.47	- -	NA-Blank Negated; not retained for further analysis.	- -
	WLSS-1B	8260B-TIC	Unknown	15 J	2.53	0	No library search match produced; not retained for further analysis.	- -
	WLSS-1B	8270C-TIC	Unknown Aldol Condensate	1800 A	2.77	- -	Should not have been reported; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
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Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Western WW Lagoon	WLSS-2A	8260B-TIC	Unknown	100 J	1.04	0	No library search match produced; not retained for further analysis.	- -
	WLSS-2A	8260B-TIC	Unknown	690 J	1.39	64	Preservative artifact; not retained for further analysis.	- -
	WLSS-2A	8260B-TIC	Unknown	510 J	1.51	86	Probable TIC Identity.	acetaldehyde
	WLSS-2A	8260B-TIC	Unknown	97 J	1.58	0	No library search match produced; not retained for further analysis.	- -
	WLSS-2A	8260B-TIC	Unknown	81 J	1.63	0	No library search match produced; not retained for further analysis.	- -
	WLSS-2A	8260B-TIC	Unknown	200 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	WLSS-2A	8260B-TIC	Unknown	1700 J	5.17	58	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown Aldol Condensate	17000 A	2.77	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown Alkane	21000 J	4.44	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown Alcohol	30000 J	6.28	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown Organic Acid	3500 J	7.11	33	Low quality due to differing mass intensities; not retained for further analysis. -	-
	WLSS-2A	8270C-TIC	Unknown	2300 J	7.56	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown Alcohol	17000 J	7.86	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown Alkane	6000 J	9.21	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown Alkane	3100 J	9.92	46	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2A	8270C-TIC	Unknown	2400 J	16.23	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
Western WW Lagoon	WLSS-2B	8260B-TIC	Unknown	17 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	WLSS-2B	8260B-TIC	Unknown	28 J	1.38	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8260B-TIC	Unknown	160 J	1.51	90	Probable TIC Identity.	acetaldehyde
	WLSS-2B	8260B-TIC	Unknown	51 J	1.58	78	Probable TIC Identity.	ethane, methoxy
	WLSS-2B	8260B-TIC	Unknown	12 J	1.72	0	No library search match produced; not retained for further analysis.	- -
	WLSS-2B	8260B-TIC	Unknown	140 J	5.17	72	Probable TIC Chemical Class.	Chemical Class: alkyl ether
	WLSS-2B	8260B-TIC	Unknown Alkene	5.1 J	6.09	91	Probable TIC Chemical Class.	Chemical Class: alkene
	WLSS-2B	8260B-TIC	Unknown	21 J	7.02	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Aldol Condensate	1300 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Aldol Condensate	200 A	2.82	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alcohol	900 J	3.92	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alcohol	20000 J	4.44	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alcohol	810 J	5.86	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alkane	28000 J	6.29	72	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alcohol	350 J	7.54	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alcohol	18000 J	7.86	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alcohol	6800 J	9.21	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-2B	8270C-TIC	Unknown Alkane	1100 J	10.40	47	Low quality due to differing mass intensities; not retained for further analysis.	- -

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Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Western WW Lagoon	WLSS-3A	8260B-TIC	Unknown	85 J	1.04	0	No library search match produced; not retained for further analysis.	- -
	WLSS-3A	8260B-TIC	Unknown	240 J	1.17	0	No library search match produced; not retained for further analysis.	- -
	WLSS-3A	8260B-TIC	Unknown	64 J	1.4	0	No library search match produced; not retained for further analysis.	- -
	WLSS-3A	8260B-TIC	Unknown	60 J	1.61	0	No library search match produced; not retained for further analysis.	- -
	WLSS-3A	8270C-TIC	Unknown Aldol Condensate	5800 A	2.74	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-3A	8270C-TIC	Unknown Amine	2400 J	9.65	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-3A	8270C-TIC	Unknown Cycloalkane	2500 J	9.76	22	Low quality due to differing mass intensities; not retained for further analysis. -	-
	WLSS-3A	8270C-TIC	Unknown	8200 J	9.89	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-3A	8270C-TIC	Unknown Alkene	2700 J	16.45	46	Low quality due to differing mass intensities; not retained for further analysis.	- -
Western WW Lagoon	WLSS-3B	8260B-TIC	Unknown	6.4 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	WLSS-3B	8260B-TIC	Unknown	23 J	1.51	83	Probable TIC Identity.	acetaldehyde
	WLSS-3B	8260B-TIC	Unknown	8.9 J	1.64	0	No library search match produced; not retained for further analysis.	- -
	WLSS-3B	8260B-TIC	Unknown	7.4 J	1.66	0	No library search match produced; not retained for further analysis.	- -
	WLSS-3B	8260B-TIC	Unknown Alkene	55 J	8.06	95	Probable TIC Chemical Class; possible lab artifact; peak appeared in raw data for associated method blank.	Chemical Class: alkene
	WLSS-3B	8270C-TIC	Unknown Aldol Condensate	1500 A	2.73	- -	Should not have been reported; not retained for further analysis.	- -
Western WW Lagoon	WLSS-4A	8260B-TIC	Unknown	250 J	1.19	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4A	8260B-TIC	Unknown	48 J	1.50	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4A	8260B-TIC	Unknown	73 J	1.64	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4A	8260B-TIC	Unknown	50 J	2.01	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4A	8260B-TIC	Unknown	67 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	WLSS-4A	8260B-TIC	Unknown	57 J	2.47	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4A	8270C-TIC	Unknown Aldol Condensate	5100 A	3.50	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-4A	8270C-TIC	Unknown Cycloalkane	1300 J	9.77	43	Probable TIC Chemical Class.	Chemical Class: alkyl ring
	WLSS-4A	8270C-TIC	Unknown	2200 J	9.91	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4A	8270C-TIC	Unknown	3800 J	10.04	0	No library search match produced; not retained for further analysis.	- -
Western WW Lagoon	WLSS-4ADUP	8260B-TIC	Unknown	330 J	1.17	43	Low quality due to differing mass intensities; not retained for further analysis. -	-
	WLSS-4ADUP	8260B-TIC	Unknown	61 J	1.39	0	No library search match produced; not retained for further analysis.	- -
Blind Dup ID:	WLSS-4ADUP	8260B-TIC	Unknown Alkene	270 J	8.06	97	Probable TIC Chemical Class; possible lab artifact; peak appeared in raw data for associated method blank.	Chemical Class: alkene
BD-6	WLSS-4ADUP	8270C-TIC	Unknown Aldol Condensate	5000 A	2.74	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-4ADUP	8270C-TIC	Unknown Cycloalkane	4400 J	9.89	32	Probable TIC Chemical Class.	Chemical Class: alkyl ring
Western WW Lagoon	WLSS-4B	8260B-TIC	Unknown	39 J	1.21	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4B	8260B-TIC	Unknown	120 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4B	8260B-TIC	Unknown	47 J	1.71	0	No library search match produced; not retained for further analysis.	- -
	WLSS-4B	8260B-TIC	Unknown	12 J	2.74	90	Probable TIC Chemical Class.	Chemical Class: alkyl chain
	WLSS-4B	8270C-TIC	Unknown Aldol Condensate	1800 A	2.73	- -	Should not have been reported; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Western WW Lagoon	WLSS-5A	8260B-TIC	Unknown	70 J	1.17	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5A	8260B-TIC	Unknown	200 J	1.40	64	Preservative artifact; not retained for further analysis.	- -
	WLSS-5A	8260B-TIC	Unknown	130 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5A	8260B-TIC	Unknown	71 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5A	8260B-TIC	Unknown	75 J	1.72	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5A	8260B-TIC	Unknown	71 J	2.08	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5A	8260B-TIC	Unknown	72 B	2.47	- -	NA-Blank Negated; not retained for further analysis.	- -
	WLSS-5A	8260B-TIC	Unknown	400 J	8.06	64	Probable TIC Chemical Class; possible lab artifact; peak appeared in raw data for associated method blank.	Chemical Class: dichlorobenzene
	WLSS-5A	8270C-TIC	Unknown Aldol Condensate	9000 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-5A	8270C-TIC	Unknown PAH	2000 J	9.92	25	Low quality due to differing mass intensities; not retained for further analysis.	- -
Western WW Lagoon	WLSS-5B	8260B-TIC	Unknown	12 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5B	8260B-TIC	Unknown	38 J	1.36	74	Preservative artifact; not retained for further analysis.	- -
	WLSS-5B	8260B-TIC	Unknown	30 J	1.51	86	Probable TIC Identity.	acetaldehyde
	WLSS-5B	8260B-TIC	Unknown	8.5 J	1.58	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5B	8260B-TIC	Unknown	6.9 J	1.73	0	No library search match produced; not retained for further analysis.	- -
	WLSS-5B	8260B-TIC	Unknown	7.3 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	WLSS-5B	8260B-TIC	Unknown Alkane	16 J	5.17	91	Probable TIC Identity.	ethane, 1,2-diethoxy
	WLSS-5B	8270C-TIC	Unknown Aldol Condensate	1500 A	2.78	- -	Should not have been reported; not retained for further analysis.	- -
	WLSS-5B	8270C-TIC	Unknown Alkane	370 J	3.94	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-5B	8270C-TIC	Unknown Alkane	450 J	4.45	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-5B	8270C-TIC	Unknown Alcohol	240 J	5.86	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-5B	8270C-TIC	Unknown Alkane	990 J	6.29	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-5B	8270C-TIC	Unknown Alcohol	950 J	7.86	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSS-5B	8270C-TIC	Unknown Alcohol	210 J	9.22	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
Natrosol Lagoon	NLSS-1A	8260B-TIC	Unknown Alkene	53 J	1.39	72	Probable TIC Chemical Class.	Chemical Class: alkene
	NLSS-1A	8260B-TIC	Unknown	26 J	1.51	86	Probable TIC Identity.	acetaldehyde
	NLSS-1A	8260B-TIC	Unknown	10 J	1.58	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1A	8260B-TIC	Unknown	13 J	1.64	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1A	8260B-TIC	Unknown	11 J	1.73	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1A	8260B-TIC	Unknown	8.7 J	2.47	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1A	8270C-TIC	Unknown Aldol Condensate	1400 B	2.79	- -	NA-Blank Negated; not retained for further analysis.	- -
	NLSS-1A	8270C-TIC	Unknown Ketone	300 J	15.70	32	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Natrosol Lagoon	NLSS-1B	8260B-TIC	Unknown Alkene	21 J	1.39	87	Probable TIC Chemical Class.	Chemical Class: alkene
	NLSS-1B	8260B-TIC	Unknown	45 J	1.52	90	Probable TIC Identity.	acetaldehyde
	NLSS-1B	8260B-TIC	Unknown	11 J	1.58	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1B	8260B-TIC	Unknown	19 J	1.72	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1B	8260B-TIC	Unknown	24 J	2.02	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1B	8260B-TIC	Unknown	30 J	2.19	72	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NLSS-1B	8260B-TIC	Unknown	10 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1B	8260B-TIC	Unknown	12 J	2.46	0	No library search match produced; not retained for further analysis.	- -
	NLSS-1B	8270C-TIC	Unknown Aldol Condensate	1100 B	2.79	- -	NA-Blank Negated; not retained for further analysis.	- -
	NLSS-1B	8270C-TIC	Unknown	210 J	15.70	46	Low quality due to differing mass intensities; not retained for further analysis.	- -
Natrosol Lagoon	NLSS-2A	8260B-TIC	Unknown	80 J	1.18	0	No library search match produced; not retained for further analysis.	- -
	NLSS-2A	8260B-TIC	Unknown	35 J	1.39	0	No library search match produced; not retained for further analysis.	- -
	NLSS-2A	8260B-TIC	Unknown	18 J	1.51	64	Probable TIC Identity.	acetaldehyde
	NLSS-2A	8260B-TIC	Unknown	16 J	1.57	0	No library search match produced; not retained for further analysis.	- -
	NLSS-2A	8260B-TIC	Unknown	8.3 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	NLSS-2A	8260B-TIC	Unknown	12 J	1.72	0	No library search match produced; not retained for further analysis.	- -
	NLSS-2A	8260B-TIC	Unknown	13 J	2.31	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	NLSS-2A	8260B-TIC	Unknown	14 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	NLSS-2A	8270C-TIC	Unknown Aldol Condensate	1400 B	2.80	- -	NA-Blank Negated; not retained for further analysis.	- -
	NLSS-2A	8270C-TIC	Unknown Amide	180 J	9.68	50	Probable TIC Chemical Class.	Chemical Class: amide
Natrosol Lagoon	NLSS-2B	8260B-TIC	Unknown Alkene	68 J	1.39	90	Probable TIC Chemical Class.	Chemical Class: alkene
	NLSS-2B	8260B-TIC	Unknown	11 J	1.52	0	No library search match produced; not retained for further analysis.	- -
	NLSS-2B	8270C-TIC	Unknown Aldol Condensate	1500 B	2.79	- -	NA-Blank Negated; not retained for further analysis.	- -
Natrosol Lagoon	NLSS-3A	8260B-TIC	Unknown	12 J	1.19	0	No library search match produced; not retained for further analysis.	- -
	NLSS-3A	8260B-TIC	Unknown Alkene	23 J	1.39	90	Probable TIC Chemical Class.	Chemical Class: alkene
	NLSS-3A	8260B-TIC	Unknown	29 J	1.51	64	Probable TIC Identity.	acetaldehyde
	NLSS-3A	8260B-TIC	Unknown	17 J	2.19	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	NLSS-3A	8270C-TIC	Unknown Aldol Condensate	1600 B	2.79	- -	NA-Blank Negated; not retained for further analysis.	- -
Natrosol Lagoon	NLSS-3B	8260B-TIC	Unknown Alkene	120 J	1.39	87	Probable TIC Chemical Class.	Chemical Class: alkene
	NLSS-3B	8260B-TIC	Unknown	10 J	1.51	83	Probable TIC Identity.	acetaldehyde
	NLSS-3B	8270C-TIC	Unknown Aldol Condensate	1200 B	2.79	- -	NA-Blank Negated; not retained for further analysis.	- -
	NLSS-3B	8270C-TIC	Unknown Alcohol	400 J	2.82	27	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
East Bear Creek	EBSED-1	8260B-TIC	Unknown	76 J	1.35	90	Cannot name Probable TIC Identity or Chemical class.	- -
	EBSED-1	8260B-TIC	Unknown	11 J	7.49	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
	EBSED-1	8260B-TIC	Unknown	15 J	7.76	50	Probable TIC Chemical Class.	Chemical Class: alkane
	EBSED-1	8260B-TIC	Unknown	6.5 J	8.23	0	No library search match produced; not retained for further analysis.	- -
	EBSED-1	8260B-TIC	Unknown Alkene	11 J	8.57	94	Probable TIC Chemical Class.	Chemical Class: alkene
	EBSED-1	8260B-TIC	Unknown	14 J	8.77	72	Probable TIC Chemical Class.	Chemical Class: alkane
	EBSED-1	8260B-TIC	Unknown Alkene	17 J	8.93	93	Probable TIC Chemical Class.	Chemical Class: alkene
	EBSED-1	8260B-TIC	Unknown	9.5 J	9.01	43	Low quality due to differing mass intensities; not retained for further analysis.	- -
	EBSED-1	8270C-TIC	Unknown Aldol Condensate	26000 A	2.70	- -	Should not have been reported; not retained for further analysis.	- -
	EBSED-1	8270C-TIC	Unknown Aldol Condensate	430 A	3.20	- -	Should not have been reported; not retained for further analysis.	- -
East Bear Creek	EBSED-2	8260B-TIC	Unknown	180 J	1.17	0	No library search match produced; not retained for further analysis.	- -
	EBSED-2	8260B-TIC	Unknown	41 J	1.35	0	No library search match produced; not retained for further analysis.	- -
	EBSED-2	8260B-TIC	Unknown	78 J	1.38	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	EBSED-2	8260B-TIC	Unknown	39 J	1.51	86	Probable TIC Identity.	acetaldehyde
	EBSED-2	8260B-TIC	Unknown	25 B	1.71	- -	NA-Blank Negated; not retained for further analysis.	- -
	EBSED-2	8260B-TIC	Unknown	20 J	1.88	72	Low quality due to differing mass intensities; not retained for further analysis.	- -
	EBSED-2	8260B-TIC	Unknown Alkane	34 J	3.75	91	Probable TIC Chemical Class.	Chemical Class: alkane
	EBSED-2	8260B-TIC	Unknown Alkene	10 J	5.02	91	Probable TIC Chemical Class.	Chemical Class: alkene
	EBSED-2	8270C-TIC	Unknown Aldol Condensate	340 B	3.21	- -	NA-Blank Negated; not retained for further analysis.	- -
	EBSED-2	8270C-TIC	Unknown PAH	380 J	12.49	49	Low quality due to differing mass intensities; not retained for further analysis.	- -
East Bear Creek	EBSED-3	8260B-TIC	Unknown	320 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	EBSED-3	8260B-TIC	Unknown	390 J	1.34	90	Cannot name Probable TIC Identity or Chemical class.	- -
	EBSED-3	8260B-TIC	Unknown	73 J	1.51	50	Probable TIC Identity.	acetaldehyde
	EBSED-3	8260B-TIC	Unknown	67 J	1.76	90	Cannot name Probable TIC Identity or Chemical class.	- -
	EBSED-3	8260B-TIC	Unknown	19 J	8.63	64	Probable TIC Chemical Class.	Chemical Class: alkane
	EBSED-3	8270C-TIC	Unknown Aldol Condensate	6500 A	2.71	- -	Should not have been reported; not retained for further analysis.	- -
	EBSED-3	8270C-TIC	Unknown Alcohol	270 J	10.12	53	Probable TIC Chemical Class.	Chemical Class: alcohol
West Bear Creek	WBSED-1	8260B-TIC	Unknown	150 J	1.21	0	No library search match produced; not retained for further analysis.	- -
	WBSED-1	8260B-TIC	Unknown	140 J	1.35	90	Cannot name Probable TIC Identity or Chemical class.	- -
	WBSED-1	8260B-TIC	Unknown	51 J	1.51	86	Probable TIC Identity.	acetaldehyde
	WBSED-1	8260B-TIC	Unknown	23 J	1.72	0	No library search match produced; not retained for further analysis.	- -
	WBSED-1	8260B-TIC	Unknown	31 J	2.49	83	Probable TIC Chemical Class.	Chemical Class: silane
	WBSED-1	8260B-TIC	Unknown	28 J	3.14	83	Probable TIC Chemical Class.	Chemical Class: silanol
	WBSED-1	8260B-TIC	Unknown	11 J	5.17	90	Cannot name Probable TIC Identity or Chemical class.	- -
	WBSED-1	8260B-TIC	Unknown	12 J	5.48	90	Probable TIC Chemical Class.	Chemical Class: hexanal
	WBSED-1	8270C-TIC	Unknown Aldol Condensate	320 B	3.21	- -	NA-Blank Negated; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
West Bear Creek	WBSED-2	8260B-TIC	Unknown	36 J	1.21	0	No library search match produced; not retained for further analysis.	- -
	WBSED-2	8260B-TIC	Unknown	97 J	1.35	90	Cannot name Probable TIC Identity or Chemical class.	- -
	WBSED-2	8260B-TIC	Unknown	83 J	1.51	74	Probable TIC Identity.	acetaldehyde
	WBSED-2	8260B-TIC	Unknown	25 J	1.58	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WBSED-2	8260B-TIC	Unknown	14 J	1.70	0	No library search match produced; not retained for further analysis.	- -
	WBSED-2	8260B-TIC	Unknown	9.9 J	2.18	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WBSED-2	8260B-TIC	Unknown Alkane	16 J	5.17	91	Probable TIC Chemical Class.	Chemical Class: alkane
	WBSED-2	8270C-TIC	Unknown Aldol Condensate	21000 B	2.71	- -	NA-Blank Negated; not retained for further analysis.	- -
	WBSED-2	8270C-TIC	Unknown Ketone	280 J	3.21	64	Probable TIC Chemical Class.	Chemical Class: ketone
	WBSED-2	8270C-TIC	Unknown Amine	340 J	5.39	27	Low quality due to differing mass intensities; not retained for further analysis.	- -
West Bear Creek	WBSED-3	8260B-TIC	Unknown	45 J	1.04	0	No library search match produced; not retained for further analysis.	- -
	WBSED-3	8260B-TIC	Unknown	130 J	1.19	0	No library search match produced; not retained for further analysis.	- -
	WBSED-3	8260B-TIC	Unknown	120 J	1.50	90	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WBSED-3	8260B-TIC	Unknown	46 B	1.66	- -	NA-Blank Negated; not retained for further analysis.	- -
	WBSED-3	8260B-TIC	Unknown	43 J	2.18	0	No library search match produced; not retained for further analysis.	- -
	WBSED-3	8260B-TIC	Unknown	64 J	2.29	0	No library search match produced; not retained for further analysis.	- -
	WBSED-3	8260B-TIC	Unknown	65 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	WBSED-3	8260B-TIC	Unknown	58 J	2.74	90	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WBSED-3	8270C-TIC	Unknown Aldol Condensate	2100 B	2.78	- -	NA-Blank Negated; not retained for further analysis.	- -
	WBSED-3	8270C-TIC	Unknown Alkene	1100 J	5.44	27	Probable TIC Chemical Class.	Chemical Class: alkene
	WBSED-3	8270C-TIC	Unknown Ketone	3400 J	12.45	53	Probable TIC Chemical Class.	Chemical Class: ketone
	WBSED-3	8270C-TIC	Unknown PAH	2700 J	12.55	43	Probable TIC Chemical Class.	Chemical Class: PAH
	WBSED-3	8270C-TIC	Unknown Alcohol	1500 J	16.30	70	Probable TIC Chemical Class.	Chemical Class: alcohol
Unnamed Tributary	UTSED-1	8260B-TIC	Unknown	19 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	UTSED-1	8260B-TIC	Unknown	89 J	1.38	74	Cannot name Probable TIC Identity or Chemical class.	- -
	UTSED-1	8260B-TIC	Unknown	67 J	1.51	50	Probable TIC Identity.	acetaldehyde
	UTSED-1	8260B-TIC	Unknown	17 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	UTSED-1	8260B-TIC	Unknown	81 J	1.82	90	Cannot name Probable TIC Identity or Chemical class.	- -
	UTSED-1	8260B-TIC	Unknown	17 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	UTSED-1	8260B-TIC	Unknown	17 J	2.54	0	No library search match produced; not retained for further analysis.	- -
	UTSED-1	8260B-TIC	Unknown	12 J	5.48	72	Probable TIC Chemical Class.	Chemical Class: hexanal
	UTSED-1	8270C-TIC	Unknown Aldol Condensate	24000 A	2.71	- -	Should not have been reported; not retained for further analysis.	- -
	UTSED-1	8270C-TIC	Unknown Aldol Condensate	340 A	3.21	- -	Should not have been reported; not retained for further analysis.	- -

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Unnamed	UTSED-2	8260B-TIC	Unknown	46 J	1.18	0	No library search match produced; not retained for further analysis.	- -
Tributary	UTSED-2	8260B-TIC	Unknown	100 J	1.21	0	No library search match produced; not retained for further analysis.	- -
	UTSED-2	8260B-TIC	Unknown	51 J	1.40	0	No library search match produced; not retained for further analysis.	- -
	UTSED-2	8260B-TIC	Unknown	69 J	1.51	74	Probable TIC Identity.	acetaldehyde
	UTSED-2	8260B-TIC	Unknown	68 J	1.81	90	Cannot name Probable TIC Identity or Chemical class.	- -
	UTSED-2	8260B-TIC	Unknown	27 J	2.19	0	No library search match produced; not retained for further analysis.	- -
	UTSED-2	8260B-TIC	Unknown	34 J	2.31	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	UTSED-2	8260B-TIC	Unknown	29 B	2.43	- -	NA-Blank Negated; not retained for further analysis.	- -
	UTSED-2	8270C-TIC	Unknown Aldol Condensate	27000 B	2.67	- -	NA-Blank Negated; not retained for further analysis.	- -
	UTSED-2	8270C-TIC	Unknown	460 J	3.59	39	Low quality due to differing mass intensities; not retained for further analysis.	- -
	UTSED-2	8270C-TIC	Unknown	680 J	10.08	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	UTSED-2	8270C-TIC	Unknown PAH	530 J	14.37	43	Probable TIC Chemical Class.	Chemical Class: PAH
	UTSED-2	8270C-TIC	Unknown Alkene	850 J	15.46	53	Probable TIC Chemical Class.	Chemical Class: alkene
	UTSED-2	8270C-TIC	Unknown Alkane	370 J	15.56	40	Probable TIC Chemical Class.	Chemical Class: alkane
	UTSED-2	8270C-TIC	Unknown Alcohol	1000 J	15.96	38	Probable TIC Chemical Class.	Chemical Class: alcohol
Unnamed	UTSED-3	8260B-TIC	Unknown	35 J	1.42	0	No library search match produced; not retained for further analysis.	- -
Tributary	UTSED-3	8260B-TIC	Unknown	13 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	UTSED-3	8260B-TIC	Unknown	21 J	1.81	90	Cannot name Probable TIC Identity or Chemical class.	- -
	UTSED-3	8270C-TIC	Unknown Aldol Condensate	17000 A	2.70	- -	Should not have been reported; not retained for further analysis.	- -
	UTSED-3	8270C-TIC	Unknown Aldol Condensate	260 A	3.20	- -	Should not have been reported; not retained for further analysis.	- -
	UTSED-3	8270C-TIC	Unknown	190 J	7.55	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	UTSED-3	8270C-TIC	Unknown	210 J	16.24	46	Low quality due to differing mass intensities; not retained for further analysis.	- -
	UTSED-3	8270C-TIC	Unknown	370 J	16.39	42	Low quality due to differing mass intensities; not retained for further analysis.	- -
Cattail Creek	CCSED-1	8260B-TIC	Unknown	45 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	CCSED-1	8260B-TIC	Unknown	100 J	1.38	86	Cannot name Probable TIC Identity or Chemical class.	- -
	CCSED-1	8260B-TIC	Unknown	140 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	CCSED-1	8260B-TIC	Unknown	38 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	CCSED-1	8260B-TIC	Unknown	100 J	1.79	90	Cannot name Probable TIC Identity or Chemical class.	- -
	CCSED-1	8260B-TIC	Unknown	30 J	2.06	0	No library search match produced; not retained for further analysis.	- -
	CCSED-1	8260B-TIC	Unknown	40 J	2.30	0	Target VOA analyte; not reported on quantitation report; retention time match.	carbon disulfide
	CCSED-1	8260B-TIC	Unknown	30 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	CCSED-1	8270C-TIC	Unknown Aldol Condensate	26000 A	2.71	- -	Should not have been reported; not retained for further analysis.	- -
	CCSED-1	8270C-TIC	Unknown Aldol Condensate	430 A	3.21	- -	Should not have been reported; not retained for further analysis.	- -
	CCSED-1	8270C-TIC	Unknown Alkene	490 J	16.45	51	Probable TIC Chemical Class.	Chemical Class: alkene

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Cattail Creek	CCSED-2	8260B-TIC	Unknown	66 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	CCSED-2	8260B-TIC	Unknown	38 J	1.51	83	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSED-2	8260B-TIC	Unknown	53 B	1.66	- -	NA-Blank Negated; not retained for further analysis.	- -
	CCSED-2	8260B-TIC	Unknown	30 B	1.70	- -	NA-Blank Negated; not retained for further analysis.	- -
	CCSED-2	8260B-TIC	Unknown	19 J	1.90	0	No library search match produced; not retained for further analysis.	- -
	CCSED-2	8260B-TIC	Unknown	19 J	2.05	0	No library search match produced; not retained for further analysis.	- -
	CCSED-2	8260B-TIC	Unknown	29 J	2.29	0	No library search match produced; not retained for further analysis.	- -
	CCSED-2	8260B-TIC	Unknown	15 J	2.74	83	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSED-2	8270C-TIC	Unknown Aldol Condensate	2500 B	2.76	- -	NA-Blank Negated; not retained for further analysis.	- -
	CCSED-2	8270C-TIC	Unknown Ketone	550 J	12.55	38	Probable TIC Chemical Class.	Chemical Class: ketone
	CCSED-2	8270C-TIC	Unknown Alkane	600 J	13.25	64	Probable TIC Chemical Class.	Chemical Class: alkane
	CCSED-2	8270C-TIC	Unknown Alcohol	670 J	15.68	78	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-2	8270C-TIC	Unknown Alcohol	1300 J	16.31	76	Probable TIC Chemical Class.	Chemical Class: alcohol
Cattail Creek	CCSED-3	8260B-TIC	Unknown	130 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	CCSED-3	8260B-TIC	Unknown	77 J	1.40	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSED-3	8260B-TIC	Unknown	59 J	1.51	0	No library search match produced; not retained for further analysis.	- -
	CCSED-3	8260B-TIC	Unknown	31 J	1.58	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSED-3	8260B-TIC	Unknown	16 J	1.64	0	No library search match produced; not retained for further analysis.	- -
	CCSED-3	8260B-TIC	Unknown	21 J	1.67	0	No library search match produced; not retained for further analysis.	- -
	CCSED-3	8260B-TIC	Unknown	40 J	1.70	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSED-3	8260B-TIC	Unknown	14 J	2.19	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSED-3	8270C-TIC	Unknown Aldol Condensate	1500 A	2.73	- -	Should not have been reported; not retained for further analysis.	- -
	CCSED-3	8270C-TIC	Unknown Alcohol	6900 J	4.39	56	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-3	8270C-TIC	Unknown Alcohol	9100 J	6.23	64	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-3	8270C-TIC	Unknown Alcohol	3900 J	7.82	78	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-3	8270C-TIC	Unknown Cycloalkane	550 J	8.23	52	Probable TIC Chemical Class.	Chemical Class: cycloalkane
	CCSED-3	8270C-TIC	Unknown Alcohol	730 J	9.18	78	Probable TIC Chemical Class.	Chemical Class: alcohol

TABLE B-3
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SEDIMENT
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/Kg)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Cattail Creek	CCSED-3DUP	8260B-TIC	Unknown	400 J	1.17	0	No library search match produced; not retained for further analysis.	- -
	CCSED-3DUP	8260B-TIC	Unknown	220 J	1.38	90	Cannot name Probable TIC Identity or Chemical class.	- -
Blind Dup ID:	CCSED-3DUP	8260B-TIC	Unknown	110 J	1.51	64	Probable TIC Identity.	acetaldehyde
BD-4	CCSED-3DUP	8260B-TIC	Unknown	180 J	1.58	86	Probable TIC Chemical Class.	Chemical Class: alkane
	CCSED-3DUP	8260B-TIC	Unknown	60 J	1.69	0	No library search match produced; not retained for further analysis.	- -
	CCSED-3DUP	8260B-TIC	Unknown	44 J	1.73	0	No library search match produced; not retained for further analysis.	- -
	CCSED-3DUP	8260B-TIC	Unknown	24 J	2.19	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSED-3DUP	8260B-TIC	Unknown Alkane	24 J	5.18	91	Probable TIC Chemical Class.	Chemical Class: alkane
	CCSED-3DUP	8270C-TIC	Unknown Aldol Condensate	1200 A	2.73	- -	Should not have been reported; not retained for further analysis.	- -
	CCSED-3DUP	8270C-TIC	Unknown Alcohol	4900 J	4.39	56	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-3DUP	8270C-TIC	Unknown Alcohol	7600 J	6.23	64	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-3DUP	8270C-TIC	Unknown Alcohol	2700 J	7.82	74	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-3DUP	8270C-TIC	Unknown Alcohol	410 J	8.23	53	Probable TIC Chemical Class.	Chemical Class: alcohol
	CCSED-3DUP	8270C-TIC	Unknown Ketone	450 J	12.43	68	Probable TIC Chemical Class.	Chemical Class: ketone
	CCSED-3DUP	8270C-TIC	Unknown PAH	900 J	12.53	47	Probable TIC Chemical Class.	Chemical Class: PAH
Bailey Creek	BCSED-1	8260B-TIC	Unknown	92 J	1.20	0	No library search match produced; not retained for further analysis.	- -
	BCSED-1	8260B-TIC	Unknown	230 J	1.36	90	Cannot name Probable TIC Identity or Chemical class.	- -
	BCSED-1	8260B-TIC	Unknown	78 J	1.51	90	Probable TIC Identity.	acetaldehyde
	BCSED-1	8260B-TIC	Unknown	50 J	1.77	90	Cannot name Probable TIC Identity or Chemical class.	- -
	BCSED-1	8260B-TIC	Unknown	24 J	2.41	0	No library search match produced; not retained for further analysis.	- -
	BCSED-1	8260B-TIC	Unknown	30 J	2.48	0	No library search match produced; not retained for further analysis.	- -
	BCSED-1	8260B-TIC	Unknown	20 J	2.54	0	No library search match produced; not retained for further analysis.	- -
	BCSED-1	8260B-TIC	Unknown	21 J	2.75	90	Probable TIC Chemical Class.	Chemical Class: propanal
	BCSED-1	8260B-TIC	Unknown Alkene	130 J	8.07	97	Probable TIC Chemical Class.	Chemical Class: alkene
	BCSED-1	8270C-TIC	Unknown Aldol Condensate	25000 B	2.69	- -	NA-Blank Negated; not retained for further analysis.	- -
	BCSED-1	8270C-TIC	Unknown Alcohol	680 J	13.15	74	Probable TIC Chemical Class.	Chemical Class: alcohol
	BCSED-1	8270C-TIC	Unknown Cycloalkane	620 J	14.13	52	Probable TIC Chemical Class.	Chemical Class: cycloalkane
	BCSED-1	8270C-TIC	Unknown	800 J	14.42	81	Low quality due to differing mass intensities; not retained for further analysis.	- -
	BCSED-1	8270C-TIC	Unknown Alcohol	1200 J	16.00	47	Probable TIC Chemical Class.	Chemical Class: alcohol
	BCSED-1	8270C-TIC	Unknown Alkene	1400 J	16.11	50	Low quality due to differing mass intensities; not retained for further analysis.	- -

Notes:
ug/Kg - micrograms per kilogram
TIC - Tentatively Identified Compound
WW - White Water
A - The tentatively identified compound is a suspected aldol-condensation product.
B - The compound / analyte was not detected substantially above the level of the associated method blank / preparation or field blank.
J - The positive result for this analyte is a quantitative estimate.

TABLE B-4
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Eastern WW	ELSW-1	8260B-TIC	Unknown	21 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
Lagoon	ELSW-1	8270C-TIC	Unknown Aldol Condensate	44 A	3.34	- -	Should not have been reported; not retained for further analysis.	- -
	ELSW-1	8270C-TIC	Unknown	4.2 J	4.17	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSW-1	8270C-TIC	Unknown	13 J	11.54	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
Eastern WW	ELSW-2	8260B-TIC	Unknown	21 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
Lagoon	ELSW-2	8270C-TIC	Unknown Aldol Condensate	64 A	3.35	- -	Should not have been reported; not retained for further analysis.	- -
	ELSW-2	8270C-TIC	Unknown	4.9 J	9.63	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	ELSW-2	8270C-TIC	Unknown	4.1 J	11.54	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
Eastern WW	ELSW-3	8260B-TIC	Unknown Alkane	5.2 J	2.08	86	Probable TIC Chemical Class.	Chemical Class: alkane
Lagoon	ELSW-3	8260B-TIC	Unknown	26 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
	ELSW-3	8270C-TIC	Unknown Aldol Condensate	95 A	3.66	- -	Should not have been reported; not retained for further analysis.	- -
	ELSW-3	8270C-TIC	Unknown Organic Acid	8.5 J	10.17	58	Low quality due to differing mass intensities; not retained for further analysis. -	-
	ELSW-3	8270C-TIC	Unknown	5.1 J	11.91	37	Low quality due to differing mass intensities; not retained for further analysis.	- -
Western WW	WLSW-1	8260B-TIC	Unknown	5.1 J	2.03	36	Low quality due to differing mass intensities; not retained for further analysis.	- -
Lagoon	WLSW-1	8260B-TIC	Unknown	20 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown Aldol Condensate	41 A	3.66	- -	Should not have been reported; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	7 J	6.29	22	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	17 J	6.96	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	56 J	8.20	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	5.5 J	8.45	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	5.4 J	8.65	0	No library search match produced; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	69 J	9.25	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	44 J	10.17	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	8.2 J	11.00	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-1	8270C-TIC	Unknown	7.8 J	11.93	35	Low quality due to differing mass intensities; not retained for further analysis.	- -
Western WW	WLSW-2	8260B-TIC	Unknown	6.9 J	2.25	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
Lagoon	WLSW-2	8270C-TIC	Unknown Aldol Condensate	44 A	3.67	- -	Should not have been reported; not retained for further analysis.	- -
	WLSW-2	8270C-TIC	Unknown	17 J	5.34	23	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-2	8270C-TIC	Unknown	160 J	6.97	78	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-2	8270C-TIC	Unknown	250 J	8.22	45	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-2	8270C-TIC	Unknown	12 J	8.46	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-2	8270C-TIC	Unknown Organic Acid	250 J	9.27	38	Probable TIC Chemical Class.	Chemical Class: organic acid
	WLSW-2	8270C-TIC	Unknown	200 J	10.19	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-2	8270C-TIC	Unknown	39 J	11.02	50	Low quality due to differing mass intensities; not retained for further analysis.	- -

TABLE B-4
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Western WW Lagoon	WLSW-3	8270C-TIC	Unknown	110 J	3.66	0	No library search match produced; not retained for further analysis.	- -
	WLSW-3	8270C-TIC	Unknown	15 J	5.33	23	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-3	8270C-TIC	Unknown	130 J	6.96	56	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-3	8270C-TIC	Unknown	260 J	8.20	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-3	8270C-TIC	Unknown	11 J	8.45	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-3	8270C-TIC	Unknown	280 J	9.25	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-3	8270C-TIC	Unknown	180 J	10.17	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WLSW-3	8270C-TIC	Unknown	37 J	11.00	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
Natrosol Lagoon	NLSW-1	8260B-TIC	Unknown	21 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
	NLSW-1	8270C-TIC	Unknown	120 J	3.77	0	No library search match produced; not retained for further analysis.	- -
Natrosol Lagoon	NLSW-2	8260B-TIC	Unknown	13 B	2.14	- -	NA-Blank Negated; not retained for further analysis.	- -
East Bear Creek	EBSW-1	8260B-TIC	Unknown	6 J	2.03	38	Low quality due to differing mass intensities; not retained for further analysis.	- -
	EBSW-1	8260B-TIC	Unknown	11 J	2.17	0	No library search match produced; not retained for further analysis.	- -
	EBSW-1	8270C-TIC	Unknown Aldol Condensate	40 B	3.45	- -	NA-Blank Negated; not retained for further analysis.	- -
East Bear Creek	EBSW-2	8260B-TIC	Unknown	21 B	2.13	- -	NA-Blank Negated; not retained for further analysis.	- -
	EBSW-2	8270C-TIC	Unknown Aldol Condensate	24 A	3.61	- -	Should not have been reported; not retained for further analysis.	- -
	EBSW-2	8270C-TIC	Unknown	8.6 J	6.62	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
	EBSW-2	8270C-TIC	Unknown	4.5 J	6.70	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
East Bear Creek	EBSW-3	8260B-TIC	Unknown	5.5 J	1.99	0	No library search match produced; not retained for further analysis.	- -
	EBSW-3	8260B-TIC	Unknown	6.9 J	2.05	0	No library search match produced; not retained for further analysis.	- -
	EBSW-3	8270C-TIC	Unknown Aldol Condensate	36 B	3.45	- -	NA-Blank Negated; not retained for further analysis.	- -
West Bear Creek	WBSW-1	8260B-TIC	Unknown	8.9 B	2.05	- -	NA-Blank Negated; not retained for further analysis.	- -
	WBSW-1	8270C-TIC	Unknown Aldol Condensate	59 A	3.61	- -	Should not have been reported; not retained for further analysis.	- -
	WBSW-1	8270C-TIC	Unknown	32 J	5.37	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WBSW-1	8270C-TIC	Unknown	8.8 J	6.92	50	Low quality due to differing mass intensities; not retained for further analysis.	- -
West Bear Creek	WBSW-2	8260B-TIC	Unknown	5.2 J	1.99	0	No library search match produced; not retained for further analysis.	- -
	WBSW-2	8260B-TIC	Unknown	11 J	2.05	83	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WBSW-2	8270C-TIC	Unknown Aldol Condensate	82 A	3.61	- -	Should not have been reported; not retained for further analysis.	- -
	WBSW-2	8270C-TIC	Unknown	26 J	5.37	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	WBSW-2	8270C-TIC	Unknown	7.5 J	6.92	83	Low quality due to differing mass intensities; not retained for further analysis.	- -
West Bear Creek	WBSW -3	8270C-TIC	Unknown Aldol Condensate	35 B	3.32	- -	NA-Blank Negated; not retained for further analysis.	- -
	WBSW -3	8270C-TIC	Unknown	4.6 B	4.15	- -	NA-Blank Negated; not retained for further analysis.	- -
	WBSW -3	8270C-TIC	Unknown	8.8 J	4.95	83	Low quality due to differing mass intensities; not retained for further analysis.	- -
Unnamed Tributary	UTSW-1	8270C-TIC	Unknown Aldol Condensate	71 B	3.60	- -	NA-Blank Negated; not retained for further analysis.	- -

TABLE B-4
EVALUATION OF UNKNOWN TENTATIVELY IDENTIFIED COMPOUNDS IN SURFACE WATER
Hercules Incorporated Facility - Hopewell, Virginia

Sample Location	Sample ID	Analytical Method	Analyte	Result (ug/L)	Retention Time (minutes)	Quality of Selected Library Match	Evaluation/Identification	Probable Identity or Probable Chemical Class
Unnamed	UTSW-2	8260B-TIC	Unknown	6.1 J	2.05	0	No library search match produced; not retained for further analysis.	- -
Tributary	UTSW-2	8270C-TIC	Unknown Aldol Condensate	60 A	3.57	- -	Should not have been reported; not retained for further analysis.	- -
Unnamed	UTSW-3	8260B-TIC	Unknown	6.2 J	1.99	0	No library search match produced; not retained for further analysis.	- -
Tributary	UTSW-3	8260B-TIC	Unknown	6.1 J	2.03	0	No library search match produced; not retained for further analysis.	- -
	UTSW-3	8260B-TIC	Unknown	20 J	2.13	0	No library search match produced; not retained for further analysis.	- -
	UTSW-3	8270C-TIC	Unknown Aldol Condensate	34 B	3.45	- -	NA-Blank Negated; not retained for further analysis.	- -
	UTSW-3	8270C-TIC	Unknown	190 J	6.50	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	UTSW-3	8270C-TIC	Unknown	150 J	7.64	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	UTSW-3	8270C-TIC	Unknown	60 J	8.59	53	Low quality due to differing mass intensities; not retained for further analysis.	- -
Cattail Creek	CCSW-1	8260B-TIC	Unknown	13 J	2.16	0	No library search match produced; not retained for further analysis.	- -
	CCSW-1	8270C-TIC	Unknown Aldol Condensate	28 A	3.58	- -	Should not have been reported; not retained for further analysis.	- -
	CCSW-1	8270C-TIC	Unknown Aldol Condensate	59 B	3.60	- -	NA-Blank Negated; not retained for further analysis.	- -
Cattail Creek	CCSW-2	8270C-TIC	Unknown Aldol Condensate	55 B	3.32	- -	NA-Blank Negated; not retained for further analysis.	- -
	CCSW-2	8270C-TIC	Unknown	7.1 J	6.49	74	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSW-2	8270C-TIC	Unknown	5.6 J	7.73	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
Cattail Creek	CCSW3	8260B-TIC	Unknown	5.6 J	1.99	0	No library search match produced; not retained for further analysis.	- -
	CCSW3	8260B-TIC	Unknown	6 B	2.05	- -	NA-Blank Negated; not retained for further analysis.	- -
	CCSW3	8270C-TIC	Unknown Aldol Condensate	51 A	3.61	- -	Should not have been reported; not retained for further analysis.	- -
	CCSW3	8270C-TIC	Unknown	12 J	5.37	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSW3	8270C-TIC	Unknown	23 J	6.92	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSW3	8270C-TIC	Unknown	20 J	8.16	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
	CCSW3	8270C-TIC	Unknown	7.8 J	9.22	47	Low quality due to differing mass intensities; not retained for further analysis.	- -
Cattail Creek	CCSW-3DUP	8270C-TIC	Unknown Aldol Condensate	72 A	3.61	- -	Should not have been reported; not retained for further analysis. -	-
	CCSW-3DUP	8270C-TIC	Unknown	22 J	6.92	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
Blind Dup ID:	CCSW-3DUP	8270C-TIC	Unknown	19 J	8.16	56	Low quality due to differing mass intensities; not retained for further analysis. -	-
BD-1	CCSW-3DUP	8270C-TIC	Unknown	7.9 J	9.22	64	Low quality due to differing mass intensities; not retained for further analysis.	- -
Bailey Creek	BCSW-1	8260B-TIC	Unknown	5.5 J	2.03	0	No library search match produced; not retained for further analysis.	- -
	BCSW-1	8270C-TIC	Unknown Aldol Condensate	22 A	3.58	- -	Should not have been reported; not retained for further analysis.	- -
	BCSW-1	8270C-TIC	Unknown Aldol Condensate	45 B	3.60	- -	NA-Blank Negated; not retained for further analysis.	- -

Notes:
ug/L - micrograms per liter
TIC - Tentatively Identified Compound
WW - White Water
A - The tentatively identified compound is a suspected aldol-condensation product.
B - The compound / analyte was not detected substantially above the level of the associated method blank / preparation or field blank.
J - The positive result for this analyte is a quantitative estimate.

APPENDIX C

STATISTICAL CALCULATIONS

TABLE C-1
STATISTICS FOR SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

28-Norolean-17-en-3-one
All units in mg/Kg.

General Statistics

Number of Valid Observations 1 — Number of Distinct Observations 1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable 28-Norolean-17-en-3-one was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

2,2-dimethoxy-propane
All units in mg/Kg.

General Statistics

Number of Valid Observations 2 — Number of Distinct Observations 2

Warning: This data set only has 2 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable 2,2-dimethoxy-propane was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

TABLE C-1
STATISTICS FOR SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Arsenic
All units in mg/Kg.

General Statistics

Number of Valid Observations	8
Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	1.1	Minimum of Log Data	0.0953
Maximum	22	Maximum of Log Data	3.091
Mean	4.619	Mean of log Data	0.996
Median	2.15	SD of log Data	0.918
SD	7.063		
Coefficient of Variation	1.529		
Skewness	2.766		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.519	Shapiro Wilk Test Statistic	0.791
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	9.35	95% H-UCL	12.65
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9.438
95% Adjusted-CLT UCL	11.34	97.5% Chebyshev (MVUE) UCL	11.85
95% Modified-t UCL	9.757	99% Chebyshev (MVUE) UCL	16.59
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.753	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	6.131		
MLE of Mean	4.619		
MLE of Standard Deviation	5.321		
nu star	12.05		
Approximate Chi Square Value (.05)	5.263	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	8.726
Adjusted Chi Square Value	4.185	95% Jackknife UCL	9.35
		95% Standard Bootstrap UCL	8.371
Anderson-Darling Test Statistic	1.239	95% Bootstrap-t UCL	40.49
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	29.34
Kolmogorov-Smirnov Test Statistic	0.352	95% Percentile Bootstrap UCL	9.344
Kolmogorov-Smirnov 5% Critical Value	0.301	95% BCA Bootstrap UCL	12.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	15.5
		97.5% Chebyshev(Mean, Sd) UCL	20.21
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	29.46
95% Approximate Gamma UCL	10.58		
95% Adjusted Gamma UCL	13.3		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 15.5

TABLE C-1
STATISTICS FOR SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Chromium
All units in mg/Kg.

General Statistics

Number of Valid Observations	8
Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	9.7	Minimum of Log Data	2.272
Maximum	31	Maximum of Log Data	3.434
Mean	20.03	Mean of log Data	2.906
Median	18.5	SD of log Data	0.464
SD	8.794		
Coefficient of Variation	0.439		
Skewness	0.161		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.863	Shapiro Wilk Test Statistic	0.878
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	25.92	95% H-UCL	30.46
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	34.56
95% Adjusted-CLT UCL	25.33	97.5% Chebyshev (MVUE) UCL	40.83
95% Modified-t UCL	25.95	99% Chebyshev (MVUE) UCL	53.15

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	3.609	**Data appear Normal at 5% Significance Level**
Theta Star	5.548	
MLE of Mean	20.03	
MLE of Standard Deviation	10.54	
nu star	57.75	
Approximate Chi Square Value (.05)	41.28	**Nonparametric Statistics**
Adjusted Level of Significance	0.0195	95% CLT UCL 25.14
Adjusted Chi Square Value	37.78	95% Jackknife UCL 25.92
		95% Standard Bootstrap UCL 24.79
Anderson-Darling Test Statistic	0.546	95% Bootstrap-t UCL 26.88
Anderson-Darling 5% Critical Value	0.719	95% Hall's Bootstrap UCL 23.8
Kolmogorov-Smirnov Test Statistic	0.245	95% Percentile Bootstrap UCL 25.19
Kolmogorov-Smirnov 5% Critical Value	0.295	95% BCA Bootstrap UCL 24.78
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 33.58
		97.5% Chebyshev(Mean, Sd) UCL 39.44
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 50.96
95% Approximate Gamma UCL	28.01	
95% Adjusted Gamma UCL	30.61	

Potential UCL to Use	Use 95% Student's-t UCL 25.92

TABLE C-1
STATISTICS FOR SOIL - DIRECT CONTACT
LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Thallium
All units in mg/Kg.

General Statistics

Number of Valid Data	8	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	3
		Percent Non-Detects	37.50%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.16	Minimum Detected	-1.833
Maximum Detected	0.89	Maximum Detected	-0.117
Mean of Detected	0.361	Mean of Detected	-1.224
SD of Detected	0.3	SD of Detected	0.66
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.21	Maximum Non-Detect	-1.561

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	5
Number treated as Detected	3
Single DL Non-Detect Percentage	62.50%

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions
It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.711	Shapiro Wilk Test Statistic	0.86
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.263	Mean	-1.629
SD	0.264	SD	0.75
95% DL/2 (t) UCL	0.44	95% H-Stat (DL/2) UCL	0.634
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0458	Mean in Log Scale	-1.517
SD	0.449	SD in Log Scale	0.645
95% MLE (t) UCL	0.346	Mean in Original Scale	0.276
95% MLE (Tiku) UCL	0.494	SD in Original Scale	0.255
		95% Percentile Bootstrap UCL	0.445
		95% BCA Bootstrap UCL	0.487

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.171	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.308		
nu star	11.71		
A-D Test Statistic	0.602	**Nonparametric Statistics**	
5% A-D Critical Value	0.683	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.683	Mean	0.287
5% K-S Critical Value	0.36	SD	0.233
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.092
		95% KM (t) UCL	0.461
Assuming Gamma Distribution		95% KM (z) UCL	0.438
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.447
Minimum	0.16	95% KM (bootstrap t) UCL	0.835
Maximum	0.89	95% KM (BCA) UCL	0.496
Mean	0.356	95% KM (Percentile Bootstrap) UCL	0.464
Median	0.315	95% KM (Chebyshev) UCL	0.688
SD	0.227	97.5% KM (Chebyshev) UCL	0.862
k star	2.616	99% KM (Chebyshev) UCL	1.203
Theta star	0.136		
Nu star	41.86	**Potential UCLs to Use**	
AppChi2	28.03	95% KM (Percentile Bootstrap) UCL	0.464
95% Gamma Approximate UCL	0.531		
95% Adjusted Gamma UCL	0.591		

Note: DL/2 is not a recommended method.

TABLE C-2
STATISTICS FOR SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Arsenic
All units in mg/Kg.

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	1.1	Minimum of Log Data	0.0953
Maximum	3.8	Maximum of Log Data	1.335
Mean	2.4	Mean of log Data	0.785
Median	2.5	SD of log Data	0.466
SD	1.012		
Coefficient of Variation	0.422		
Skewness	0.00929		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.926	Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	3.028	95% H-UCL	3.511
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.067
95% Adjusted-CLT UCL	2.956	97.5% Chebyshev (MVUE) UCL	4.783
95% Modified-t UCL	3.028	99% Chebyshev (MVUE) UCL	6.189
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.877	**Data appear Normal at 5% Significance Level**	
Theta Star	0.619		
MLE of Mean	2.4		
MLE of Standard Deviation	1.219		
nu star	69.78		
Approximate Chi Square Value (.05)	51.55	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	2.955
Adjusted Chi Square Value	48.26	95% Jackknife UCL	3.028
		95% Standard Bootstrap UCL	2.92
Anderson-Darling Test Statistic	0.357	95% Bootstrap-t UCL	3.034
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL	2.872
Kolmogorov-Smirnov Test Statistic	0.172	95% Percentile Bootstrap UCL	2.9
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL	2.911
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.871
		97.5% Chebyshev(Mean, Sd) UCL	4.508
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5.758
95% Approximate Gamma UCL	3.249		
95% Adjusted Gamma UCL	3.47		

Potential UCL to Use	Use 95% Student's-t UCL	3.028

TABLE C-2
STATISTICS FOR SOIL - DIRECT CONTACT
SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Chromium
All units in mg/Kg.

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics

Minimum	10.5
Maximum	52.2
Mean	29.54
Median	28.3
SD	11
Coefficient of Variation	0.372
Skewness	0.519

Log-transformed Statistics

Minimum of Log Data	2.351
Maximum of Log Data	3.955
Mean of log Data	3.314
SD of log Data	0.43

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	36.36

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	36.26
95% Modified-t UCL	36.47

Gamma Distribution Test

k star (bias corrected)	4.815
Theta Star	6.136
MLE of Mean	29.54
MLE of Standard Deviation	13.46
nu star	86.67
Approximate Chi Square Value (.05)	66.21
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	62.45
Anderson-Darling Test Statistic	0.622
Anderson-Darling 5% Critical Value	0.722
Kolmogorov-Smirnov Test Statistic	0.264
Kolmogorov-Smirnov 5% Critical Value	0.28

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	38.67
95% Adjusted Gamma UCL	41

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.852
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	41.88
95% Chebyshev (MVUE) UCL	48.64
97.5% Chebyshev (MVUE) UCL	56.78
99% Chebyshev (MVUE) UCL	72.78

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	35.58
95% Jackknife UCL	36.36
95% Standard Bootstrap UCL	35.06
95% Bootstrap-t UCL	37.01
95% Hall's Bootstrap UCL	40.22
95% Percentile Bootstrap UCL	35.3
95% BCA Bootstrap UCL	35.29
95% Chebyshev(Mean, Sd) UCL	45.53
97.5% Chebyshev(Mean, Sd) UCL	52.45
99% Chebyshev(Mean, Sd) UCL	66.04

Potential UCL to Use — Use 95% Student's-t UCL 36.36

TABLE C-3
STATISTICS FOR SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Arsenic
All units in mg/Kg.

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	3.3	Minimum of Log Data	1.194
Maximum	9.1	Maximum of Log Data	2.208
Mean	7.544	Mean of log Data	1.982
Median	8.6	SD of log Data	0.324
SD	1.886		
Coefficient of Variation	0.25		
Skewness	-1.631		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.802	Shapiro Wilk Test Statistic	0.718
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8.714	95% H-UCL	9.657
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	11.2
95% Adjusted-CLT UCL	8.213	97.5% Chebyshev (MVUE) UCL	12.76
95% Modified-t UCL	8.657	99% Chebyshev (MVUE) UCL	15.82
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	8.734	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	0.864		
MLE of Mean	7.544		
MLE of Standard Deviation	2.553		
nu star	157.2		
Approximate Chi Square Value (.05)	129.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	8.579
Adjusted Chi Square Value	123.9	95% Jackknife UCL	8.714
		95% Standard Bootstrap UCL	8.497
Anderson-Darling Test Statistic	0.958	95% Bootstrap-t UCL	8.449
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL	8.299
Kolmogorov-Smirnov Test Statistic	0.273	95% Percentile Bootstrap UCL	8.456
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL	8.3
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10.29
		97.5% Chebyshev(Mean, Sd) UCL	11.47
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	13.8
95% Approximate Gamma UCL	9.178		
95% Adjusted Gamma UCL	9.575		

Potential UCL to Use	Use 95% Approximate Gamma UCL 9.178
Recommended UCL exceeds the maximum observation	

TABLE C-3
STATISTICS FOR SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Chromium
All units in mg/Kg.

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	86.7	Minimum of Log Data	4.462
Maximum	205	Maximum of Log Data	5.323
Mean	143.6	Mean of log Data	4.93
Median	162	SD of log Data	0.293
SD	39.46		
Coefficient of Variation	0.275		
Skewness	-0.138		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.927	Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	168	95% H-UCL	177.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	205.4
95% Adjusted-CLT UCL	164.6	97.5% Chebyshev (MVUE) UCL	232
95% Modified-t UCL	167.9	99% Chebyshev (MVUE) UCL	284.3

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	9.313	**Data appear Normal at 5% Significance Level**	
Theta Star	15.42		
MLE of Mean	143.6		
MLE of Standard Deviation	47.05		
nu star	167.6		
Approximate Chi Square Value (.05)	138.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	165.2
Adjusted Chi Square Value	133.1	95% Jackknife UCL	168
		95% Standard Bootstrap UCL	164
Anderson-Darling Test Statistic	0.485	95% Bootstrap-t UCL	167.1
Anderson-Darling 5% Critical Value	0.721	95% Hall's Bootstrap UCL	163.8
Kolmogorov-Smirnov Test Statistic	0.264	95% Percentile Bootstrap UCL	163.3
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL	163.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	200.9
		97.5% Chebyshev(Mean, Sd) UCL	225.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	274.4
95% Approximate Gamma UCL	173.5		
95% Adjusted Gamma UCL	180.8		

Potential UCL to Use	Use 95% Student's-t UCL 168

TABLE C-3
STATISTICS FOR SOIL - DIRECT CONTACT
VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Iron
All units in mg/Kg.

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	38200	Minimum of Log Data	10.55
Maximum	112650	Maximum of Log Data	11.63
Mean	76217	Mean of log Data	11.17
Median	69000	SD of log Data	0.404
SD	27940		
Coefficient of Variation	0.367		
Skewness	-0.0967		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.916	Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	93535	95% H-UCL	104876
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	121905
95% Adjusted-CLT UCL	91215	97.5% Chebyshev (MVUE) UCL	141535
95% Modified-t UCL	93485	99% Chebyshev (MVUE) UCL	180096

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	5.098	**Data appear Normal at 5% Significance Level**	
Theta Star	14950		
MLE of Mean	76217		
MLE of Standard Deviation	33755		
nu star	91.77		
Approximate Chi Square Value (.05)	70.68	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	91536
Adjusted Chi Square Value	66.79	95% Jackknife UCL	93535
		95% Standard Bootstrap UCL	90740
Anderson-Darling Test Statistic	0.402	95% Bootstrap-t UCL	93781
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL	89377
Kolmogorov-Smirnov Test Statistic	0.217	95% Percentile Bootstrap UCL	90189
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL	90644
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	116813
		97.5% Chebyshev(Mean, Sd) UCL	134379
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	168884
95% Approximate Gamma UCL	98960		
95% Adjusted Gamma UCL	104728		

Potential UCL to Use	Use 95% Student's-t UCL	93535

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

1,1,2,2-Tetrachloroethene
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	14
		Percent Non-Detects	93.33%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 1,1,2,2-Tetrachloroethene was not processed!

1,1-Dichloroethane
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	14
		Percent Non-Detects	93.33%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 1,1-Dichloroethane was not processed!

Chloroform
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	14
		Percent Non-Detects	93.33%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Chloroform was not processed!

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diethyl ether
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	14
Number of Distinct Detected Data	13	Number of Non-Detect Data	1
		Percent Non-Detects	6.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	1	Minimum Detected	0
Maximum Detected	11000	Maximum Detected	9.306
Mean of Detected	1711	Mean of Detected	5.87
SD of Detected	2848	SD of Detected	2.705
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.598	Shapiro Wilk Test Statistic	0.85
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1597	Mean	5.586
SD	2780	SD	2.829
95% DL/2 (t) UCL	2862	95% H-Stat (DL/2) UCL	2057121
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1174	Mean in Log Scale	5.599
SD	3139	SD in Log Scale	2.809
95% MLE (t) UCL	2601	Mean in Original Scale	1598
95% MLE (Tiku) UCL	2579	SD in Original Scale	2780
		95% Percentile Bootstrap UCL	2911
		95% BCA Bootstrap UCL	3523

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.374	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	4576		
nu star	10.47		
A-D Test Statistic	0.283	**Nonparametric Statistics**	
5% A-D Critical Value	0.81	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.81	Mean	1597
5% K-S Critical Value	0.244	SD	2686
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	719.7
		95% KM (t) UCL	2865
Assuming Gamma Distribution		95% KM (z) UCL	2781
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2862
Minimum	1E-09	95% KM (bootstrap t) UCL	5073
Maximum	11000	95% KM (BCA) UCL	3016
Mean	1597	95% KM (Percentile Bootstrap) UCL	2976
Median	740	95% KM (Chebyshev) UCL	4734
SD	2780	97.5% KM (Chebyshev) UCL	6091
k star	0.221	99% KM (Chebyshev) UCL	8758
Theta star	7220		
Nu star	6.636	**Potential UCLs to Use**	
AppChi2	1.973	95% KM (Chebyshev) UCL	4734
95% Gamma Approximate UCL	5371		
95% Adjusted Gamma UCL	6323		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

t-Butanol
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	5
		Percent Non-Detects	33.33%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	7.7	Minimum Detected	2.041
Maximum Detected	5000	Maximum Detected	8.517
Mean of Detected	1449	Mean of Detected	6.259
SD of Detected	1615	SD of Detected	1.988
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	250	Maximum Non-Detect	5.521

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

		Number treated as Non-Detect	8
		Number treated as Detected	7
		Single DL Non-Detect Percentage	53.33%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.85	Shapiro Wilk Test Statistic	0.916
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	976.3	Mean	4.892
SD	1468	SD	2.732
95% DL/2 (t) UCL	1644	95% H-Stat (DL/2) UCL	652096
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	7.892	Mean in Log Scale	4.823
SD	2414	SD in Log Scale	2.686
95% MLE (t) UCL	1106	Mean in Original Scale	969
95% MLE (Tiku) UCL	1415	SD in Original Scale	1473
		95% Percentile Bootstrap UCL	1635
		95% BCA Bootstrap UCL	1787

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.49	**Data appear Normal at 5% Significance Level**	
Theta Star	2955		
nu star	9.805		
A-D Test Statistic	0.166	**Nonparametric Statistics**	
5% A-D Critical Value	0.769	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.769	Mean	970.5
5% K-S Critical Value	0.279	SD	1422
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	387.1
		95% KM (t) UCL	1652
Assuming Gamma Distribution		95% KM (z) UCL	1607
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1626
Minimum	7.7	95% KM (bootstrap t) UCL	2150
Maximum	5000	95% KM (BCA) UCL	1764
Mean	1101	95% KM (Percentile Bootstrap) UCL	1652
Median	496.2	95% KM (Chebyshev) UCL	2658
SD	1397	97.5% KM (Chebyshev) UCL	3388
k star	0.595	99% KM (Chebyshev) UCL	4822
Theta star	1850		
Nu star	17.85	**Potential UCLs to Use**	
AppChi2	9.284	95% KM (t) UCL	1652
95% Gamma Approximate UCL	2117	95% KM (Percentile Bootstrap) UCL	1652
95% Adjusted Gamma UCL	2304		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Tetrachloroethene
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	14
		Percent Non-Detects	93.33%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Tetrachloroethene was not processed!

Trichloroethene
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	14
		Percent Non-Detects	93.33%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Trichloroethene was not processed!

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

1,4-Dioxane
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	8
Number of Distinct Detected Data	6	Number of Non-Detect Data	7
		Percent Non-Detects	46.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.9	Minimum Detected	1.775
Maximum Detected	24	Maximum Detected	3.178
Mean of Detected	16.28	Mean of Detected	2.647
SD of Detected	7.958	SD of Detected	0.617
Minimum Non-Detect	9.4	Minimum Non-Detect	2.241
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	10
Number treated as Detected	5
Single DL Non-Detect Percentage	66.67%

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.828	Shapiro Wilk Test Statistic	0.793
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	10.95	Mean	2.15
SD	8.15	SD	0.702
95% DL/2 (t) UCL	14.66	95% H-Stat (DL/2) UCL	19.05
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	21.8	Mean in Log Scale	2.332
SD	2.4	SD in Log Scale	0.579
95% MLE (t) UCL	22.89	Mean in Original Scale	12.12
95% MLE (Tiku) UCL	23.69	SD in Original Scale	7.359
		95% Percentile Bootstrap UCL	15.1
		95% BCA Bootstrap UCL	15.38

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.363	**Data appear Normal at 5% Significance Level**	
Theta Star	6.891		
nu star	37.81		
A-D Test Statistic	0.758	**Nonparametric Statistics**	
5% A-D Critical Value	0.72	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.72	Mean	11.79
5% K-S Critical Value	0.296	SD	7.32
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	2.065
		95% KM (t) UCL	15.43
Assuming Gamma Distribution		95% KM (z) UCL	15.19
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	15.37
Minimum	5.9	95% KM (bootstrap t) UCL	15.58
Maximum	24	95% KM (BCA) UCL	19.2
Mean	16.33	95% KM (Percentile Bootstrap) UCL	16.14
Median	16.73	95% KM (Chebyshev) UCL	20.79
SD	5.764	97.5% KM (Chebyshev) UCL	24.68
k star	5.228	99% KM (Chebyshev) UCL	32.33
Theta star	3.124		
Nu star	156.8	**Potential UCLs to Use**	
AppChi2	128.9	95% KM (t) UCL	15.43
95% Gamma Approximate UCL	19.88	95% KM (Percentile Bootstrap) UCL	16.14
95% Adjusted Gamma UCL	20.37		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

1,1,2-trichloro-1-propene
All units are in ug/L.

General Statistics

Number of Valid Observations	2	Number of Distinct Observations	2

Warning: This data set only has 2 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable 1,1,2-trichloro-1-propene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

1,2,3-trichloro-1-propene
All units are in ug/L.

General Statistics

Number of Valid Observations	1	Number of Distinct Observations	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable 1,2,3-trichloro-1-propene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Ethane, 1,1'-oxybis[2-ethoxy-]
All units are in ug/L.

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	150	Minimum of Log Data	5.011
Maximum	875	Maximum of Log Data	6.774
Mean	414.5	Mean of log Data	5.879
Median	425	SD of log Data	0.593
SD	227.3		
Coefficient of Variation	0.548		
Skewness	0.683		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.918	Shapiro Wilk Test Statistic	0.923
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	546.3	95% H-UCL	678.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	767.3
95% Adjusted-CLT UCL	549.3	97.5% Chebyshev (MVUE) UCL	918.6
95% Modified-t UCL	548.9	99% Chebyshev (MVUE) UCL	1216

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.541	**Data appear Normal at 5% Significance Level**	
Theta Star	163.1		
MLE of Mean	414.5		
MLE of Standard Deviation	260		
nu star	50.82		
Approximate Chi Square Value (.05)	35.45	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	532.7
Adjusted Chi Square Value	33.23	95% Jackknife UCL	546.3
		95% Standard Bootstrap UCL	524.9
Anderson-Darling Test Statistic	0.375	95% Bootstrap-t UCL	566.8
Anderson-Darling 5% Critical Value	0.731	95% Hall's Bootstrap UCL	565.1
Kolmogorov-Smirnov Test Statistic	0.183	95% Percentile Bootstrap UCL	536
Kolmogorov-Smirnov 5% Critical Value	0.268	95% BCA Bootstrap UCL	541.5
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	727.8
		97.5% Chebyshev(Mean, Sd) UCL	863.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1130
95% Approximate Gamma UCL	594.2		
95% Adjusted Gamma UCL	633.9		

Potential UCL to Use	Use 95% Student's-t UCL 546.3

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Ethanol
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	12
Number of Distinct Detected Data	11	Number of Non-Detect Data	3
		Percent Non-Detects	20.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	450	Minimum Detected	6.109
Maximum Detected	11000	Maximum Detected	9.306
Mean of Detected	2399	Mean of Detected	7.364
SD of Detected	2870	SD of Detected	0.904
Minimum Non-Detect	1000	Minimum Non-Detect	6.908
Maximum Non-Detect	1000	Maximum Non-Detect	6.908

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.633	Shapiro Wilk Test Statistic	0.95
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2019	Mean	7.134
SD	2663	SD	0.932
95% DL/2 (t) UCL	3230	95% H-Stat (DL/2) UCL	4595
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	740.7	Mean in Log Scale	7.167
SD	3843	SD in Log Scale	0.913
95% MLE (t) UCL	2489	Mean in Original Scale	2044
95% MLE (Tiku) UCL	2832	SD in Original Scale	2650
		95% Percentile Bootstrap UCL	3315
		95% BCA Bootstrap UCL	3896
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.058	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	2268		
nu star	25.39		
A-D Test Statistic	0.52	**Nonparametric Statistics**	
5% A-D Critical Value	0.749	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.749	Mean	2046
5% K-S Critical Value	0.25	SD	2559
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	690.8
		95% KM (t) UCL	3263
Assuming Gamma Distribution		95% KM (z) UCL	3183
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3253
Minimum	1E-09	95% KM (bootstrap t) UCL	5299
Maximum	11000	95% KM (BCA) UCL	3267
Mean	2110	95% KM (Percentile Bootstrap) UCL	3290
Median	1700	95% KM (Chebyshev) UCL	5057
SD	2640	97.5% KM (Chebyshev) UCL	6360
k star	0.295	99% KM (Chebyshev) UCL	8919
Theta star	7148		
Nu star	8.853	**Potential UCLs to Use**	
AppChi2	3.239	95% KM (BCA) UCL	3267
95% Gamma Approximate UCL	5767		
95% Adjusted Gamma UCL	6591		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Methanol
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	13
Number of Distinct Detected Data	11	Number of Non-Detect Data	2
		Percent Non-Detects	13.33%

Raw Statistics

Minimum Detected	490
Maximum Detected	3000
Mean of Detected	1536
SD of Detected	745.6
Minimum Non-Detect	1000
Maximum Non-Detect	1000

Log-transformed Statistics

Minimum Detected	6.194
Maximum Detected	8.006
Mean of Detected	7.218
SD of Detected	0.527
Minimum Non-Detect	6.908
Maximum Non-Detect	6.908

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.96
5% Shapiro Wilk Critical Value	0.866

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	1398
SD	780.7
95% DL/2 (t) UCL	1753
Maximum Likelihood Estimate(MLE) Method	
Mean	1266
SD	937.8
95% MLE (t) UCL	1693
95% MLE (Tiku) UCL	1748

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.406
Theta Star	451
nu star	88.55
A-D Test Statistic	0.15
5% A-D Critical Value	0.737
K-S Test Statistic	0.737
5% K-S Critical Value	0.238

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	490
Maximum	3000
Mean	1454
Median	1200
SD	730.1
k star	3.45
Theta star	421.5
Nu star	103.5
AppChi2	81.02
95% Gamma Approximate UCL	1857
95% Adjusted Gamma UCL	1915

Note: DL/2 is not a recommended method.

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.974
5% Shapiro Wilk Critical Value	0.866

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	7.084
SD	0.602
95% H-Stat (DL/2) UCL	2299
Log ROS Method	
Mean in Log Scale	7.137
SD in Log Scale	0.536
Mean in Original Scale	1431
SD in Original Scale	744.7
95% Percentile Bootstrap UCL	1751
95% BCA Bootstrap UCL	1798

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	1432
SD	721
SE of Mean	195
95% KM (t) UCL	1775
95% KM (z) UCL	1753
95% KM (jackknife) UCL	1775
95% KM (bootstrap t) UCL	1825
95% KM (BCA) UCL	1754
95% KM (Percentile Bootstrap) UCL	1741
95% KM (Chebyshev) UCL	2282
97.5% KM (Chebyshev) UCL	2650
99% KM (Chebyshev) UCL	3372

Potential UCLs to Use

95% KM (t) UCL	1775
95% KM (Percentile Bootstrap) UCL	1741

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Aluminum - Total
All units are in ug/L.

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	14

Raw Statistics

Minimum	25
Maximum	1200
Mean	353.1
Median	250
SD	356.7
Coefficient of Variation	1.01
Skewness	1.633

Log-transformed Statistics

Minimum of Log Data	3.219
Maximum of Log Data	7.09
Mean of log Data	5.387
SD of log Data	1.074

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.78
Shapiro Wilk Critical Value	0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	515.3

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	546
95% Modified-t UCL	521.7

Assuming Lognormal Distribution

95% H-UCL	886.2
95% Chebyshev (MVUE) UCL	859.2
97.5% Chebyshev (MVUE) UCL	1072
99% Chebyshev (MVUE) UCL	1489

Gamma Distribution Test

k star (bias corrected)	0.99
Theta Star	356.7
MLE of Mean	353.1
MLE of Standard Deviation	354.9
nu star	29.69
Approximate Chi Square Value (.05)	18.25
Adjusted Level of Significance	0.0324
Adjusted Chi Square Value	17.15
Anderson-Darling Test Statistic	0.357
Anderson-Darling 5% Critical Value	0.76
Kolmogorov-Smirnov Test Statistic	0.137
Kolmogorov-Smirnov 5% Critical Value	0.227

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	574.4
95% Adjusted Gamma UCL	611.2

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	504.5
95% Jackknife UCL	515.3
95% Standard Bootstrap UCL	492.5
95% Bootstrap-t UCL	644.4
95% Hall's Bootstrap UCL	1408
95% Percentile Bootstrap UCL	512.3
95% BCA Bootstrap UCL	561.1
95% Chebyshev(Mean, Sd) UCL	754.5
97.5% Chebyshev(Mean, Sd) UCL	928.2
99% Chebyshev(Mean, Sd) UCL	1269

Potential UCL to Use	Use 95% Approximate Gamma UCL 574.4

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Arsenic - Total
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	12
Number of Distinct Detected Data	11	Number of Non-Detect Data	3
		Percent Non-Detects	20.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.86	Minimum Detected	-0.151
Maximum Detected	46	Maximum Detected	3.829
Mean of Detected	8.855	Mean of Detected	1.383
SD of Detected	13.48	SD of Detected	1.243
Minimum Non-Detect	2.5	Minimum Non-Detect	0.916
Maximum Non-Detect	2.5	Maximum Non-Detect	0.916

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.642	Shapiro Wilk Test Statistic	0.923
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	7.334	Mean	1.151
SD	12.36	SD	1.202
95% DL/2 (t) UCL	12.96	95% H-Stat (DL/2) UCL	22.39
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.159
		SD in Log Scale	1.215
		Mean in Original Scale	7.372
		SD in Original Scale	12.34
		95% Percentile Bootstrap UCL	13.12
		95% BCA Bootstrap UCL	15.39

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.618	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	14.32		
nu star	14.84		
A-D Test Statistic	0.849	**Nonparametric Statistics**	
5% A-D Critical Value	0.766	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.766	Mean	7.378
5% K-S Critical Value	0.255	SD	11.92
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	3.216
		95% KM (t) UCL	13.04
Assuming Gamma Distribution		95% KM (z) UCL	12.67
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	12.99
Minimum	1E-09	95% KM (bootstrap t) UCL	25.49
Maximum	46	95% KM (BCA) UCL	13.04
Mean	7.629	95% KM (Percentile Bootstrap) UCL	12.72
Median	2.7	95% KM (Chebyshev) UCL	21.39
SD	12.3	97.5% KM (Chebyshev) UCL	27.46
k star	0.298	99% KM (Chebyshev) UCL	39.37
Theta star	25.64		
Nu star	8.927	**Potential UCLs to Use**	
AppChi2	3.283	95% KM (Chebyshev) UCL	21.39
95% Gamma Approximate UCL	20.75		
95% Adjusted Gamma UCL	23.69		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Barium - Total
All units are in ug/L.

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	14

Raw Statistics

Minimum	16
Maximum	1100
Mean	368.4
Median	130
SD	362.1
Coefficient of Variation	0.983
Skewness	0.93

Log-transformed Statistics

Minimum of Log Data	2.773
Maximum of Log Data	7.003
Mean of log Data	5.332
SD of log Data	1.219

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.927
Shapiro Wilk Critical Value	0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	533.1

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	546.2
95% Modified-t UCL	536.8

Assuming Lognormal Distribution

95% H-UCL	1199
95% Chebyshev (MVUE) UCL	1021
97.5% Chebyshev (MVUE) UCL	1289
99% Chebyshev (MVUE) UCL	1814

Gamma Distribution Test

k star (bias corrected)	0.845
Theta Star	435.9
MLE of Mean	368.4
MLE of Standard Deviation	400.8
nu star	25.35
Approximate Chi Square Value (.05)	14.88
Adjusted Level of Significance	0.0324
Adjusted Chi Square Value	13.9
Anderson-Darling Test Statistic	0.589
Anderson-Darling 5% Critical Value	0.763
Kolmogorov-Smirnov Test Statistic	0.236
Kolmogorov-Smirnov 5% Critical Value	0.228

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	627.6
95% Adjusted Gamma UCL	671.9

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	522.2
95% Jackknife UCL	533.1
95% Standard Bootstrap UCL	516
95% Bootstrap-t UCL	573.2
95% Hall's Bootstrap UCL	516.6
95% Percentile Bootstrap UCL	521.1
95% BCA Bootstrap UCL	533.9
95% Chebyshev(Mean, Sd) UCL	776
97.5% Chebyshev(Mean, Sd) UCL	952.3
99% Chebyshev(Mean, Sd) UCL	1299

Potential UCL to Use	Use 95% Approximate Gamma UCL 627.6

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Cadmium - Total
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	10
		Percent Non-Detects	66.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.14	Minimum Detected	-1.966
Maximum Detected	9.6	Maximum Detected	2.262
Mean of Detected	3.086	Mean of Detected	0.114
SD of Detected	4.072	SD of Detected	1.74
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.801	Shapiro Wilk Test Statistic	0.942
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.195	Mean	-0.886
SD	2.579	SD	1.183
95% DL/2 (t) UCL	2.368	95% H-Stat (DL/2) UCL	2.526
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.033
		SD in Log Scale	1.548
		Mean in Original Scale	1.246
		SD in Original Scale	2.572
		95% Percentile Bootstrap UCL	2.418
		95% BCA Bootstrap UCL	3.068

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.377	**Data appear Normal at 5% Significance Level**	
Theta Star	8.19		
nu star	3.768		
A-D Test Statistic	0.359	**Nonparametric Statistics**	
5% A-D Critical Value	0.705	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.705	Mean	1.222
5% K-S Critical Value	0.369	SD	2.485
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.723
		95% KM (t) UCL	2.495
Assuming Gamma Distribution		95% KM (z) UCL	2.41
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.424
Minimum	1E-09	95% KM (bootstrap t) UCL	8.848
Maximum	9.6	95% KM (BCA) UCL	3.132
Mean	2.385	95% KM (Percentile Bootstrap) UCL	2.897
Median	1.928	95% KM (Chebyshev) UCL	4.371
SD	2.614	97.5% KM (Chebyshev) UCL	5.734
k star	0.178	99% KM (Chebyshev) UCL	8.411
Theta star	13.38		
Nu star	5.345	**Potential UCLs to Use**	
AppChi2	1.315	95% KM (t) UCL	2.495
95% Gamma Approximate UCL	9.694	95% KM (Percentile Bootstrap) UCL	2.897
95% Adjusted Gamma UCL	11.72		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Chromium - Total
All units are in ug/L.

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	13

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.2	Minimum of Log Data	0.788
Maximum	26	Maximum of Log Data	3.258
Mean	8.583	Mean of log Data	1.862
Median	6	SD of log Data	0.762
SD	7.441		
Coefficient of Variation	0.867		
Skewness	1.643		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.768	Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	11.97	95% H-UCL	13.99
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16.05
95% Adjusted-CLT UCL	12.61	97.5% Chebyshev (MVUE) UCL	19.36
95% Modified-t UCL	12.1	99% Chebyshev (MVUE) UCL	25.86

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.554	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	5.525		
MLE of Mean	8.583		
MLE of Standard Deviation	6.886		
nu star	46.61		
Approximate Chi Square Value (.05)	31.94	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	11.74
Adjusted Chi Square Value	30.45	95% Jackknife UCL	11.97
		95% Standard Bootstrap UCL	11.6
Anderson-Darling Test Statistic	0.558	95% Bootstrap-t UCL	14.75
Anderson-Darling 5% Critical Value	0.748	95% Hall's Bootstrap UCL	14.55
Kolmogorov-Smirnov Test Statistic	0.193	95% Percentile Bootstrap UCL	11.89
Kolmogorov-Smirnov 5% Critical Value	0.225	95% BCA Bootstrap UCL	12.56
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	16.96
		97.5% Chebyshev(Mean, Sd) UCL	20.58
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	27.7
95% Approximate Gamma UCL	12.52		
95% Adjusted Gamma UCL	13.14		

Potential UCL to Use	Use 95% Approximate Gamma UCL 12.52

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Cobalt - Total
All units are in ug/L.

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	15

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.61	Minimum of Log Data	-0.494
Maximum	330	Maximum of Log Data	5.799
Mean	40.09	Mean of log Data	2.199
Median	6.5	SD of log Data	1.763
SD	85.49		
Coefficient of Variation	2.133		
Skewness	3.185		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.509	Shapiro Wilk Test Statistic	0.963
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	78.97	95% H-UCL	295.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	113.2
95% Adjusted-CLT UCL	95.79	97.5% Chebyshev (MVUE) UCL	147.3
95% Modified-t UCL	81.99	99% Chebyshev (MVUE) UCL	214.3

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.392	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	102.1	
MLE of Mean	40.09	
MLE of Standard Deviation	63.98	
nu star	11.77	
Approximate Chi Square Value (.05)	5.079	**Nonparametric Statistics**
Adjusted Level of Significance	0.0324	95% CLT UCL 76.39
Adjusted Chi Square Value	4.548	95% Jackknife UCL 78.97
		95% Standard Bootstrap UCL 74.12
Anderson-Darling Test Statistic	0.974	95% Bootstrap-t UCL 149.1
Anderson-Darling 5% Critical Value	0.807	95% Hall's Bootstrap UCL 178.7
Kolmogorov-Smirnov Test Statistic	0.236	95% Percentile Bootstrap UCL 80.89
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL 104.8
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 136.3
		97.5% Chebyshev(Mean, Sd) UCL 177.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 259.7
95% Approximate Gamma UCL	92.93	
95% Adjusted Gamma UCL	103.8	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 103.8

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Iron - Total
All units are in ug/L.

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	14

Raw Statistics		**Log-transformed Statistics**	
Minimum	330	Minimum of Log Data	5.799
Maximum	160000	Maximum of Log Data	11.98
Mean	39110	Mean of log Data	9.669
Median	29000	SD of log Data	1.816
SD	42498		
Coefficient of Variation	1.087		
Skewness	1.76		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.825	Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	58437	95% H-UCL	634600
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	218990
95% Adjusted-CLT UCL	62487	97.5% Chebyshev (MVUE) UCL	285497
95% Modified-t UCL	59268	99% Chebyshev (MVUE) UCL	416138

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.582	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	67231	
MLE of Mean	39110	
MLE of Standard Deviation	51278	
nu star	17.45	
Approximate Chi Square Value (.05)	8.996	
Adjusted Level of Significance	0.0324	
Adjusted Chi Square Value	8.257	
Anderson-Darling Test Statistic	0.284	
Anderson-Darling 5% Critical Value	0.781	
Kolmogorov-Smirnov Test Statistic	0.174	
Kolmogorov-Smirnov 5% Critical Value	0.231	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution	
95% Approximate Gamma UCL	75872
95% Adjusted Gamma UCL	82663

Nonparametric Statistics	
95% CLT UCL	57159
95% Jackknife UCL	58437
95% Standard Bootstrap UCL	56217
95% Bootstrap-t UCL	68751
95% Hall's Bootstrap UCL	91530
95% Percentile Bootstrap UCL	57859
95% BCA Bootstrap UCL	63040
95% Chebyshev(Mean, Sd) UCL	86940
97.5% Chebyshev(Mean, Sd) UCL	107636
99% Chebyshev(Mean, Sd) UCL	148290

Potential UCL to Use	Use 95% Approximate Gamma UCL 75872

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Lead - Total
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	8
		Percent Non-Detects	53.33%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.22	Minimum Detected	-1.514
Maximum Detected	1.2	Maximum Detected	0.182
Mean of Detected	0.766	Mean of Detected	-0.372
SD of Detected	0.315	SD of Detected	0.554
Minimum Non-Detect	1.5	Minimum Non-Detect	0.405
Maximum Non-Detect	1.5	Maximum Non-Detect	0.405

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.951	Shapiro Wilk Test Statistic	0.826
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.757	Mean	-0.327
SD	0.207	SD	0.366
95% DL/2 (t) UCL	0.851	95% H-Stat (DL/2) UCL	1.735
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.372
		SD in Log Scale	0.509
		Mean in Original Scale	0.767
		SD in Original Scale	0.341
		95% Percentile Bootstrap UCL	0.905
		95% BCA Bootstrap UCL	0.915

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	2.897	**Data appear Normal at 5% Significance Level**	
Theta Star	0.264		
nu star	40.55		
A-D Test Statistic	0.477	**Nonparametric Statistics**	
5% A-D Critical Value	0.71	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.71	Mean	0.766
5% K-S Critical Value	0.313	SD	0.292
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.119
		95% KM (t) UCL	0.976
Assuming Gamma Distribution		95% KM (z) UCL	0.962
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.985
Minimum	0.22	95% KM (bootstrap t) UCL	0.999
Maximum	1.2	95% KM (BCA) UCL	0.938
Mean	0.765	95% KM (Percentile Bootstrap) UCL	0.95
Median	0.748	95% KM (Chebyshev) UCL	1.285
SD	0.3	97.5% KM (Chebyshev) UCL	1.51
k star	4.155	99% KM (Chebyshev) UCL	1.952
Theta star	0.184		
Nu star	124.7	**Potential UCLs to Use**	
AppChi2	99.87	95% KM (t) UCL	0.976
95% Gamma Approximate UCL	0.954	95% KM (Percentile Bootstrap) UCL	0.95
95% Adjusted Gamma UCL	0.981		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Manganese - Total
All units are in ug/L.

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	13

Raw Statistics		**Log-transformed Statistics**	
Minimum	220	Minimum of Log Data	5.394
Maximum	32000	Maximum of Log Data	10.37
Mean	4953	Mean of log Data	7.759
Median	2100	SD of log Data	1.239
SD	8035		
Coefficient of Variation	1.622		
Skewness	3.124		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.563	Shapiro Wilk Test Statistic	0.984
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8607	95% H-UCL	14269
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	11917
95% Adjusted-CLT UCL	10154	97.5% Chebyshev (MVUE) UCL	15060
95% Modified-t UCL	8886	99% Chebyshev (MVUE) UCL	21234

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.679	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	7297		
MLE of Mean	4953		
MLE of Standard Deviation	6012		
nu star	20.37		
Approximate Chi Square Value (.05)	11.12	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	8366
Adjusted Chi Square Value	10.29	95% Jackknife UCL	8607
		95% Standard Bootstrap UCL	8223
Anderson-Darling Test Statistic	0.629	95% Bootstrap-t UCL	19022
Anderson-Darling 5% Critical Value	0.773	95% Hall's Bootstrap UCL	23428
Kolmogorov-Smirnov Test Statistic	0.191	95% Percentile Bootstrap UCL	8540
Kolmogorov-Smirnov 5% Critical Value	0.23	95% BCA Bootstrap UCL	10537
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13996
		97.5% Chebyshev(Mean, Sd) UCL	17909
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	25595
95% Approximate Gamma UCL	9071		
95% Adjusted Gamma UCL	9806		

Potential UCL to Use	Use 95% Approximate Gamma UCL 9071

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Mercury - Total
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	13
		Percent Non-Detects	86.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.65	Minimum Detected	-0.431
Maximum Detected	1.3	Maximum Detected	0.262
Mean of Detected	0.975	Mean of Detected	-0.0842
SD of Detected	0.46	SD of Detected	0.49
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.347	Mean	-1.213
SD	0.283	SD	0.477
95% DL/2 (t) UCL	0.475	95% H-Stat (DL/2) UCL	0.432
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.693
5% K-S Critical Value	N/A	SD	0.162
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0592
		95% KM (t) UCL	0.798
Assuming Gamma Distribution		95% KM (z) UCL	0.791
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	N/A
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.951
SD	N/A	97.5% KM (Chebyshev) UCL	1.063
k star	N/A	99% KM (Chebyshev) UCL	1.282
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	0.798
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	N/A
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Nickel - Total
All units are in ug/L.

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	15

Raw Statistics

Minimum	1.5
Maximum	100
Mean	19.95
Median	5.15
SD	30.91
Coefficient of Variation	1.549
Skewness	2.162

Log-transformed Statistics

Minimum of Log Data	0.405
Maximum of Log Data	4.605
Mean of log Data	2.124
SD of log Data	1.303

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.616
Shapiro Wilk Critical Value	0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.917
Shapiro Wilk Critical Value	0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	34.01

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	37.84
95% Modified-t UCL	34.75

Assuming Lognormal Distribution

95% H-UCL	60.79
95% Chebyshev (MVUE) UCL	47.3
97.5% Chebyshev (MVUE) UCL	60.04
99% Chebyshev (MVUE) UCL	85.08

Gamma Distribution Test

k star (bias corrected)	0.601
Theta Star	33.2
MLE of Mean	19.95
MLE of Standard Deviation	25.73
nu star	18.03
Approximate Chi Square Value (.05)	9.412
Adjusted Level of Significance	0.0324
Adjusted Chi Square Value	8.654
Anderson-Darling Test Statistic	1.045
Anderson-Darling 5% Critical Value	0.779
Kolmogorov-Smirnov Test Statistic	0.249
Kolmogorov-Smirnov 5% Critical Value	0.231

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	38.22
95% Adjusted Gamma UCL	41.56

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	33.08
95% Jackknife UCL	34.01
95% Standard Bootstrap UCL	32.73
95% Bootstrap-t UCL	67.25
95% Hall's Bootstrap UCL	101.7
95% Percentile Bootstrap UCL	34.18
95% BCA Bootstrap UCL	37.2
95% Chebyshev(Mean, Sd) UCL	54.74
97.5% Chebyshev(Mean, Sd) UCL	69.79
99% Chebyshev(Mean, Sd) UCL	99.36

Potential UCL to Use	Use 95% Chebyshev (MVUE) UCL 47.3

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Vanadium - Total
All units are in ug/L.

General Statistics

Number of Valid Data	15	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	7
		Percent Non-Detects	46.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	2.5	Minimum Detected	0.916
Maximum Detected	1700	Maximum Detected	7.438
Mean of Detected	218.8	Mean of Detected	2.557
SD of Detected	598.5	SD of Detected	2.033
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5	Maximum Non-Detect	1.609

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.424	Shapiro Wilk Test Statistic	0.653
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	117.9	Mean	1.791
SD	437.7	SD	1.669
95% DL/2 (t) UCL	316.9	95% H-Stat (DL/2) UCL	149.5
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.144
		SD in Log Scale	2.253
		Mean in Original Scale	117.1
		SD in Original Scale	437.9
		95% Percentile Bootstrap UCL	343.4
		95% BCA Bootstrap UCL	456.6

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.24	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	911.5		
nu star	3.841		
A-D Test Statistic	1.982	**Nonparametric Statistics**	
5% A-D Critical Value	0.816	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.816	Mean	117.9
5% K-S Critical Value	0.32	SD	422.9
Data not Gamma Distributed at 5% Significance Level		SE of Mean	116.7
		95% KM (t) UCL	323.4
Assuming Gamma Distribution		95% KM (z) UCL	309.8
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	315.9
Minimum	1E-09	95% KM (bootstrap t) UCL	26010
Maximum	1700	95% KM (BCA) UCL	456.6
Mean	261.7	95% KM (Percentile Bootstrap) UCL	344.2
Median	7.3	95% KM (Chebyshev) UCL	626.6
SD	539.9	97.5% KM (Chebyshev) UCL	846.8
k star	0.122	99% KM (Chebyshev) UCL	1279
Theta star	2153		
Nu star	3.647	**Potential UCLs to Use**	
AppChi2	0.587	99% KM (Chebyshev) UCL	1279
95% Gamma Approximate UCL	1625		
95% Adjusted Gamma UCL	2075		

Note: DL/2 is not a recommended method.

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Unknown; Chemical Class: glycol ether derivative
All units are in ug/L.

General Statistics

Number of Valid Observations	58	Number of Distinct Observations	47

Raw Statistics		**Log-transformed Statistics**	
Minimum	4.1	Minimum of Log Data	1.411
Maximum	1400	Maximum of Log Data	7.244
Mean	135.8	Mean of log Data	3.96
Median	50.5	SD of log Data	1.442
SD	228.5		
Coefficient of Variation	1.682		
Skewness	3.825		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.282	Lilliefors Test Statistic	0.0945
Lilliefors Critical Value	0.116	Lilliefors Critical Value	0.116
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	186	95% H-UCL	266
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	299.9
95% Adjusted-CLT UCL	201.3	97.5% Chebyshev (MVUE) UCL	367.7
95% Modified-t UCL	188.5	99% Chebyshev (MVUE) UCL	500.8

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.621	**Data appear Lognormal at 5% Significance Level**	
Theta Star	218.7		
MLE of Mean	135.8		
MLE of Standard Deviation	172.4		
nu star	72.04		
Approximate Chi Square Value (.05)	53.5	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0459	95% CLT UCL	185.2
Adjusted Chi Square Value	53.09	95% Jackknife UCL	186
		95% Standard Bootstrap UCL	185.7
Anderson-Darling Test Statistic	1.255	95% Bootstrap-t UCL	224.9
Anderson-Darling 5% Critical Value	0.802	95% Hall's Bootstrap UCL	426.8
Kolmogorov-Smirnov Test Statistic	0.126	95% Percentile Bootstrap UCL	190.5
Kolmogorov-Smirnov 5% Critical Value	0.122	95% BCA Bootstrap UCL	205.6
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	266.6
		97.5% Chebyshev(Mean, Sd) UCL	323.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	434.4
95% Approximate Gamma UCL	182.9		
95% Adjusted Gamma UCL	184.3		

Potential UCL to Use	Use 95% H-UCL 266

TABLE C-4
STATISTICS FOR GROUNDWATER
MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Unknown; Chemical Class: chlorinated VOC
All units are in ug/L.

General Statistics

Number of Valid Observations	3	Number of Distinct Observations	3

Warning: This data set only has 3 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Unknown; trichloroethene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

TABLE C-5
STATISTICS FOR SEDIMENT
EASTERN WHITEWATER LAGOON (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Arsenic
All units in mg/Kg.

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10

Raw Statistics

Minimum	1.2
Maximum	6.5
Mean	3.86
Median	3.05
SD	1.934
Coefficient of Variation	0.501
Skewness	0.249

Log-transformed Statistics

Minimum of Log Data	0.182
Maximum of Log Data	1.872
Mean of log Data	1.222
SD of log Data	0.558

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.883
Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical Value	0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	4.981

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	4.918
95% Modified-t UCL	4.989

Assuming Lognormal Distribution

95% H-UCL	6.083
95% Chebyshev (MVUE) UCL	6.956
97.5% Chebyshev (MVUE) UCL	8.28
99% Chebyshev (MVUE) UCL	10.88

Gamma Distribution Test

k star (bias corrected)	2.892
Theta Star	1.335
MLE of Mean	3.86
MLE of Standard Deviation	2.27
nu star	57.84
Approximate Chi Square Value (.05)	41.35
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	38.94
Anderson-Darling Test Statistic	0.486
Anderson-Darling 5% Critical Value	0.729
Kolmogorov-Smirnov Test Statistic	0.231
Kolmogorov-Smirnov 5% Critical Value	0.268

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	5.399
95% Adjusted Gamma UCL	5.733

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	4.866
95% Jackknife UCL	4.981
95% Standard Bootstrap UCL	4.825
95% Bootstrap-t UCL	5.067
95% Hall's Bootstrap UCL	4.722
95% Percentile Bootstrap UCL	4.82
95% BCA Bootstrap UCL	4.85
95% Chebyshev(Mean, Sd) UCL	6.526
97.5% Chebyshev(Mean, Sd) UCL	7.679
99% Chebyshev(Mean, Sd) UCL	9.945

Potential UCL to Use	Use 95% Student's-t UCL 4.981

TABLE C-5
STATISTICS FOR SEDIMENT
EASTERN WHITEWATER LAGOON (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Chromium
All units in mg/Kg.

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	9

Raw Statistics

Minimum	19
Maximum	78
Mean	47.4
Median	52.5
SD	17.68
Coefficient of Variation	0.373
Skewness	-0.027

Log-transformed Statistics

Minimum of Log Data	2.944
Maximum of Log Data	4.357
Mean of log Data	3.785
SD of log Data	0.426

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	57.65

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	56.55
95% Modified-t UCL	57.64

Gamma Distribution Test

k star (bias corrected)	4.922
Theta Star	9.63
MLE of Mean	47.4
MLE of Standard Deviation	21.37
nu star	98.44
Approximate Chi Square Value (.05)	76.55
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	73.2
Anderson-Darling Test Statistic	0.343
Anderson-Darling 5% Critical Value	0.728
Kolmogorov-Smirnov Test Statistic	0.206
Kolmogorov-Smirnov 5% Critical Value	0.267

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	60.95
95% Adjusted Gamma UCL	63.74

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.932
Shapiro Wilk Critical Value	0.842

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	65.13
95% Chebyshev (MVUE) UCL	76.13
97.5% Chebyshev (MVUE) UCL	88.42
99% Chebyshev (MVUE) UCL	112.5

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	56.6
95% Jackknife UCL	57.65
95% Standard Bootstrap UCL	56.17
95% Bootstrap-t UCL	57.72
95% Hall's Bootstrap UCL	57.17
95% Percentile Bootstrap UCL	56.4
95% BCA Bootstrap UCL	55.9
95% Chebyshev(Mean, Sd) UCL	71.78
97.5% Chebyshev(Mean, Sd) UCL	82.32
99% Chebyshev(Mean, Sd) UCL	103

Potential UCL to Use — Use 95% Student's-t UCL 57.65

TABLE C-5
STATISTICS FOR SEDIMENT
EASTERN WHITEWATER LAGOON (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Thallium
All units in mg/Kg.

General Statistics

Number of Valid Data	10	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	2
		Percent Non-Detects	20.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.21	Minimum Detected	-1.561
Maximum Detected	0.5	Maximum Detected	-0.693
Mean of Detected	0.374	Mean of Detected	-1.047
SD of Detected	0.13	SD of Detected	0.393
Minimum Non-Detect	1.8	Minimum Non-Detect	0.588
Maximum Non-Detect	2	Maximum Non-Detect	0.693

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	10
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions
It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.789	Shapiro Wilk Test Statistic	0.766
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.489	Mean	-0.848
SD	0.27	SD	0.544
95% DL/2 (t) UCL	0.645	95% H-Stat (DL/2) UCL	1.9
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.047
		SD in Log Scale	0.346
		Mean in Original Scale	0.369
		SD in Original Scale	0.115
		95% Percentile Bootstrap UCL	0.424
		95% BCA Bootstrap UCL	0.422

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	5.185	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	0.0721		
nu star	82.96		
A-D Test Statistic	0.94	**Nonparametric Statistics**	
5% A-D Critical Value	0.716	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.716	Mean	0.374
5% K-S Critical Value	0.295	SD	0.122
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.046
		95% KM (t) UCL	0.458
Assuming Gamma Distribution		95% KM (z) UCL	0.449
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.459
Minimum	0.21	95% KM (bootstrap t) UCL	0.445
Maximum	0.5	95% KM (BCA) UCL	0.444
Mean	0.378	95% KM (Percentile Bootstrap) UCL	0.443
Median	0.407	95% KM (Chebyshev) UCL	0.574
SD	0.115	97.5% KM (Chebyshev) UCL	0.661
k star	7.152	99% KM (Chebyshev) UCL	0.831
Theta star	0.0528		
Nu star	143	**Potential UCLs to Use**	
AppChi2	116.4	95% KM (BCA) UCL	0.444
95% Gamma Approximate UCL	0.464		
95% Adjusted Gamma UCL	0.481		

Note: DL/2 is not a recommended method.

TABLE C-5
STATISTICS FOR SEDIMENT
EASTERN WHITEWATER LAGOON (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Unknown; Chemical Class: PAH
All units in mg/Kg.

General Statistics

Number of Valid Observations	1	Number of Distinct Observations	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Unknown; Benzo(a)pyrene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

TABLE C-6
STATISTICS FOR SEDIMENT
WESTERN WHITEWATER LAGOON (SWMU 4)
Hercules Incorporated Facility - Hopewell, Virginia

Arsenic
All units in mg/Kg.

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10

Raw Statistics

Minimum	0.44
Maximum	6.5
Mean	3.298
Median	3.5
SD	2.152
Coefficient of Variation	0.652
Skewness	0.0616

Log-transformed Statistics

Minimum of Log Data	-0.821
Maximum of Log Data	1.872
Mean of log Data	0.906
SD of log Data	0.897

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.93
Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.904
Shapiro Wilk Critical Value	0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	4.545

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	4.431
95% Modified-t UCL	4.548

Assuming Lognormal Distribution

95% H-UCL	8.807
95% Chebyshev (MVUE) UCL	8.056
97.5% Chebyshev (MVUE) UCL	10.02
99% Chebyshev (MVUE) UCL	13.88

Gamma Distribution Test

k star (bias corrected)	1.391
Theta Star	2.371
MLE of Mean	3.298
MLE of Standard Deviation	2.796
nu star	27.82
Approximate Chi Square Value (.05)	16.79
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	15.32
Anderson-Darling Test Statistic	0.393
Anderson-Darling 5% Critical Value	0.736
Kolmogorov-Smirnov Test Statistic	0.221
Kolmogorov-Smirnov 5% Critical Value	0.27

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	5.465
95% Adjusted Gamma UCL	5.991

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	4.417
95% Jackknife UCL	4.545
95% Standard Bootstrap UCL	4.341
95% Bootstrap-t UCL	4.627
95% Hall's Bootstrap UCL	4.24
95% Percentile Bootstrap UCL	4.368
95% BCA Bootstrap UCL	4.367
95% Chebyshev(Mean, Sd) UCL	6.264
97.5% Chebyshev(Mean, Sd) UCL	7.547
99% Chebyshev(Mean, Sd) UCL	10.07

Potential UCL to Use — Use 95% Student's-t UCL 4.545

TABLE C-6
STATISTICS FOR SEDIMENT
WESTERN WHITEWATER LAGOON (SWMU 4)
Hercules Incorporated Facility - Hopewell, Virginia

Chromium
All units in mg/Kg.

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10

Raw Statistics

Minimum	7.3
Maximum	52
Mean	28.73
Median	27.5
SD	15.02
Coefficient of Variation	0.523
Skewness	0.0877

Log-transformed Statistics

Minimum of Log Data	1.988
Maximum of Log Data	3.951
Mean of log Data	3.199
SD of log Data	0.641

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.963
Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	37.43

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	36.68
95% Modified-t UCL	37.46

Gamma Distribution Test

k star (bias corrected)	2.382
Theta Star	12.06
MLE of Mean	28.73
MLE of Standard Deviation	18.62
nu star	47.64
Approximate Chi Square Value (.05)	32.8
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	30.67
Anderson-Darling Test Statistic	0.264
Anderson-Darling 5% Critical Value	0.731
Kolmogorov-Smirnov Test Statistic	0.148
Kolmogorov-Smirnov 5% Critical Value	0.268

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	41.73
95% Adjusted Gamma UCL	44.62

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.929
Shapiro Wilk Critical Value	0.842

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	50.63
95% Chebyshev (MVUE) UCL	56.08
97.5% Chebyshev (MVUE) UCL	67.63
99% Chebyshev (MVUE) UCL	90.31

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	36.54
95% Jackknife UCL	37.43
95% Standard Bootstrap UCL	35.97
95% Bootstrap-t UCL	37.18
95% Hall's Bootstrap UCL	36.3
95% Percentile Bootstrap UCL	36.4
95% BCA Bootstrap UCL	36.2
95% Chebyshev(Mean, Sd) UCL	49.43
97.5% Chebyshev(Mean, Sd) UCL	58.38
99% Chebyshev(Mean, Sd) UCL	75.97

Potential UCL to Use — Use 95% Student's-t UCL 37.43

TABLE C-6
STATISTICS FOR SEDIMENT
WESTERN WHITEWATER LAGOON (SWMU 4)
Hercules Incorporated Facility - Hopewell, Virginia

Thallium
All units in mg/Kg.

General Statistics

Number of Valid Data	10	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	6
		Percent Non-Detects	60.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.12	Minimum Detected	-2.12
Maximum Detected	0.31	Maximum Detected	-1.171
Mean of Detected	0.208	Mean of Detected	-1.633
SD of Detected	0.0818	SD of Detected	0.407
Minimum Non-Detect	0.24	Minimum Non-Detect	-1.427
Maximum Non-Detect	2.8	Maximum Non-Detect	1.03

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	10
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.985	Shapiro Wilk Test Statistic	0.995
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.68	Mean	-0.791
SD	0.531	SD	1.033
95% DL/2 (t) UCL	0.988	95% H-Stat (DL/2) UCL	18.94
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.674
		SD in Log Scale	0.24
		Mean in Original Scale	0.193
		SD in Original Scale	0.0493
		95% Percentile Bootstrap UCL	0.22
		95% BCA Bootstrap UCL	0.222

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	2.269	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0915		
nu star	18.15		
A-D Test Statistic	0.198	**Nonparametric Statistics**	
5% A-D Critical Value	0.658	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.658	Mean	0.201
5% K-S Critical Value	0.395	SD	0.0679
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.037
		95% KM (t) UCL	0.269
Assuming Gamma Distribution		95% KM (z) UCL	0.262
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.274
Minimum	0.12	95% KM (bootstrap t) UCL	0.28
Maximum	0.31	95% KM (BCA) UCL	0.26
Mean	0.223	95% KM (Percentile Bootstrap) UCL	0.266
Median	0.238	95% KM (Chebyshev) UCL	0.362
SD	0.0497	97.5% KM (Chebyshev) UCL	0.432
k star	13.4	99% KM (Chebyshev) UCL	0.569
Theta star	0.0166		
Nu star	268.1	**Potential UCLs to Use**	
AppChi2	231.2	95% KM (t) UCL	0.269
95% Gamma Approximate UCL	0.259	95% KM (Percentile Bootstrap) UCL	0.266
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

TABLE C-7
STATISTICS FOR SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Arsenic
All units in mg/Kg.

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	5

Raw Statistics

Minimum	1.4
Maximum	5
Mean	2.283
Median	1.55
SD	1.416
Coefficient of Variation	0.62
Skewness	1.917

Log-transformed Statistics

Minimum of Log Data	0.336
Maximum of Log Data	1.609
Mean of log Data	0.703
SD of log Data	0.504

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.706
Shapiro Wilk Critical Value	0.788

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.77
Shapiro Wilk Critical Value	0.788

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3.448

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	3.718
95% Modified-t UCL	3.524

Assuming Lognormal Distribution

95% H-UCL	4.169
95% Chebyshev (MVUE) UCL	4.253
97.5% Chebyshev (MVUE) UCL	5.123
99% Chebyshev (MVUE) UCL	6.831

Gamma Distribution Test

k star (bias corrected)	2.235
Theta Star	1.022
MLE of Mean	2.283
MLE of Standard Deviation	1.527
nu star	26.82
Approximate Chi Square Value (.05)	16.01
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	13.1
Anderson-Darling Test Statistic	0.826
Anderson-Darling 5% Critical Value	0.7
Kolmogorov-Smirnov Test Statistic	0.367
Kolmogorov-Smirnov 5% Critical Value	0.333

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	3.824
95% Adjusted Gamma UCL	4.676

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	3.234
95% Jackknife UCL	3.448
95% Standard Bootstrap UCL	3.155
95% Bootstrap-t UCL	16.71
95% Hall's Bootstrap UCL	10.96
95% Percentile Bootstrap UCL	3.25
95% BCA Bootstrap UCL	3.467
95% Chebyshev(Mean, Sd) UCL	4.804
97.5% Chebyshev(Mean, Sd) UCL	5.894
99% Chebyshev(Mean, Sd) UCL	8.036

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 4.804

TABLE C-7
STATISTICS FOR SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Chromium
All units in mg/Kg.

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	5

Raw Statistics

Minimum	18
Maximum	39
Mean	29.17
Median	30.5
SD	7.468
Coefficient of Variation	0.256
Skewness	-0.337

Log-transformed Statistics

Minimum of Log Data	2.89
Maximum of Log Data	3.664
Mean of log Data	3.343
SD of log Data	0.276

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.973
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	35.31

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	33.73
95% Modified-t UCL	35.24

Gamma Distribution Test

k star (bias corrected)	8.483
Theta Star	3.438
MLE of Mean	29.17
MLE of Standard Deviation	10.01
nu star	101.8
Approximate Chi Square Value (.05)	79.52
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	72.43
Anderson-Darling Test Statistic	0.256
Anderson-Darling 5% Critical Value	0.697
Kolmogorov-Smirnov Test Statistic	0.225
Kolmogorov-Smirnov 5% Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	37.34
95% Adjusted Gamma UCL	40.99

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.945
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	38.53
95% Chebyshev (MVUE) UCL	43.58
97.5% Chebyshev (MVUE) UCL	49.8
99% Chebyshev (MVUE) UCL	62.01

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	34.18
95% Jackknife UCL	35.31
95% Standard Bootstrap UCL	33.87
95% Bootstrap-t UCL	35.14
95% Hall's Bootstrap UCL	33.96
95% Percentile Bootstrap UCL	33.67
95% BCA Bootstrap UCL	33.33
95% Chebyshev(Mean, Sd) UCL	42.46
97.5% Chebyshev(Mean, Sd) UCL	48.21
99% Chebyshev(Mean, Sd) UCL	59.5

Potential UCL to Use Use 95% Student's-t UCL 35.31

TABLE C-7
STATISTICS FOR SEDIMENT
NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Thallium
All units in mg/Kg.

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics

Minimum	0.077
Maximum	0.32
Mean	0.205
Median	0.21
SD	0.0958
Coefficient of Variation	0.469
Skewness	-0.147

Log-transformed Statistics

Minimum of Log Data	-2.564
Maximum of Log Data	-1.139
Mean of log Data	-1.699
SD of log Data	0.548

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.283

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.266
95% Modified-t UCL	0.283

Gamma Distribution Test

k star (bias corrected)	2.42
Theta Star	0.0845
MLE of Mean	0.205
MLE of Standard Deviation	0.131
nu star	29.04
Approximate Chi Square Value (.05)	17.74
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	14.64
Anderson-Darling Test Statistic	0.319
Anderson-Darling 5% Critical Value	0.699
Kolmogorov-Smirnov Test Statistic	0.255
Kolmogorov-Smirnov 5% Critical Value	0.333

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.335
95% Adjusted Gamma UCL	0.406

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	0.417
95% Chebyshev (MVUE) UCL	0.408
97.5% Chebyshev (MVUE) UCL	0.495
99% Chebyshev (MVUE) UCL	0.666

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	0.269
95% Jackknife UCL	0.283
95% Standard Bootstrap UCL	0.264
95% Bootstrap-t UCL	0.286
95% Hall's Bootstrap UCL	0.251
95% Percentile Bootstrap UCL	0.263
95% BCA Bootstrap UCL	0.26
95% Chebyshev(Mean, Sd) UCL	0.375
97.5% Chebyshev(Mean, Sd) UCL	0.449
99% Chebyshev(Mean, Sd) UCL	0.594

Potential UCL to Use — Use 95% Student's-t UCL 0.283

APPENDIX D

CALCULATION OF VOLATILIZATION FACTORS FOR GROUNDWATER TO AMBIENT AIR

APPENDIX D

Calculation of Volatilization Factors for Groundwater to Ambient Air

The volatilization factors for groundwater to ambient air (VF_{wamb}) were estimated for each volatile constituent of interest using standard guidance from the American Society for Testing and Materials (ASTM; 2002), specifically, ASTM E-1739 "Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites". This guidance provides simple analytical fate and transport models for use in risk-based corrective action (RBCA) analyses.

The volatilization model provided in the equations below defines the steady-state ratio of the concentration in air at the point of exposure to the source concentration in the underlying groundwater. The volatilization factor algorithm is presented in the ASTM (2002) guidance:

$$VF_{wamb}\left[\frac{(mg/m^3-air)}{(mg/L-H_2O)}\right]=\frac{H}{1+\left[\frac{U_{air}\delta_{air}L_{GW}}{WD_{ws}^{eff}}\right]}\text{x}10^3$$

where:

H	=	Henry's law constant (cm^3-H^2O)/(cm^3-air)
U_{air}	=	Wind speed above ground surface in ambient mixing zone (cm/s)
δ_{air}	=	Ambient air mixing zone height (cm)
L_{GW}	=	Depth to groundwater = h_{cap} + h_v (cm)
h_{cap}	=	Thickness of capillary fringe (cm)
h_v	=	Thickness of vadose zone (cm)
W	=	Width of source area parallel to wind, or groundwater flow direction (cm)

and:

D_{ws}^{eff} Effective diffusivity above the water table:

$$D_{ws}^{eff}\left[\frac{cm^2}{s}\right]=\left(h_{cap}+h_v\right)\left[\frac{h_{cap}}{D_{cap}^{eff}}+\frac{h_v}{D_s^{eff}}\right]^{-1}$$

D_{cap}^{eff} Effective diffusivity in the capillary zone:

$$D_{cap}^{eff}\left[\frac{cm^2}{s}\right]=D^{air}\frac{\theta_{acap}^{3.33}}{\theta_T^2}+\left[\frac{D^{wat}}{H}\right]\left[\frac{\theta_{wcap}^{3.33}}{\theta_T^2}\right]$$

D_s^{eff} Effective diffusivity in vadose zone soils:

$$D_s^{eff}\left[\frac{cm^2}{s}\right] = D^{air}\frac{\theta_{as}^{3.33}}{\theta_T^2} + \left[\frac{D^{wat}}{H}\right]\left[\frac{\theta_{ws}^{3.33}}{\theta_T^2}\right]$$

where:

D_{air}	=	Diffusion coefficient in air (cm^2/s)
D_{wat}	=	Diffusion coefficient in water (cm^2/s)
θ_{acap}	=	Volumetric air content in capillary fringe soils (cm^3-air/cm^3-soil)
θ_{as}	=	Volumetric air content in vadose zone soils (cm^3-air/cm^3-soil)
θ_T	=	Total soil porosity (cm^3-pore-space/ cm^3-soil)
θ_{wcap}	=	Volumetric water content in capillary fringe soils (cm^3-H_2O/cm^3-soil)
θ_{ws}	=	Volumetric water content in vadose zone soils (cm^3-H_2O/cm^3-soil)

The input parameters required for the fate and transport model are presented in Tables D-1 and D-2. Table D-1 provides the constituent-specific parameter values. These are chemical-physical properties of constituents that are based on published laboratory values. The constituent-specific values include Henry's Law constants and air and water diffusion coefficients. The Henry's Law constants are the unitless constants at the system temperature (13.9°C for the state of Virginia). The sources of the constituent-specific values are the USEPA (2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings.

Table D-2 presents the site-specific and system parameter measurements. Site-specific values are required for parameters which 1) exhibit a wide range of site-specific variability (e.g., orders of magnitude) that may significantly impact model predictions and 2) are amenable to characterization based upon limited site-specific measurements. Examples include depth to groundwater and source dimensions. The site-specific assumptions used for this site represent a scenario in which a construction worker is involved in excavation of soil down to the saturated zone. A depth to groundwater of only 10 cm has been incorporated in the model. Other system parameters, such as wind speed, are based on default values from ASTM (2002).

The soil porosity values (air-filled, water-filled, and total porosity) are based on USEPA recommended default values for a "silty-clay" soil type, as presented in USEPA (2004). This is consistent with the soil type selected for the vapor intrusion modeling. The total soil porosity is 0.481 cm^3/cm^3, and the water-filled porosity is 0.216 cm^3-H2O/cm^3-soil. Thus, the air-filled porosity is to 0.265 (cm^3-air/cm^3-soil).

The final calculated VF_{wamb} values for volatile constituents in groundwater are presented in Table D-3.

References

American Society for Testing and Materials (ASTM; 2002) Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites. ASTM E-1739-95 (Reapproved 2002).

United States Environmental Protection Agency (USEPA, 2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. Office of Emergency and Remedial Response, February 22, 2004.

TABLE D-1
CONSTITUENT-SPECIFIC VALUES USED TO CALCULATE VF_{wamb}
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	Diffusivity in Air (D_{air}) (cm^2/sec)	Diffusivity in Water (D_{wat}) (cm^2/sec)	Henry's Law Constant at 13.9°C (unitless)
Volatile Organics			
1,1,2,2-Tetrachloroethane	7.10E-02	7.90E-06	7.36E-03
1,1-Dichloroethane	7.42E-02	1.05E-05	1.47E-01
Chloroform	1.04E-01	1.00E-05	9.52E-02
Diethyl ether	7.82E-02	8.61E-06	9.07E-01
Tetrachloroethene	7.20E-02	8.20E-06	4.19E-01
Trichloroethene	7.90E-02	9.10E-06	2.50E-01
Inorganics			
Mercury	3.07E-02	6.30E-06	1.68E-01
Unknown TICs			
Unknown; Chemical Class: chlorinated VOC [1]	7.90E-02	9.10E-06	2.50E-01

Notes:
Constituent-specific properties are obtained from and USEPA (2004). H'_{TS} is calculated assuming a default subsurface temperature of 13.9°C and using the equations provided in the vapor intrusion User's Guide (USEPA, 2004).

[1] Values for Unknown; Chemical Class; chlorinated VOC are based on trichloroethene.

TABLE D-2
SITE-SPECIFIC AND SYSTEM PARAMETERS USED TO CALCULATE VF_{wamb}
Hercules Incorporated Facility - Hopewell, Virginia

Symbol	Parameter and Units	Value	Source
U_{air}	Wind speed (cm/s)	45	Lower end of default range (ASTM, 2002)
δ_{air}	Ambient air mixing zone height (cm)	200	Default value (ASTM, 2002)
L_{GW}	Depth to groundwater (cm)	10	Calculated as $h_{cap} + h_v$
h_{cap}	Thickness of capillary fringe (cm)	5	Very conservative estimate assuming excavation
h_v	Thickness of vadose zone (cm)	5	Very conservative estimate assuming excavation
W	Width of source area (cm)	300	Assumed to be width of work area of 10 feet
θ_{acap}	Volumetric air content in capillary fringe (cm^3-air/cm^3-soil)	0.27	Conservatively assumed equal to vadose zone
θ_{as}	Volumetric air content in vadose zone (cm^3-air/cm^3-soil)	0.265	Calculated as $\theta_T - \theta_{ws}$
θ_T	Total soil porosity (cm^3-pore-space/ cm^3-soil)	0.481	USEPA (2004) default for silty clay
θ_{wcap}	Volumetric water content in capillary fringe (cm^3-H_2O/cm^3-soil)	0.216	Conservatively assumed equal to vadose zone
θ_{ws}	Volumetric water content in vadose zone (cm^3-H_2O/cm^3-soil)	0.216	USEPA (2004) default for silty clay

TABLE D-3
CALCULATED VOLATILIZATION FACTORS FOR WATER TO AMBIENT AIR
Hercules Incorporated Facility - Hopewell, Virginia

Constituent of Interest	D^{eff}_{cap} (cm^2/sec)	D^{eff}_{s} (cm^2/sec)	D^{eff}_{ws} (cm^2/sec)	VF_{wamb} $(mg/m^3)/(mg/L)$
Volatile Organics				
1,1,2,2-Tetrachloroethane	3.71E-03	3.71E-03	3.71E-03	9.11E-05
1,1-Dichloroethane	3.85E-03	3.85E-03	3.85E-03	1.88E-03
Chloroform	5.40E-03	5.40E-03	5.40E-03	1.71E-03
Diethyl ether	4.06E-03	4.06E-03	4.06E-03	1.23E-02
Tetrachloroethene	3.74E-03	3.74E-03	3.74E-03	5.22E-03
Trichloroethene	4.10E-03	4.10E-03	4.10E-03	3.42E-03
Inorganics				
Mercury	1.59E-03	1.59E-03	1.59E-03	8.91E-04
Unknown TICs				
Unknown; Chemical Class: chlorinated VOC	4.10E-03	4.10E-03	4.10E-03	3.42E-03

APPENDIX E

CALCULATION OF TRANSPORT FACTORS USED TO ESTIMATE INDOOR AIR CONCENTRATIONS

APPENDIX E

Calculation of Transport Factors Used to Estimate Indoor Air Concentrations

This appendix presents the methodology for calculating transport factors that are used to convert soil gas concentrations to concentrations in indoor air. Several constituents were identified as COI for potential vapor intrusion from groundwater associated with the Eastern and Western Whitewater Lagoons (SWMUs 3 and 4), Landfill Areas (SWMU 5), Natrosol Lagoon (SWMU 7), Reten/Aqualon Basin (SWMUs 8 and 29), Sludge Drying Beds (SWMU14), Vacuum Filter Sludge Pile (SWMU 15), and Main Holding Basin for the Hercules Incorporated Facility located in Hopewell, Virginia (site). These constituents include: diethyl ether, tetrachloroethene, trichloroethene, 1,1,2-trichloro-1-propene, 1,2,3-trichloro-1-propene, mercury, Unknown; Chemical Class: chlorinated VOC, Unknown; Chemical Class: alkene, and Unknown; 2-methyl-1-propene. In this appendix, transport factors are calculated to estimate concentrations of COI in indoor air of potential future buildings which could be built in the vicinity of each SWMU.

Transport Factor for Indoor Air

The concentration of a constituent in indoor air (C_{ia}) is proportional to the concentration of the constituent in the pore space in soil (i.e., soil gas concentration or C_{sg}) beneath the building. The following equation is used to calculate C_{ia} from C_{sg}:

$$C_{ia} = C_{sg} \times TF$$

where:

- C_{ia} = concentration of constituent in indoor air (mg/m^3);
- C_{sg} = concentration of constituent in soil gas (mg/m^3); and
- TF = transport factor from soil gas to indoor air.

The transport factor (TF) is an infinite source attenuation coefficient, and can be calculated based on a model developed by Johnson and Ettinger (1991). The equation for calculating TF is as follows:

$$\frac{(D_{eff} \times A_B)/(Q_B \times L_T) \times \exp[(Q_{soil} \times L_{crack})/(D_{crack} \times A_{crack})]}{\exp[(Q_{soil} \times L_{crack})/(D_{crack} \times A_{crack})] + (D_{eff} \times A_B)/(Q_B \times L_T) + (D_{eff} \times A_B)/(Q_{soil} \times L_T) \times (\exp[(Q_{soil} \times L_{crack})/(D_{crack} \times A_{crack})] - 1)}$$

where:

- D_{eff} = effective diffusion coefficient for vadose zone soil (cm^2/sec);
- A_B = area of enclosed space below grade (cm^2);
- Q_B = building ventilation rate (cm^3/sec);

L_T = distance from contaminant source to building foundation (cm);
Q_{soil} = volumetric flow rate of soil gas into building (cm^3/sec);
L_{crack} = foundation thickness (cm);
D_{crack} = vapor diffusion coefficient through crack (cm^2/sec); and
A_{crack} = area of cracks through which vapors can pass (cm^2).

To solve this equation, the USEPA's "GW-ADV" spreadsheet (Version 3.1, most recently updated in February 2004) was implemented. A combination of site-specific factors and default values from the User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings (USEPA, 2004) were used as input values in the models.

The input values are defined below and presented in Tables E-2-A through E-21-A.

- The groundwater source concentrations (i.e., EPCs) for the vapor intrusion COI in groundwater associated with each of the evaluated areas are presented in Section 4 of the risk assessment. Specifically, the EPCs for the Eastern and Western Whitewater Lagoons are presented in Table 4-6; the EPCs for the Landfill Areas are presented in Table 4-7; the EPCs for the Natrosol Lagoon are presented in Table 4-8; the EPCs for the Reten/Aqualon Basin are presented in Table 4-9; the EPCs for the Sludge Drying Beds are presented in Table 4-10; the EPCs for the Vacuum Filter Sludge Pile are presented in Table 4-11; and the EPCs for the Main Holding Basin are presented in Table 4-12.

- The average system temperature (T_S) is set to 13.9°C, the average value for Virginia as estimated from Figure 8 of the vapor intrusion user's guide (USEPA, 2004).

- The depth below grade to the bottom of the enclosed space floor (L_F) is set to 15 cm, the default value provided by USEPA (2004). The assumption of a slab-on-grade foundation was selected as opposed to a basement foundation, because it is more conservative (i.e., the overall building volume is less).

- The depth below grade to the water table (L_{WT}) is set to the site-specific value for each of the evaluated areas. For this evaluation, it was conservatively assumed that the groundwater could be present at the minimum measured depth for each area. Minimum depth values vary from one-foot in the area of the Vacuum Filter Sludge Pile to 22-feet in the area of the Eastern and Western Whitewater Lagoons. Depth to groundwater measurements are from the Monitoring Well Construction Table (Table 5) from the *Phase III Site Investigation Summary Report* (GES, 2007)

and are presented in Table E-1. The minimum depth to water was used to conservatively model vapor intrusion to indoor air for each area.

- The vadose zone soil type and soil properties are set to the model default values for silty clay ("SIC"). As discussed in the Phase III Report (GES, 2007), review of the various boring logs and related reports indicate that the surface stratigraphy below the topographic highs at the facility is composed of a fairly thick sequence (10 to 30 feet) of silty clay/clay, which is underlain by a layer of gray silty sand. The silty sand layer ranges in thickness from 10 to 20 feet and forms the uppermost aquifer at the site. Therefore, the following soil properties were based on USEPA (2004) default values for silty clay: the bulk density is 1.38 g/cm^3; the total porosity is 0.481 cm^3/cm^3, and the water-filled porosity is 0.216 cm^3-H_2O/cm^3-soil. It should be noted, that due to the shallow depth to water in some of the site areas (i.e., the Landfill Areas and the Vacuum Filter Sludge Pile), the thickness of the capillary zone was manually adjusted to one-half the depth to water, in order to get the model to run.

- The floor thickness (L_{crack}) is set to the USEPA (2004) default value of 10 cm.

- The soil-building pressure differential (ΔP) is set to the USEPA (2004) default value of 40 g/cm-s^2.

- The building dimensions are set to the USEPA (2004) default dimensions, namely 1,000 cm length by 1,000 cm width by 244 cm height (a single-story slab on grade building approximately 33' x 33' x 8'). The default dimensions were used to be conservative for a future building scenario.

- The floor-wall seam crack width (w) is set to the USEPA (2004) default value of 0.1 cm.

- An indoor air exchange rate (ER) of 0.83/hour is recommended for commercial and industrial buildings, based on ASTM (2002) guidance.

Tables E-2-B through E-21-B present the constituent-specific properties for each COI in groundwater that were used in the TF calculations. Tables E-2-C through E-21-C present the intermediate calculations used to determine the indoor air attenuation coefficient (i.e., the transport factor). The shaded boxes in Tables E-2-C through E-21-C present the resulting TF value that is applied to the concentration of each COI in soil gas, and the resulting estimated indoor air concentration.

References

American Society for Testing and Materials (ASTM; 2002) Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites. ASTM E-1739-95 (Reapproved 2002).

Groundwater & Environmental Services, Inc. (GES; 2007) Phase III Site Investigation Summary Report (Including Response to Comments on Phase I/II RFI Report) - Facility Lead Corrective Action. Hercules Incorporated – Aqualon Division. Hopewell, Virginia. November 2007.

Johnson, P.C. and R.A. Ettinger (1991) Heuristic model for predicting the intrusion rate of contaminant vapors into buildings. *Environ. Sci. Technology*, 25: 1445-1452.

United States Environmental Protection Agency (USEPA; 2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. February 22, 2004.

TABLE E-1
DEPTH TO GROUNDWATER DETERMINATIONS FOR ALL AREAS
Hercules Incorporated Facility - Hopewell, Virginia

Area	Well ID	Top of Ground Surface[1]	GW Elevation[1]	Depth to Groundwater Below Ground Surface	Minimum Depth To Groundwater Below Ground Surface
Eastern and Western Whitewater Lagoons (SWMU 3 and 4)	WWL-1	32.88	9.42	23.46	
	WWL-2	32.2	9.78	22.42	
	WWL-3L	37.94	9.36	28.58	
	WWL-3U	37.94	9.37	28.57	22.42
Landfill Areas (SWMU 5)	LF-1	13.04	8.09	4.95	
	LF-2	13.79	7.57	6.22	
	LF-3	23.24	8.65	14.59	
	LF-4	33.79	9.79	24	
	LF-5	38.71	9.68	29.03	4.95
Natrosol Lagoon (SWMU 7)	NAT-1	40.95	14.76	26.19	
	NAT-2	33.39	14.25	19.14	
	NAT-3	28.89	13.91	14.98	
	NAT-4	29.76	18.86	10.9	10.9
Reten/Aqualon Basin (SWMUS 8 and 29)	RAB-MW-1	25.4	10.33	15.07	
	RAB-MW-2	23.49	13.8	9.69	
	RAB-MW-3	27.23	13.86	13.37	
	RAB-MW-4	24.31	13.21	11.1	9.69
Sludge Drying Beds (SWMU 14)	SDB-MW1	29.34	11.35	17.99	
	SDB-MW2	25.5	10.31	15.19	
	SDB-MW3	25.94	9.9	16.04	15.19
Vacuum Filter Sludge Pile (SWMU 15)	VFSP-MW1	9.39	8.12	1.27	1.27
Main Holding Basin	MW-1	41.84	9.68	32.16	
	MW-2	40.45	9.49	30.96	
	MW-3	33.13	9.09	24.04	
	MW-4	32.38	9.22	23.16	
	MW-4U	32.08	9.23	22.85	
	MW-5	29.44	9.21	20.23	
	MW-5U	29.34	9.27	20.07	
	MW-5D	29.3	--	---	
	MW-6	15.18	8.22	6.96	
	MW-7L	42.76	11.19	31.57	
	MW-7U	42.73	11.06	31.67	
	MW-8D	17.97	9.1	8.87	
	MW-8L	18.08	8.66	9.42	
	MW-8U	18.03	8.2	9.83	
	MW-9	39.57	9.32	30.25	
	MW-10	19.74	9.78	9.96	6.96

Notes:
[1] Values are from Table 5 Monitoring Well Construction Table from the Phase III Site Investigation Summary Report (GES, 2007).

TABLE E-2-A
DATA ENTRY SHEET FOR DIETHYL ETHER - EASTERN AND WESTERN WHITEWATER LAGOONS (SWMUS 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
60297	8.20E+03	Ethyl ether

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	683	683			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-2-B
CHEMICAL PROPERTIES SHEET FOR DIETHYL ETHER - EASTERN AND WESTERN WHITEWATER LAGOONS (SWMUS 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.82E-02	8.61E-06	3.29E-02	25	6,338	307.50	466.74	5.73E+00	5.68E+04	0.0E+00	7.0E-01

END

TABLE E-2-C
INTERMEDIATE CALCULATIONS SHEET FOR DIETHYL ETHER - EASTERN AND WESTERN WHITEWATER LAGOONS (SWMUS 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	668	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	6,629	2.14E-02	9.07E-01	1.77E-04	4.06E-03	0.00E+00	0.00E+00	2.72E-05	9.29E-05	668

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	7.43E+06	0.10	1.26E+00	4.06E-03	4.00E+02	2.31E+03	**2.34E-06**	**1.74E+01**	NA	7.0E-01

END

TABLE E-3-A
DATA ENTRY SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: CHLORINATED VOC - EASTERN AND WESTERN WHITEWATER LAGOONS (SWMUS 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	8.00E+00	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	683	683			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-3-B
CHEMICAL PROPERTIES SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: CHLORINATED VOC - EASTERN AND WESTERN WHITEWATER LAGOONS (SWMUS 3 AND 4)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	4.0E-02

END

TABLE E-3-C
INTERMEDIATE CALCULATIONS SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: CHLORINATED VOC - EASTERN AND WESTERN WHITEWATER LAGOONS (SWMUS 3 A 4)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	668	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	8,509	5.90E-03	2.50E-01	1.77E-04	4.10E-03	0.00E+00	0.00E+00	3.41E-05	1.16E-04	668

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.00E+03	0.10	1.26E+00	4.10E-03	4.00E+02	2.13E+03	**2.85E-06**	**5.72E-03**	1.1E-04	4.0E-02

END

TABLE E-4-A
DATA ENTRY SHEET FOR DIETHYL ETHER - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
60297	2.00E+02	Ethyl ether

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	151	151			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-4-B
CHEMICAL PROPERTIES SHEET FOR DIETHYL ETHER - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.82E-02	8.61E-06	3.29E-02	25	6,338	307.50	466.74	5.73E+00	5.68E+04	0.0E+00	7.0E-01

END

TABLE E-4-C
INTERMEDIATE CALCULATIONS SHEET FOR DIETHYL ETHER - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	136	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	75.50	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	6,629	2.14E-02	9.07E-01	1.77E-04	4.06E-03	0.00E+00	0.00E+00	2.72E-05	4.87E-05	136

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.81E+05	0.10	1.26E+00	4.06E-03	4.00E+02	2.31E+03	**5.18E-06**	**9.40E-01**	NA	7.0E-01

END

TABLE E-5-A
DATA ENTRY SHEET FOR 1,1,2-TRICHLORO-1-PROPENE - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	7.40E+00	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	151	151			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-5-B
CHEMICAL PROPERTIES SHEET FOR 1,1,2-TRICHLORO-1-PROPENE - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	6.0E-01

END

TABLE E-5-C
INTERMEDIATE CALCULATIONS SHEET FOR 1,1,2-TRICHLORO-1-PROPENE - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	136	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	75.50	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	9,514	9.86E-03	4.19E-01	1.77E-04	3.74E-03	0.00E+00	0.00E+00	2.77E-05	4.96E-05	136

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	3.10E+03	0.10	1.26E+00	3.74E-03	4.00E+02	4.49E+03	**5.26E-06**	**1.63E-02**	5.9E-06	6.0E-01

END

TABLE E-6-A
DATA ENTRY SHEET FOR 1,2,3-TRICHLORO-1-PROPENE - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	6.70E+00	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	151	151			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-6-B
CHEMICAL PROPERTIES SHEET FOR 1,2,3-TRICHLORO-1-PROPENE - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	6.0E-01

END

TABLE E-6-C
INTERMEDIATE CALCULATIONS SHEET FOR 1,2,3-TRICHLORO-1-PROPENE - LANDFILL AREAS (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	136	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	75.50	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	9,514	9.86E-03	4.19E-01	1.77E-04	3.74E-03	0.00E+00	0.00E+00	2.77E-05	4.96E-05	136

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.81E+03	0.10	1.26E+00	3.74E-03	4.00E+02	4.49E+03	**5.26E-06**	**1.48E-02**	5.9E-06	6.0E-01

END

TABLE E-7-A
DATA ENTRY SHEET FOR DIETHYL ETHER - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
60297	5.00E-01	Ethyl ether

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	332	332			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-7-B
CHEMICAL PROPERTIES SHEET FOR DIETHYL ETHER - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.82E-02	8.61E-06	3.29E-02	25	6,338	307.50	466.74	5.73E+00	5.68E+04	0.0E+00	7.0E-01

END

TABLE E-7-C
INTERMEDIATE CALCULATIONS SHEET FOR DIETHYL ETHER - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	317	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	6,629	2.14E-02	9.07E-01	1.77E-04	4.06E-03	0.00E+00	0.00E+00	2.72E-05	4.46E-05	317

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4.53E+02	0.10	1.26E+00	4.06E-03	4.00E+02	2.31E+03	**2.37E-06**	**1.07E-03**	NA	7.0E-01

END

TABLE E-8-A
DATA ENTRY SHEET FOR TRICHLOROETHENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	8.40E+00	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	332	332			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-8-B
CHEMICAL PROPERTIES SHEET FOR TRICHLOROETHENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	4.0E-02

END

TABLE E-8-C
INTERMEDIATE CALCULATIONS SHEET FOR TRICHLOROETHENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	317	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	8,509	5.90E-03	2.50E-01	1.77E-04	4.10E-03	0.00E+00	0.00E+00	3.41E-05	5.59E-05	317

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.10E+03	0.10	1.26E+00	4.10E-03	4.00E+02	2.13E+03	**2.89E-06**	**6.08E-03**	1.1E-04	4.0E-02

END

TABLE E-9-A
DATA ENTRY SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: ALKENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
110543	3.80E+01	Hexane

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	332	332			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-9-B
CHEMICAL PROPERTIES SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: ALKENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	4.34E+01	1.24E+01	0.0E+00	2.0E-01

END

TABLE E-9-C
INTERMEDIATE CALCULATIONS SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: ALKENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	317	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	7,685	1.01E+00	4.27E+01	1.77E-04	1.04E-02	0.00E+00	0.00E+00	6.35E-05	1.04E-04	317

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.62E+06	0.10	1.26E+00	1.04E-02	4.00E+02	2.07E+01	**4.91E-06**	**7.97E+00**	NA	2.0E-01

END

TABLE E-10-A
DATA ENTRY SHEET FOR UNKNOWN TIC; 2-METHYL-1-PROPENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
110543	3.00E+01	Hexane

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	332	332			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-10-B
CHEMICAL PROPERTIES SHEET FOR UNKNOWN TIC; 2-METHYL-1-PROPENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	4.34E+01	1.24E+01	0.0E+00	2.0E-01

END

TABLE E-10-C
INTERMEDIATE CALCULATIONS SHEET FOR UNKNOWN TIC; 2-METHYL-1-PROPENE - NATROSOL LAGOON (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	317	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	7,685	1.01E+00	4.27E+01	1.77E-04	1.04E-02	0.00E+00	0.00E+00	6.35E-05	1.04E-04	317

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.28E+06	0.10	1.26E+00	1.04E-02	4.00E+02	2.07E+01	**4.91E-06**	**6.29E+00**	NA	2.0E-01

END

TABLE E-11-A
DATA ENTRY SHEET FOR DIETHYL ETHER - RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
60297	1.10E+01	Ethyl ether

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	295	295			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-11-B
CHEMICAL PROPERTIES SHEET FOR DIETHYL ETHER - RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.82E-02	8.61E-06	3.29E-02	25	6,338	307.50	466.74	5.73E+00	5.68E+04	0.0E+00	7.0E-01

END

TABLE E-11-C
INTERMEDIATE CALCULATIONS SHEET FOR DIETHYL ETHER - RETAN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	280	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	6,629	2.14E-02	9.07E-01	1.77E-04	4.06E-03	0.00E+00	0.00E+00	2.72E-05	3.95E-05	280

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	9.97E+03	0.10	1.26E+00	4.06E-03	4.00E+02	2.31E+03	**2.37E-06**	**2.37E-02**	NA	7.0E-01

END

TABLE E-12-A
DATA ENTRY SHEET FOR MERCURY - RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
7439976	5.20E-01	Mercury (elemental)

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	295	295			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-12-B
CHEMICAL PROPERTIES SHEET FOR MERCURY - RETEN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
3.07E-02	6.30E-06	1.07E-02	25	14,127	629.88	1750.00	5.20E+01	2.00E+01	0.0E+00	3.0E-04

END

Listed value of Koc is actually value of Kd for mercury.

TABLE E-12-C
INTERMEDIATE CALCULATIONS SHEET FOR MERCURY - RETAN/AQUALON BASIN (SWMUS 8 AND 29)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	280	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	15,305	3.95E-03	1.68E-01	1.77E-04	1.59E-03	0.00E+00	0.00E+00	1.90E-05	2.76E-05	280

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	8.72E+01	0.10	1.26E+00	1.59E-03	4.00E+02	3.64E+08	**1.71E-06**	**1.49E-04**	NA	3.0E-04

END

TABLE E-13-A
DATA ENTRY SHEET FOR DIETHYL ETHER - SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
60297	5.40E-01	Ethyl ether

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	463	463			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-13-B
CHEMICAL PROPERTIES SHEET FOR DIETHYL ETHER - SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.82E-02	8.61E-06	3.29E-02	25	6,338	307.50	466.74	5.73E+00	5.68E+04	0.0E+00	7.0E-01

END

TABLE E-13-C
INTERMEDIATE CALCULATIONS SHEET FOR DIETHYL ETHER - SLUDGE DRYING BEDS (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	448	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	6,629	2.14E-02	9.07E-01	1.77E-04	4.06E-03	0.00E+00	0.00E+00	2.72E-05	6.28E-05	448

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4.90E+02	0.10	1.26E+00	4.06E-03	4.00E+02	2.31E+03	**2.36E-06**	**1.16E-03**	NA	7.0E-01

END

TABLE E-14-A
DATA ENTRY SHEET FOR DIETHYL ETHER - VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
60297	7.60E+01	Ethyl ether

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	39	39			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-14-B
CHEMICAL PROPERTIES SHEET FOR DIETHYL ETHER - VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.82E-02	8.61E-06	3.29E-02	25	6,338	307.50	466.74	5.73E+00	5.68E+04	0.0E+00	7.0E-01

END

TABLE E-14-C
INTERMEDIATE CALCULATIONS SHEET FOR DIETHYL ETHER - VACUUM FILTER SLUDGE PILE (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	24	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	19.50	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	6,629	2.14E-02	9.07E-01	1.77E-04	4.06E-03	0.00E+00	0.00E+00	2.72E-05	3.34E-05	24

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	6.89E+04	0.10	1.26E+00	4.06E-03	4.00E+02	2.31E+03	**1.21E-05**	**8.31E-01**	NA	7.0E-01

END

TABLE E-15-A
DATA ENTRY SHEET FOR DIETHYL ETHER - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
60297	4.73E+03	Ethyl ether

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	212	212			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-15-B
CHEMICAL PROPERTIES SHEET FOR DIETHYL ETHER - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.82E-02	8.61E-06	3.29E-02	25	6,338	307.50	466.74	5.73E+00	5.68E+04	0.0E+00	7.0E-01

END

TABLE E-15-C
INTERMEDIATE CALCULATIONS SHEET FOR DIETHYL ETHER - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	197	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	6,629	2.14E-02	9.07E-01	1.77E-04	4.06E-03	0.00E+00	0.00E+00	2.72E-05	2.78E-05	197

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4.29E+06	0.10	1.26E+00	4.06E-03	4.00E+02	2.31E+03	**2.38E-06**	**1.02E+01**	NA	7.0E-01

END

TABLE E-16-A
DATA ENTRY SHEET FOR TETRACHLOROETHENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	2.20E+01	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	212	212			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-16-B
CHEMICAL PROPERTIES SHEET FOR TETRACHLOROETHENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	6.0E-01

END

TABLE E-16-C
INTERMEDIATE CALCULATIONS SHEET FOR TETRACHLOROETHENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	197	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	9,514	9.86E-03	4.19E-01	1.77E-04	3.74E-03	0.00E+00	0.00E+00	2.77E-05	2.84E-05	197

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	9.21E+03	0.10	1.26E+00	3.74E-03	4.00E+02	4.49E+03	**2.42E-06**	**2.23E-02**	5.9E-06	6.0E-01

END

TABLE E-17-A
DATA ENTRY SHEET FOR TRICHLOROETHENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	3.20E+00	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	212	212			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-17-B
CHEMICAL PROPERTIES SHEET FOR TRICHLOROETHENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	4.0E-02

END

TABLE E-17-C
INTERMEDIATE CALCULATIONS SHEET FOR TRICHLOROETHENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	197	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	8,509	5.90E-03	2.50E-01	1.77E-04	4.10E-03	0.00E+00	0.00E+00	3.41E-05	3.49E-05	197

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	8.01E+02	0.10	1.26E+00	4.10E-03	4.00E+02	2.13E+03	**2.90E-06**	**2.33E-03**	1.1E-04	4.0E-02

END

TABLE E-18-A
DATA ENTRY SHEET FOR 1,1,2-TRICHLORO-1-PROPENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	7.00E+00	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	Totals must add up to value of L_{WT} (cell G28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
13.9	15	212	212				A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-18-B
CHEMICAL PROPERTIES SHEET FOR 1,1,2-TRICHLORO-1-PROPENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	6.0E-01

END

TABLE E-18-C
INTERMEDIATE CALCULATIONS SHEET FOR 1,1,2-TRICHLORO-1-PROPENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	197	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	9,514	9.86E-03	4.19E-01	1.77E-04	3.74E-03	0.00E+00	0.00E+00	2.77E-05	2.84E-05	197

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.93E+03	0.10	1.26E+00	3.74E-03	4.00E+02	4.49E+03	**2.42E-06**	**7.10E-03**	5.9E-06	6.0E-01

END

TABLE E-19-A
DATA ENTRY SHEET FOR 1,2,3-TRICHLORO-1-PROPENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	5.40E+00	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	212	212			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-19-B
CHEMICAL PROPERTIES SHEET FOR 1,2,3-TRICHLORO-1-PROPENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	6.0E-01

END

TABLE E-19-C
INTERMEDIATE CALCULATIONS SHEET FOR 1,2,3-TRICHLORO-1-PROPENE - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	197	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	9,514	9.86E-03	4.19E-01	1.77E-04	3.74E-03	0.00E+00	0.00E+00	2.77E-05	2.84E-05	197

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.26E+03	0.10	1.26E+00	3.74E-03	4.00E+02	4.49E+03	**2.42E-06**	**5.47E-03**	5.9E-06	6.0E-01

END

TABLE E-20-A
DATA ENTRY SHEET FOR MERCURY - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
7439976	8.00E-01	Mercury (elemental)

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	212	212			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-20-B
CHEMICAL PROPERTIES SHEET FOR MERCURY - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
3.07E-02	6.30E-06	1.07E-02	25	14,127	629.88	1750.00	5.20E+01	2.00E+01	0.0E+00	3.0E-04

END

Listed value of Koc is actually value of Kd for mercury.

TABLE E-20-C
INTERMEDIATE CALCULATIONS SHEET FOR MERCURY - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	197	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	15,305	3.95E-03	1.68E-01	1.77E-04	1.59E-03	0.00E+00	0.00E+00	1.90E-05	1.95E-05	197

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.34E+02	0.10	1.26E+00	1.59E-03	4.00E+02	3.64E+08	**1.72E-06**	**2.31E-04**	NA	3.0E-04

END

TABLE E-21-A
DATA ENTRY SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: CHLORINATED VOC - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

GW-ADV Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.40E+01	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
13.9	15	212	212			A	SIC	SIC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216								

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.83	

TABLE E-21-B
CHEMICAL PROPERTIES SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: CHLORINATED VOC - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	4.0E-02

END

TABLE E-21-C
INTERMEDIATE CALCULATIONS SHEET FOR UNKNOWN TIC; CHEMICAL CLASS: CHLORINATED VOC - MAIN HOLDING BASIN
Hercules Incorporated Facility - Hopewell, Virginia

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	197	0.265	ERROR	ERROR	0.284	1.49E-09	0.844	1.26E-09	192.31	0.481	0.057	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	1.06E+06	3.77E-04	15	8,509	5.90E-03	2.50E-01	1.77E-04	4.10E-03	0.00E+00	0.00E+00	3.41E-05	3.49E-05	197

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	**Infinite source indoor attenuation coefficient, α (unitless)**	**Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	3.50E+03	0.10	1.26E+00	4.10E-03	4.00E+02	2.13E+03	**2.90E-06**	**1.02E-02**	1.1E-04	4.0E-02

END

APPENDIX F

RISK CALCULATION SPREADSHEETS

APPENDIX F

Table 1-A: Intake Factors for the Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3): Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

APPENDIX F

Table 1-A: Intake Factors for the Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	900	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

APPENDIX F

Table 1-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Semi-Volatile Organics										
Benzo(a)pyrene		1.00	1		4.49E+00	1	NA	NA	7.30E+00	7.30E+00
Benzo(b)fluoranthene		1.70	1		4.55E+00	1	NA	NA	7.30E-01	7.30E-01
Indeno(1,2,3-cd)pyrene		0.86	1		4.56E+00	1	NA	NA	7.30E-01	7.30E-01
Inorganics										
Arsenic	4.98	1.20	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as chromium VI)	57.7		1		4.00E-03	0.025	3.00E-03	7.50E-05	5.00E-01	2.00E+01
Thallium	0.44		1			1	NA	NA	NA	NA
Unknown TICs										
Unknown; Chemical Class: PAH	4.50		1	0.13	4.49E+00	1	NA	NA	7.30E+00	7.30E+00

APPENDIX F
Table 1-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(b)fluoranthene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Arsenic	4.98	1	4.39E-06	3.00E-04	1.46E-02	1.57E-06	1.50E+00	2.35E-06
Chromium (evaluated as chromium VI)	57.7	1	5.08E-05	3.00E-03	1.69E-02	1.81E-05	5.00E-01	9.07E-06
Thallium	0.44	1	3.91E-07	NA	NA	1.40E-07	NA	NA
Unknown TICs								
Unknown; Chemical Class: PAH	4.50	1	3.96E-06	NA	NA	1.42E-06	7.30E+00	1.03E-05

Total Hazard Index	**0.032**

Potential Cancer Risk	**2.17E-05**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 1-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(b)fluoranthene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Indeno(1,2,3-cd)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Arsenic	4.98	0.03	8.69E-07	3.00E-04	2.90E-03	3.10E-07	1.50E+00	4.65E-07
Chromium (evaluated as chromium VI)	57.7	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Thallium	0.44	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Unknown TICs								
Unknown; Chemical Class: PAH	4.50	0.13	3.40E-06	NA	NA	1.21E-06	7.30E+00	8.86E-06

Total Hazard Index	**0.0029**

Potential Cancer Risk	**9.33E-06**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 1-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	1.00	1	3.91E-08	NA	NA	1.40E-08	7.30E+00	1.02E-07
Benzo(b)fluoranthene	1.70	1	6.65E-08	NA	NA	2.38E-08	7.30E-01	1.73E-08
Indeno(1,2,3-cd)pyrene	0.86	1	3.37E-08	NA	NA	1.20E-08	7.30E-01	8.78E-09
Inorganics								
Arsenic	1.20	1	4.70E-08	3.00E-04	1.57E-04	1.68E-08	1.50E+00	2.52E-08
Chromium (evaluated as chromium VI)	0.0	1	0.00E+00	3.00E-03	--	0.00E+00	5.00E-01	--
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown; Chemical Class: PAH	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	**0.00016**

Potential Cancer Risk	**1.53E-07**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 1-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Semi-Volatile Organics								
Benzo(a)pyrene	1.00	4.49E+00	3.16E-06	NA	NA	1.13E-06	7.30E+00	8.24E-06
Benzo(b)fluoranthene	1.70	4.55E+00	5.45E-06	NA	NA	1.95E-06	7.30E-01	1.42E-06
Indeno(1,2,3-cd)pyrene	0.86	4.56E+00	2.76E-06	NA	NA	9.87E-07	7.30E-01	7.20E-07
Inorganics								
Arsenic	1.20	2.00E-03	1.69E-09	3.00E-04	5.64E-06	6.04E-10	1.50E+00	9.06E-10
Chromium (evaluated as chromium VI)	0.0	4.00E-03	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown; Chemical Class: PAH	0.0	4.49E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	**0.0000056**

Potential Cancer Risk	**1.04E-05**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 1-G: Summary of Hazard Indices for the Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Semi-Volatile Organics					
Benzo(a)pyrene	--	--	NA	NA	NA
Benzo(b)fluoranthene	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	--	NA	NA	NA
Inorganics					
Arsenic	1.46E-02	2.90E-03	1.57E-04	5.64E-06	0.018
Chromium (evaluated as chromium VI)	1.69E-02	--	--	--	0.017
Thallium	NA	NA	--	--	NA
Unknown TICs					
Unknown; Chemical Class: PAH	NA	NA	--	--	NA
Pathway Summary	0.032	0.0029	0.00016	0.0000056	0.035

Total Cardiovascular HI =	0.018
Total Central Nervous System HI =	0.018
Total Respiratory HI =	0.017
Total Skin HI =	0.018
Total Vascular HI =	0.018

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 1-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Outdoor Worker - Eastern Whitewater Lagoon (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics					
Benzo(a)pyrene	--	--	1.02E-07	8.24E-06	8.34E-06
Benzo(b)fluoranthene	--	--	1.73E-08	1.42E-06	1.44E-06
Indeno(1,2,3-cd)pyrene	--	--	8.78E-09	7.20E-07	7.29E-07
Inorganics					
Arsenic	2.35E-06	4.65E-07	2.52E-08	9.06E-10	2.84E-06
Chromium (evaluated as chromium VI)	9.07E-06	--	--	--	9.07E-06
Thallium	NA	NA	--	--	NA
Unknown TICs					
Unknown; Chemical Class: PAH	1.03E-05	8.86E-06	--	--	1.92E-05
Pathway Summary	2.17E-05	9.33E-06	1.53E-07	1.04E-05	4.16E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 2-A: Intake Factors for the Construction Worker - Eastern Whitewater Lagoon (SWMU 3): Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	330	mg/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days

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Table 2-A: Intake Factors for the Construction Worker - Eastern Whitewater Lagoon (SWMU 3): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Water				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

APPENDIX F
Table 2-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics														
Diethyl Ether		8200	1.01E-01		1		5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
t-Butanol		190			1		5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Semi-Volatile Organics														
Benzo(a)pyrene				1.00	1		4.49E+00	1	NA	NA	NA	7.30E+00	1.10E+00	7.30E+00
Benzo(b)fluoranthene				1.70	1		4.55E+00	1	NA	NA	NA	7.30E-01	1.10E-01	7.30E-01
Indeno(1,2,3-cd)pyrene				0.86	1		4.56E+00	1	NA	NA	NA	7.30E-01	1.10E-01	7.30E-01
1.4-Dioxane		33.0			1		8.78E-04	1	3.00E-02	3.60E+00	3.00E-02	1.00E-01	7.70E-03	1.00E-01
Semi-Volatile Organics (TICs)														
1,1'-Oxybis[2-ethoxy-]ethane		340			1		5.89E-03	1	1.00E-01	1.60E+00	1.00E-01	NA	NA	NA
Alcohols and Glycols														
Ethanol		9700			1		1.29E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Methanol		1900			1		7.42E-04	1	5.00E-01	4.00E+00	5.00E-01	NA	NA	NA
Inorganics														
Aluminum		490			1		2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	4.98	4.80		1.20	1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium		1600			1		2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Cadmium (water)		0.14			1		2.00E-03	0.05	5.00E-04	1.00E-05	2.50E-05	NA	1.80E+00	NA
Chromium (evaluated as chromium VI)	57.7	12.0			1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt		79.0			1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron		180000			1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)		16000			1		2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Nickel		22.0			1		4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Thallium	0.44				1			1	NA	NA	NA	NA	NA	NA
Unknown TICs														
Unknown: Chemical Class: glycol ether derivative		5300			1		5.89E-03	1	1.00E-01	1.60E+00	1.00E-01	NA	NA	NA
Unknown: Chemical Class: chlorinated VOC		8.00	2.74E-05		1		3.71E-02	1	NA	NA	NA	5.90E-03	2.00E-03	5.90E-03
Unknown: Chemical Class: PAH	4.50				1	0.13	4.49E+00	1	NA	NA	NA	7.30E+00	1.10E+00	7.30E+00

APPENDIX F
Table 2-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(b)fluoranthene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
1.4-Dioxane	0.0	1	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	1	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	4.98	1	1.29E-06	3.00E-04	4.29E-03	1.84E-08	1.50E+00	2.76E-08
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	57.7	1	1.49E-05	3.00E-03	4.96E-03	2.13E-07	5.00E-01	1.06E-07
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Thallium	0.44	1	1.15E-07	NA	NA	1.64E-09	NA	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0.0	1	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Unknown: Chemical Class: PAH	4.50	1	1.16E-06	NA	NA	1.66E-08	7.30E+00	1.21E-07

Total Hazard Index	0.0093

Potential Cancer Risk	2.55E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 2-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	0	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(b)fluoranthene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Indeno(1,2,3-cd)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
1.4-Dioxane	0.0	0	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	0	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	4.98	0.03	1.16E-07	3.00E-04	3.86E-04	1.65E-09	1.50E+00	2.48E-09
Barium	0.0	0	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	0	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	57.7	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	0	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Thallium	0.44	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0.0	0	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Unknown: Chemical Class: PAH	4.50	0.13	4.53E-07	NA	NA	6.48E-09	7.30E+00	4.73E-08

Total Hazard Index	0.00039

Potential Cancer Risk	4.98E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 2-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	8200	1	3.21E-04	2.00E-01	1.60E-03	4.58E-06	NA	NA
t-Butanol	190	1	7.44E-06	1.00E-01	7.44E-05	1.06E-07	NA	NA
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(b)fluoranthene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
1.4-Dioxane	33.0	1	1.29E-06	3.00E-02	4.31E-05	1.85E-08	1.00E-01	1.85E-09
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	340	1	1.33E-05	1.00E-01	1.33E-04	1.90E-07	NA	NA
Alcohols and Glycols								
Ethanol	9700	1	3.80E-04	1.00E-01	3.80E-03	5.42E-06	NA	NA
Methanol	1900	1	7.44E-05	5.00E-01	1.49E-04	1.06E-06	NA	NA
Inorganics								
Aluminum	490	1	1.92E-05	1.00E+00	1.92E-05	2.74E-07	NA	NA
Arsenic	4.80	1	1.88E-07	3.00E-04	6.26E-04	2.68E-09	1.50E+00	4.03E-09
Barium	1600	1	6.26E-05	2.00E-01	3.13E-04	8.95E-07	NA	NA
Cadmium (water)	0.14	1	5.48E-09	5.00E-04	1.10E-05	7.83E-11	NA	NA
Chromium (evaluated as chromium VI)	12.0	1	4.70E-07	3.00E-03	1.57E-04	6.71E-09	5.00E-01	3.35E-09
Cobalt	79.0	1	3.09E-06	3.00E-04	1.03E-02	4.42E-08	NA	NA
Iron	180000	1	7.05E-03	7.00E-01	1.01E-02	1.01E-04	NA	NA
Manganese (water)	16000	1	6.26E-04	2.40E-02	2.61E-02	8.95E-06	NA	NA
Nickel	22.0	1	8.61E-07	2.00E-02	4.31E-05	1.23E-08	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	5300	1	2.07E-04	1.00E-01	2.07E-03	2.96E-06	NA	NA
Unknown: Chemical Class: chlorinated VOC	8.00	1	3.13E-07	NA	NA	4.47E-09	5.90E-03	2.64E-11
Unknown: Chemical Class: PAH	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	0.056

Potential Cancer Risk	9.25E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 2-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	8200	5.89E-03	1.25E-04	2.00E-01	6.24E-04	1.78E-06	NA	NA
t-Butanol	190	5.89E-03	2.89E-06	1.00E-01	2.89E-05	4.13E-08	NA	NA
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	4.49E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(b)fluoranthene	0.0	4.55E+00	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Indeno(1,2,3-cd)pyrene	0.0	4.56E+00	0.00E+00	NA	--	0.00E+00	7.30E-01	--
1.4-Dioxane	33.0	8.78E-04	7.48E-08	3.00E-02	2.49E-06	1.07E-09	1.00E-01	1.07E-10
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	340	5.89E-03	5.17E-06	1.00E-01	5.17E-05	7.39E-08	NA	NA
Alcohols and Glycols								
Ethanol	9700	1.29E-03	3.22E-05	1.00E-01	3.22E-04	4.60E-07	NA	NA
Methanol	1900	7.42E-04	3.64E-06	5.00E-01	7.29E-06	5.21E-08	NA	NA
Inorganics								
Aluminum	490	2.00E-03	2.53E-06	1.00E+00	2.53E-06	3.62E-08	NA	NA
Arsenic	4.80	2.00E-03	2.48E-08	3.00E-04	8.27E-05	3.54E-10	1.50E+00	5.31E-10
Barium	1600	2.00E-03	8.27E-06	1.40E-02	5.90E-04	1.18E-07	NA	NA
Cadmium (water)	0.14	2.00E-03	7.23E-10	2.50E-05	2.89E-05	1.03E-11	NA	NA
Chromium (evaluated as chromium VI)	12.0	4.00E-03	1.24E-07	7.50E-05	1.65E-03	1.77E-09	2.00E+01	3.54E-08
Cobalt	79.0	8.00E-04	1.63E-07	3.00E-04	5.44E-04	2.33E-09	NA	NA
Iron	180000	2.00E-03	9.30E-04	7.00E-01	1.33E-03	1.33E-05	NA	NA
Manganese (water)	16000	2.00E-03	8.27E-05	9.60E-04	8.61E-02	1.18E-06	NA	NA
Nickel	22.0	4.00E-04	2.27E-08	8.00E-04	2.84E-05	3.25E-10	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	5300	5.89E-03	8.06E-05	1.00E-01	8.06E-04	1.15E-06	NA	NA
Unknown: Chemical Class: chlorinated VOC	8.00	3.71E-02	7.67E-07	NA	NA	1.10E-08	5.90E-03	6.47E-11
Unknown: Chemical Class: PAH	0.0	4.49E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	**0.092**

Potential Cancer Risk	**3.61E-08**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 2-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	1.01E-01	4.59E-04	NA	NA	6.56E-06	NA	NA
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Benzo(b)fluoranthene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
1.4-Dioxane	0.00E+00	0.00E+00	3.60E+00	--	0.00E+00	7.70E-03	--
Semi-Volatile Organics (TICs)							
1,1'-Oxybis[2-ethoxy-]ethane	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Alcohols and Glycols							
Ethanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Methanol	0.00E+00	0.00E+00	4.00E+00	--	0.00E+00	NA	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Thallium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs							
Unknown: Chemical Class: glycol ether derivative	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	2.74E-05	1.25E-07	NA	NA	1.79E-09	2.00E-03	3.57E-12
Unknown: Chemical Class: PAH	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--

Total Hazard Index	0.00

Potential Cancer Risk	3.57E-12

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 2-H: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	1.00	1	3.91E-08	NA	NA	5.59E-10	7.30E+00	4.08E-09
Benzo(b)fluoranthene	1.70	1	6.65E-08	NA	NA	9.51E-10	7.30E-01	6.94E-10
Benzo(k)fluoranthene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-02	--
Dibenz(a,h)anthracene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.86	1	3.37E-08	NA	NA	4.81E-10	7.30E-01	3.51E-10
1.4-Dioxane	0.0	1	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	1	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.20	1	4.70E-08	3.00E-04	1.57E-04	6.71E-10	1.50E+00	1.01E-09
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	0.0	1	0.00E+00	3.00E-03	--	0.00E+00	5.00E-01	--
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0.0	1	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Unknown: Chemical Class: PAH	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	0.00016

Potential Cancer Risk	6.13E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 2-I: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	0.0	5.89E-03	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	1.00	4.49E+00	1.16E-05	NA	NA	1.66E-07	7.30E+00	1.21E-06
Benzo(b)fluoranthene	1.70	4.55E+00	2.00E-05	NA	NA	2.86E-07	7.30E-01	2.09E-07
Indeno(1,2,3-cd)pyrene	0.86	4.56E+00	1.01E-05	NA	NA	1.45E-07	7.30E-01	1.06E-07
1.4-Dioxane	0.0	8.78E-04	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	1.29E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	7.42E-04	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	2.00E-03	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.20	2.00E-03	6.20E-09	3.00E-04	2.07E-05	8.86E-11	1.50E+00	1.33E-10
Barium	0.0	2.00E-03	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	2.00E-03	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	0.0	4.00E-03	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	8.00E-04	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	2.00E-03	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	2.00E-03	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	4.00E-04	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0.0	3.71E-02	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Unknown: Chemical Class: PAH	0.0	4.49E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	0.000021

Potential Cancer Risk	1.52E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 2-J: Summary of Hazard Indices for the Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Volatile Organics								
Diethyl Ether	--	--	1.60E-03	6.24E-04	NA	--	--	0.0022
t-Butanol	--	--	7.44E-05	2.89E-05	--	--	--	0.0001
Semi-Volatile Organics								
Benzo(a)pyrene	--	--	--	--	--	NA	NA	NA
Benzo(b)fluoranthene	--	--	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	NA	NA
1.4-Dioxane	--	--	4.31E-05	2.49E-06	--	--	--	0.000046
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	--	--	1.33E-04	5.17E-05	--	--	--	0.00018
Alcohols and Glycols								
Ethanol	--	--	3.80E-03	3.22E-04	--	--	--	0.0041
Methanol	--	--	1.49E-04	7.29E-06	--	--	--	0.00016
Inorganics								
Aluminum	--	--	1.92E-05	2.53E-06	--	--	--	0.000022
Arsenic	4.29E-03	3.86E-04	6.26E-04	8.27E-05	--	1.57E-04	2.07E-05	0.0056
Barium	--	--	3.13E-04	5.90E-04	--	--	--	0.0009
Cadmium (water)	--	--	1.10E-05	2.89E-05	--	--	--	0.00004
Chromium (evaluated as chromium VI)	4.96E-03	--	1.57E-04	1.65E-03	--	--	--	0.0068
Cobalt	--	--	1.03E-02	5.44E-04	--	--	--	0.011
Iron	--	--	1.01E-02	1.33E-03	--	--	--	0.011
Manganese (water)	--	--	2.61E-02	8.61E-02	--	--	--	0.11
Nickel	--	--	4.31E-05	2.84E-05	--	--	--	0.000071
Thallium	NA	NA	--	--	--	--	--	NA

APPENDIX F

Table 2-J: Summary of Hazard Indices for the Construction Worker - Eastern Whitewater Lagoon (SWMU 3)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	--	--	2.07E-03	8.06E-04	--	--	--	0.0029
Unknown: Chemical Class: chlorinated VOC	--	--	NA	NA	NA	--	--	NA
Unknown: Chemical Class: PAH	NA	NA	--	--	--	--	--	NA
Pathway Summary	0.0093	0.00039	0.056	0.092	--	0.00016	0.000021	0.16

Total Blood HI =	0.011
Total Body Weight HI =	0.0022
Total Cardiovascular HI =	0.0056
Total Central Nervous System HI =	0.12
Total Fetal HI =	0.0009
Total GI Tract HI =	0.011
Total Kidney HI =	0.00094
Total Liver HI =	0.012
Total Not Specified HI =	0.011
Total Respiratory HI =	0.0068
Total Skin HI =	0.0056
Total Vascular HI =	0.0056
Total Whole Body HI =	0.000071

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 2-K: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Eastern Whitewater Lagoon (SWMU 3)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Volatile Organics								
Diethyl Ether	--	--	NA	NA	NA	--	--	NA
t-Butanol	--	--	NA	NA	--	--	--	NA
Semi-Volatile Organics								
Benzo(a)pyrene	--	--	--	--	--	4.08E-09	1.21E-06	1.21E-06
Benzo(b)fluoranthene	--	--	--	--	--	6.94E-10	2.09E-07	2.09E-07
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	3.51E-10	1.06E-07	1.06E-07
1.4-Dioxane	--	--	1.85E-09	1.07E-10	--	--	--	1.95E-09
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	--	--	NA	NA	--	--	--	NA
Alcohols and Glycols								
Ethanol	--	--	NA	NA	--	--	--	NA
Methanol	--	--	NA	NA	--	--	--	NA
Inorganics								
Aluminum	--	--	NA	NA	--	--	--	NA
Arsenic	2.76E-08	2.48E-09	4.03E-09	5.31E-10	--	1.01E-09	1.33E-10	3.57E-08
Barium	--	--	NA	NA	--	--	--	NA
Cadmium (water)	--	--	NA	NA	--	--	--	NA
Chromium (evaluated as chromium VI)	1.06E-07	--	3.35E-09	3.54E-08	--	--	--	1.45E-07
Cobalt	--	--	NA	NA	--	--	--	NA
Iron	--	--	NA	NA	--	--	--	NA
Manganese (water)	--	--	NA	NA	--	--	--	NA
Nickel	--	--	NA	NA	--	--	--	NA
Thallium	NA	NA	--	--	--	--	--	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	--	--	NA	NA	--	--	--	NA
Unknown: Chemical Class: chlorinated VOC	--	--	2.64E-11	6.47E-11	3.57E-12	--	--	9.46E-11
Unknown: Chemical Class: PAH	1.21E-07	4.73E-08	--	--	--	--	--	1.69E-07
Pathway Summary	2.55E-07	4.98E-08	9.25E-09	3.61E-08	3.57E-12	6.13E-09	1.52E-06	1.88E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 3-A: Intake Factors for the Indoor Worker - Eastern and Western Whitewater Lagoons (SWMUS 3 and 4): Hercules Incorporated Facility - Hopewell, Virginia

Inhalation of Volatiles				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	250	days/yr
	ED	Exposure Duration	25	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	219000	hours

APPENDIX F
Table 3-B: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles in Indoor Air- Indoor Worker - Eastern and Western Whitewater Lagoons (SWMUS 3 and 4)

Constituent	EPC Air (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl ether	1.74E-02	3.98E-03	NA	NA	1.42E-03	NA	NA
Unknown TICs							
Unknown; Chemical Class: chlorinated VOC	5.72E-06	1.30E-06	NA	NA	4.66E-07	2.00E-03	9.32E-10

Total Hazard Index	0.00

Potential Cancer Risk	9.32E-10

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 4-A: Intake Factors for the Outdoor Worker - Western Whitewater Lagoon (SWMU 4): Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

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Table 4-A: Intake Factors for the Outdoor Worker - Western Whitewater Lagoon (SWMU 4): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	900	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

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Table 4-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Inorganics										
Arsenic	4.55	1.50	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as chromium VI)	37.4	3.80	1		4.00E-03	0.025	3.00E-03	7.50E-05	5.00E-01	2.00E+01
Thallium	0.27		1			1	NA	NA	NA	NA

APPENDIX F
Table 4-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Outdoor Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.55	1	4.00E-06	3.00E-04	1.33E-02	1.43E-06	1.50E+00	2.14E-06
Chromium (evaluated as chromium VI)	37.4	1	3.30E-05	3.00E-03	1.10E-02	1.18E-05	5.00E-01	5.89E-06
Thallium	0.27	1	2.37E-07	NA	NA	8.46E-08	NA	NA

Total Hazard Index	0.024

Potential Cancer Risk	8.03E-06

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 4-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Outdoor Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.55	0.03	7.92E-07	3.00E-04	2.64E-03	2.83E-07	1.50E+00	4.25E-07
Chromium (evaluated as chromium VI)	37.4	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Thallium	0.27	0	0.00E+00	NA	NA	0.00E+00	NA	NA

Total Hazard Index	0.0026

Potential Cancer Risk	4.25E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 4-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Outdoor Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	1.50	1	5.87E-08	3.00E-04	1.96E-04	2.10E-08	1.50E+00	3.15E-08
Chromium (evaluated as chromium VI)	3.80	1	1.49E-07	3.00E-03	4.96E-05	5.31E-08	5.00E-01	2.66E-08
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.00025

Potential Cancer Risk	5.80E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 4-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Outdoor Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Inorganics								
Arsenic	1.50	2.00E-03	2.11E-09	3.00E-04	7.05E-06	7.55E-10	1.50E+00	1.13E-09
Chromium (evaluated as chromium VI)	3.80	4.00E-03	1.07E-08	7.50E-05	1.43E-04	3.82E-09	2.00E+01	7.65E-08
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.00015

Potential Cancer Risk	7.76E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 4-G: Summary of Hazard Indices for the Outdoor Worker - Western Whitewater Lagoon (SWMU 4)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Inorganics					
Arsenic	1.33E-02	2.64E-03	1.96E-04	7.05E-06	0.016
Chromium (evaluated as chromium VI)	1.10E-02	--	4.96E-05	1.43E-04	0.011
Thallium	NA	NA	--	--	NA
Pathway Summary	0.024	0.0026	0.00025	0.00015	0.027

Total Cardiovascular HI =	0.016
Total Central Nervous System HI =	0.016
Total Respiratory HI =	0.011
Total Skin HI =	0.016
Total Vascular HI =	0.016

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 4-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Outdoor Worker - Western Whitewater Lagoon (SWMU 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Inorganics					
Arsenic	2.14E-06	4.25E-07	3.15E-08	1.13E-09	2.60E-06
Chromium (evaluated as chromium VI)	5.89E-06	--	2.66E-08	7.65E-08	5.99E-06
Thallium	NA	NA	--	--	NA
Pathway Summary	8.03E-06	4.25E-07	5.80E-08	7.76E-08	8.59E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 5-A: Intake Factors for the Construction Worker - Western Whitewater Lagoon (SWMU 4): Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	330	mg/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days

APPENDIX F

Table 5-A: Intake Factors for the Construction Worker - Western Whitewater Lagoon (SWMU 4): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Water				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

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Table 5-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics														
Diethyl Ether		8200	1.01E-01		1		5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
t-Butanol		190			1		5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Semi-Volatile Organics														
1.4-Dioxane		33.0			1		8.78E-04	1	3.00E-02	3.60E+00	3.00E-02	1.00E-01	7.70E-03	1.00E-01
Semi-Volatile Organics (TICs)														
1,1'-Oxybis[2-ethoxy-]ethane		340			1		5.89E-03	1	1.00E-01	1.60E+00	1.00E-01	NA	NA	NA
Alcohols and Glycols														
Ethanol		9700			1		1.29E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Methanol		1900			1		7.42E-04	1	5.00E-01	4.00E+00	5.00E-01	NA	NA	NA
Inorganics														
Aluminum		490			1		2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	4.55	4.80		1.50	1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium		1600			1		2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Cadmium (water)		0.14			1		2.00E-03	0.05	5.00E-04	1.00E-05	2.50E-05	NA	1.80E+00	NA
Chromium (evaluated as chromium VI)	37.4	12.0		3.80	1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt		79.0			1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron		180000			1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)		16000			1		2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Nickel		22.0			1		4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Thallium	0.27				1			1	NA	NA	NA	NA	NA	NA
Unknown TICs														
Unknown: Chemical Class: glycol ether derivative		5300			1		5.89E-03	1	1.00E-01	1.60E+00	1.00E-01	NA	NA	NA
Unknown: Chemical Class: chlorinated VOC		8.00	2.74E-05		1		3.71E-02	1	NA	NA	NA	5.90E-03	2.00E-03	5.90E-03

APPENDIX F
Table 5-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Construction Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	1	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	1	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	4.55	1	1.17E-06	3.00E-04	3.91E-03	1.68E-08	1.50E+00	2.52E-08
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	37.4	1	9.67E-06	3.00E-03	3.22E-03	1.38E-07	5.00E-01	6.91E-08
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Thallium	0.27	1	6.95E-08	NA	NA	9.93E-10	NA	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0.0	1	0.00E+00	NA	--	0.00E+00	5.90E-03	--

Total Hazard Index	0.0071

Potential Cancer Risk	9.42E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 5-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Construction Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	0	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	0	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	0	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	4.55	0.03	1.06E-07	3.00E-04	3.52E-04	1.51E-09	1.50E+00	2.26E-09
Barium	0.0	0	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	0	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	37.4	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	0	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Thallium	0.27	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0	0	0.00E+00	NA	--	0.00E+00	5.90E-03	--

Total Hazard Index	0.00035

Potential Cancer Risk	2.26E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 5-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	8200	1	3.21E-04	2.00E-01	1.60E-03	4.58E-06	NA	NA
t-Butanol	190	1	7.44E-06	1.00E-01	7.44E-05	1.06E-07	NA	NA
Semi-Volatile Organics								
1.4-Dioxane	33.0	1	1.29E-06	3.00E-02	4.31E-05	1.85E-08	1.00E-01	1.85E-09
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	340	1	1.33E-05	1.00E-01	1.33E-04	1.90E-07	NA	NA
Alcohols and Glycols								
Ethanol	9700	1	3.80E-04	1.00E-01	3.80E-03	5.42E-06	NA	NA
Methanol	1900	1	7.44E-05	5.00E-01	1.49E-04	1.06E-06	NA	NA
Inorganics								
Aluminum	490	1	1.92E-05	1.00E+00	1.92E-05	2.74E-07	NA	NA
Arsenic	4.80	1	1.88E-07	3.00E-04	6.26E-04	2.68E-09	1.50E+00	4.03E-09
Barium	1600	1	6.26E-05	2.00E-01	3.13E-04	8.95E-07	NA	NA
Cadmium (water)	0.14	1	5.48E-09	5.00E-04	1.10E-05	7.83E-11	NA	NA
Chromium (evaluated as chromium VI)	12.0	1	4.70E-07	3.00E-03	1.57E-04	6.71E-09	5.00E-01	3.35E-09
Cobalt	79.0	1	3.09E-06	3.00E-04	1.03E-02	4.42E-08	NA	NA
Iron	180000	1	7.05E-03	7.00E-01	1.01E-02	1.01E-04	NA	NA
Manganese (water)	16000	1	6.26E-04	2.40E-02	2.61E-02	8.95E-06	NA	NA
Nickel	22.0	1	8.61E-07	2.00E-02	4.31E-05	1.23E-08	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	5300	1	2.07E-04	1.00E-01	2.07E-03	2.96E-06	NA	NA
Unknown: Chemical Class: chlorinated VOC	8.00	1	3.13E-07	NA	NA	4.47E-09	5.90E-03	2.64E-11

Total Hazard Index	0.056

Potential Cancer Risk	9.25E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 5-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	8200	5.89E-03	1.25E-04	2.00E-01	6.24E-04	1.78E-06	NA	NA
t-Butanol	190	5.89E-03	2.89E-06	1.00E-01	2.89E-05	4.13E-08	NA	NA
Semi-Volatile Organics								
1.4-Dioxane	33.0	8.78E-04	7.48E-08	3.00E-02	2.49E-06	1.07E-09	1.00E-01	1.07E-10
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	340	5.89E-03	5.17E-06	1.00E-01	5.17E-05	7.39E-08	NA	NA
Alcohols and Glycols								
Ethanol	9700	1.29E-03	3.22E-05	1.00E-01	3.22E-04	4.60E-07	NA	NA
Methanol	1900	7.42E-04	3.64E-06	5.00E-01	7.29E-06	5.21E-08	NA	NA
Inorganics								
Aluminum	490	2.00E-03	2.53E-06	1.00E+00	2.53E-06	3.62E-08	NA	NA
Arsenic	4.80	2.00E-03	2.48E-08	3.00E-04	8.27E-05	3.54E-10	1.50E+00	5.31E-10
Barium	1600	2.00E-03	8.27E-06	1.40E-02	5.90E-04	1.18E-07	NA	NA
Cadmium (water)	0.14	2.00E-03	7.23E-10	2.50E-05	2.89E-05	1.03E-11	NA	NA
Chromium (evaluated as chromium VI)	12.0	4.00E-03	1.24E-07	7.50E-05	1.65E-03	1.77E-09	2.00E+01	3.54E-08
Cobalt	79.0	8.00E-04	1.63E-07	3.00E-04	5.44E-04	2.33E-09	NA	NA
Iron	180000	2.00E-03	9.30E-04	7.00E-01	1.33E-03	1.33E-05	NA	NA
Manganese (water)	16000	2.00E-03	8.27E-05	9.60E-04	8.61E-02	1.18E-06	NA	NA
Nickel	22.0	4.00E-04	2.27E-08	8.00E-04	2.84E-05	3.25E-10	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	5300	5.89E-03	8.06E-05	1.00E-01	8.06E-04	1.15E-06	NA	NA
Unknown: Chemical Class: chlorinated VOC	8.00	3.71E-02	7.67E-07	NA	NA	1.10E-08	5.90E-03	6.47E-11

Total Hazard Index	0.092

Potential Cancer Risk	3.61E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 5-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	1.01E-01	4.59E-04	NA	NA	6.56E-06	NA	NA
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
1.4-Dioxane	0.00E+00	0.00E+00	3.60E+00	--	0.00E+00	7.70E-03	--
Semi-Volatile Organics (TICs)							
1,1'-Oxybis[2-ethoxy-]ethane	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Alcohols and Glycols							
Ethanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Methanol	0.00E+00	0.00E+00	4.00E+00	--	0.00E+00	NA	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Thallium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs							
Unknown: Chemical Class: glycol ether derivative	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	2.74E-05	1.25E-07	NA	NA	1.79E-09	2.00E-03	3.57E-12

Total Hazard Index	0.00

Potential Cancer Risk	3.57E-12

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 5-H: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Construction Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	1	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	1	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.50	1	5.87E-08	3.00E-04	1.96E-04	8.39E-10	1.50E+00	1.26E-09
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	3.80	1	1.49E-07	3.00E-03	4.96E-05	2.12E-09	5.00E-01	1.06E-09
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0.0	1	0.00E+00	NA	--	0.00E+00	5.90E-03	--

Total Hazard Index	0.00025

Potential Cancer Risk	2.32E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 5-I: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Construction Worker - Western Whitewater Lagoon (SWMU 4)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	0.0	5.89E-03	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	8.78E-04	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Alcohols and Glycols								
Ethanol	0.0	1.29E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Methanol	0.0	7.42E-04	0.00E+00	5.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	2.00E-03	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.50	2.00E-03	7.75E-09	3.00E-04	2.58E-05	1.11E-10	1.50E+00	1.66E-10
Barium	0.0	2.00E-03	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	2.00E-03	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	3.80	4.00E-03	3.93E-08	7.50E-05	5.24E-04	5.61E-10	2.00E+01	1.12E-08
Cobalt	0.0	8.00E-04	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	2.00E-03	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	2.00E-03	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	4.00E-04	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	0.0	3.71E-02	0.00E+00	NA	--	0.00E+00	5.90E-03	--

Total Hazard Index	0.00055

Potential Cancer Risk	1.14E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 5-J: Summary of Hazard Indices for the Construction Worker - Western Whitewater Lagoon (SWMU 4)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Volatile Organics								
Diethyl Ether	--	--	1.60E-03	6.24E-04	NA	--	--	0.0022
t-Butanol	--	--	7.44E-05	2.89E-05	--	--	--	0.0001
Semi-Volatile Organics								
1.4-Dioxane	--	--	4.31E-05	2.49E-06	--	--	--	0.000046
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	--	--	1.33E-04	5.17E-05	--	--	--	0.00018
Alcohols and Glycols								
Ethanol	--	--	3.80E-03	3.22E-04	--	--	--	0.0041
Methanol	--	--	1.49E-04	7.29E-06	--	--	--	0.00016
Inorganics								
Aluminum	--	--	1.92E-05	2.53E-06	--	--	--	0.000022
Arsenic	3.91E-03	3.52E-04	6.26E-04	8.27E-05	--	1.96E-04	2.58E-05	0.0052
Barium	--	--	3.13E-04	5.90E-04	--	--	--	0.0009
Cadmium (water)	--	--	1.10E-05	2.89E-05	--	--	--	0.00004
Chromium (evaluated as chromium VI)	3.22E-03	--	1.57E-04	1.65E-03	--	4.96E-05	5.24E-04	0.0056
Cobalt	--	--	1.03E-02	5.44E-04	--	--	--	0.011
Iron	--	--	1.01E-02	1.33E-03	--	--	--	0.011
Manganese (water)	--	--	2.61E-02	8.61E-02	--	--	--	0.11
Nickel	--	--	4.31E-05	2.84E-05	--	--	--	0.000071
Thallium	NA	NA	--	--	--	--	--	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	--	--	2.07E-03	8.06E-04	--	--	--	0.0029
Unknown: Chemical Class: chlorinated VOC	--	--	NA	NA	NA	--	--	NA
Pathway Summary	0.0071	0.00035	0.056	0.092	--	0.00025	0.00055	0.16

Total Blood HI =	0.011
Total Body Weight HI =	0.0022
Total Cardiovascular HI =	0.0052
Total Central Nervous System HI =	0.12
Total Fetal HI =	0.0009
Total GI Tract HI =	0.011
Total Kidney HI =	0.00094
Total Liver HI =	0.015
Total Not Specified HI =	0.011
Total Respiratory HI =	0.0056
Total Skin HI =	0.0052
Total Vascular HI =	0.0052
Total Whole Body HI =	0.000071

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 5-K: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Western Whitewater Lagoon (SWMU 4)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Volatile Organics								
Diethyl Ether	--	--	NA	NA	NA	--	--	NA
t-Butanol	--	--	NA	NA	--	--	--	NA
Semi-Volatile Organics								
1.4-Dioxane	--	--	1.85E-09	1.07E-10	--	--	--	1.95E-09
Semi-Volatile Organics (TICs)								
1,1'-Oxybis[2-ethoxy-]ethane	--	--	NA	NA	--	--	--	NA
Alcohols and Glycols								
Ethanol	--	--	NA	NA	--	--	--	NA
Methanol	--	--	NA	NA	--	--	--	NA
Inorganics								
Aluminum	--	--	NA	NA	--	--	--	NA
Arsenic	2.52E-08	2.26E-09	4.03E-09	5.31E-10	--	1.26E-09	1.66E-10	3.34E-08
Barium	--	--	NA	NA	--	--	--	NA
Cadmium (water)	--	--	NA	NA	--	--	--	NA
Chromium (evaluated as chromium VI)	6.91E-08	--	3.35E-09	3.54E-08	--	1.06E-09	1.12E-08	1.20E-07
Cobalt	--	--	NA	NA	--	--	--	NA
Iron	--	--	NA	NA	--	--	--	NA
Manganese (water)	--	--	NA	NA	--	--	--	NA
Nickel	--	--	NA	NA	--	--	--	NA
Thallium	NA	NA	--	--	--	--	--	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivati	--	--	NA	NA	--	--	--	NA
Unknown: Chemical Class: chlorinated VOC	--	--	2.64E-11	6.47E-11	3.57E-12	--	--	9.46E-11
Pathway Summary	9.42E-08	2.26E-09	9.25E-09	3.61E-08	3.57E-12	2.32E-09	1.14E-08	1.56E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 6-A: Intake Factors for the Outdoor Worker - Landfill Areas (SWMU 5):
Hercules Incorporated Facility - Hopewell, Virginia

Soil Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Soil				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Inhalation of Particulates or Volatiles from Soil				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	year
	ATc	Averaging Time (Cancer)	613200	hours
	ATn	Averaging Time (Non-cancer)	219000	hours

APPENDIX F

Table 6-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Soil (mg/kg)	EPC Air Part (mg/m^3)	VF (m^3/kg)	EPC Air VOC (Soil) (mg/m^3)	Oral AF (unitless)	Dermal AF (unitless)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfC - C (mg/m^3)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Semi-Volatile Organics (TICs)													
28-Norolean-17-en-3-one	1.50	1.1E-09			1	0.10	1	NA	NA	NA	3.00E+00	NA	3.00E+00
2,2-dimethoxy-propane	1.80		55520	3.24E-05	1	0.10	1	2.00E-04	2.00E-04	2.00E-04	8.00E-01	6.00E+00	8.00E-01
Inorganics													
Arsenic	15.5	1.14E-08			1	0.03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Chromium (evaluated as chromium VI)	25.9	1.91E-08			1		0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Thallium	0.46	3.41E-10			1		1	NA	NA	NA	NA	NA	NA

APPENDIX F
Table 6-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Outdoor Worker - Landfill Areas (SWMU 5)

Constituent	Soil EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
28-Norolean-17-en-3-one	1.50	1	1.32E-06	NA	NA	4.72E-07	3.00E+00	1.42E-06
2,2-dimethoxy-propane	1.80	1	1.59E-06	2.00E-04	7.93E-03	5.66E-07	8.00E-01	4.53E-07
Inorganics								
Arsenic	15.5	1	1.36E-05	3.00E-04	4.55E-02	4.87E-06	1.50E+00	7.31E-06
Chromium (evaluated as chromium VI)	25.9	1	2.28E-05	3.00E-03	7.61E-03	8.15E-06	5.00E-01	4.08E-06
Thallium	0.46	1	4.09E-07	NA	NA	1.46E-07	NA	NA

Total Hazard Index	**0.061**

Potential Cancer Risk	**1.33E-05**

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 6-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Outdoor Worker - Landfill Areas (SWMU 5)

Constituent	Soil EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
28-Norolean-17-en-3-one	1.50	0.1	8.72E-07	NA	NA	3.11E-07	3.00E+00	9.34E-07
2,2-dimethoxy-propane	1.80	0.1	1.05E-06	2.00E-04	5.23E-03	3.74E-07	8.00E-01	2.99E-07
Inorganics								
Arsenic	15.5	0.03	2.70E-06	3.00E-04	9.01E-03	9.65E-07	1.50E+00	1.45E-06
Chromium (evaluated as chromium VI)	25.9	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Thallium	0.46	0	0.00E+00	NA	NA	0.00E+00	NA	NA

Total Hazard Index	**0.014**

Potential Cancer Risk	**2.68E-06**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 6-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Particulates from Soil - Outdoor Worker - Landfill Areas (SWMU 5)

Constituent	EPC Air Part (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)							
28-Norolean-17-en-3-one	1.10E-09	2.27E-10	NA	NA	8.09E-11	NA	NA
2,2-dimethoxy-propane	0.00E+00	0.00E+00	2.00E-04	--	0.00E+00	6.00E+00	--
Inorganics							
Arsenic	1.14E-08	2.34E-09	1.50E-05	1.56E-04	8.36E-10	4.30E+00	3.60E-09
Chromium (evaluated as chromium VI)	1.91E-08	3.92E-09	1.00E-04	3.92E-05	1.40E-09	8.40E+01	1.17E-07
Thallium	3.41E-10	7.01E-11	NA	NA	2.50E-11	NA	NA

Total Hazard Index	0.0002

Potential Cancer Risk	1.21E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 6-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Soil - Outdoor Worker - Landfill Areas (SWMU 5)

Constituent	EPC Air VOC (Soil) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)							
28-Norolean-17-en-3-one	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
2,2-dimethoxy-propane	3.24E-05	6.66E-06	2.00E-04	3.33E-02	2.38E-06	6.00E+00	1.43E-05
Inorganics							
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Thallium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.033

Potential Cancer Risk	1.43E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 6-G: Summary of Hazard Indices for the Outdoor Worker - Landfill Areas (SWMU 5)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Inhalation of Volatiles from Soil	Total Hazard Index
Semi-Volatile Organics (TICs)					
28-Norolean-17-en-3-one	NA	NA	NA	--	NA
2,2-dimethoxy-propane	7.93E-03	5.23E-03	--	3.33E-02	0.046
Inorganics					
Arsenic	4.55E-02	9.01E-03	1.56E-04	--	0.055
Chromium (evaluated as chromium VI)	7.61E-03	--	3.92E-05	--	0.0076
Thallium	NA	NA	NA	--	NA
Pathway Summary	0.061	0.014	0.0002	0.033	0.11

Total Cardiovascular HI =	0.055
Total Central Nervous System HI =	0.055
Total Respiratory HI =	0.0076
Total Skin HI =	0.055
Total Testes HI =	0.046
Total Vascular HI =	0.055

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 6-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Outdoor Worker - Landfill Areas (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Inhalation of Volatiles from Soil	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)					
28-Norolean-17-en-3-one	1.42E-06	9.34E-07	NA	--	2.35E-06
2,2-dimethoxy-propane	4.53E-07	2.99E-07	--	1.43E-05	1.50E-05
Inorganics					
Arsenic	7.31E-06	1.45E-06	3.60E-09	--	8.76E-06
Chromium (evaluated as chromium VI)	4.08E-06	--	1.17E-07	--	4.19E-06
Thallium	NA	NA	NA	--	NA
Pathway Summary	1.33E-05	2.68E-06	1.21E-07	1.43E-05	3.03E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 7-A: Intake Factors for the Construction Worker - Landfill Areas (SWMU 5): Hercules Incorporated Facility - Hopewell, Virginia

Soil Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	330	mg/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Soil				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Particulates or Volatiles from Soil				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	ATc	Averaging Time (Cancer)	613200	hours
	ATn	Averaging Time (Non-cancer)	8760	hours

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Table 7-A: Intake Factors for the Construction Worker - Landfill Areas (SWMU 5): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Groundwater				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Groundwater				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Groundwater				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

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Table 7-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Soil (mg/kg)	EPC Air Part (mg/m^3)	VF (m^3/kg)	EPC Air VOC (Soil) (mg/m^3)	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics																
1,1-Dichloroethane					1.10	2.07E-06	1		1.85E-02	1	2.00E+00	NA	2.00E+00	5.70E-03	1.60E-03	5.70E-03
Diethyl Ether					200	2.45E-03	1		5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
t-Butanol					680		1		5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Semi-Volatile Organics																
1.4-Dioxane					24.0		1		8.78E-04	1	3.00E-02	3.60E+00	3.00E-02	1.00E-01	7.70E-03	1.00E-01
Semi-Volatile Organics (TICs)																
1,1,2-Trichloro-1-propene					7.40	3.86E-05	1		1.23E-01	1	1.00E-02	2.70E-01	1.00E-02	5.40E-01	5.90E-03	5.40E-01
1,2,3-Trichloro-1-propene					6.70	3.49E-05	1		1.23E-01	1	1.00E-02	2.70E-01	1.00E-02	5.40E-01	5.90E-03	5.40E-01
28-Norolean-17-en-3-one	1.50	1.103E-09					1	0.10		1	NA	NA	NA	3.00E+00	NA	3.00E+00
2,2-dimethoxy-propane	1.80		11104	1.62E-04			1	0.10		1	2.00E-03	2.00E-04	2.00E-03	8.00E-01	6.00E+00	8.00E-01
1,1'-Oxybis[2-ethoxy-]ethane					220		1		5.89E-03	1	1.00E-01	1.60E+00	1.00E-01	NA	NA	NA
Inorganics																
Aluminum					340		1		2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	15.5	1.14E-08			0.68		1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium					150		1		2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Chromium (evaluated as chromium VI)	25.9	1.906E-08			4.20		1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt					5.90		1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron					10000		1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)					3000		1		2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Nickel					7.70		1		4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Thallium	0.46	3.412E-10					1			1	NA	NA	NA	NA	NA	NA
Vanadium		0			3.20		1		2.00E-03	0.026	5.00E-03	NA	1.30E-04	NA	NA	NA

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Table 7-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Construction Worker - Landfill Areas (SWMU 5)

Constituent	Soil EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
1,1-Dichloroethane	0.0	1	0.00E+00	2.00E+00	--	0.00E+00	5.70E-03	--
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	1	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	0.0	1	0.00E+00	1.00E-02	--	0.00E+00	5.40E-01	--
1,2,3-Trichloro-1-propene	0.0	1	0.00E+00	1.00E-02	--	0.00E+00	5.40E-01	--
28-Norolean-17-en-3-one	1.50	1	3.87E-07	NA	NA	5.54E-09	3.00E+00	1.66E-08
2,2-dimethoxy-propane	1.80	1	4.65E-07	2.00E-03	2.32E-04	6.64E-09	8.00E-01	5.31E-09
1,1'-Oxybis[2-ethoxy-]ethane	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	15.5	1	4.00E-06	3.00E-04	1.33E-02	5.72E-08	1.50E+00	8.58E-08
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	25.9	1	6.70E-06	3.00E-03	2.23E-03	9.57E-08	5.00E-01	4.78E-08
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Thallium	0.46	1	1.20E-07	NA	NA	1.71E-09	NA	NA
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--

Total Hazard Index	0.016

Potential Cancer Risk	1.56E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 7-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Construction Worker - Landfill Areas (SWMU 5)

Constituent	Soil EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
1,1-Dichloroethane	0.0	0	0.00E+00	2.00E+00	--	0.00E+00	5.70E-03	--
Diethyl Ether	0.0	0	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	0	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	0.0	0	0.00E+00	1.00E-02	--	0.00E+00	5.40E-01	--
1,2,3-Trichloro-1-propene	0.0	0	0.00E+00	1.00E-02	--	0.00E+00	5.40E-01	--
28-Norolean-17-en-3-one	1.50	0.1	1.16E-07	NA	NA	1.66E-09	3.00E+00	4.98E-09
2,2-dimethoxy-propane	1.80	0.1	1.39E-07	2.00E-03	6.97E-05	1.99E-09	8.00E-01	1.59E-09
1,1'-Oxybis[2-ethoxy-]ethane	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	15.5	0.03	3.60E-07	3.00E-04	1.20E-03	5.15E-09	1.50E+00	7.72E-09
Barium	0.0	0	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	0	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	25.9	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	0	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Thallium	0.46	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Vanadium	0.0	0	0.00E+00	1.30E-04	--	0.00E+00	NA	--

Total Hazard Index	0.0013

Potential Cancer Risk	1.43E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 7-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Particulates from Soil - Construction Worker - Landfill Areas (SWMU 5)

Constituent	EPC Air Part (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
1,1-Dichloroethane	0.00E+00	0.00E+00	NA	--	0.00E+00	1.60E-03	--
Diethyl Ether	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
1.4-Dioxane	0.00E+00	0.00E+00	3.60E+00	--	0.00E+00	7.70E-03	--
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene	0.00E+00	0.00E+00	2.70E-01	--	0.00E+00	5.90E-03	--
1,2,3-Trichloro-1-propene	0.00E+00	0.00E+00	2.70E-01	--	0.00E+00	5.90E-03	--
28-Norolean-17-en-3-one	1.10E-09	2.01E-11	NA	NA	2.88E-13	NA	NA
2,2-dimethoxy-propane	0.00E+00	0.00E+00	2.00E-04	--	0.00E+00	6.00E+00	--
1,1'-Oxybis[2-ethoxy-]ethane	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	1.14E-08	2.08E-10	1.50E-05	1.39E-05	2.97E-12	4.30E+00	1.28E-11
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	1.91E-08	3.48E-10	1.00E-04	3.48E-06	4.97E-12	8.40E+01	4.18E-10
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Thallium	3.41E-10	6.23E-12	NA	NA	8.90E-14	NA	NA
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	**0.000017**

Potential Cancer Risk	**4.31E-10**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 7-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Soil - Construction Worker - Landfill Areas (SWMU 5)

Constituent	EPC Air VOC (Soil) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
1,1-Dichloroethane	0.00E+00	0.00E+00	NA	--	0.00E+00	1.60E-03	--
Diethyl Ether	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
1.4-Dioxane	0.00E+00	0.00E+00	3.60E+00	--	0.00E+00	7.70E-03	--
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene	0.00E+00	0.00E+00	2.70E-01	--	0.00E+00	5.90E-03	--
1,2,3-Trichloro-1-propene	0.00E+00	0.00E+00	2.70E-01	--	0.00E+00	5.90E-03	--
28-Norolean-17-en-3-one	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
2,2-dimethoxy-propane	1.62E-04	2.96E-06	2.00E-04	1.48E-02	4.23E-08	6.00E+00	2.54E-07
1,1'-Oxybis[2-ethoxy-]ethane	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Thallium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.015

Potential Cancer Risk	2.54E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 7-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Landfill Areas (SWMU 5)

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
1,1-Dichloroethane	1.10	1	4.31E-08	2.00E+00	2.15E-08	6.15E-10	5.70E-03	3.51E-12
Diethyl Ether	200	1	7.83E-06	2.00E-01	3.91E-05	1.12E-07	NA	NA
t-Butanol	680	1	2.66E-05	1.00E-01	2.66E-04	3.80E-07	NA	NA
Semi-Volatile Organics								
1.4-Dioxane	24.0	1	9.39E-07	3.00E-02	3.13E-05	1.34E-08	1.00E-01	1.34E-09
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	7.40	1	2.90E-07	1.00E-02	2.90E-05	4.14E-09	5.40E-01	2.23E-09
1,2,3-Trichloro-1-propene	6.70	1	2.62E-07	1.00E-02	2.62E-05	3.75E-09	5.40E-01	2.02E-09
28-Norolean-17-en-3-one	0.0	1	0.00E+00	NA	--	0.00E+00	3.00E+00	--
2,2-dimethoxy-propane	0.0	1	0.00E+00	2.00E-03	--	0.00E+00	8.00E-01	--
1,1'-Oxybis[2-ethoxy-]ethane	220	1	8.61E-06	1.00E-01	8.61E-05	1.23E-07	NA	NA
Inorganics								
Aluminum	340	1	1.33E-05	1.00E+00	1.33E-05	1.90E-07	NA	NA
Arsenic	0.68	1	2.66E-08	3.00E-04	8.87E-05	3.80E-10	1.50E+00	5.70E-10
Barium	150	1	5.87E-06	2.00E-01	2.94E-05	8.39E-08	NA	NA
Chromium (evaluated as chromium VI)	4.20	1	1.64E-07	3.00E-03	5.48E-05	2.35E-09	5.00E-01	1.17E-09
Cobalt	5.90	1	2.31E-07	3.00E-04	7.70E-04	3.30E-09	NA	NA
Iron	10000	1	3.91E-04	7.00E-01	5.59E-04	5.59E-06	NA	NA
Manganese (water)	3000	1	1.17E-04	2.40E-02	4.89E-03	1.68E-06	NA	NA
Nickel	7.70	1	3.01E-07	2.00E-02	1.51E-05	4.31E-09	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	3.20	1	1.25E-07	5.00E-03	2.50E-05	1.79E-09	NA	NA

Total Hazard Index	0.0069

Potential Cancer Risk	7.35E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 7-H: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Landfill Areas (SWMU 5)

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Volatile Organics								
1,1-Dichloroethane	1.10	1.85E-02	5.25E-08	2.00E+00	2.63E-08	7.51E-10	5.70E-03	4.28E-12
Diethyl Ether	200	5.89E-03	3.04E-06	2.00E-01	1.52E-05	4.35E-08	NA	NA
t-Butanol	680	5.89E-03	1.03E-05	1.00E-01	1.03E-04	1.48E-07	NA	NA
Semi-Volatile Organics								
1.4-Dioxane	24.0	8.78E-04	5.44E-08	3.00E-02	1.81E-06	7.77E-10	1.00E-01	7.77E-11
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	7.40	1.23E-01	2.35E-06	1.00E-02	2.35E-04	3.36E-08	5.40E-01	1.81E-08
1,2,3-Trichloro-1-propene	6.70	1.23E-01	2.13E-06	1.00E-02	2.13E-04	3.04E-08	5.40E-01	1.64E-08
28-Norolean-17-en-3-one	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	3.00E+00	--
2,2-dimethoxy-propane	0.0	0.00E+00	0.00E+00	2.00E-03	--	0.00E+00	8.00E-01	--
1,1'-Oxybis[2-ethoxy-]ethane	220	5.89E-03	3.35E-06	1.00E-01	3.35E-05	4.78E-08	NA	NA
Inorganics								
Aluminum	340	2.00E-03	1.76E-06	1.00E+00	1.76E-06	2.51E-08	NA	NA
Arsenic	0.68	2.00E-03	3.51E-09	3.00E-04	1.17E-05	5.02E-11	1.50E+00	7.53E-11
Barium	150	2.00E-03	7.75E-07	1.40E-02	5.54E-05	1.11E-08	NA	NA
Chromium (evaluated as chromium VI)	4.20	4.00E-03	4.34E-08	7.50E-05	5.79E-04	6.20E-10	2.00E+01	1.24E-08
Cobalt	5.90	8.00E-04	1.22E-08	3.00E-04	4.06E-05	1.74E-10	NA	NA
Iron	10000	2.00E-03	5.17E-05	7.00E-01	7.38E-05	7.38E-07	NA	NA
Manganese (water)	3000	2.00E-03	1.55E-05	9.60E-04	1.61E-02	2.21E-07	NA	NA
Nickel	7.70	4.00E-04	7.96E-09	8.00E-04	9.95E-06	1.14E-10	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	3.20	2.00E-03	1.65E-08	1.30E-04	1.27E-04	2.36E-10	NA	NA

Total Hazard Index	**0.018**

Potential Cancer Risk	**4.71E-08**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 7-I: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Landfill Areas (SWMU 5)

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
1,1-Dichloroethane	2.07E-06	9.47E-09	NA	NA	1.35E-10	1.60E-03	2.16E-13
Diethyl Ether	2.45E-03	1.12E-05	NA	NA	1.60E-07	NA	NA
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
1.4-Dioxane	0.00E+00	0.00E+00	3.60E+00	--	0.00E+00	7.70E-03	--
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene	3.86E-05	1.76E-07	2.70E-01	6.53E-07	2.52E-09	5.90E-03	1.49E-11
1,2,3-Trichloro-1-propene	3.49E-05	1.60E-07	2.70E-01	5.91E-07	2.28E-09	5.90E-03	1.35E-11
28-Norolean-17-en-3-one	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
2,2-dimethoxy-propane	0.00E+00	0.00E+00	2.00E-04	--	0.00E+00	6.00E+00	--
1,1'-Oxybis[2-ethoxy-]ethane	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Thallium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.0000012

Potential Cancer Risk	2.85E-11

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 7-J: Summary of Hazard Indices for the Construction Worker - Landfill Areas (SWMU 5)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Inhalation of Volatiles from Soil	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Total Hazard Index
Volatile Organics								
1,1-Dichloroethane	--	--	--	--	2.15E-08	2.63E-08	NA	0.000000048
Diethyl Ether	--	--	--	--	3.91E-05	1.52E-05	NA	0.000054
t-Butanol	--	--	--	--	2.66E-04	1.03E-04	--	0.00037
Semi-Volatile Organics								
1.4-Dioxane	--	--	--	--	3.13E-05	1.81E-06	--	0.000033
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	--	--	--	--	2.90E-05	2.35E-04	6.53E-07	0.00026
1,2,3-Trichloro-1-propene	--	--	--	--	2.62E-05	2.13E-04	5.91E-07	0.00024
28-Norolean-17-en-3-one	NA	NA	NA	--	--	--	--	NA
2,2-dimethoxy-propane	2.32E-04	6.97E-05	--	1.48E-02	--	--	--	0.015
1,1'-Oxybis[2-ethoxy-]ethane	--	--	--	--	8.61E-05	3.35E-05	--	0.00012
Inorganics								
Aluminum	--	--	--	--	1.33E-05	1.76E-06	--	0.000015
Arsenic	1.33E-02	1.20E-03	1.39E-05	--	8.87E-05	1.17E-05	--	0.015
Barium	--	--	--	--	2.94E-05	5.54E-05	--	0.000085
Chromium (evaluated as chromium VI)	2.23E-03	--	3.48E-06	--	5.48E-05	5.79E-04	--	0.0029
Cobalt	--	--	--	--	7.70E-04	4.06E-05	--	0.00081
Iron	--	--	--	--	5.59E-04	7.38E-05	--	0.00063
Manganese (water)	--	--	--	--	4.89E-03	1.61E-02	--	0.021
Nickel	--	--	--	--	1.51E-05	9.95E-06	--	0.000025
Thallium	NA	NA	NA	--	--	--	--	NA
Vanadium	--	--	--	--	2.50E-05	1.27E-04	--	0.00015
Pathway Summary	0.016	0.0013	0.000017	0.015	0.0069	0.018	0.0000012	0.056

Total Blood HI =	0.00063
Total Body Weight HI =	0.000054
Total Cardiovascular HI =	0.015
Total Central Nervous System HI =	0.037
Total Fetal HI =	0.000085
Total GI Tract HI =	0.00063
Total Kidney HI =	0.00024
Total Liver HI =	0.0013
Total Not Specified HI =	0.00081
Total Respiratory HI =	0.0029
Total Skin HI =	0.015
Total Testes HI =	0.015
Total Vascular HI =	0.015
Total Whole Body HI =	0.000025

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 7-K: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Landfill Areas (SWMU 5)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Inhalation of Volatiles from Soil	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Theoretical Excess Lifetime Cancer Risk
Volatile Organics								
1,1-Dichloroethane	--	--	--	--	3.51E-12	4.28E-12	2.16E-13	8.00E-12
Diethyl Ether	--	--	--	--	NA	NA	NA	NA
t-Butanol	--	--	--	--	NA	NA	--	NA
Semi-Volatile Organics								
1.4-Dioxane	--	--	--	--	1.34E-09	7.77E-11	--	1.42E-09
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	--	--	--	--	2.23E-09	1.81E-08	1.49E-11	2.04E-08
1,2,3-Trichloro-1-propene	--	--	--	--	2.02E-09	1.64E-08	1.35E-11	1.85E-08
28-Norolean-17-en-3-one	1.66E-08	4.98E-09	NA	--	--	--	--	2.16E-08
2,2-dimethoxy-propane	5.31E-09	1.59E-09	--	2.54E-07	--	--	--	2.61E-07
1,1'-Oxybis[2-ethoxy-]ethane	--	--	--	--	NA	NA	--	NA
Inorganics								
Aluminum	--	--	--	--	NA	NA	--	NA
Arsenic	8.58E-08	7.72E-09	1.28E-11	--	5.70E-10	7.53E-11	--	9.42E-08
Barium	--	--	--	--	NA	NA	--	NA
Chromium (evaluated as chromium VI)	4.78E-08	--	4.18E-10	--	1.17E-09	1.24E-08	--	6.18E-08
Cobalt	--	--	--	--	NA	NA	--	NA
Iron	--	--	--	--	NA	NA	--	NA
Manganese (water)	--	--	--	--	NA	NA	--	NA
Nickel	--	--	--	--	NA	NA	--	NA
Thallium	NA	NA	NA	--	--	--	--	NA
Vanadium	--	--	--	--	NA	NA	--	NA
Pathway Summary	1.56E-07	1.43E-08	4.31E-10	2.54E-07	7.35E-09	4.71E-08	2.85E-11	4.79E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 8-A: Intake Factors for the Indoor Worker - Landfill Areas (SWMU 5):
Hercules Incorporated Facility - Hopewell, Virginia

Inhalation of Volatiles				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	250	days/yr
	ED	Exposure Duration	25	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	219000	hours

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Table 8-B: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles in Indoor Air- Indoor Worker - Landfill Areas (SWMU 5)

Constituent	EPC Air (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl ether	9.40E-04	2.15E-04	NA	NA	7.66E-05	NA	NA
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene	1.63E-05	3.72E-06	2.70E-01	0.000014	1.33E-06	5.90E-03	7.84E-09
1,2,3-Trichloro-1-propene	1.48E-05	3.37E-06	2.70E-01	0.000012	1.20E-06	5.90E-03	7.10E-09

Total Hazard Index	**0.000026**

Potential Cancer Risk	**1.49E-08**

Total Central Nervous System HI =	0.000026
Total Liver HI =	0.000026

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 9-A: Intake Factors for the Outdoor Worker - Natrosol Lagoon (SWMU 7):
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

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Table 9-A: Intake Factors for the Outdoor Worker - Natrosol Lagoon (SWMU 7):
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	900	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

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Table 9-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Inorganics										
Arsenic	4.80	1.40	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as chromium VI)	35.3	1.70	1		4.00E-03	0.025	3.00E-03	7.50E-05	5.00E-01	2.00E+01
Thallium	0.28		1			1	NA	NA	NA	NA

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Table 9-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Outdoor Worker - Natrosol Lagoon (SWMU 7)

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.80	1	4.23E-06	3.00E-04	1.41E-02	1.51E-06	1.50E+00	2.27E-06
Chromium (evaluated as chromium VI)	35.3	1	3.11E-05	3.00E-03	1.04E-02	1.11E-05	5.00E-01	5.55E-06
Thallium	0.28	1	2.49E-07	NA	NA	8.90E-08	NA	NA

Total Hazard Index	0.024

Potential Cancer Risk	7.82E-06

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 9-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Outdoor Worker - Natrosol Lagoon (SWMU 7)

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.80	0.03	8.38E-07	3.00E-04	2.79E-03	2.99E-07	1.50E+00	4.49E-07
Chromium (evaluated as chromium VI)	35.3	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Thallium	0.28	0	0.00E+00	NA	NA	0.00E+00	NA	NA

Total Hazard Index	0.0028

Potential Cancer Risk	4.49E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 9-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Outdoor Worker - Natrosol Lagoon (SWMU 7)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	1.40	1	5.48E-08	3.00E-04	1.83E-04	1.96E-08	1.50E+00	2.94E-08
Chromium (evaluated as chromium VI)	1.70	1	6.65E-08	3.00E-03	2.22E-05	2.38E-08	5.00E-01	1.19E-08
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.0002

Potential Cancer Risk	4.12E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 9-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Outdoor Worker - Natrosol Lagoon (SWMU 7)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Inorganics								
Arsenic	1.4	2.00E-03	1.97E-09	3.00E-04	6.58E-06	7.05E-10	1.50E+00	1.06E-09
Chromium (evaluated as chromium VI)	1.7	4.00E-03	4.79E-09	7.50E-05	6.39E-05	1.71E-09	2.00E+01	3.42E-08
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.00007

Potential Cancer Risk	3.53E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 9-G: Summary of Hazard Indices for the Outdoor Worker - Natrosol Lagoon (SWMU 7)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Inorganics					
Arsenic	1.41E-02	2.79E-03	1.83E-04	6.58E-06	0.017
Chromium (evaluated as chromium VI)	1.04E-02	--	2.22E-05	6.39E-05	0.010
Thallium	NA	NA	--	--	NA
Pathway Summary	0.024	0.0028	0.0002	0.00007	0.028

Total Cardiovascular HI =	0.017
Total Central Nervous System HI =	0.017
Total Respiratory HI =	0.010
Total Skin HI =	0.017
Total Vascular HI =	0.017

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 9-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Outdoor Worker - Natrosol Lagoon (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Inorganics					
Arsenic	2.27E-06	4.49E-07	2.94E-08	1.06E-09	2.75E-06
Chromium (evaluated as chromium VI)	5.55E-06	--	1.19E-08	3.42E-08	5.60E-06
Thallium	NA	NA	--	--	NA
Pathway Summary	7.82E-06	4.49E-07	4.12E-08	3.53E-08	8.34E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 10-A: Intake Factors for the Construction Worker - Natrosol Lagoon (SWMU 7): Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	330	mg/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days

APPENDIX F

Table 10-A: Intake Factors for the Construction Worker - Natrosol Lagoon (SWMU 7): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Water				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

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Table 10-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics														
Diethyl Ether		0.50	6.13E-06		1		5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
t-Butanol		92000			1		5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Trichloroethene		8.40	2.87E-05		1		3.71E-02	1	NA	NA	NA	5.90E-03	2.00E-03	5.90E-03
Semi-Volatile Organics														
1.4-Dioxane		13.0			1		8.78E-04	1	3.00E-02	3.60E+00	3.00E-02	1.00E-01	7.70E-03	1.00E-01
Inorganics														
Aluminum		3200			1		2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	4.80	7.00		1.40	1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium		125			1		2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Cadmium (water)		0.29			1		2.00E-03	0.05	5.00E-04	1.00E-05	2.50E-05	NA	1.80E+00	NA
Chromium (evaluated as chromium VI)	35.3	19.0		1.70	1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt		27.0			1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron		9600			1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)		2750			1		2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Nickel		34.5			1		4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Thallium	0.28				1			1	NA	NA	NA	NA	NA	NA
Vanadium		14.0			1		2.00E-03	0.026	5.00E-03	NA	1.30E-04	NA	NA	NA
Unknown TICs														
Unknown: Chemical Class: alcohol		1600			1		5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA

APPENDIX F
Table 10-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Construction Worker - Natrosol Lagoon (SWMU 7)

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Trichloroethene	0.0	1	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	1	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	4.80	1	1.24E-06	3.00E-04	4.14E-03	1.77E-08	1.50E+00	2.66E-08
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	35.3	1	9.12E-06	3.00E-03	3.04E-03	1.30E-07	5.00E-01	6.52E-08
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Thallium	0.28	1	7.31E-08	NA	NA	1.04E-09	NA	NA
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: alcohol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--

Total Hazard Index	0.0072

Potential Cancer Risk	9.17E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 10-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Construction Worker - Natrosol Lagoon (SWMU 7)

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	0	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Trichloroethene	0.0	0	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	0	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	4.80	0.03	1.12E-07	3.00E-04	3.72E-04	1.60E-09	1.50E+00	2.39E-09
Barium	0.0	0	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	0	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	35.3	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	0	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Thallium	0.28	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Vanadium	0.0	0	0.00E+00	1.30E-04	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: alcohol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--

Total Hazard Index	0.00037

Potential Cancer Risk	2.39E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 10-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Natrosol Lagoon (SWMU 7)

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg-d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.50	1	1.94E-08	2.00E-01	9.69E-08	2.77E-10	NA	NA
t-Butanol	92000	1	3.60E-03	1.00E-01	3.60E-02	5.14E-05	NA	NA
Trichloroethene	8.40	1	3.29E-07	NA	NA	4.70E-09	5.90E-03	2.77E-11
Semi-Volatile Organics								
1.4-Dioxane	13.0	1	5.09E-07	3.00E-02	1.70E-05	7.27E-09	1.00E-01	7.27E-10
Inorganics								
Aluminum	3200	1	1.25E-04	1.00E+00	1.25E-04	1.79E-06	NA	NA
Arsenic	7.00	1	2.74E-07	3.00E-04	9.13E-04	3.91E-09	1.50E+00	5.87E-09
Barium	125	1	4.89E-06	2.00E-01	2.45E-05	6.99E-08	NA	NA
Cadmium (water)	0.29	1	1.14E-08	5.00E-04	2.27E-05	1.62E-10	NA	NA
Chromium (evaluated as chromium VI)	19.0	1	7.44E-07	3.00E-03	2.48E-04	1.06E-08	5.00E-01	5.31E-09
Cobalt	27.0	1	1.06E-06	3.00E-04	3.52E-03	1.51E-08	NA	NA
Iron	9600	1	3.76E-04	7.00E-01	5.37E-04	5.37E-06	NA	NA
Manganese (water)	2750	1	1.08E-04	2.40E-02	4.48E-03	1.54E-06	NA	NA
Nickel	34.5	1	1.35E-06	2.00E-02	6.75E-05	1.93E-08	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	14.0	1	5.48E-07	5.00E-03	1.10E-04	7.83E-09	NA	NA
Unknown TICs								
Unknown: Chemical Class: alcohol	1600	1	6.26E-05	1.00E-01	6.26E-04	8.95E-07	NA	NA

Total Hazard Index	**0.047**

Potential Cancer Risk	**1.19E-08**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 10-F Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Natrosol Lagoon (SWMU 7)

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	0.50	5.89E-03	7.53E-09	2.00E-01	3.76E-08	1.08E-10	NA	NA
t-Butanol	92000	5.89E-03	1.40E-03	1.00E-01	1.40E-02	2.00E-05	NA	NA
Trichloroethene	8.40	3.71E-02	8.05E-07	NA	NA	1.15E-08	5.90E-03	6.79E-11
Semi-Volatile Organics								
1.4-Dioxane	13.0	8.78E-04	2.95E-08	3.00E-02	9.83E-07	4.21E-10	1.00E-01	4.21E-11
Inorganics								
Aluminum	3200	2.00E-03	1.65E-05	1.00E+00	1.65E-05	2.36E-07	NA	NA
Arsenic	7.00	2.00E-03	3.62E-08	3.00E-04	1.21E-04	5.17E-10	1.50E+00	7.75E-10
Barium	125	2.00E-03	6.46E-07	1.40E-02	4.61E-05	9.23E-09	NA	NA
Cadmium (water)	0.29	2.00E-03	1.50E-09	2.50E-05	5.99E-05	2.14E-11	NA	NA
Chromium (evaluated as chromium VI)	19.0	4.00E-03	1.96E-07	7.50E-05	2.62E-03	2.80E-09	2.00E+01	5.61E-08
Cobalt	27.0	8.00E-04	5.58E-08	3.00E-04	1.86E-04	7.97E-10	NA	NA
Iron	9600	2.00E-03	4.96E-05	7.00E-01	7.09E-05	7.09E-07	NA	NA
Manganese (water)	2750	2.00E-03	1.42E-05	9.60E-04	1.48E-02	2.03E-07	NA	NA
Nickel	34.5	4.00E-04	3.56E-08	8.00E-04	4.46E-05	5.09E-10	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	14.0	2.00E-03	7.23E-08	1.30E-04	5.56E-04	1.03E-09	NA	NA
Unknown TICs								
Unknown: Chemical Class: alcohol	1600	5.89E-03	2.43E-05	1.00E-01	2.43E-04	3.48E-07	NA	NA

Total Hazard Index	0.033

Potential Cancer Risk	5.70E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 10-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Natrosol Lagoon (SWMU 7)

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	6.13E-06	2.80E-08	NA	NA	4.00E-10	NA	NA
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Trichloroethene	2.87E-05	1.31E-07	NA	NA	1.87E-09	2.00E-03	3.75E-12
Semi-Volatile Organics							
1.4-Dioxane	0.00E+00	0.00E+00	3.60E+00	--	0.00E+00	7.70E-03	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Thallium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs							
Unknown: Chemical Class: alcohol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.00

Potential Cancer Risk	3.75E-12

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 10-H: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Construction Worker - Natrosol Lagoon (SWMU 7)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Trichloroethene	0.0	1	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	1	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.40	1	5.48E-08	3.00E-04	1.83E-04	7.83E-10	1.50E+00	1.17E-09
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	1.70	1	6.65E-08	3.00E-03	2.22E-05	9.51E-10	5.00E-01	4.75E-10
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: alcohol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--

Total Hazard Index	0.0002

Potential Cancer Risk	1.65E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 10-I: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Construction Worker - Natrosol Lagoon (SWMU 7)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	0.0	5.89E-03	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Trichloroethene	0.0	3.71E-02	0.00E+00	NA	--	0.00E+00	5.90E-03	--
Semi-Volatile Organics								
1.4-Dioxane	0.0	8.78E-04	0.00E+00	3.00E-02	--	0.00E+00	1.00E-01	--
Inorganics								
Aluminum	0.0	2.00E-03	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.40	2.00E-03	7.23E-09	3.00E-04	2.41E-05	1.03E-10	1.50E+00	1.55E-10
Barium	0.0	2.00E-03	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	2.00E-03	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	1.70	4.00E-03	1.76E-08	7.50E-05	2.34E-04	2.51E-10	2.00E+01	5.02E-09
Cobalt	0.0	8.00E-04	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	2.00E-03	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	2.00E-03	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	4.00E-04	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	0.0	2.00E-03	0.00E+00	1.30E-04	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: alcohol	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--

Total Hazard Index	**0.00026**

Potential Cancer Risk	**5.17E-09**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 10-J: Summary of Hazard Indices for the Construction Worker - Natrosol Lagoon (SWMU 7)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Volatile Organics								
Diethyl Ether	--	--	9.69E-08	3.76E-08	NA	--	--	0.00000013
t-Butanol	--	--	3.60E-02	1.40E-02	--	--	--	0.050
Trichloroethene	--	--	NA	NA	NA	--	--	NA
Semi-Volatile Organics								
1.4-Dioxane	--	--	1.70E-05	9.83E-07	--	--	--	0.000018
Inorganics								
Aluminum	--	--	1.25E-04	1.65E-05	--	--	--	0.00014
Arsenic	4.14E-03	3.72E-04	9.13E-04	1.21E-04	--	1.83E-04	2.41E-05	0.0057
Barium	--	--	2.45E-05	4.61E-05	--	--	--	0.000071
Cadmium (water)	--	--	2.27E-05	5.99E-05	--	--	--	0.000083
Chromium (evaluated as chromium VI)	3.04E-03	--	2.48E-04	2.62E-03	--	2.22E-05	2.34E-04	0.0062
Cobalt	--	--	3.52E-03	1.86E-04	--	--	--	0.0037
Iron	--	--	5.37E-04	7.09E-05	--	--	--	0.00061
Manganese (water)	--	--	4.48E-03	1.48E-02	--	--	--	0.019
Nickel	--	--	6.75E-05	4.46E-05	--	--	--	0.00011
Thallium	NA	NA	--	--	--	--	--	NA
Vanadium	--	--	1.10E-04	5.56E-04	--	--	--	0.00067
Unknown TICs								
Unknown: Chemical Class: alcohol	--	--	6.26E-04	2.43E-04	--	--	--	0.00087
Pathway Summary	0.0072	0.00037	0.047	0.033	--	0.0002	0.00026	0.087

Total Blood HI =	0.00061
Total Body Weight HI =	0.00000013
Total Cardiovascular HI =	0.0057
Total Central Nervous System HI =	0.076
Total Fetal HI =	0.000071
Total GI Tract HI =	0.00061
Total Kidney HI =	0.00082
Total Liver HI =	0.00063
Total Not Specified HI =	0.0037
Total Respiratory HI =	0.0062
Total Skin HI =	0.0057
Total Vascular HI =	0.0057
Total Whole Body HI =	0.00011

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 10-M: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Natrosol Lagoon (SWMU 7)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Volatile Organics								
Diethyl Ether	--	--	NA	NA	NA	--	--	NA
t-Butanol	--	--	NA	NA	--	--	--	NA
Trichloroethene	--	--	2.77E-11	6.79E-11	3.75E-12	--	--	9.93E-11
Semi-Volatile Organics								
1.4-Dioxane	--	--	7.27E-10	4.21E-11	--	--	--	7.69E-10
Inorganics								
Aluminum	--	--	NA	NA	--	--	--	NA
Arsenic	2.66E-08	2.39E-09	5.87E-09	7.75E-10	--	1.17E-09	1.55E-10	3.70E-08
Barium	--	--	NA	NA	--	--	--	NA
Cadmium (water)	--	--	NA	NA	--	--	--	NA
Chromium (evaluated as chromium VI)	6.52E-08	--	5.31E-09	5.61E-08	--	4.75E-10	5.02E-09	1.32E-07
Cobalt	--	--	NA	NA	--	--	--	NA
Iron	--	--	NA	NA	--	--	--	NA
Manganese (water)	--	--	NA	NA	--	--	--	NA
Nickel	--	--	NA	NA	--	--	--	NA
Thallium	NA	NA	--	--	--	--	--	NA
Vanadium	--	--	NA	NA	--	--	--	NA
Unknown TICs								
Unknown: Chemical Class: alcohol	--	--	NA	NA	--	--	--	NA
Pathway Summary	9.17E-08	2.39E-09	1.19E-08	5.70E-08	3.75E-12	1.65E-09	5.17E-09	1.70E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 11-A: Intake Factors for the Indoor Worker - Natrosol Lagoon (SWMU 7):
Hercules Incorporated Facility - Hopewell, Virginia

Inhalation of Volatiles				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	250	days/yr
	ED	Exposure Duration	25	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	219000	hours

APPENDIX F
Table 11-B: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles in Indoor Air- Indoor Worker - Natrosol Lagoon (SWMU 7)

Constituent	EPC Air (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl ether	1.07E-06	2.45E-07	NA	NA	8.76E-08	NA	NA
Trichloroethene	6.08E-06	1.39E-06	NA	NA	4.96E-07	2.00E-03	9.92E-10
Unknown TICs							
Unknown; Chemical Class: alkene	7.97E-03	1.82E-03	7.00E-01	0.0026	6.50E-04	NA	NA
Unknown; 2-methyl-1-propene	6.29E-03	1.44E-03	7.00E-01	0.0021	5.13E-04	NA	NA

Total Hazard Index	0.0047

Potential Cancer Risk	9.92E-10

Total Central Nervous System HI =	0.0047
Total Nasal Epithelium HI =	0.0047
Total Testes HI =	0.0047

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 12-A: Intake Factors for the Construction Worker - Reten/Aqualon Basin (SWMUS 8 and 29): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Groundwater				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Water				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

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Table 12-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	Oral AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics											
Diethyl Ether	11.0	1.35E-04	1	5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
t-Butanol	560		1	5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Alcohols and Glycols											
Methanol	1100		1	7.42E-04	1	5.00E-01	4.00E+00	5.00E-01	NA	NA	NA
Inorganics											
Aluminum	24000		1	2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	9.30		1	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium	200		1	2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Cadmium (water)	0.47		1	2.00E-03	0.05	5.00E-04	1.00E-05	2.50E-05	NA	1.80E+00	NA
Chromium (evaluated as chromium VI)	79.0		1	4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt	150		1	8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron	150000		1	2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)	12000		1	2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Mercury	0.52	4.63E-07	1	2.00E-03	1	1.60E-04	3.00E-04	1.60E-04	NA	NA	NA
Nickel	100		1	4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Vanadium	95.0		1	2.00E-03	0.026	5.00E-03	NA	1.30E-04	NA	NA	NA

APPENDIX F
Table 12-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Reten/Aqualon Basin (SWMUS 8 and 29)

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	11.0	1	4.31E-07	2.00E-01	2.15E-06	6.15E-09	NA	NA
t-Butanol	560	1	2.19E-05	1.00E-01	2.19E-04	3.13E-07	NA	NA
Alcohols and Glycols								
Methanol	1100	1	4.31E-05	5.00E-01	8.61E-05	6.15E-07	NA	NA
Inorganics								
Aluminum	24000	1	9.39E-04	1.00E+00	9.39E-04	1.34E-05	NA	NA
Arsenic	9.30	1	3.64E-07	3.00E-04	1.21E-03	5.20E-09	1.50E+00	7.80E-09
Barium	200	1	7.83E-06	2.00E-01	3.91E-05	1.12E-07	NA	NA
Cadmium (water)	0.47	1	1.84E-08	5.00E-04	3.68E-05	2.63E-10	NA	NA
Chromium (evaluated as chromium VI)	79.0	1	3.09E-06	3.00E-03	1.03E-03	4.42E-08	5.00E-01	2.21E-08
Cobalt	150	1	5.87E-06	3.00E-04	1.96E-02	8.39E-08	NA	NA
Iron	150000	1	5.87E-03	7.00E-01	8.39E-03	8.39E-05	NA	NA
Manganese (water)	12000	1	4.70E-04	2.40E-02	1.96E-02	6.71E-06	NA	NA
Mercury	0.52	1	2.04E-08	1.60E-04	1.27E-04	2.91E-10	NA	NA
Nickel	100	1	3.91E-06	2.00E-02	1.96E-04	5.59E-08	NA	NA
Vanadium	95.0	1	3.72E-06	5.00E-03	7.44E-04	5.31E-08	NA	NA

Total Hazard Index	**0.052**

Potential Cancer Risk	**2.99E-08**

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 12-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Reten/Aqualon Basin (SWMUS 8 and 29)

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	11.0	5.89E-03	1.67E-07	2.00E-01	8.37E-07	2.39E-09	NA	NA
t-Butanol	560	5.89E-03	8.52E-06	1.00E-01	8.52E-05	1.22E-07	NA	NA
Alcohols and Glycols								
Methanol	1100	7.42E-04	2.11E-06	5.00E-01	4.22E-06	3.01E-08	NA	NA
Inorganics								
Aluminum	24000	2.00E-03	1.24E-04	1.00E+00	1.24E-04	1.77E-06	NA	NA
Arsenic	9.30	2.00E-03	4.80E-08	3.00E-04	1.60E-04	6.86E-10	1.50E+00	1.03E-09
Barium	200	2.00E-03	1.03E-06	1.40E-02	7.38E-05	1.48E-08	NA	NA
Cadmium (water)	0.47	2.00E-03	2.43E-09	2.50E-05	9.71E-05	3.47E-11	NA	NA
Chromium (evaluated as chromium VI)	79.0	4.00E-03	8.16E-07	7.50E-05	1.09E-02	1.17E-08	2.00E+01	2.33E-07
Cobalt	150	8.00E-04	3.10E-07	3.00E-04	1.03E-03	4.43E-09	NA	NA
Iron	150000	2.00E-03	7.75E-04	7.00E-01	1.11E-03	1.11E-05	NA	NA
Manganese (water)	12000	2.00E-03	6.20E-05	9.60E-04	6.46E-02	8.86E-07	NA	NA
Mercury	0.52	2.00E-03	2.69E-09	1.60E-04	1.68E-05	3.84E-11	NA	NA
Nickel	100	4.00E-04	1.03E-07	8.00E-04	1.29E-04	1.48E-09	NA	NA
Vanadium	95.0	2.00E-03	4.91E-07	1.30E-04	3.78E-03	7.01E-09	NA	NA

Total Hazard Index	0.082

Potential Cancer Risk	2.34E-07

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 12-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Reten/Aqualon Basin (SWMUS 8 and 29)

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	1.35E-04	6.16E-07	NA	NA	8.80E-09	NA	NA
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Alcohols and Glycols							
Methanol	0.00E+00	0.00E+00	4.00E+00	--	0.00E+00	NA	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Mercury	4.63E-07	2.12E-09	3.00E-04	7.05E-06	3.02E-11	NA	NA
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.0000071

Potential Cancer Risk	0.00E+00

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 12-F: Summary of Hazard Indices for the Construction Worker - Reten/Aqualon Basin (SWMUS 8 and 29)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Total Hazard Index
Volatile Organics				
Diethyl Ether	2.15E-06	8.37E-07	NA	0.000003
t-Butanol	2.19E-04	8.52E-05	--	0.0003
Alcohols and Glycols				
Methanol	8.61E-05	4.22E-06	--	0.00009
Inorganics				
Aluminum	9.39E-04	1.24E-04	--	0.0011
Arsenic	1.21E-03	1.60E-04	--	0.0014
Barium	3.91E-05	7.38E-05	--	0.00011
Cadmium (water)	3.68E-05	9.71E-05	--	0.00013
Chromium (evaluated as chromium VI)	1.03E-03	1.09E-02	--	0.012
Cobalt	1.96E-02	1.03E-03	--	0.021
Iron	8.39E-03	1.11E-03	--	0.0095
Manganese (water)	1.96E-02	6.46E-02	--	0.084
Mercury	1.27E-04	1.68E-05	7.05E-06	0.00015
Nickel	1.96E-04	1.29E-04	--	0.00032
Vanadium	7.44E-04	3.78E-03	--	0.0045
Pathway Summary	0.052	0.082	0.0000071	0.13

Total Blood HI =	0.0095
Total Body Weight HI =	0.000003
Total Cardiovascular HI =	0.0014
Total Central Nervous System HI =	0.087
Total Fetal HI =	0.00011
Total GI Tract HI =	0.0095
Total Kidney HI =	0.0048
Total Liver HI =	0.010
Total Not Specified HI =	0.021
Total Respiratory HI =	0.012
Total Skin HI =	0.0014
Total Vascular HI =	0.0014
Total Whole Body HI =	0.00032

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 12-G: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Reten/Aqualon Basin (SWMUS 8 and 29)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Theoretical Excess Lifetime Cancer Risk
Volatile Organics				
Diethyl Ether	NA	NA	NA	NA
t-Butanol	NA	NA	--	NA
Alcohols and Glycols				
Methanol	NA	NA	--	NA
Inorganics				
Aluminum	NA	NA	--	NA
Arsenic	7.80E-09	1.03E-09	--	8.83E-09
Barium	NA	NA	--	NA
Cadmium (water)	NA	NA	--	NA
Chromium (evaluated as chromium VI)	2.21E-08	2.33E-07	--	2.55E-07
Cobalt	NA	NA	--	NA
Iron	NA	NA	--	NA
Manganese (water)	NA	NA	--	NA
Mercury	NA	NA	NA	NA
Nickel	NA	NA	--	NA
Vanadium	NA	NA	--	NA
Pathway Summary	2.99E-08	2.34E-07	--	2.64E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 13-A: Intake Factors for the Indoor Worker - Reten/Aqualon Basin (SWMUS 8 and 29): Hercules Incorporated Facility - Hopewell, Virginia

Inhalation of Volatiles				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	250	days/yr
	ED	Exposure Duration	25	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	219000	hours

APPENDIX F
Table 13-B: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles in Indoor Air- Indoor Worker - Reten/Aqualon Basin (SWMUS 8 and 29)

Constituent	EPC Air (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl ether	2.37E-05	5.40E-06	NA	NA	1.93E-06	NA	NA
Inorganics							
Mercury	1.49E-07	3.41E-08	3.00E-04	0.00011	1.22E-08	NA	NA

Total Hazard Index	0.00011

Potential Cancer Risk	0.00E+00

Total Central Nervous System HI =	0.00011

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 14-A: Intake Factors for the Outdoor Worker - Sludge Drying Beds (SWMU 14): Hercules Incorporated Facility - Hopewell, Virginia

Soil Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Soil				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Inhalation of Particulates from Soil				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	year
	ATc	Averaging Time (Cancer)	613200	hours
	ATn	Averaging Time (Non-cancer)	219000	hours

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Table 14-A: Intake Factors for the Outdoor Worker - Sludge Drying Beds (SWMU 14): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	900	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

APPENDIX F
Table 14-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Soil (mg/kg)	EPC Air Particulate (mg/m^3)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfC - C (mg/m^3)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Semi-Volatile Organics													
Benzo(a)pyrene			0.66	1		4.49E+00	1	NA	NA	NA	7.30E+00	1.10E+00	7.30E+00
Dibenz(a,h)anthracene			1.30	1		6.93E+00	1	NA	NA	NA	7.30E+00	1.20E+00	7.30E+00
Indeno(1,2,3-cd)pyrene			1.30	1		4.56E+00	1	NA	NA	NA	7.30E-01	1.10E-01	7.30E-01
Inorganics													
Arsenic	3.03	2.23E-09	0.95	1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Chromium (evaluated as chromium VI)	36.4	2.67E-08	2.20	1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt			1.53	1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron		0	5400	1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)			235	1		2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA

APPENDIX F
Table 14-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Outdoor Worker - Sludge Drying Beds (SWMU 14)

Constituent	Soil EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Dibenz(a,h)anthracene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Arsenic	3.03	1	2.67E-06	3.00E-04	8.89E-03	9.52E-07	1.50E+00	1.43E-06
Chromium (evaluated as chromium VI)	36.4	1	3.20E-05	3.00E-03	1.07E-02	1.14E-05	5.00E-01	5.72E-06
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--

Total Hazard Index	0.020

Potential Cancer Risk	7.15E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 14-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Outdoor Worker - Sludge Drying Beds (SWMU 14)

Constituent	Soil EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Dibenz(a,h)anthracene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Arsenic	3.03	0.03	5.28E-07	3.00E-04	1.76E-03	1.89E-07	1.50E+00	2.83E-07
Chromium (evaluated as chromium VI)	36.4	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--

Total Hazard Index	0.0018

Potential Cancer Risk	2.83E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 14-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Particulates from Soil - Outdoor Worker - Sludge Drying Beds (SWMU 14)

Constituent	EPC Air Part (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.20E+00	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Inorganics							
Arsenic	2.23E-09	4.57E-10	1.50E-05	3.05E-05	1.63E-10	4.30E+00	7.03E-10
Chromium (evaluated as chromium VI)	2.67E-08	5.49E-09	1.00E-04	5.49E-05	1.96E-09	8.40E+01	1.65E-07
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--

Total Hazard Index	**0.000085**

Potential Cancer Risk	**1.66E-07**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 14-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Outdoor Worker - Sludge Drying Beds (SWMU 14)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.66	1	2.58E-08	NA	NA	9.23E-09	7.30E+00	6.73E-08
Dibenz(a,h)anthracene	1.30	1	5.09E-08	NA	NA	1.82E-08	7.30E+00	1.33E-07
Indeno(1,2,3-cd)pyrene	1.30	1	5.09E-08	NA	NA	1.82E-08	7.30E-01	1.33E-08
Inorganics								
Arsenic	0.95	1	3.72E-08	3.00E-04	1.24E-04	1.33E-08	1.50E+00	1.99E-08
Chromium (evaluated as chromium VI)	2.20	1	8.61E-08	3.00E-03	2.87E-05	3.08E-08	5.00E-01	1.54E-08
Cobalt	1.53	1	5.97E-08	3.00E-04	1.99E-04	2.13E-08	NA	NA
Iron	5400	1	2.11E-04	7.00E-01	3.02E-04	7.55E-05	NA	NA
Manganese (water)	235	1	9.20E-06	2.40E-02	3.83E-04	3.28E-06	NA	NA

Total Hazard Index	0.001

Potential Cancer Risk	2.49E-07

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 14-H: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Outdoor Worker - Sludge Drying Beds (SWMU 14)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.66	4.49E+00	2.09E-06	NA	NA	7.45E-07	7.30E+00	5.44E-06
Dibenz(a,h)anthracene	1.30	6.93E+00	6.35E-06	NA	NA	2.27E-06	7.30E+00	1.65E-05
Indeno(1,2,3-cd)pyrene	1.30	4.56E+00	4.18E-06	NA	NA	1.49E-06	7.30E-01	1.09E-06
Inorganics								
Arsenic	0.95	2.00E-03	1.34E-09	3.00E-04	4.46E-06	4.78E-10	1.50E+00	7.17E-10
Chromium (evaluated as chromium VI)	2.20	4.00E-03	6.20E-09	7.50E-05	8.27E-05	2.21E-09	2.00E+01	4.43E-08
Cobalt	1.53	8.00E-04	8.59E-10	3.00E-04	2.86E-06	3.07E-10	NA	NA
Iron	5400	2.00E-03	7.61E-06	7.00E-01	1.09E-05	2.72E-06	NA	NA
Manganese (water)	235	2.00E-03	3.31E-07	9.60E-04	3.45E-04	1.18E-07	NA	NA

Total Hazard Index	0.00045

Potential Cancer Risk	2.31E-05

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 14-I: Summary of Hazard Indices for the Outdoor Worker - Sludge Drying Beds (SWMU 14)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Semi-Volatile Organics						
Benzo(a)pyrene	--	--	--	NA	NA	NA
Dibenz(a,h)anthracene	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	--	--	NA	NA	NA
Inorganics						
Arsenic	8.89E-03	1.76E-03	3.05E-05	1.24E-04	4.46E-06	0.011
Chromium (evaluated as chromium VI)	1.07E-02	--	5.49E-05	2.87E-05	8.27E-05	0.011
Cobalt	--	--	--	1.99E-04	2.86E-06	0.0002
Iron	--	--	--	3.02E-04	1.09E-05	0.00031
Manganese (water)	--	--	--	3.83E-04	3.45E-04	0.00073
Pathway Summary	0.020	0.0018	0.000085	0.001	0.00045	0.023

Total Blood HI =	0.00031
Total Cardiovascular HI =	0.011
Total Central Nervous System HI =	0.012
Total GI Tract HI =	0.00031
Total Liver HI =	0.00031
Total Not Specified HI =	0.0002
Total Respiratory HI =	0.011
Total Skin HI =	0.011
Total Vascular HI =	0.011

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 14-J: Summary of Theoretical Excess Lifetime Cancer Risks for the Outdoor Worker - Sludge Drying Beds (SWMU 14)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics						
Benzo(a)pyrene	--	--	--	6.73E-08	5.44E-06	5.51E-06
Dibenz(a,h)anthracene	--	--	--	1.33E-07	1.65E-05	1.67E-05
Indeno(1,2,3-cd)pyrene	--	--	--	1.33E-08	1.09E-06	1.10E-06
Inorganics						
Arsenic	1.43E-06	2.83E-07	7.03E-10	1.99E-08	7.17E-10	1.73E-06
Chromium (evaluated as chromium VI)	5.72E-06	--	1.65E-07	1.54E-08	4.43E-08	5.94E-06
Cobalt	--	--	--	NA	NA	NA
Iron	--	--	--	NA	NA	NA
Manganese (water)	--	--	--	NA	NA	NA
Pathway Summary	7.15E-06	2.83E-07	1.66E-07	2.49E-07	2.31E-05	3.10E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 15-A: Intake Factors for the Construction Worker - Sludge Drying Beds (SWMU 14): Hercules Incorporated Facility - Hopewell, Virginia

Soil Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	330	mg/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Soil				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Particulates or Volatiles from Soil				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	ATc	Averaging Time (Cancer)	613200	hours
	ATn	Averaging Time (Non-cancer)	8760	hours

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Table 15-A: Intake Factors for the Construction Worker - Sludge Drying Beds (SWMU 14): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Water				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

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Table 15-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Soil (mg/kg)	EPC Air Part (mg/m^3)	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics															
Diethyl Ether			0.54	6.62E-06		1		5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
t-Butanol			3.00			1		5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Semi-Volatile Organics															
Benzo(a)pyrene					0.66	1		4.49E+00	1	NA	NA	NA	7.30E+00	1.10E+00	7.30E+00
Dibenz(a,h)anthracene					1.30	1		6.93E+00	1	NA	NA	NA	7.30E+00	1.20E+00	7.30E+00
Indeno(1,2,3-cd)pyrene					1.30	1		4.56E+00	1	NA	NA	NA	7.30E-01	1.10E-01	7.30E-01
Inorganics															
Aluminum			9800			1		2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	3.03	2.226E-09	7.30		0.95	1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium			540			1		2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Cadmium (water)			0.38			1		2.00E-03	0.05	5.00E-04	1.00E-05	2.50E-05	NA	1.80E+00	NA
Chromium (evaluated as chromium VI)	36.4	2.674E-08	22.0		2.20	1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt			14.0		1.53	1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron		0	190000		5400	1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)			2300		235	1		2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Nickel			31.0			1		4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Vanadium		0	45.0			1		2.00E-03	0.026	5.00E-03	NA	1.30E-04	NA	NA	NA

APPENDIX F
Table 15-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	Soil EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Dibenz(a,h)anthracene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	3.03	1	7.82E-07	3.00E-04	2.61E-03	1.12E-08	1.50E+00	1.68E-08
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	36.4	1	9.39E-06	3.00E-03	3.13E-03	1.34E-07	5.00E-01	6.71E-08
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--

Total Hazard Index	0.0057

Potential Cancer Risk	8.38E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	Soil EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	0	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	0	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Dibenz(a,h)anthracene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	3.03	0.03	7.04E-08	3.00E-04	2.35E-04	1.01E-09	1.50E+00	1.51E-09
Barium	0.0	0	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	0	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	36.4	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	0	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Vanadium	0.0	0	0.00E+00	1.30E-04	--	0.00E+00	NA	--

Total Hazard Index	0.00023

Potential Cancer Risk	1.51E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Particulates from Soil - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	EPC Air Part (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.20E+00	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	2.23E-09	4.07E-11	1.50E-05	2.71E-06	5.81E-13	4.30E+00	2.50E-12
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	2.67E-08	4.88E-10	1.00E-04	4.88E-06	6.98E-12	8.40E+01	5.86E-10
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	**0.0000076**

Potential Cancer Risk	**5.88E-10**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Soil - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	EPC Air VOC (Soil) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.20E+00	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	**0.00**

Potential Cancer Risk	**0.00E+00**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.54	1	2.11E-08	2.00E-01	1.06E-07	3.02E-10	NA	NA
t-Butanol	3.00	1	1.17E-07	1.00E-01	1.17E-06	1.68E-09	NA	NA
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Dibenz(a,h)anthracene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	9800	1	3.84E-04	1.00E+00	3.84E-04	5.48E-06	NA	NA
Arsenic	7.30	1	2.86E-07	3.00E-04	9.52E-04	4.08E-09	1.50E+00	6.12E-09
Barium	540	1	2.11E-05	2.00E-01	1.06E-04	3.02E-07	NA	NA
Cadmium (water)	0.38	1	1.49E-08	5.00E-04	2.97E-05	2.12E-10	NA	NA
Chromium (evaluated as chromium VI)	22.0	1	8.61E-07	3.00E-03	2.87E-04	1.23E-08	5.00E-01	6.15E-09
Cobalt	14.0	1	5.48E-07	3.00E-04	1.83E-03	7.83E-09	NA	NA
Iron	190000	1	7.44E-03	7.00E-01	1.06E-02	1.06E-04	NA	NA
Manganese (water)	2300	1	9.00E-05	2.40E-02	3.75E-03	1.29E-06	NA	NA
Nickel	31.0	1	1.21E-06	2.00E-02	6.07E-05	1.73E-08	NA	NA
Vanadium	45.0	1	1.76E-06	5.00E-03	3.52E-04	2.52E-08	NA	NA

Total Hazard Index	0.018

Potential Cancer Risk	1.23E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-H: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	0.54	5.89E-03	8.21E-09	2.00E-01	4.11E-08	1.17E-10	NA	NA
t-Butanol	3.00	5.89E-03	4.56E-08	1.00E-01	4.56E-07	6.52E-10	NA	NA
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	4.49E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Dibenz(a,h)anthracene	0.0	6.93E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	4.56E+00	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	9800	2.00E-03	5.06E-05	1.00E+00	5.06E-05	7.23E-07	NA	NA
Arsenic	7.30	2.00E-03	3.77E-08	3.00E-04	1.26E-04	5.39E-10	1.50E+00	8.08E-10
Barium	540	2.00E-03	2.79E-06	1.40E-02	1.99E-04	3.99E-08	NA	NA
Cadmium (water)	0.38	2.00E-03	1.96E-09	2.50E-05	7.85E-05	2.80E-11	NA	NA
Chromium (evaluated as chromium VI)	22.0	4.00E-03	2.27E-07	7.50E-05	3.03E-03	3.25E-09	2.00E+01	6.49E-08
Cobalt	14.0	8.00E-04	2.89E-08	3.00E-04	9.64E-05	4.13E-10	NA	NA
Iron	190000	2.00E-03	9.82E-04	7.00E-01	1.40E-03	1.40E-05	NA	NA
Manganese (water)	2300	2.00E-03	1.19E-05	9.60E-04	1.24E-02	1.70E-07	NA	NA
Nickel	31.0	4.00E-04	3.20E-08	8.00E-04	4.00E-05	4.58E-10	NA	NA
Vanadium	45.0	2.00E-03	2.32E-07	1.30E-04	1.79E-03	3.32E-09	NA	NA

Total Hazard Index	**0.019**

Potential Cancer Risk	**6.58E-08**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-I: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	6.62E-06	3.02E-08	NA	NA	4.32E-10	NA	NA
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.20E+00	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.00

Potential Cancer Risk	0.00E+00

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-J: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg-d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	1	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.66	1	2.58E-08	NA	NA	3.69E-10	7.30E+00	2.69E-09
Dibenz(a,h)anthracene	1.30	1	5.09E-08	NA	NA	7.27E-10	7.30E+00	5.31E-09
Indeno(1,2,3-cd)pyrene	1.30	1	5.09E-08	NA	NA	7.27E-10	7.30E-01	5.31E-10
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	0.95	1	3.72E-08	3.00E-04	1.24E-04	5.31E-10	1.50E+00	7.97E-10
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	2.20	1	8.61E-08	3.00E-03	2.87E-05	1.23E-09	5.00E-01	6.15E-10
Cobalt	1.53	1	5.97E-08	3.00E-04	1.99E-04	8.53E-10	NA	NA
Iron	5400	1	2.11E-04	7.00E-01	3.02E-04	3.02E-06	NA	NA
Manganese (water)	235	1	9.20E-06	2.40E-02	3.83E-04	1.31E-07	NA	NA
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--

Total Hazard Index	0.001

Potential Cancer Risk	9.94E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 15-K: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Construction Worker - Sludge Drying Beds (SWMU 14)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	0.0	5.89E-03	0.00E+00	2.00E-01	--	0.00E+00	NA	--
t-Butanol	0.0	5.89E-03	0.00E+00	1.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.66	4.49E+00	7.65E-06	NA	NA	1.09E-07	7.30E+00	7.98E-07
Dibenz(a,h)anthracene	1.30	6.93E+00	2.33E-05	NA	NA	3.32E-07	7.30E+00	2.43E-06
Indeno(1,2,3-cd)pyrene	1.30	4.56E+00	1.53E-05	NA	NA	2.19E-07	7.30E-01	1.60E-07
Inorganics								
Aluminum	0.0	2.00E-03	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	0.95	2.00E-03	4.91E-09	3.00E-04	1.64E-05	7.01E-11	1.50E+00	1.05E-10
Barium	0.0	2.00E-03	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0.0	2.00E-03	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	2.20	4.00E-03	2.27E-08	7.50E-05	3.03E-04	3.25E-10	2.00E+01	6.49E-09
Cobalt	1.53	8.00E-04	3.15E-09	3.00E-04	1.05E-05	4.50E-11	NA	NA
Iron	5400	2.00E-03	2.79E-05	7.00E-01	3.99E-05	3.99E-07	NA	NA
Manganese (water)	235	2.00E-03	1.21E-06	9.60E-04	1.26E-03	1.73E-08	NA	NA
Nickel	0.0	4.00E-04	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Vanadium	0.0	2.00E-03	0.00E+00	1.30E-04	--	0.00E+00	NA	--

Total Hazard Index	0.0016

Potential Cancer Risk	3.39E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 15-L: Summary of Hazard Indices for the Construction Worker - Sludge Drying Beds (SWMU 14)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Inhalation of Volatiles from Soil	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Volatile Organics										
Diethyl Ether	--	--	--	--	1.06E-07	4.11E-08	NA	--	--	0.00000015
t-Butanol	--	--	--	--	1.17E-06	4.56E-07	--	--	--	0.0000016
Semi-Volatile Organics										
Benzo(a)pyrene	--	--	--	--	--	--	--	NA	NA	NA
Dibenz(a,h)anthracene	--	--	--	--	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--	--	NA	NA	NA
Inorganics										
Aluminum	--	--	--	--	3.84E-04	5.06E-05	--	--	--	0.00043
Arsenic	2.61E-03	2.35E-04	2.71E-06	--	9.52E-04	1.26E-04	--	1.24E-04	1.64E-05	0.0041
Barium	--	--	--	--	1.06E-04	1.99E-04	--	--	--	0.0003
Cadmium (water)	--	--	--	--	2.97E-05	7.85E-05	--	--	--	0.00011
Chromium (evaluated as chromium VI)	3.13E-03	--	4.88E-06	--	2.87E-04	3.03E-03	--	2.87E-05	3.03E-04	0.0068
Cobalt	--	--	--	--	1.83E-03	9.64E-05	--	1.99E-04	1.05E-05	0.0021
Iron	--	--	--	--	1.06E-02	1.40E-03	--	3.02E-04	3.99E-05	0.012
Manganese (water)	--	--	--	--	3.75E-03	1.24E-02	--	3.83E-04	1.26E-03	0.018
Nickel	--	--	--	--	6.07E-05	4.00E-05	--	--	--	0.0001
Vanadium	--	--	--	--	3.52E-04	1.79E-03	--	--	--	0.0021
Pathway Summary	0.0057	0.00023	0.0000076	--	0.018	0.019	--	0.0010	0.0016	0.046

Total Blood HI =	0.012
Total Body Weight HI =	0.00000015
Total Cardiovascular HI =	0.0041
Total Central Nervous System HI =	0.022
Total Fetal HI =	0.0003
Total GI Tract HI =	0.012
Total Kidney HI =	0.0026
Total Liver HI =	0.012
Total Not Specified HI =	0.0021
Total Respiratory HI =	0.0068
Total Skin HI =	0.0041
Total Vascular HI =	0.0041
Total Whole Body HI =	0.0001

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 15-M: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Sludge Drying Beds (SWMU 14)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Inhalation of Volatiles from Soil	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Volatile Organics										
Diethyl Ether	--	--	--	--	NA	NA	NA	--	--	NA
t-Butanol	--	--	--	--	NA	NA	--	--	--	NA
Semi-Volatile Organics										
Benzo(a)pyrene	--	--	--	--	--	--	--	2.69E-09	7.98E-07	8.01E-07
Dibenz(a,h)anthracene	--	--	--	--	--	--	--	5.31E-09	2.43E-06	2.43E-06
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--	--	5.31E-10	1.60E-07	1.60E-07
Inorganics										
Aluminum	--	--	--	--	NA	NA	--	--	--	NA
Arsenic	1.68E-08	1.51E-09	2.50E-12	--	6.12E-09	8.08E-10	--	7.97E-10	1.05E-10	2.61E-08
Barium	--	--	--	--	NA	NA	--	--	--	NA
Cadmium (water)	--	--	--	--	NA	NA	--	--	--	NA
Chromium (evaluated as chromium VI)	6.71E-08	--	5.86E-10	--	6.15E-09	6.49E-08	--	6.15E-10	6.49E-09	1.46E-07
Cobalt	--	--	--	--	NA	NA	--	NA	NA	NA
Iron	--	--	--	--	NA	NA	--	NA	NA	NA
Manganese (water)	--	--	--	--	NA	NA	--	NA	NA	NA
Nickel	--	--	--	--	NA	NA	--	--	--	NA
Vanadium	--	--	--	--	NA	NA	--	--	--	NA
Pathway Summary	8.38E-08	1.51E-09	5.88E-10	--	1.23E-08	6.58E-08	--	9.94E-09	3.39E-06	3.56E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 16-A: Intake Factors for the Indoor Worker - Sludge Drying Beds (SWMU 14):
Hercules Incorporated Facility - Hopewell, Virginia

Inhalation of Volatiles			
ET	Exposure Time	8	hours/day
EF	Exposure Frequency	250	days/yr
ED	Exposure Duration	25	year
AT-C	Averaging Time (Cancer)	613200	hours
AT-N	Averaging Time (Non-cancer)	219000	hours

APPENDIX F
Table 16-B: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles in Indoor Air- Indoor Worker - Sludge Drying Beds (SWMU 14)

Constituent	EPC Air (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl ether	1.16E-06	2.64E-07	NA	NA	9.42E-08	NA	NA

Total Hazard Index	**0.00**

Potential Cancer Risk	**0.00E+00**

Total Body Weight HI =	0.000

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 17-A: Intake Factors for the Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15): Hercules Incorporated Facility - Hopewell, Virginia

Soil Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Soil				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Inhalation of Particulates or Volatiles from Soil				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	225	days/yr
	ED	Exposure Duration	25	year
	ATc	Averaging Time (Cancer)	613200	hours
	ATn	Averaging Time (Non-cancer)	219000	hours

APPENDIX F

Table 17-A: Intake Factors for the Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	900	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	25	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	9125	days

APPENDIX F
Table 17-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Soil (mg/kg)	EPC Air Part (mg/m^3)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfC - C (mg/m^3)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Semi-Volatile Organics													
Benzo(a)pyrene			0.96	1		4.49E+00	1	NA	NA	NA	7.30E+00	1.10E+00	7.30E+00
Benzo(k)fluoranthene			0.58	1		4.55E+00	1	NA	NA	NA	7.30E-02	1.10E-01	7.30E-02
Dibenz(a,h)anthracene			2.60	1		6.93E+00	1	NA	NA	NA	7.30E+00	1.20E+00	7.30E+00
Indeno(1,2,3-cd)pyrene			1.70	1		4.56E+00	1	NA	NA	NA	7.30E-01	1.10E-01	7.30E-01
Inorganics													
Arsenic	9.10	6.69E-09	1.20	1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Chromium (evaluated as chromium VI)	168	1.24E-07	4.20	1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt			1.20	1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron	93535	6.88E-05	7000	1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA

APPENDIX F
Table 17-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Soil EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(k)fluoranthene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-02	--
Dibenz(a,h)anthracene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Arsenic	9.10	1	8.01E-06	3.00E-04	2.67E-02	2.86E-06	1.50E+00	4.29E-06
Chromium (evaluated as chromium VI)	168	1	1.48E-04	3.00E-03	4.93E-02	5.28E-05	5.00E-01	2.64E-05
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	93535	1	8.24E-02	7.00E-01	1.18E-01	2.94E-02	NA	NA

Total Hazard Index	0.19

Potential Cancer Risk	3.07E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 17-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Soil EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(k)fluoranthene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-02	--
Dibenz(a,h)anthracene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Arsenic	9.10	0.03	1.59E-06	3.00E-04	5.29E-03	5.67E-07	1.50E+00	8.50E-07
Chromium (evaluated as chromium VI)	168	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	93535	0	0.00E+00	7.00E-01	--	0.00E+00	NA	NA

Total Hazard Index	0.0053

Potential Cancer Risk	8.50E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 17-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Particulates from Soil - Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	EPC Air Part (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Benzo(k)fluoranthene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.20E+00	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Inorganics							
Arsenic	6.69E-09	1.37E-09	1.50E-05	9.17E-05	4.91E-10	4.30E+00	2.11E-09
Chromium (evaluated as chromium VI)	1.24E-07	2.54E-08	1.00E-04	2.54E-04	9.07E-09	8.40E+01	7.61E-07
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	6.88E-05	1.41E-05	NA	NA	5.05E-06	NA	NA

Total Hazard Index	**0.00035**

Potential Cancer Risk	**7.64E-07**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 17-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.96	1	3.76E-08	NA	NA	1.34E-08	7.30E+00	9.80E-08
Benzo(k)fluoranthene	0.58	1	2.27E-08	NA	NA	8.11E-09	7.30E-02	5.92E-10
Dibenz(a,h)anthracene	2.60	1	1.02E-07	NA	NA	3.63E-08	7.30E+00	2.65E-07
Indeno(1,2,3-cd)pyrene	1.70	1	6.65E-08	NA	NA	2.38E-08	7.30E-01	1.73E-08
Inorganics								
Arsenic	1.20	1	4.70E-08	3.00E-04	1.57E-04	1.68E-08	1.50E+00	2.52E-08
Chromium (evaluated as chromium VI)	4.20	1	1.64E-07	3.00E-03	5.48E-05	5.87E-08	5.00E-01	2.94E-08
Cobalt	1.20	1	4.70E-08	3.00E-04	1.57E-04	1.68E-08	NA	NA
Iron	7000	1	2.74E-04	7.00E-01	3.91E-04	9.78E-05	NA	NA

Total Hazard Index	**0.00076**

Potential Cancer Risk	**4.36E-07**

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 17-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Semi-Volatile Organics								
Benzo(a)pyrene	0.96	4.49E+00	3.04E-06	NA	NA	1.08E-06	7.30E+00	7.91E-06
Benzo(k)fluoranthene	0.58	4.55E+00	1.86E-06	NA	NA	6.65E-07	7.30E-02	4.85E-08
Dibenz(a,h)anthracene	2.60	6.93E+00	1.27E-05	NA	NA	4.53E-06	7.30E+00	3.31E-05
Indeno(1,2,3-cd)pyrene	1.70	4.56E+00	5.46E-06	NA	NA	1.95E-06	7.30E-01	1.42E-06
Inorganics								
Arsenic	1.20	2.00E-03	1.69E-09	3.00E-04	5.64E-06	6.04E-10	1.50E+00	9.06E-10
Chromium (evaluated as chromium VI)	4.20	4.00E-03	1.18E-08	7.50E-05	1.58E-04	4.23E-09	2.00E+01	8.45E-08
Cobalt	1.20	8.00E-04	6.76E-10	3.00E-04	2.25E-06	2.42E-10	NA	NA
Iron	7000	2.00E-03	9.86E-06	7.00E-01	1.41E-05	3.52E-06	NA	NA

Total Hazard Index	0.00018

Potential Cancer Risk	4.26E-05

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 17-H: Summary of Hazard Indices for the Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Semi-Volatile Organics						
Benzo(a)pyrene	--	--	--	NA	NA	NA
Benzo(k)fluoranthene	--	--	--	NA	NA	NA
Dibenz(a,h)anthracene	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	--	--	NA	NA	NA
Inorganics						
Arsenic	2.67E-02	5.29E-03	9.17E-05	1.57E-04	5.64E-06	0.032
Chromium (evaluated as chromium VI)	4.93E-02	--	2.54E-04	5.48E-05	1.58E-04	0.050
Cobalt	--	--	--	1.57E-04	2.25E-06	0.00016
Iron	1.18E-01	--	NA	3.91E-04	1.41E-05	0.12
Pathway Summary	0.19	0.0053	0.00035	0.00076	0.00018	0.20

Total Blood HI =	0.12
Total Cardiovascular HI =	0.032
Total Central Nervous System HI =	0.032
Total GI Tract HI =	0.12
Total Liver HI =	0.12
Total Not Specified HI =	0.00016
Total Respiratory HI =	0.050
Total Skin HI =	0.032
Total Vascular HI =	0.032

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 17-I: Summary of Theoretical Excess Lifetime Cancer Risks for the Outdoor Worker - Vacuum Filter Sludge Pile (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics						
Benzo(a)pyrene	--	--	--	9.80E-08	7.91E-06	8.01E-06
Benzo(k)fluoranthene	--	--	--	5.92E-10	4.85E-08	4.91E-08
Dibenz(a,h)anthracene	--	--	--	2.65E-07	3.31E-05	3.34E-05
Indeno(1,2,3-cd)pyrene	--	--	--	1.73E-08	1.42E-06	1.44E-06
Inorganics						
Arsenic	4.29E-06	8.50E-07	2.11E-09	2.52E-08	9.06E-10	5.17E-06
Chromium (evaluated as chromium VI)	2.64E-05	--	7.61E-07	2.94E-08	8.45E-08	2.73E-05
Cobalt	--	--	--	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Pathway Summary	3.07E-05	8.50E-07	7.64E-07	4.36E-07	4.26E-05	7.53E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 18-A: Intake Factors for the Construction Worker - Vacuum Filter Sludge Pile (SWMU 15): Hercules Incorporated Facility - Hopewell, Virginia

Soil Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	330	mg/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Soil				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Particulates or Volatiles from Soil				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	ATc	Averaging Time (Cancer)	613200	hours
	ATn	Averaging Time (Non-cancer)	8760	hours

APPENDIX F

Table 18-A: Intake Factors for the Construction Worker - Vacuum Filter Sludge Pile (SWMU 15): Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Water				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

APPENDIX F

Table 18-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Soil (mg/kg)	EPC Air Part (mg/m^3)	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics															
Diethyl Ether			76.0	9.32E-04		1		5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
Semi-Volatile Organics															
Benzo(a)pyrene					0.96	1		4.49E+00	1	NA	NA	NA	7.30E+00	1.10E+00	7.30E+00
Benzo(k)fluoranthene					0.58	1		4.55E+00	1	NA	NA	NA	7.30E-02	1.10E-01	7.30E-02
Dibenz(a,h)anthracene					2.60	1		6.93E+00	1	NA	NA	NA	7.30E+00	1.20E+00	7.30E+00
Indeno(1,2,3-cd)pyrene					1.70	1		4.56E+00	1	NA	NA	NA	7.30E-01	1.10E-01	7.30E-01
Inorganics															
Aluminum			270			1		2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	9.10	6.691E-09	1.50		1.20	1	0.03	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium			140			1		2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Chromium (evaluated as chromium VI)	168	1.235E-07	1.40		4.20	1		4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt			2.50		1.20	1		8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron	93535	6.878E-05	4300		7000	1		2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)			750			1		2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Nickel			2.10			1		4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Vanadium		0	1.50			1		2.00E-03	0.026	5.00E-03	NA	1.30E-04	NA	NA	NA

APPENDIX F
Table 18-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Soil Ingestion - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Soil EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(k)fluoranthene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-02	--
Dibenz(a,h)anthracene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	9.10	1	2.35E-06	3.00E-04	7.84E-03	3.36E-08	1.50E+00	5.04E-08
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	168	1	4.34E-05	3.00E-03	1.45E-02	6.20E-07	5.00E-01	3.10E-07
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	93535	1	2.42E-02	7.00E-01	3.45E-02	3.45E-04	NA	NA
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--
				Total Hazard Index	**0.057**		**Potential Cancer Risk**	**3.60E-07**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 18-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Soil - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Soil EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	0	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(k)fluoranthene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-02	--
Dibenz(a,h)anthracene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	0	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	9.10	0.03	2.12E-07	3.00E-04	7.05E-04	3.02E-09	1.50E+00	4.53E-09
Barium	0.0	0	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Cadmium (water)	0	0	0.00E+00	2.50E-05	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	168	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	93535	0	0.00E+00	7.00E-01	--	0.00E+00	NA	NA
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	0	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Vanadium	0.0	0	0.00E+00	1.30E-04	--	0.00E+00	NA	--

Total Hazard Index	0.00071

Potential Cancer Risk	4.53E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 18-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Particulates from Soil - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	EPC Air Part (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Benzo(k)fluoranthene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.20E+00	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	6.69E-09	1.22E-10	1.50E-05	8.15E-06	1.75E-12	4.30E+00	7.51E-12
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	1.24E-07	2.26E-09	1.00E-04	2.26E-05	3.22E-11	8.40E+01	2.71E-09
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	6.88E-05	1.26E-06	NA	NA	1.79E-08	NA	NA
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.000031

Potential Cancer Risk	2.72E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 18-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	76.0	1	2.97E-06	2.00E-01	1.49E-05	4.25E-08	NA	NA
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(k)fluoranthene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-02	--
Dibenz(a,h)anthracene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	270	1	1.06E-05	1.00E+00	1.06E-05	1.51E-07	NA	NA
Arsenic	1.50	1	5.87E-08	3.00E-04	1.96E-04	8.39E-10	1.50E+00	1.26E-09
Barium	140	1	5.48E-06	2.00E-01	2.74E-05	7.83E-08	NA	NA
Cadmium (water)	0.0	1	0.00E+00	5.00E-04	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	1.40	1	5.48E-08	3.00E-03	1.83E-05	7.83E-10	5.00E-01	3.91E-10
Cobalt	2.50	1	9.78E-08	3.00E-04	3.26E-04	1.40E-09	NA	NA
Iron	4300	1	1.68E-04	7.00E-01	2.40E-04	2.40E-06	NA	NA
Manganese (water)	750	1	2.94E-05	2.40E-02	1.22E-03	4.19E-07	NA	NA
Nickel	2.10	1	8.22E-08	2.00E-02	4.11E-06	1.17E-09	NA	NA
Vanadium	1.50	1	5.87E-08	5.00E-03	1.17E-05	8.39E-10	NA	NA

Total Hazard Index	0.0021

Potential Cancer Risk	1.65E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 18-G: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	76.0	5.89E-03	1.16E-06	2.00E-01	5.78E-06	1.65E-08	NA	NA
Semi-Volatile Organics								
Benzo(a)pyrene	0.0	4.49E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Benzo(k)fluoranthene	0.0	4.55E+00	0.00E+00	NA	--	0.00E+00	7.30E-02	--
Dibenz(a,h)anthracene	0.0	6.93E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--
Indeno(1,2,3-cd)pyrene	0.0	4.56E+00	0.00E+00	NA	--	0.00E+00	7.30E-01	--
Inorganics								
Aluminum	270	2.00E-03	1.39E-06	1.00E+00	1.39E-06	1.99E-08	NA	NA
Arsenic	1.50	2.00E-03	7.75E-09	3.00E-04	2.58E-05	1.11E-10	1.50E+00	1.66E-10
Barium	140	2.00E-03	7.23E-07	1.40E-02	5.17E-05	1.03E-08	NA	NA
Chromium (evaluated as chromium VI)	1.40	4.00E-03	1.45E-08	7.50E-05	1.93E-04	2.07E-10	2.00E+01	4.13E-09
Cobalt	2.50	8.00E-04	5.17E-09	3.00E-04	1.72E-05	7.38E-11	NA	NA
Iron	4300	2.00E-03	2.22E-05	7.00E-01	3.17E-05	3.17E-07	NA	NA
Manganese (water)	750	2.00E-03	3.87E-06	9.60E-04	4.04E-03	5.54E-08	NA	NA
Nickel	2.10	4.00E-04	2.17E-09	8.00E-04	2.71E-06	3.10E-11	NA	NA
Vanadium	1.50	2.00E-03	7.75E-09	1.30E-04	5.96E-05	1.11E-10	NA	NA

Total Hazard Index	0.0044

Potential Cancer Risk	4.30E-09

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 18-H: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl Ether	9.32E-04	4.26E-06	NA	NA	6.08E-08	NA	NA
Semi-Volatile Organics							
Benzo(a)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E+00	--
Benzo(k)fluoranthene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.20E+00	--
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	NA	--	0.00E+00	1.10E-01	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.0000

Potential Cancer Risk	0.00E+00

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 18-I: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
Diethyl Ether	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.96	1	3.76E-08	NA	NA	5.37E-10	7.30E+00	3.92E-09
Benzo(k)fluoranthene	0.58	1	2.27E-08	NA	NA	3.24E-10	7.30E-02	2.37E-11
Dibenz(a,h)anthracene	2.60	1	1.02E-07	NA	NA	1.45E-09	7.30E+00	1.06E-08
Indeno(1,2,3-cd)pyrene	1.70	1	6.65E-08	NA	NA	9.51E-10	7.30E-01	6.94E-10
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.20	1	4.70E-08	3.00E-04	1.57E-04	6.71E-10	1.50E+00	1.01E-09
Barium	0.0	1	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	4.20	1	1.64E-07	3.00E-03	5.48E-05	2.35E-09	5.00E-01	1.17E-09
Cobalt	1.20	1	4.70E-08	3.00E-04	1.57E-04	6.71E-10	NA	NA
Iron	7000	1	2.74E-04	7.00E-01	3.91E-04	3.91E-06	NA	NA
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Nickel	0.0	1	0.00E+00	2.00E-02	--	0.00E+00	NA	--
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--

Total Hazard Index	0.00076

Potential Cancer Risk	1.74E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 18-J: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Volatile Organics								
Diethyl Ether	0.0	5.89E-03	0.00E+00	2.00E-01	--	0.00E+00	NA	--
Semi-Volatile Organics								
Benzo(a)pyrene	0.96	4.49E+00	1.11E-05	NA	NA	1.59E-07	7.30E+00	1.16E-06
Benzo(k)fluoranthene	0.58	4.55E+00	6.82E-06	NA	NA	9.75E-08	7.30E-02	7.12E-09
Dibenz(a,h)anthracene	2.60	6.93E+00	4.65E-05	NA	NA	6.65E-07	7.30E+00	4.85E-06
Indeno(1,2,3-cd)pyrene	1.70	4.56E+00	2.00E-05	NA	NA	2.86E-07	7.30E-01	2.09E-07
Inorganics								
Aluminum	0.0	2.00E-03	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	1.20	2.00E-03	6.20E-09	3.00E-04	2.07E-05	8.86E-11	1.50E+00	1.33E-10
Barium	0.0	2.00E-03	0.00E+00	1.40E-02	--	0.00E+00	NA	--
Chromium (evaluated as chromium VI)	4.20	4.00E-03	4.34E-08	7.50E-05	5.79E-04	6.20E-10	2.00E+01	1.24E-08
Cobalt	1.20	8.00E-04	2.48E-09	3.00E-04	8.27E-06	3.54E-11	NA	NA
Iron	7000	2.00E-03	3.62E-05	7.00E-01	5.17E-05	5.17E-07	NA	NA
Manganese (water)	0.0	2.00E-03	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Nickel	0.0	4.00E-04	0.00E+00	8.00E-04	--	0.00E+00	NA	--
Vanadium	0.0	2.00E-03	0.00E+00	1.30E-04	--	0.00E+00	NA	--

Total Hazard Index	0.00066

Potential Cancer Risk	6.24E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 18-K: Summary of Hazard Indices for the Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Volatile Organics									
Diethyl Ether	--	--	--	1.49E-05	5.78E-06	NA	--	--	0.000021
Semi-Volatile Organics									
Benzo(a)pyrene	--	--	--	--	--	--	NA	NA	NA
Benzo(k)fluoranthene	--	--	--	--	--	--	NA	NA	NA
Dibenz(a,h)anthracene	--	--	--	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--	NA	NA	NA
Inorganics									
Aluminum	--	--	--	1.06E-05	1.39E-06	--	--	--	0.000012
Arsenic	7.84E-03	7.05E-04	8.15E-06	1.96E-04	2.58E-05	--	1.57E-04	2.07E-05	0.0089
Barium	--	--	--	2.74E-05	5.17E-05	--	--	--	0.000079
Chromium (evaluated as chromium VI)	1.45E-02	--	2.26E-05	1.83E-05	1.93E-04	--	5.48E-05	5.79E-04	0.015
Cobalt	--	--	--	3.26E-04	1.72E-05	--	1.57E-04	8.27E-06	0.00051
Iron	3.45E-02	--	NA	2.40E-04	3.17E-05	--	3.91E-04	5.17E-05	0.035
Manganese (water)	--	--	--	1.22E-03	4.04E-03	--	--	--	0.0053
Nickel	--	--	--	4.11E-06	2.71E-06	--	--	--	0.0000068
Vanadium	--	--	--	1.17E-05	5.96E-05	--	--	--	0.000071
Pathway Summary	0.057	0.00071	0.000031	0.0021	0.0044	--	0.00076	0.00066	0.065

Total Blood HI =	0.035
Total Body Weight HI =	0.000021
Total Cardiovascular HI =	0.0089
Total Central Nervous System HI =	0.014
Total Fetal HI =	0.000079
Total GI Tract HI =	0.035
Total Kidney HI =	0.00015
Total Liver HI =	0.035
Total Not Specified HI =	0.00051
Total Respiratory HI =	0.015
Total Skin HI =	0.0089
Total Vascular HI =	0.0089
Total Whole Body HI =	0.0000068

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 18-L: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Vacuum Filter Sludge Pile (SWMU 15)
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates from Soil	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Volatile Organics									
Diethyl Ether	--	--	--	NA	NA	NA	--	--	NA
Semi-Volatile Organics									
Benzo(a)pyrene	--	--	--	--	--	--	3.92E-09	1.16E-06	1.16E-06
Benzo(k)fluoranthene	--	--	--	--	--	--	2.37E-11	7.12E-09	7.14E-09
Dibenz(a,h)anthracene	--	--	--	--	--	--	1.06E-08	4.85E-06	4.86E-06
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--	6.94E-10	2.09E-07	2.10E-07
Inorganics									
Aluminum	--	--	--	NA	NA	--	--	--	NA
Arsenic	5.04E-08	4.53E-09	7.51E-12	1.26E-09	1.66E-10	--	1.01E-09	1.33E-10	5.75E-08
Barium	--	--	--	NA	NA	--	--	--	NA
Chromium (evaluated as chromium VI)	3.10E-07	--	2.71E-09	3.91E-10	4.13E-09	--	1.17E-09	1.24E-08	3.31E-07
Cobalt	--	--	--	NA	NA	--	NA	NA	NA
Iron	NA	NA	NA	NA	NA	--	NA	NA	NA
Manganese (water)	--	--	--	NA	NA	--	--	--	NA
Nickel	--	--	--	NA	NA	--	--	--	NA
Vanadium	--	--	--	NA	NA	--	--	--	NA
Pathway Summary	3.60E-07	4.53E-09	2.72E-09	1.65E-09	4.30E-09	--	1.74E-08	6.24E-06	6.63E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 19-A: Intake Factors for the Indoor Worker - Vacuum Filter Sludge Pile (SWMU 15): Hercules Incorporated Facility - Hopewell, Virginia

Inhalation of Volatiles				
	ET	Exposure Time	8	hours/day
	EF	Exposure Frequency	250	days/yr
	ED	Exposure Duration	25	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	219000	hours

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Table 19-B: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles in Indoor Air- Indoor Worker - Vacuum Filter Sludge Pile (SWMU 15)

Constituent	EPC Air (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl ether	8.31E-04	1.90E-04	NA	NA	6.78E-05	NA	NA

Total Hazard Index	**0.000**

Potential Cancer Risk	**0.00E+00**

Total Body Weight HI =	0.000

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 20-A: Intake Factors for the Construction Worker - Main Holding Basin:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Groundwater				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Dermal Contact with Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	3300	cm^2
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	365	days
Inhalation of Volatiles from Water				
	ET	Exposure Time	2	hours/day
	EF	Exposure Frequency	20	days/yr
	ED	Exposure Duration	1	year
	AT-C	Averaging Time (Cancer)	613200	hours
	AT-N	Averaging Time (Non-cancer)	8760	hours

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Table 20-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Groundwater (µg/L)	EPC Air VOC (Water) (mg/m^3)	Oral AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - SC (mg/kg-day)	RfC - SC (mg/m^3)	RfDd - SC (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Volatile Organics											
1,1,2,2-Tetrachloroethane	0.96	8.75E-08	1	2.60E-02	1	5.00E-02	NA	5.00E-02	2.00E-01	5.80E-02	2.00E-01
1,1-Dichloroethane	2.50	4.71E-06	1	1.85E-02	1	2.00E+00	NA	2.00E+00	5.70E-03	1.60E-03	5.70E-03
Chloroform	0.65	1.11E-06	1	2.04E-02	1	1.00E-02	9.80E-02	1.00E-02	3.10E-02	2.30E-02	3.10E-02
Diethyl Ether	4734	5.81E-02	1	5.89E-03	1	2.00E-01	NA	2.00E-01	NA	NA	NA
t-Butanol	1652		1	5.89E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Tetrachloroethene	22.0	1.15E-04	1	1.23E-01	1	1.00E-02	2.70E-01	1.00E-02	5.40E-01	5.90E-03	5.40E-01
Trichloroethene	3.20	1.09E-05	1	3.71E-02	1	NA	NA	NA	5.90E-03	2.00E-03	5.90E-03
Semi-Volatile Organics											
1.4-Dioxane	15.4		1	8.78E-04	1	3.00E-02	3.60E+00	3.00E-02	1.00E-01	7.70E-03	1.00E-01
Semi-Volatile Organics (TICs)											
1,1,2-Trichloro-1-propene	7.00	3.65E-05	1	1.23E-01	1	1.00E-02	2.70E-01	1.00E-02	5.40E-01	5.90E-03	5.40E-01
1,2,3-Trichloro-1-propene	5.40	2.82E-05	1	1.23E-01	1	1.00E-02	2.70E-01	1.00E-02	5.40E-01	5.90E-03	5.40E-01
1,1'-Oxybis[2-ethoxy-]ethane	546		1	5.89E-03	1	1.00E-01	1.60E+00	1.00E-01	NA	NA	NA
Alcohols and Glycols											
Ethanol	3267		1	1.29E-03	1	1.00E-01	NA	1.00E-01	NA	NA	NA
Methanol	1775		1	7.42E-04	1	5.00E-01	4.00E+00	5.00E-01	NA	NA	NA
Inorganics											
Aluminum	574		1	2.00E-03	1	1.00E+00	5.00E-03	1.00E+00	NA	NA	NA
Arsenic	21.4		1	2.00E-03	1	3.00E-04	1.50E-05	3.00E-04	1.50E+00	4.30E+00	1.50E+00
Barium	628		1	2.00E-03	0.07	2.00E-01	5.00E-03	1.40E-02	NA	NA	NA
Cadmium (water)	2.50		1	2.00E-03	0.05	5.00E-04	1.00E-05	2.50E-05	NA	1.80E+00	NA
Chromium (evaluated as chromium VI)	12.5		1	4.00E-03	0.025	3.00E-03	1.00E-04	7.50E-05	5.00E-01	8.40E+01	2.00E+01
Cobalt	104		1	8.00E-04	1	3.00E-04	6.00E-06	3.00E-04	NA	9.00E+00	NA
Iron	75872		1	2.00E-03	1	7.00E-01	NA	7.00E-01	NA	NA	NA
Manganese (water)	9071		1	2.00E-03	0.04	2.40E-02	5.00E-05	9.60E-04	NA	NA	NA
Mercury	0.80	7.11E-07	1	2.00E-03	1	1.60E-04	3.00E-04	1.60E-04	NA	NA	NA
Nickel	47.3		1	4.00E-04	0.04	2.00E-02	9.00E-05	8.00E-04	NA	2.60E-01	NA
Vanadium	1279		1	2.00E-03	0.026	5.00E-03	NA	1.30E-04	NA	NA	NA
Unknown TICs											
Unknown: Chemical Class: glycol ether derivative	266		1	5.89E-03	1	1.00E-01	1.60E+00	1.00E-01	NA	NA	NA
Unknown: Chemical Class: chlorinated VOC	14.0	4.79E-05	1	3.71E-02	1	NA	NA	NA	5.90E-03	2.00E-03	5.90E-03

APPENDIX F
Table 20-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Groundwater - Construction Worker - Main Holding Basi

Constituent	Groundwater EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Volatile Organics								
1,1,2,2-Tetrachloroethane	0.96	1	3.76E-08	5.00E-02	7.51E-07	5.37E-10	2.00E-01	1.07E-10
1,1-Dichloroethane	2.50	1	9.78E-08	2.00E+00	4.89E-08	1.40E-09	5.70E-03	7.97E-12
Chloroform	0.65	1	2.54E-08	1.00E-02	2.54E-06	3.63E-10	3.10E-02	1.13E-11
Diethyl Ether	4734	1	1.85E-04	2.00E-01	9.26E-04	2.65E-06	NA	NA
t-Butanol	1652	1	6.47E-05	1.00E-01	6.47E-04	9.24E-07	NA	NA
Tetrachloroethene	22.0	1	8.61E-07	1.00E-02	8.61E-05	1.23E-08	5.40E-01	6.64E-09
Trichloroethene	3.20	1	1.25E-07	NA	NA	1.79E-09	5.90E-03	1.06E-11
Semi-Volatile Organics								
1.4-Dioxane	15.4	1	6.04E-07	3.00E-02	2.01E-05	8.63E-09	1.00E-01	8.63E-10
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	7.00	1	2.74E-07	1.00E-02	2.74E-05	3.91E-09	5.40E-01	2.11E-09
1,2,3-Trichloro-1-propene	5.40	1	2.11E-07	1.00E-02	2.11E-05	3.02E-09	5.40E-01	1.63E-09
1,1'-Oxybis[2-ethoxy-]ethane	546	1	2.14E-05	1.00E-01	2.14E-04	3.05E-07	NA	NA
Alcohols and Glycols								
Ethanol	3267	1	1.28E-04	1.00E-01	1.28E-03	1.83E-06	NA	NA
Methanol	1775	1	6.95E-05	5.00E-01	1.39E-04	9.92E-07	NA	NA
Inorganics								
Aluminum	574	1	2.25E-05	1.00E+00	2.25E-05	3.21E-07	NA	NA
Arsenic	21.4	1	8.37E-07	3.00E-04	2.79E-03	1.20E-08	1.50E+00	1.79E-08
Barium	628	1	2.46E-05	2.00E-01	1.23E-04	3.51E-07	NA	NA
Cadmium (water)	2.50	1	9.77E-08	5.00E-04	1.95E-04	1.40E-09	NA	NA
Chromium (evaluated as chromium VI)	12.5	1	4.90E-07	3.00E-03	1.63E-04	7.00E-09	5.00E-01	3.50E-09
Cobalt	104	1	4.06E-06	3.00E-04	1.35E-02	5.80E-08	NA	NA
Iron	75872	1	2.97E-03	7.00E-01	4.24E-03	4.24E-05	NA	NA
Manganese (water)	9071	1	3.55E-04	2.40E-02	1.48E-02	5.07E-06	NA	NA
Mercury	0.80	1	3.12E-08	1.60E-04	1.95E-04	4.46E-10	NA	NA
Nickel	47.3	1	1.85E-06	2.00E-02	9.26E-05	2.64E-08	NA	NA
Vanadium	1279	1	5.01E-05	5.00E-03	1.00E-02	7.15E-07	NA	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	266	1	1.04E-05	1.00E-01	1.04E-04	1.49E-07	NA	NA
Unknown: Chemical Class: chlorinated VOC	14.0	1	5.48E-07	NA	NA	7.83E-09	5.90E-03	4.62E-11

Total Hazard Index	0.05

Potential Cancer Risk	3.29E-08

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 20-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Groundwater - Construction Worker - Main Holding Basin

Constituent	Groundwater EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Volatile Organics								
1,1,2,2-Tetrachloroethane	0.96	2.60E-02	6.45E-08	5.00E-02	1.29E-06	9.21E-10	2.00E-01	1.84E-10
1,1-Dichloroethane	2.50	1.85E-02	1.19E-07	2.00E+00	5.97E-08	1.71E-09	5.70E-03	9.72E-12
Chloroform	0.65	2.04E-02	3.43E-08	1.00E-02	3.43E-06	4.89E-10	3.10E-02	1.52E-11
Diethyl Ether	4734	5.89E-03	7.20E-05	2.00E-01	3.60E-04	1.03E-06	NA	NA
t-Butanol	1652	5.89E-03	2.51E-05	1.00E-01	2.51E-04	3.59E-07	NA	NA
Tetrachloroethene	22.0	1.23E-01	6.99E-06	1.00E-02	6.99E-04	9.99E-08	5.40E-01	5.39E-08
Trichloroethene	3.20	3.71E-02	3.07E-07	NA	NA	4.38E-09	5.90E-03	2.59E-11
Semi-Volatile Organics								
1.4-Dioxane	15.4	8.78E-04	3.50E-08	3.00E-02	1.17E-06	5.00E-10	1.00E-01	5.00E-11
Semi-Volatile Organics (TICs)								
1,1,2-Trichloro-1-propene	7.00	1.23E-01	2.23E-06	1.00E-02	2.23E-04	3.18E-08	5.40E-01	1.72E-08
1,2,3-Trichloro-1-propene	5.40	1.23E-01	1.72E-06	1.00E-02	1.72E-04	2.45E-08	5.40E-01	1.32E-08
1,1'-Oxybis[2-ethoxy-]ethane	546	5.89E-03	8.31E-06	1.00E-01	8.31E-05	1.19E-07	NA	NA
Alcohols and Glycols								
Ethanol	3267	1.29E-03	1.08E-05	1.00E-01	1.08E-04	1.55E-07	NA	NA
Methanol	1775	7.42E-04	3.40E-06	5.00E-01	6.81E-06	4.86E-08	NA	NA
Inorganics								
Aluminum	574	2.00E-03	2.97E-06	1.00E+00	2.97E-06	4.24E-08	NA	NA
Arsenic	21.4	2.00E-03	1.11E-07	3.00E-04	3.68E-04	1.58E-09	1.50E+00	2.37E-09
Barium	628	2.00E-03	3.24E-06	1.40E-02	2.32E-04	4.63E-08	NA	NA
Cadmium (water)	2.50	2.00E-03	1.29E-08	2.50E-05	5.16E-04	1.84E-10	NA	NA
Chromium (evaluated as chromium VI)	12.5	4.00E-03	1.29E-07	7.50E-05	1.72E-03	1.85E-09	2.00E+01	3.70E-08
Cobalt	104	8.00E-04	2.15E-07	3.00E-04	7.15E-04	3.06E-09	NA	NA
Iron	75872	2.00E-03	3.92E-04	7.00E-01	5.60E-04	5.60E-06	NA	NA
Manganese (water)	9071	2.00E-03	4.69E-05	9.60E-04	4.88E-02	6.69E-07	NA	NA
Mercury	0.80	2.00E-03	4.12E-09	1.60E-04	2.58E-05	5.89E-11	NA	NA
Nickel	47.3	4.00E-04	4.89E-08	8.00E-04	6.11E-05	6.98E-10	NA	NA
Vanadium	1279	2.00E-03	6.61E-06	1.30E-04	5.08E-02	9.44E-08	NA	NA
Unknown TICs								
Unknown: Chemical Class: glycol ether derivative	266	5.89E-03	4.05E-06	1.00E-01	4.05E-05	5.78E-08	NA	NA
Unknown: Chemical Class: chlorinated VOC	14.0	3.71E-02	1.34E-06	NA	NA	1.92E-08	5.90E-03	1.13E-10

Total Hazard Index	0.11

Potential Cancer Risk	1.24E-07

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 20-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles from Groundwater - Construction Worker - Main Holding Basi

Constituent	EPC Air VOC (Groundwater) (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
1,1,2,2-Tetrachloroethane	8.75E-08	3.99E-10	NA	NA	5.71E-12	5.80E-02	3.31E-13
1,1-Dichloroethane	4.71E-06	2.15E-08	NA	NA	3.07E-10	1.60E-03	4.92E-13
Chloroform	1.11E-06	5.08E-09	9.80E-02	5.19E-08	7.26E-11	2.30E-02	1.67E-12
Diethyl Ether	5.81E-02	2.65E-04	NA	NA	3.79E-06	NA	NA
t-Butanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Tetrachloroethene	1.15E-04	5.24E-07	2.70E-01	1.94E-06	7.49E-09	5.90E-03	4.42E-11
Trichloroethene	1.09E-05	5.00E-08	NA	NA	7.14E-10	2.00E-03	1.43E-12
Semi-Volatile Organics							
1.4-Dioxane	0.00E+00	0.00E+00	3.60E+00	--	0.00E+00	7.70E-03	--
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene	3.65E-05	1.67E-07	2.70E-01	6.18E-07	2.38E-09	5.90E-03	1.41E-11
1,2,3-Trichloro-1-propene	2.82E-05	1.29E-07	2.70E-01	4.76E-07	1.84E-09	5.90E-03	1.08E-11
1,1'-Oxybis[2-ethoxy-]ethane	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Alcohols and Glycols							
Ethanol	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Methanol	0.00E+00	0.00E+00	4.00E+00	--	0.00E+00	NA	--
Inorganics							
Aluminum	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Arsenic	0.00E+00	0.00E+00	1.50E-05	--	0.00E+00	4.30E+00	--
Barium	0.00E+00	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Cadmium (water)	0.00E+00	0.00E+00	1.00E-05	--	0.00E+00	1.80E+00	--
Chromium (evaluated as chromium VI)	0.00E+00	0.00E+00	1.00E-04	--	0.00E+00	8.40E+01	--
Cobalt	0.00E+00	0.00E+00	6.00E-06	--	0.00E+00	9.00E+00	--
Iron	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Manganese (water)	0.00E+00	0.00E+00	5.00E-05	--	0.00E+00	NA	--
Mercury	7.11E-07	3.25E-09	3.00E-04	1.08E-05	4.64E-11	NA	NA
Nickel	0.00E+00	0.00E+00	9.00E-05	--	0.00E+00	2.60E-01	--
Vanadium	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs							
Unknown: Chemical Class: glycol ether derivative	0.00E+00	0.00E+00	1.60E+00	--	0.00E+00	NA	--
Unknown: Chemical Class: chlorinated VOC	4.79E-05	2.19E-07	NA	NA	3.12E-09	2.00E-03	6.25E-12

Total Hazard Index	0.000014

Potential Cancer Risk	7.92E-11

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 20-F: Summary of Hazard Indices for the Construction Worker - Main Holding Basin
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Total Hazard Index
Volatile Organics				
1,1,2,2-Tetrachloroethane	7.51E-07	1.29E-06	NA	0.000002
1,1-Dichloroethane	4.89E-08	5.97E-08	NA	0.00000011
Chloroform	2.54E-06	3.43E-06	5.19E-08	0.000006
Diethyl Ether	9.26E-04	3.60E-04	NA	0.0013
t-Butanol	6.47E-04	2.51E-04	--	0.0009
Tetrachloroethene	8.61E-05	6.99E-04	1.94E-06	0.00079
Trichloroethene	NA	NA	NA	NA
Semi-Volatile Organics				
1.4-Dioxane	2.01E-05	1.17E-06	--	0.000021
Semi-Volatile Organics (TICs)				
1,1,2-Trichloro-1-propene	2.74E-05	2.23E-04	6.18E-07	0.00025
1,2,3-Trichloro-1-propene	2.11E-05	1.72E-04	4.76E-07	0.00019
1,1'-Oxybis[2-ethoxy-]ethane	2.14E-04	8.31E-05	--	0.0003
Alcohols and Glycols				
Ethanol	1.28E-03	1.08E-04	--	0.0014
Methanol	1.39E-04	6.81E-06	--	0.00015
Inorganics				
Aluminum	2.25E-05	2.97E-06	--	0.000025
Arsenic	2.79E-03	3.68E-04	--	0.0032
Barium	1.23E-04	2.32E-04	--	0.00035
Cadmium (water)	1.95E-04	5.16E-04	--	0.00071
Chromium (evaluated as chromium VI)	1.63E-04	1.72E-03	--	0.0019
Cobalt	1.35E-02	7.15E-04	--	0.014
Iron	4.24E-03	5.60E-04	--	0.0048
Manganese (water)	1.48E-02	4.88E-02	--	0.064
Mercury	1.95E-04	2.58E-05	1.08E-05	0.00023
Nickel	9.26E-05	6.11E-05	--	0.00015
Vanadium	1.00E-02	5.08E-02	--	0.061

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Table 20-F: Summary of Hazard Indices for the Construction Worker - Main Holding Basin
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Total Hazard Index
Unknown TICs				
Unknown: Chemical Class: glycol ether derivative	1.04E-04	4.05E-05	--	0.00014
Unknown: Chemical Class: chlorinated VOC	NA	NA	NA	NA
Pathway Summary	0.05	0.11	0.000014	0.16

Total Blood HI =	0.0048
Total Body Weight HI =	0.0013
Total Cardiovascular HI =	0.0032
Total Central Nervous System HI =	0.071
Total Fetal HI =	0.00035
Total GI Tract HI =	0.0048
Total Kidney HI =	0.062
Total Liver HI =	0.0066
Total Not Specified HI =	0.014
Total Respiratory HI =	0.0019
Total Skin HI =	0.0032
Total Vascular HI =	0.0032
Total Whole Body HI =	0.00015

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 20-G: Summary of Theoretical Excess Lifetime Cancer Risks for the Construction Worker - Main Holding Basin
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Theoretical Excess Lifetime Cancer Risk
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.07E-10	1.84E-10	3.31E-13	2.92E-10
1,1-Dichloroethane	7.97E-12	9.72E-12	4.92E-13	1.82E-11
Chloroform	1.13E-11	1.52E-11	1.67E-12	2.81E-11
Diethyl Ether	NA	NA	NA	NA
t-Butanol	NA	NA	--	NA
Tetrachloroethene	6.64E-09	5.39E-08	4.42E-11	6.06E-08
Trichloroethene	1.06E-11	2.59E-11	1.43E-12	3.78E-11
Semi-Volatile Organics				
1.4-Dioxane	8.63E-10	5.00E-11	--	9.13E-10
Semi-Volatile Organics (TICs)				
1,1,2-Trichloro-1-propene	2.11E-09	1.72E-08	1.41E-11	1.93E-08
1,2,3-Trichloro-1-propene	1.63E-09	1.32E-08	1.08E-11	1.49E-08
1,1'-Oxybis[2-ethoxy-]ethane	NA	NA	--	NA
Alcohols and Glycols				
Ethanol	NA	NA	--	NA
Methanol	NA	NA	--	NA
Inorganics				
Aluminum	NA	NA	--	NA
Arsenic	1.79E-08	2.37E-09	--	2.03E-08
Barium	NA	NA	--	NA
Cadmium (water)	NA	NA	--	NA
Chromium (evaluated as chromium VI)	3.50E-09	3.70E-08	--	4.05E-08
Cobalt	NA	NA	--	NA
Iron	NA	NA	--	NA
Manganese (water)	NA	NA	--	NA
Mercury	NA	NA	NA	NA
Nickel	NA	NA	--	NA
Vanadium	NA	NA	--	NA
Unknown TICs				
Unknown: Chemical Class: glycol ether derivative	NA	NA	--	NA
Unknown: Chemical Class: chlorinated VOC	4.62E-11	1.13E-10	6.25E-12	1.66E-10
Pathway Summary	3.29E-08	1.24E-07	7.92E-11	1.57E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 21-A: Intake Factors for the Indoor Worker - Main Holding Basin:
Hercules Incorporated Facility - Hopewell, Virginia

Inhalation of Volatiles			
ET	Exposure Time	8	hours/day
EF	Exposure Frequency	250	days/yr
ED	Exposure Duration	25	year
AT-C	Averaging Time (Cancer)	613200	hours
AT-N	Averaging Time (Non-cancer)	219000	hours

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Table 21-B: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Inhalation of Volatiles in Indoor Air- Indoor Worker - Main Holding Basin

Constituent	EPC Air (mg/m^3)	Intake (ADD) (mg/kg-d)	RfC (mg/m^3)	Hazard Quotient	Intake (LADD) (mg/kg-d)	URF $(mg/m^3)^{-1}$	Potential Cancer Risk
Volatile Organics							
Diethyl ether	1.02E-02	2.33E-03	NA	NA	8.33E-04	NA	NA
Tetrachloroethene	2.23E-05	5.09E-06	2.70E-01	0.000019	1.82E-06	5.90E-03	1.07E-08
Trichloroethene	2.33E-06	5.31E-07	NA	NA	1.90E-07	2.00E-03	3.79E-10
Semi-Volatile Organics (TICs)							
1,1,2-Trichloro-1-propene	7.10E-06	1.62E-06	2.70E-01	0.000006	5.79E-07	5.90E-03	3.41E-09
1,2,3-Trichloro-1-propene	5.47E-06	1.25E-06	2.70E-01	0.000005	4.46E-07	5.90E-03	2.63E-09
Inorganics							
Mercury	2.31E-07	5.27E-08	3.00E-04	0.00018	1.88E-08	NA	NA
Unknown TICs							
Unknown; Chemical Class: chlorinated VOC	1.02E-05	2.32E-06	NA	NA	8.30E-07	2.00E-03	1.66E-09

Total Hazard Index	**0.00021**

Potential Cancer Risk	**1.88E-08**

Total Central Nervous System HI =	0.00021
Total Liver HI =	0.000029

Notes:
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 22-A: Intake Factors for the Youth Trespasser - East Bear Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

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Table 22-A: Intake Factors for the Youth Trespasser - East Bear Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

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Table 22-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Inorganics										
Aluminum		65000	1		2.00E-03	1	1.00E+00	1.00E+00	NA	NA
Arsenic	12.0	28.0	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as Chromium VI)	71.0	120	1		4.00E-03	0.025	3.00E-03	7.50E-05	1.50E+00	6.00E+01
Cobalt		20.0	1		8.00E-04	1	3.00E-04	3.00E-04	NA	NA
Iron		67000	1		2.00E-03	1	7.00E-01	7.00E-01	NA	NA
Manganese (water)		1300	1		2.00E-03	0.04	2.40E-02	9.60E-04	NA	NA
Mercury		0.27	1		2.00E-03	1	1.60E-04	1.60E-04	NA	NA
Thallium	0.72	1.80	1			1	NA	NA	NA	NA
Vanadium		140	1		2.00E-03	0.026	5.00E-03	1.30E-04	NA	NA

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Table 22-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Youth Trespasser - East Bear Creek

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	12.0	1	1.82E-06	3.00E-04	6.06E-03	2.60E-07	1.50E+00	3.90E-07
Chromium (evaluated as Chromium VI)	71.0	1	1.08E-05	3.00E-03	3.59E-03	1.54E-06	1.50E+00	2.31E-06
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Mercury	0.0	1	0.00E+00	1.60E-04	--	0.00E+00	NA	--
Thallium	0.72	1	1.09E-07	NA	NA	1.56E-08	NA	NA
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--

Total Hazard Index	**0.010**

Potential Cancer Risk	**2.69E-06**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 22-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Youth Trespasser - East Bear Creek

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	12.0	0.03	5.45E-07	3.00E-04	1.82E-03	7.79E-08	1.50E+00	1.17E-07
Chromium (evaluated as Chromium VI)	71.0	0	0.00E+00	7.50E-05	--	0.00E+00	6.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Mercury	0.0	0	0.00E+00	1.60E-04	--	0.00E+00	NA	--
Thallium	0.72	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Vanadium	0.0	0	0.00E+00	1.30E-04	--	0.00E+00	NA	--

Total Hazard Index	0.0018

Potential Cancer Risk	1.17E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 22-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Youth Trespasser - East Bear Creek

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Aluminum	65000	1	4.92E-03	1.00E+00	4.92E-03	7.03E-04	NA	NA
Arsenic	28	1	2.12E-06	3.00E-04	7.07E-03	3.03E-07	1.50E+00	4.55E-07
Chromium (evaluated as Chromium VI)	120	1	9.09E-06	3.00E-03	3.03E-03	1.30E-06	1.50E+00	1.95E-06
Cobalt	20	1	1.52E-06	3.00E-04	5.05E-03	2.16E-07	NA	NA
Iron	67000	1	5.08E-03	7.00E-01	7.25E-03	7.25E-04	NA	NA
Manganese (water)	1300	1	9.85E-05	2.40E-02	4.10E-03	1.41E-05	NA	NA
Mercury	0.27	1	2.05E-08	1.60E-04	1.28E-04	2.92E-09	NA	NA
Thallium	1.80	1	1.36E-07	NA	NA	1.95E-08	NA	NA
Vanadium	140	1	1.06E-05	5.00E-03	2.12E-03	1.52E-06	NA	NA

Total Hazard Index	0.034

Potential Cancer Risk	2.40E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 22-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Youth Trespasser - East Bear Creek

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Inorganics								
Aluminum	65000	2.00E-03	9.85E-04	1.00E+00	9.85E-04	1.41E-04	NA	NA
Arsenic	28.0	2.00E-03	4.24E-07	3.00E-04	1.41E-03	6.06E-08	1.50E+00	9.09E-08
Chromium (evaluated as Chromium VI)	120	4.00E-03	3.64E-06	7.50E-05	4.85E-02	5.19E-07	6.00E+01	3.12E-05
Cobalt	20	8.00E-04	1.21E-07	3.00E-04	4.04E-04	1.73E-08	NA	NA
Iron	67000	2.00E-03	1.02E-03	7.00E-01	1.45E-03	1.45E-04	NA	NA
Manganese (water)	1300	2.00E-03	1.97E-05	9.60E-04	2.05E-02	2.81E-06	NA	NA
Mercury	0.27	2.00E-03	4.09E-09	1.60E-04	2.56E-05	5.84E-10	NA	NA
Thallium	1.80	0.00E+00	0.00E+00	NA	NA	0.00E+00	NA	NA
Vanadium	140	2.00E-03	2.12E-06	1.30E-04	1.63E-02	3.03E-07	NA	NA

Total Hazard Index	0.09

Potential Cancer Risk	3.13E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 22-G: Summary of Hazard Indices for the Youth Trespasser - East Bear Creek

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Inorganics					
Aluminum	--	--	4.92E-03	9.85E-04	0.0059
Arsenic	6.06E-03	1.82E-03	7.07E-03	1.41E-03	0.016
Chromium (evaluated as Chromium VI)	3.59E-03	--	3.03E-03	4.85E-02	0.055
Cobalt	--	--	5.05E-03	4.04E-04	0.0055
Iron	--	--	7.25E-03	1.45E-03	0.0087
Manganese (water)	--	--	4.10E-03	2.05E-02	0.025
Mercury	--	--	1.28E-04	2.56E-05	0.00015
Thallium	NA	NA	NA	NA	NA
Vanadium	--	--	2.12E-03	1.63E-02	0.018
Pathway Summary	0.01	0.0018	0.034	0.09	0.13

Total Blood HI =	0.0087
Total Cardiovascular HI =	0.016
Total Central Nervous System HI =	0.047
Total GI Tract HI =	0.0087
Total Kidney HI =	0.018
Total Liver HI =	0.0087
Total Not Specified HI =	0.0055
Total Respiratory HI =	0.055
Total Skin HI =	0.016
Total Vascular HI =	0.016

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 22-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Youth Trespasser - East Bear Creek
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Inorganics					
Aluminum	--	--	NA	NA	NA
Arsenic	3.90E-07	1.17E-07	4.55E-07	9.09E-08	1.05E-06
Chromium (evaluated as Chromium VI)	2.31E-06	--	1.95E-06	3.12E-05	3.54E-05
Cobalt	--	--	NA	NA	NA
Iron	--	--	NA	NA	NA
Manganese (water)	--	--	NA	NA	NA
Mercury	--	--	NA	NA	NA
Thallium	NA	NA	NA	NA	NA
Vanadium	--	--	NA	NA	NA
Pathway Summary	2.69E-06	1.17E-07	2.40E-06	3.13E-05	3.65E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 23-A: Intake Factors for the Youth Trespasser - West Bear Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

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Table 23-A: Intake Factors for the Youth Trespasser - West Bear Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

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Table 23-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Semi-Volatile Organics (TICs)										
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	0.22		1	0.14		1	NA	NA	6.50E+01	6.50E+01
PCBs										
PCB-1254	1.32		1	0.14		1	2.00E-05	2.00E-05	2.00E+00	2.00E+00
Pentachlorobiphenyl	0.12		1	0.14		1	NA	NA	1.30E+01	1.30E+01
Inorganics										
Aluminum		4000	1		2.00E-03	1	1.00E+00	1.00E+00	NA	NA
Arsenic	7.30	2.90	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as Chromium VI)	35.0	6.50	1		4.00E-03	0.025	3.00E-03	7.50E-05	1.50E+00	6.00E+01
Cobalt		2.70	1		8.00E-04	1	3.00E-04	3.00E-04	NA	NA
Iron		4400	1		2.00E-03	1	7.00E-01	7.00E-01	NA	NA
Manganese (water)		580	1		2.00E-03	0.04	2.40E-02	9.60E-04	NA	NA
Thallium	0.32		1			1	NA	NA	NA	NA
Vanadium		210	1		2.00E-03	0.026	5.00E-03	1.30E-04	NA	NA
Unknown TICs										
Unknown: Chemical Class: PAH	2.70		1	0.13		1	NA	NA	2.19E+01	2.19E+01

APPENDIX F
Table 23-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Youth Trespasser - West Bear Creek

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	0.22	1	3.33E-08	NA	NA	4.76E-09	6.50E+01	3.10E-07
PCBs								
PCB-1254	1.32	1	1.99E-07	2.00E-05	9.96E-03	2.85E-08	2.00E+00	5.69E-08
Pentachlorobiphenyl	0.12	1	1.82E-08	NA	NA	2.60E-09	1.30E+01	3.38E-08
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	7.30	1	1.11E-06	3.00E-04	3.69E-03	1.58E-07	1.50E+00	2.37E-07
Chromium (evaluated as Chromium VI)	35.0	1	5.30E-06	3.00E-03	1.77E-03	7.58E-07	1.50E+00	1.14E-06
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Thallium	0.32	1	4.85E-08	NA	NA	6.93E-09	NA	NA
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: PAH	2.70	1	4.09E-07	NA	NA	5.84E-08	2.19E+01	1.28E-06

Total Hazard Index	0.015

Potential Cancer Risk	3.05E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 23-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Youth Trespasser - West Bear Creek

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	0.22	0.14	4.67E-08	NA	NA	6.67E-09	6.50E+01	4.33E-07
PCBs								
PCB-1254	1.32	0.14	2.79E-07	2.00E-05	1.39E-02	3.98E-08	2.00E+00	7.97E-08
Pentachlorobiphenyl	0.12	0.14	2.55E-08	NA	NA	3.64E-09	1.30E+01	4.73E-08
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	7.30	0.03	3.32E-07	3.00E-04	1.11E-03	4.74E-08	1.50E+00	7.11E-08
Chromium (evaluated as Chromium VI)	35.0	0	0.00E+00	7.50E-05	--	0.00E+00	6.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Thallium	0.32	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Vanadium	0	0	0.00E+00	1.30E-04	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: PAH	2.70	0.13	5.32E-07	NA	NA	7.60E-08	2.19E+01	1.66E-06

Total Hazard Index	**0.015**

Potential Cancer Risk	**2.30E-06**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 23-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Youth Trespasser - West Bear Creek

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	0.0	1	0.00E+00	NA	--	0.00E+00	6.50E+01	--
PCBs								
PCB-1254	0.0	1	0.00E+00	2.00E-05	--	0.00E+00	2.00E+00	--
Pentachlorobiphenyl	0.0	1	0.00E+00	NA	--	0.00E+00	1.30E+01	--
Inorganics								
Aluminum	4000	1	3.03E-04	1.00E+00	3.03E-04	4.33E-05	NA	NA
Arsenic	2.90	1	2.20E-07	3.00E-04	7.32E-04	3.14E-08	1.50E+00	4.71E-08
Chromium (evaluated as Chromium VI)	6.50	1	4.92E-07	3.00E-03	1.64E-04	7.03E-08	1.50E+00	1.06E-07
Cobalt	2.70	1	2.05E-07	3.00E-04	6.82E-04	2.92E-08	NA	NA
Iron	4400	1	3.33E-04	7.00E-01	4.76E-04	4.76E-05	NA	NA
Manganese (water)	580	1	4.39E-05	2.40E-02	1.83E-03	6.28E-06	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	210	1	1.59E-05	5.00E-03	3.18E-03	2.27E-06	NA	NA
Unknown TICs								
Unknown: Chemical Class: PAH	0.0	1	0.00E+00	NA	--	0.00E+00	2.19E+01	--

Total Hazard Index	**0.0074**

Potential Cancer Risk	**1.53E-07**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 23-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Youth Trespasser - West Bear Creek

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Semi-Volatile Organics (TICs)								
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	6.50E+01	--
PCBs								
PCB-1254	0.0	0.00E+00	0.00E+00	2.00E-05	--	0.00E+00	2.00E+00	--
Pentachlorobiphenyl	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	1.30E+01	--
Inorganics								
Aluminum	4000	2.00E-03	6.06E-05	1.00E+00	6.06E-05	8.66E-06	NA	NA
Arsenic	2.90	2.00E-03	4.39E-08	3.00E-04	1.46E-04	6.28E-09	1.50E+00	9.41E-09
Chromium (evaluated as Chromium VI)	6.50	4.00E-03	1.97E-07	7.50E-05	2.63E-03	2.81E-08	6.00E+01	1.69E-06
Cobalt	2.70	8.00E-04	1.64E-08	3.00E-04	5.45E-05	2.34E-09	NA	NA
Iron	4400	2.00E-03	6.67E-05	7.00E-01	9.52E-05	9.52E-06	NA	NA
Manganese (water)	580	2.00E-03	8.79E-06	9.60E-04	9.15E-03	1.26E-06	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	210	2.00E-03	3.18E-06	1.30E-04	2.45E-02	4.55E-07	NA	NA
Unknown TICs								
Unknown: Chemical Class: PAH	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	2.19E+01	--

Total Hazard Index	**0.037**

Potential Cancer Risk	**1.70E-06**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 23-G: Summary of Hazard Indices for the Youth Trespasser - West Bear Creek

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Semi-Volatile Organics (TICs)					
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	NA	NA	--	--	NA
PCBs					
PCB-1254	9.96E-03	1.39E-02	--	--	0.024
Pentachlorobiphenyl	NA	NA	--	--	NA
Inorganics					
Aluminum	--	--	3.03E-04	6.06E-05	0.00036
Arsenic	3.69E-03	1.11E-03	7.32E-04	1.46E-04	0.0057
Chromium (evaluated as Chromium VI)	1.77E-03	--	1.64E-04	2.63E-03	0.0046
Cobalt	--	--	6.82E-04	5.45E-05	0.00074
Iron	--	--	4.76E-04	9.52E-05	0.00057
Manganese (water)	--	--	1.83E-03	9.15E-03	0.011
Thallium	NA	NA	--	--	NA
Vanadium	--	--	3.18E-03	2.45E-02	0.028
Unknown TICs					
Unknown: Chemical Class: PAH	NA	NA	--	--	NA
Pathway Summary	0.015	0.015	0.0074	0.037	0.074

Total Blood HI =	0.00057
Total Cardiovascular HI =	0.0057
Total Central Nervous System HI =	0.017
Total GI Tract HI =	0.00057
Total Immune System HI =	0.024
Total Kidney HI =	0.028
Total Liver HI =	0.00057
Total Not Specified HI =	0.00074
Total Respiratory HI =	0.0046
Total Skin HI =	0.0057
Total Vascular HI =	0.0057

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 23-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Youth Trespasser - West Bear Creek

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)					
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	3.10E-07	4.33E-07	--	--	7.43E-07
PCBs					
PCB-1254	5.69E-08	7.97E-08	--	--	1.37E-07
Pentachlorobiphenyl	3.38E-08	4.73E-08	--	--	8.10E-08
Inorganics					
Aluminum	--	--	NA	NA	NA
Arsenic	2.37E-07	7.11E-08	4.71E-08	9.41E-09	3.65E-07
Chromium (evaluated as Chromium VI)	1.14E-06	--	1.06E-07	1.69E-06	2.93E-06
Cobalt	--	--	NA	NA	NA
Iron	--	--	NA	NA	NA
Manganese (water)	--	--	NA	NA	NA
Thallium	NA	NA	--	--	NA
Vanadium	--	--	NA	NA	NA
Unknown TICs					
Unknown: Chemical Class: PAH	1.28E-06	1.66E-06	--	--	2.94E-06
Pathway Summary	3.05E-06	2.30E-06	1.53E-07	1.70E-06	7.20E-06

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 24-A: Intake Factors for the Youth Trespasser - Unnamed Tributary:
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

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Table 24-A: Intake Factors for the Youth Trespasser - Unnamed Tributary:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	24	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

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Table 24-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
PCBs										
PCB-1254	3.60		1	0.14		1	2.00E-05	2.00E-05	2.00E+00	2.00E+00
Pentachlorobiphenyl	0.23		1	0.14		1	NA	NA	1.30E+01	1.30E+01
Inorganics										
Aluminum		4800	1		2.00E-03	1	1.00E+00	1.00E+00	NA	NA
Arsenic	12.0	4.50	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as Chromium VI)	46.0	8.00	1		4.00E-03	0.025	3.00E-03	7.50E-05	1.50E+00	6.00E+01
Cobalt		3.90	1		8.00E-04	1	3.00E-04	3.00E-04	NA	NA
Iron		20000	1		2.00E-03	1	7.00E-01	7.00E-01	NA	NA
Manganese (water)		900	1		2.00E-03	0.04	2.40E-02	9.60E-04	NA	NA
Thallium	0.33		1			1	NA	NA	NA	NA
Vanadium		66.0	1		2.00E-03	0.026	5.00E-03	1.30E-04	NA	NA
Unknown TICs										
Unknown: Chemical Class: PAH	0.53		1	0.13		1	NA	NA	2.19E+01	2.19E+01

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Table 24-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Youth Trespasser - Unnamed Tributary

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
PCBs								
PCB-1254	3.60	1	5.45E-07	2.00E-05	2.73E-02	7.79E-08	2.00E+00	1.56E-07
Pentachlorobiphenyl	0.23	1	3.48E-08	NA	NA	4.98E-09	1.30E+01	6.47E-08
Inorganics								
Aluminum	0.0	1	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	12.0	1	1.82E-06	3.00E-04	6.06E-03	2.60E-07	1.50E+00	3.90E-07
Chromium (evaluated as Chromium VI)	46.0	1	6.97E-06	3.00E-03	2.32E-03	9.96E-07	1.50E+00	1.49E-06
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Thallium	0.33	1	5.00E-08	NA	NA	7.14E-09	NA	NA
Vanadium	0.0	1	0.00E+00	5.00E-03	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: PAH	0.53	1	8.03E-08	NA	NA	1.15E-08	2.19E+01	2.51E-07

Total Hazard Index	**0.036**

Potential Cancer Risk	**2.35E-06**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 24-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Youth Trespasser - Unnamed Tributary

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
PCBs								
PCB-1254	3.60	0.14	7.64E-07	2.00E-05	3.82E-02	1.09E-07	2.00E+00	2.18E-07
Pentachlorobiphenyl	0.23	0.14	4.88E-08	NA	NA	6.97E-09	1.30E+01	9.06E-08
Inorganics								
Aluminum	0.0	0	0.00E+00	1.00E+00	--	0.00E+00	NA	--
Arsenic	12.0	0.03	5.45E-07	3.00E-04	1.82E-03	7.79E-08	1.50E+00	1.17E-07
Chromium (evaluated as Chromium VI)	46.0	0	0.00E+00	7.50E-05	--	0.00E+00	6.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Thallium	0.33	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Vanadium	0.0	0	0.00E+00	1.30E-04	--	0.00E+00	NA	--
Unknown TICs								
Unknown: Chemical Class: PAH	0.53	0.13	1.04E-07	NA	NA	1.49E-08	2.19E+01	3.27E-07

Total Hazard Index	0.04

Potential Cancer Risk	7.52E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 24-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Youth Trespasser - Unnamed Tributary

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
PCBs								
PCB-1254	0.0	1	0.00E+00	2.00E-05	--	0.00E+00	2.00E+00	--
Pentachlorobiphenyl	0.0	1	0.00E+00	NA	--	0.00E+00	1.30E+01	--
Inorganics								
Aluminum	4800	1	3.64E-04	1.00E+00	3.64E-04	5.19E-05	NA	NA
Arsenic	4.50	1	3.41E-07	3.00E-04	1.14E-03	4.87E-08	1.50E+00	7.30E-08
Chromium (evaluated as Chromium VI)	8.00	1	6.06E-07	3.00E-03	2.02E-04	8.66E-08	1.50E+00	1.30E-07
Cobalt	3.90	1	2.95E-07	3.00E-04	9.85E-04	4.22E-08	NA	NA
Iron	20000	1	1.52E-03	7.00E-01	2.16E-03	2.16E-04	NA	NA
Manganese (water)	900	1	6.82E-05	2.40E-02	2.84E-03	9.74E-06	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	66.0	1	5.00E-06	5.00E-03	1.00E-03	7.14E-07	NA	NA
Unknown TICs								
Unknown: Chemical Class: PAH	0.0	1	0.00E+00	NA	--	0.00E+00	2.19E+01	--

Total Hazard Index	0.0087

Potential Cancer Risk	2.03E-07

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 24-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Youth Trespasser - Unnamed Tributary

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
PCBs								
PCB-1254	0.0	0.00E+00	0.00E+00	2.00E-05	--	0.00E+00	2.00E+00	--
Pentachlorobiphenyl	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	1.30E+01	--
Inorganics								
Aluminum	4800	2.00E-03	7.27E-05	1.00E+00	7.27E-05	1.04E-05	NA	NA
Arsenic	4.50	2.00E-03	6.82E-08	3.00E-04	2.27E-04	9.74E-09	1.50E+00	1.46E-08
Chromium (evaluated as Chromium VI)	8.00	4.00E-03	2.42E-07	7.50E-05	3.23E-03	3.46E-08	6.00E+01	2.08E-06
Cobalt	3.90	8.00E-04	2.36E-08	3.00E-04	7.88E-05	3.38E-09	NA	NA
Iron	20000	2.00E-03	3.03E-04	7.00E-01	4.33E-04	4.33E-05	NA	NA
Manganese (water)	900	2.00E-03	1.36E-05	9.60E-04	1.42E-02	1.95E-06	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Vanadium	66.0	2.00E-03	1.00E-06	1.30E-04	7.69E-03	1.43E-07	NA	NA
Unknown TICs								
Unknown: Chemical Class: PAH	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	2.19E+01	--

Total Hazard Index	0.026

Potential Cancer Risk	2.09E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 24-G: Summary of Hazard Indices for the Youth Trespasser - Unnamed Tributary

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
PCBs					
PCB-1254	2.73E-02	3.82E-02	--	--	0.065
Pentachlorobiphenyl	NA	NA	--	--	NA
Inorganics					
Aluminum	--	--	3.64E-04	7.27E-05	0.00044
Arsenic	6.06E-03	1.82E-03	1.14E-03	2.27E-04	0.0092
Chromium (evaluated as Chromium VI)	2.32E-03	--	2.02E-04	3.23E-03	0.0058
Cobalt	--	--	9.85E-04	7.88E-05	0.0011
Iron	--	--	2.16E-03	4.33E-04	0.0026
Manganese (water)	--	--	2.84E-03	1.42E-02	0.017
Thallium	NA	NA	--	--	NA
Vanadium	--	--	1.00E-03	7.69E-03	0.0087
Unknown TICs					
Unknown: Chemical Class: PAH	NA	NA	--	--	NA
Pathway Summary	0.036	0.04	0.0087	0.026	0.11

Total Blood HI =	0.0026
Total Cardiovascular HI =	0.0092
Total Central Nervous System HI =	0.027
Total GI Tract HI =	0.0026
Total Immune System HI =	0.065
Total Kidney HI =	0.0087
Total Liver HI =	0.0026
Total Not Specified HI =	0.0011
Total Respiratory HI =	0.0058
Total Skin HI =	0.0092
Total Vascular HI =	0.0092

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 24-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Youth Trespasser - Unnamed Tributary

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
PCBs					
PCB-1254	1.56E-07	2.18E-07	--	--	3.74E-07
Pentachlorobiphenyl	6.47E-08	9.06E-08	--	--	1.55E-07
Inorganics					
Aluminum	--	--	NA	NA	NA
Arsenic	3.90E-07	1.17E-07	7.30E-08	1.46E-08	5.94E-07
Chromium (evaluated as Chromium VI)	1.49E-06	--	1.30E-07	2.08E-06	3.70E-06
Cobalt	--	--	NA	NA	NA
Iron	--	--	NA	NA	NA
Manganese (water)	--	--	NA	NA	NA
Thallium	NA	NA	--	--	NA
Vanadium	--	--	NA	NA	NA
Unknown TICs					
Unknown: Chemical Class: PAH	2.51E-07	3.27E-07	--	--	5.78E-07
Pathway Summary	2.35E-06	7.52E-07	2.03E-07	2.09E-06	5.40E-06

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

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Table 25-A: Intake Factors for the Recreational Adult - Cattail Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.07	mg/cm^2
	SA	Skin Surface Area Available	5700	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days

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Table 25-A: Intake Factors for the Recreational Adult - Cattail Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	18000	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days

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Table 25-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Semi-Volatile Organics (TICs)										
Hexadecane	480		1	0.10		1	6.00E-02	6.00E-02	NA	NA
Inorganics										
Arsenic	75.0	5.90	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as chromium VI)	39.5	3.70	1		4.00E-03	0.025	3.00E-03	7.50E-05	5.00E-01	2.00E+01
Cobalt		2.60	1		8.00E-04	1	3.00E-04	3.00E-04	NA	NA
Iron		4900	1		2.00E-03	1	7.00E-01	7.00E-01	NA	NA
Manganese (water)		570	1		2.00E-03	0.04	2.40E-02	9.60E-04	NA	NA
Thallium	0.51		1			1	NA	NA	NA	NA
Unknown TICs										
Unknown; Chemical Class: PAH	0.90		1	0		1	NA	NA	7.30E+00	7.30E+00

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Table 25-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Recreational Adult - Cattail Creek

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
Hexadecane	480	1	8.45E-05	6.00E-02	1.41E-03	3.62E-05	NA	NA
Inorganics								
Arsenic	75.0	1	1.32E-05	3.00E-04	4.40E-02	5.66E-06	1.50E+00	8.49E-06
Chromium (evaluated as chromium VI)	39.5	1	6.96E-06	3.00E-03	2.32E-03	2.98E-06	5.00E-01	1.49E-06
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Thallium	0.51	1	8.98E-08	NA	NA	3.85E-08	NA	NA
Unknown TICs								
Unknown; Chemical Class: PAH	0.90	1	1.59E-07	NA	NA	6.79E-08	7.30E+00	4.96E-07

Total Hazard Index	0.048

Potential Cancer Risk	1.05E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 25-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Recreational Adult - Cattail Creek

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
Hexadecane	480	0.1	3.37E-05	6.00E-02	5.62E-04	1.45E-05	NA	NA
Inorganics								
Arsenic	75.0	0.03	1.58E-06	3.00E-04	5.27E-03	6.78E-07	1.50E+00	1.02E-06
Chromium (evaluated as chromium VI)	39.5	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Thallium	0.51	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Unknown TICs								
Unknown; Chemical Class: PAH	0.90	0.13	8.22E-08	NA	NA	3.52E-08	7.30E+00	2.57E-07

Total Hazard Index	0.0058

Potential Cancer Risk	1.27E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 25-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Recreational Adult - Cattail Creek

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
Hexadecane	0.0	1	0.00E+00	6.00E-02	--	0.00E+00	NA	--
Inorganics								
Arsenic	5.90	1	5.20E-07	3.00E-04	1.73E-03	2.23E-07	1.50E+00	3.34E-07
Chromium (evaluated as chromium VI)	3.70	1	3.26E-07	3.00E-03	1.09E-04	1.40E-07	5.00E-01	6.98E-08
Cobalt	2.60	1	2.29E-07	3.00E-04	7.63E-04	9.81E-08	NA	NA
Iron	4900	1	4.32E-04	7.00E-01	6.16E-04	1.85E-04	NA	NA
Manganese (water)	570	1	5.02E-05	2.40E-02	2.09E-03	2.15E-05	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown; Chemical Class: PAH	0.0	1	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	**0.0053**

Potential Cancer Risk	**4.04E-07**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 25-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Recreational Adult - Cattail Creek

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Semi-Volatile Organics (TICs)								
Hexadecane	0.0	0.00E+00	0.00E+00	6.00E-02	--	0.00E+00	NA	--
Inorganics								
Arsenic	5.90	2.00E-03	3.74E-07	3.00E-04	1.25E-03	1.60E-07	1.50E+00	2.40E-07
Chromium (evaluated as chromium VI)	3.70	4.00E-03	4.69E-07	7.50E-05	6.26E-03	2.01E-07	2.00E+01	4.02E-06
Cobalt	2.60	8.00E-04	6.59E-08	3.00E-04	2.20E-04	2.83E-08	NA	NA
Iron	4900	2.00E-03	3.11E-04	7.00E-01	4.44E-04	1.33E-04	NA	NA
Manganese (water)	570	2.00E-03	3.61E-05	9.60E-04	3.76E-02	1.55E-05	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown; Chemical Class: PAH	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	7.30E+00	--

Total Hazard Index	0.046

Potential Cancer Risk	4.26E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 25-G: Summary of Hazard Indices for the Recreational Adult - Cattail Creek

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Semi-Volatile Organics (TICs)					
Hexadecane	1.41E-03	5.62E-04	--	--	0.002
Inorganics					
Arsenic	4.40E-02	5.27E-03	1.73E-03	1.25E-03	0.052
Chromium (evaluated as chromium VI)	2.32E-03	--	1.09E-04	6.26E-03	0.0087
Cobalt	--	--	7.63E-04	2.20E-04	0.00098
Iron	--	--	6.16E-04	4.44E-04	0.0011
Manganese (water)	--	--	2.09E-03	3.76E-02	0.040
Thallium	NA	NA	--	--	NA
Unknown TICs					
Unknown; Chemical Class: PAH	NA	NA	--	--	NA
Pathway Summary	0.048	0.0058	0.0053	0.046	0.10

Total Blood HI =	0.0011
Total Cardiovascular HI =	0.052
Total Central Nervous System HI =	0.094
Total GI Tract HI =	0.0011
Total Liver HI =	0.0011
Total Nasal Epithelium HI =	0.002
Total Not Specified HI =	0.0010
Total Respiratory HI =	0.0087
Total Skin HI =	0.052
Total Testes HI =	0.002
Total Vascular HI =	0.052

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 25-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Recreational Adult - Cattail Creek
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)					
Hexadecane	NA	NA	--	--	NA
Inorganics					
Arsenic	8.49E-06	1.02E-06	3.34E-07	2.40E-07	1.01E-05
Chromium (evaluated as chromium VI)	1.49E-06	--	6.98E-08	4.02E-06	5.58E-06
Cobalt	--	--	NA	NA	NA
Iron	--	--	NA	NA	NA
Manganese (water)	--	--	NA	NA	NA
Thallium	NA	NA	--	--	NA
Unknown TICs					
Unknown; Chemical Class: PAH	4.96E-07	2.57E-07	--	--	7.53E-07
Pathway Summary	1.05E-05	1.27E-06	4.04E-07	4.26E-06	1.64E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 26-A: Intake Factors for the Recreational Youth - Bailey Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

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Table 26-A: Intake Factors for the Recreational Youth - Bailey Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	13200	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

APPENDIX F

Table 26-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Semi-Volatile Organics (TICs)										
Hexadecane	480		1	0.10		1	6.00E-02	6.00E-02	NA	NA
Inorganics										
Arsenic	75.0	5.90	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as chromium VI)	39.5	3.70	1		4.00E-03	0.025	3.00E-03	7.50E-05	1.50E+00	6.00E+01
Cobalt		2.60	1		8.00E-04	1	3.00E-04	3.00E-04	NA	NA
Iron		4900	1		2.00E-03	1	7.00E-01	7.00E-01	NA	NA
Manganese (water)		570	1		2.00E-03	0.04	2.40E-02	9.60E-04	NA	NA
Thallium	0.51		1			1	NA	NA	NA	NA
Unknown TICs										
Unknown; Chemical Class: PAH	0.90		1	0.13		1	NA	NA	2.19E+01	2.19E+01

APPENDIX F
Table 26-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Recreational Youth - Bailey Creek

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
Hexadecane	480	1	1.36E-04	6.00E-02	2.27E-03	1.95E-05	NA	NA
Inorganics								
Arsenic	75.0	1	2.13E-05	3.00E-04	7.10E-02	3.04E-06	1.50E+00	4.57E-06
Chromium (evaluated as chromium VI)	39.5	1	1.12E-05	3.00E-03	3.74E-03	1.60E-06	1.50E+00	2.40E-06
Cobalt	0.0	1	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Thallium	0.51	1	1.45E-07	NA	NA	2.07E-08	NA	NA
Unknown TICs								
Unknown; Chemical Class: PAH	0.90	1	2.56E-07	NA	NA	3.65E-08	2.19E+01	8.00E-07

Total Hazard Index	0.077

Potential Cancer Risk	7.77E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 26-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Recreational Youth - Bailey Creek

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
Hexadecane	480	0.1	1.36E-04	6.00E-02	2.27E-03	1.95E-05	NA	NA
Inorganics								
Arsenic	75.0	0.03	6.39E-06	3.00E-04	2.13E-02	9.13E-07	1.50E+00	1.37E-06
Chromium (evaluated as chromium VI)	39.5	0	0.00E+00	7.50E-05	--	0.00E+00	6.00E+01	--
Cobalt	0.0	0	0.00E+00	3.00E-04	--	0.00E+00	NA	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Thallium	0.51	0	0.00E+00	NA	NA	0.00E+00	NA	NA
Unknown TICs								
Unknown; Chemical Class: PAH	0.90	0.13	3.32E-07	NA	NA	4.75E-08	2.19E+01	1.04E-06

Total Hazard Index	0.024

Potential Cancer Risk	2.41E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 26-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Recreational Youth - Bailey Creek

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Semi-Volatile Organics (TICs)								
Hexadecane	0.0	1	0.00E+00	6.00E-02	--	0.00E+00	NA	--
Inorganics								
Arsenic	5.90	1	8.38E-07	3.00E-04	2.79E-03	1.20E-07	1.50E+00	1.80E-07
Chromium (evaluated as chromium VI)	3.70	1	5.26E-07	3.00E-03	1.75E-04	7.51E-08	1.50E+00	1.13E-07
Cobalt	2.60	1	3.69E-07	3.00E-04	1.23E-03	5.28E-08	NA	NA
Iron	4900	1	6.96E-04	7.00E-01	9.94E-04	9.94E-05	NA	NA
Manganese (water)	570	1	8.10E-05	2.40E-02	3.37E-03	1.16E-05	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown; Chemical Class: PAH	0.0	1	0.00E+00	NA	--	0.00E+00	2.19E+01	--

Total Hazard Index	**0.0086**

Potential Cancer Risk	**2.92E-07**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 26-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Recreational Youth - Bailey Creek

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Semi-Volatile Organics (TICs)								
Hexadecane	0.0	0.00E+00	0.00E+00	6.00E-02	--	0.00E+00	NA	--
Inorganics								
Arsenic	5.9	2.00E-03	4.42E-07	3.00E-04	1.47E-03	6.32E-08	1.50E+00	9.48E-08
Chromium (evaluated as chromium VI)	3.7	4.00E-03	5.55E-07	7.50E-05	7.40E-03	7.93E-08	6.00E+01	4.76E-06
Cobalt	3	8.00E-04	7.80E-08	3.00E-04	2.60E-04	1.11E-08	NA	NA
Iron	4900.0	2.00E-03	3.67E-04	7.00E-01	5.25E-04	5.25E-05	NA	NA
Manganese (water)	570	2.00E-03	4.27E-05	9.60E-04	4.45E-02	6.11E-06	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--
Unknown TICs								
Unknown; Chemical Class: PAH	0	0.00E+00	0.00E+00	NA	--	0.00E+00	2.19E+01	--

Total Hazard Index	**0.054**

Potential Cancer Risk	**4.85E-06**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 26-G: Summary of Hazard Indices for the Recreational Youth - Bailey Creek
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Semi-Volatile Organics (TICs)					
Hexadecane	2.27E-03	2.27E-03	--	--	0.0045
Inorganics					
Arsenic	7.10E-02	2.13E-02	2.79E-03	1.47E-03	0.097
Chromium (evaluated as chromium VI)	3.74E-03	--	1.75E-04	7.40E-03	0.011
Cobalt	--	--	1.23E-03	2.60E-04	0.0015
Iron	--	--	9.94E-04	5.25E-04	0.0015
Manganese (water)	--	--	3.37E-03	4.45E-02	0.048
Thallium	NA	NA	--	--	NA
Unknown TICs					
Unknown; Chemical Class: PAH	NA	NA	--	--	NA
Pathway Summary	0.077	0.024	0.0086	0.054	0.16

Total Blood HI =	0.0015
Total Cardiovascular HI =	0.097
Total Central Nervous System HI =	0.15
Total GI Tract HI =	0.0015
Total Liver HI =	0.0015
Total Nasal Epithelium HI =	0.0045
Total Not Specified HI =	0.0015
Total Respiratory HI =	0.011
Total Skin HI =	0.097
Total Testes HI =	0.0045
Total Vascular HI =	0.097

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 26-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Recreational Youth - Bailey Creek
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Semi-Volatile Organics (TICs)					
Hexadecane	NA	NA	--	--	NA
Inorganics					
Arsenic	4.57E-06	1.37E-06	1.80E-07	9.48E-08	6.21E-06
Chromium (evaluated as chromium VI)	2.40E-06	--	1.13E-07	4.76E-06	7.27E-06
Cobalt	--	--	NA	NA	NA
Iron	--	--	NA	NA	NA
Manganese (water)	--	--	NA	NA	NA
Thallium	NA	NA	--	--	NA
Unknown TICs					
Unknown; Chemical Class: PAH	8.00E-07	1.04E-06	--	--	1.84E-06
Pathway Summary	7.77E-06	2.41E-06	2.92E-07	4.85E-06	1.53E-05

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 27-A: Intake Factors for the Recreational Adult - Bailey Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.07	mg/cm^2
	SA	Skin Surface Area Available	5700	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days

APPENDIX F

Table 27-A: Intake Factors for the Recreational Adult - Bailey Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	18000	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	30	years
	BW	Body Weight	70	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	10950	days

APPENDIX F

Table 27-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Inorganics										
Arsenic	4.80	1.50	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as chromium VI)	34		1		4.00E-03	0.025	3.00E-03	7.50E-05	5.00E-01	2.00E+01
Iron		3300	1		2.00E-03	1	7.00E-01	7.00E-01	NA	NA
Manganese (water)		160	1		2.00E-03	0.04	2.40E-02	9.60E-04	NA	NA
Thallium	0.39		1			1	NA	NA	NA	NA

APPENDIX F
Table 27-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Recreational Adult - Bailey Creek

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.80	1	8.45E-07	3.00E-04	2.82E-03	3.62E-07	1.50E+00	5.43E-07
Chromium (evaluated as chromium VI)	34.0	1	5.99E-06	3.00E-03	2.00E-03	2.57E-06	5.00E-01	1.28E-06
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Thallium	0.39	1	6.87E-08	NA	NA	2.94E-08	NA	NA

Total Hazard Index	0.0048

Potential Cancer Risk	1.83E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 27-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Recreational Adult - Bailey Creek

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.80	0.03	1.01E-07	3.00E-04	3.37E-04	4.34E-08	1.50E+00	6.51E-08
Chromium (evaluated as chromium VI)	34.0	0	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Thallium	0.39	0	0.00E+00	NA	NA	0.00E+00	NA	NA

Total Hazard Index	0.00034

Potential Cancer Risk	6.51E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 27-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Recreational Adult - Bailey Creek

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	1.50	1	1.32E-07	3.00E-04	4.40E-04	5.66E-08	1.50E+00	8.49E-08
Chromium (evaluated as chromium VI)	0.00	1	0.00E+00	3.00E-03	--	0.00E+00	5.00E-01	--
Iron	3300	1	2.91E-04	7.00E-01	4.15E-04	1.25E-04	NA	NA
Manganese (water)	160	1	1.41E-05	2.40E-02	5.87E-04	6.04E-06	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.0014

Potential Cancer Risk	8.49E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 27-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Recreational Adult - Bailey Creek

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg-d)^{-1}$	Potential Risk
Inorganics								
Arsenic	1.50	2.00E-03	9.51E-08	3.00E-04	3.17E-04	4.08E-08	1.50E+00	6.11E-08
Chromium (evaluated as chromium VI)	0.00	4.00E-03	0.00E+00	7.50E-05	--	0.00E+00	2.00E+01	--
Iron	3300	2.00E-03	2.09E-04	7.00E-01	2.99E-04	8.97E-05	NA	NA
Manganese (water)	160	2.00E-03	1.01E-05	9.60E-04	1.06E-02	4.35E-06	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.011

Potential Cancer Risk	6.11E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 27-G: Summary of Hazard Indices for the Recreational Adult - Bailey Creek

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Inorganics					
Arsenic	2.82E-03	3.37E-04	4.40E-04	3.17E-04	0.0039
Chromium (evaluated as chromium VI)	2.00E-03	--	--	--	0.002
Iron	--	--	4.15E-04	2.99E-04	0.00071
Manganese (water)	--	--	5.87E-04	1.06E-02	0.011
Thallium	NA	NA	--	--	NA
Pathway Summary	0.0048	0.00034	0.0014	0.011	0.018

Total Blood HI =	0.00071
Total Cardiovascular HI =	0.0039
Total Central Nervous System HI =	0.015
Total GI Tract HI =	0.00071
Total Liver HI =	0.00071
Total Respiratory HI =	0.002
Total Skin HI =	0.0039
Total Vascular HI =	0.0039

Notes:

-- = Constituent is not a COI for this medium or exposure pathway.

NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 27-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Recreational Adult - Bailey Creek
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Inorganics					
Arsenic	5.43E-07	6.51E-08	8.49E-08	6.11E-08	7.55E-07
Chromium (evaluated as chromium VI)	1.28E-06	--	--	--	1.28E-06
Iron	--	--	NA	NA	NA
Manganese (water)	--	--	NA	NA	NA
Thallium	NA	NA	--	--	NA
Vanadium	--	--	--	--	NA
Pathway Summary	1.83E-06	6.51E-08	8.49E-08	6.11E-08	2.04E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 28-A: Intake Factors for the Recreational Youth - Bailey Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Sediment Ingestion				
	CF	Conversion Factor	1.00E-06	kg/mg
	IRs	Ingestion Rate - Soil	100	mg/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Sediment				
	CF	Conversion Factor	1.00E-06	kg/mg
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2
	SA	Skin Surface Area Available	5000	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

APPENDIX F

Table 28-A: Intake Factors for the Recreational Youth - Bailey Creek:
Hercules Incorporated Facility - Hopewell, Virginia

Ingestion of Surface Water				
	IRw	Ingestion Rate - Water	0.05	L/day
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	CF	Conversion Factor	0.001	mg/µg
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days
Dermal Contact with Surface Water				
	CF1	Conversion Factor 1	1.00E-03	mg/µg
	CF2	Conversion Factor 2	0.001	L/cm^3
	SA	Skin Surface Area Available	13200	cm^2
	EF	Exposure Frequency	45	days/yr
	ED	Exposure Duration	10	years
	BW	Body Weight	43.4	kg
	ATc	Averaging Time (Cancer)	25550	days
	ATn	Averaging Time (Non-cancer)	3650	days

APPENDIX F

Table 28-B: Constituent-Specific Factors - Hercules Incorporated Facility - Hopewell, Virginia

Constituent	EPC Sediment (mg/kg)	EPC Surface Water (µg/L)	Oral AF (unitless)	Dermal AF (unitless)	DA_{event} (mg/cm^2-day)	Frac Abs (unitless)	RfDo - C (mg/kg-day)	RfDd - C (mg/kg-day)	CSFo $(mg/kg\text{-}day)^{-1}$	CSFd $(mg/kg\text{-}day)^{-1}$
Inorganics										
Arsenic	4.80	1.50	1	0.03	2.00E-03	1	3.00E-04	3.00E-04	1.50E+00	1.50E+00
Chromium (evaluated as chromium VI)	34.0		1		4.00E-03	0.025	3.00E-03	7.50E-05	1.50E+00	6.00E+01
Iron		3300	1		2.00E-03	1	7.00E-01	7.00E-01	NA	NA
Manganese (water)		160	1		2.00E-03	0.04	2.40E-02	9.60E-04	NA	NA
Thallium	0.39		1			1	NA	NA	NA	NA

APPENDIX F
Table 28-C: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Sediment Ingestion - Recreational Youth - Bailey Creek

Constituent	Sediment EPC (mg/kg)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.80	1	1.36E-06	3.00E-04	4.55E-03	1.95E-07	1.50E+00	2.92E-07
Chromium (evaluated as chromium VI)	34.0	1	9.66E-06	3.00E-03	3.22E-03	1.38E-06	1.50E+00	2.07E-06
Iron	0.0	1	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	1	0.00E+00	2.40E-02	--	0.00E+00	NA	--
Thallium	0.39	1	1.11E-07	NA	NA	1.58E-08	NA	NA

Total Hazard Index	0.0078

Potential Cancer Risk	2.36E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 28-D: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Sediment - Recreational Youth - Bailey Creek

Constituent	Sediment EPC (mg/kg)	Dermal AF (unitless)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	4.80	0.03	4.09E-07	3.00E-04	1.36E-03	5.84E-08	1.50E+00	8.77E-08
Chromium (evaluated as chromium VI)	34.0	0	0.00E+00	7.50E-05	--	0.00E+00	6.00E+01	--
Iron	0.0	0	0.00E+00	7.00E-01	--	0.00E+00	NA	--
Manganese (water)	0.0	0	0.00E+00	9.60E-04	--	0.00E+00	NA	--
Thallium	0.39	0	0.00E+00	NA	NA	0.00E+00	NA	NA

Total Hazard Index	0.0014

Potential Cancer Risk	8.77E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 28-E: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Incidental Ingestion of Surface Water - Recreational Youth - Bailey Creek

Constituent	Surface Water EPC (µg/L)	Oral AF (unitless)	Intake (ADD) (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFo $(mg/kg\text{-}d)^{-1}$	Potential Cancer Risk
Inorganics								
Arsenic	1.50	1	2.13E-07	3.00E-04	7.10E-04	3.04E-08	1.50E+00	4.57E-08
Chromium (evaluated as chromium VI)	0.0	1	0.00E+00	3.00E-03	--	0.00E+00	1.50E+00	--
Iron	3300	1	4.69E-04	7.00E-01	6.70E-04	6.70E-05	NA	NA
Manganese (water)	160	1	2.27E-05	2.40E-02	9.47E-04	3.25E-06	NA	NA
Thallium	0.0	1	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	0.0023

Potential Cancer Risk	4.57E-08

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F
Table 28-F: Hazard Indices and Theoretical Excess Lifetime Cancer Risks
Dermal Contact with Surface Water - Recreational Youth - Bailey Creek

Constituent	Surface Water EPC (µg/L)	DA_{event} (mg/cm^2-day)	Intake (ADD) (mg/kg-d)	RfDd (mg/kg-d)	Hazard Quotient	Intake (LADD) (mg/kg-d)	CSFd $(mg/kg\text{-}d)^{-1}$	Potential Risk
Inorganics								
Arsenic	1.50	2.00E-03	1.12E-07	3.00E-04	3.75E-04	1.61E-08	1.50E+00	2.41E-08
Chromium (evaluated as chromium VI)	0.0	4.00E-03	0.00E+00	7.50E-05	--	0.00E+00	6.00E+01	--
Iron	3300	2.00E-03	2.47E-04	7.00E-01	3.54E-04	3.54E-05	NA	NA
Manganese (water)	160	2.00E-03	1.20E-05	9.60E-04	1.25E-02	1.71E-06	NA	NA
Thallium	0.0	0.00E+00	0.00E+00	NA	--	0.00E+00	NA	--

Total Hazard Index	**0.013**

Potential Cancer Risk	**2.41E-08**

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 28-G: Summary of Hazard Indices for the Recreational Youth - Bailey Creek

Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Total Hazard Index
Inorganics					
Arsenic	4.55E-03	1.36E-03	7.10E-04	3.75E-04	0.007
Chromium (evaluated as chromium VI)	3.22E-03	--	--	--	0.0032
Iron	--	--	6.70E-04	3.54E-04	0.001
Manganese (water)	--	--	9.47E-04	1.25E-02	0.013
Thallium	NA	NA	--	--	NA
Pathway Summary	0.0078	0.0014	0.0023	0.013	0.025

Total Blood HI =	0.001
Total Cardiovascular HI =	0.007
Total Central Nervous System HI =	0.020
Total GI Tract HI =	0.001
Total Liver HI =	0.001
Total Respiratory HI =	0.0032
Total Skin HI =	0.007
Total Vascular HI =	0.007

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.

APPENDIX F

Table 28-H: Summary of Theoretical Excess Lifetime Cancer Risks for the Recreational Youth - Bailey Creek
Hercules Incorporated Facility - Hopewell, Virginia

Constituent	Incidental Ingestion of Sediment	Dermal Contact with Sediment	Incidental Ingestion of Surface Water	Dermal Contact with Surface Water	Theoretical Excess Lifetime Cancer Risk
Inorganics					
Arsenic	2.92E-07	8.77E-08	4.57E-08	2.41E-08	4.50E-07
Chromium (evaluated as chromium VI)	2.07E-06	--	--	--	2.07E-06
Iron	--	--	NA	NA	NA
Manganese (water)	--	--	NA	NA	NA
Thallium	NA	NA	--	--	NA
Pathway Summary	2.36E-06	8.77E-08	4.57E-08	2.41E-08	2.52E-06

Notes:
-- = Constituent is not a COI for this medium or exposure pathway.
NA = Toxicity values are not available for this endpoint or exposure pathway.