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Expanded Remedial Investigation Report for Site 2

St. Juliens Creek Annex
Chesapeake, Virginia

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Executive Summary

This report presents the activities, results, and conclusions of the Expanded Remedial Investigation (RI) conducted between 2003 and 2007 at Installation Restoration (IR) Site 2 at St. Juliens Creek Annex (SJCA) in Chesapeake, Virginia. This report also incorporates and summarizes the results from the RI conducted between 1997 and 2001 to present a comprehensive conceptual site model and risk evaluation.

Site Description and History

Site 2 is a former waste disposal area covering approximately 5.7 acres at the corner of St. Juliens Road and Cradock Street, in the southern portion of the SJCA. In earlier documents, Site 2 was referred to as "Dump B" or "Landfill B." Operations at Site 2 began in 1921 and continued until sometime after 1947. Initially, refuse was burned openly onsite and was used to fill in the adjacent swampy area (Site 2 inlet). In 1942, an incinerator was installed to replace the open burning practices. Mixed municipal wastes, abrasive blast media (ABM), waste ordnance, organics (including solvents), and inorganics were reportedly disposed of at Site 2. The total volume of waste accumulated prior to burning was estimated to be 35,000 cubic yards (yd^3).

Former Buildings 278/279, located just north of and adjacent to the Site 2 inlet, were designated as former IR Site 17. Lead-acid battery maintenance reportedly began at Building 279 in 1954 and the waste acid electrolyte was collected and hauled offsite for disposal. Two 55-gallon drums of PD-680, a commercial degreaser, were observed stored on the concrete storage pad located just outside of Building 279, which had a release onto nearby soil (A. T. Kearney, 1989). Buildings 278/279 were demolished in 2003 but the concrete foundation remains in place. Ordnance wastewaters and rinse waters were reportedly discharged into the inlet in the vicinity of former Buildings 130 and 257 (NEESA, 1981). In 1989, the site was used to store heavy equipment and machinery. Construction debris (concrete, brick, and wood), as well as ABM, are visible on the ground surface.

Four former revetted aboveground storage tanks (ASTs) (removed between 1986 and 1990) and one underground storage tank (UST) were located east of Site 2. Fuel oil and diesel may have been stored in this area. The Site 2 inlet has historically received discharges from vehicle and equipment wash racks and ordnance degreasing operations, located north of Site 2. Upgradient buildings were historically used as machine, vehicle, and locomotive maintenance shops; electrical shops; and munitions loading facilities.

Currently, the site is bounded to the north by a parking lot, to the east by a grass-covered field, to the west by a storm water drainage ditch and Cradock Street, and to the south by St. Juliens Road and St. Juliens Creek. A water body surrounded by brush, trees, and grass that is directly connected to St. Juliens Creek through a 36-inch culvert is located in the center of Site 2. This inlet is tidally influenced and drains surface water from adjoining land into the creek. Grassed drainage ditches (approximately 2 to 3 feet [ft] deep) originate north of Site 2 along Cradock Street and discharge storm water runoff to the inlet. An underground storm

drainage system originates approximately 1,000 ft northeast of the Site 2 area, within IR Site 21, and also outlets to the northernmost culvert to the inlet.

Several investigations have been conducted at Site 2 and at Site 17, which is now included within the Site 2 boundary. These investigations identified potential contamination from constituents detected in waste, surface and subsurface soil, shallow and deep groundwater, sediment, and surface water.

Field Investigation Activities

The primary objective of the Expanded RI was to further define the nature and extent of contamination and re-evaluate potential human health and ecological risk at Site 2.

The following field activities were implemented:

- Waste delineation in the parking lot and wetland areas
- Membrane interface probe (MIP) investigation
- Temporary and permanent monitoring well installation
- Shallow and deep groundwater, subsurface soil, surface water, sediment, sediment pore water, and storm water sampling and analysis
- Aquifer testing

Hydrogeologic Characteristics

The relevant hydrostratigraphic units are the Columbia aquifer (water table aquifer), the underlying Yorktown confining unit, and the Upper Yorktown aquifer. The Columbia aquifer begins at 3 to 7 ft bgs and extends to approximately 15 to 25 ft bgs and is approximately 15 ft thick. The aquifer consists predominantly of silty, fine to coarse sands with some clay. The Yorktown confining unit separating the aquifers is approximately 30-ft thick on average. This unit consists of a series of interbedded clay and fine sand layers overlying a thick (e.g., greater than 10 ft) clay layer. The Upper Yorktown aquifer is a predominately sandy unit typically encountered at an average depth of 50 ft bgs.

Data collected during previous investigations indicate the following hydrogeologic characteristics:

- Depth to groundwater (Columbia aquifer) is expected to range seasonally between 3 and 7 ft bgs. The water table gradient is relatively flat (0.007 to 0.02 feet per foot [ft/ft]) with groundwater flow radially towards the surface water at the center of Site 2. The average horizontal groundwater flow rate for the Columbia aquifer was estimated to be about 3 feet per day (ft/day)
- The shallow groundwater system discharges into the low-lying swampy area and inlet located in the middle of Site 2, and to St. Juliens Creek. Groundwater may also discharge to the nearby drainage ditches during extremely high water-table conditions

- Hydraulic head differences between the Columbia aquifer and Upper Yorktown aquifer indicate vertical groundwater flow potential is generally upward from the Upper Yorktown aquifer to the Columbia aquifer. Vertical gradients range from 0.002 to 0.047 ft/ft. The rate of vertical seepage across the Yorktown confining unit was not estimated
- Horizontal groundwater flow gradient in the Upper Yorktown aquifer is relatively flat (0.002 to 0.003 ft/ft) with groundwater flow and discharge towards St. Juliens Creek

Nature and Extent of Contamination

Extent of Waste

The extent of waste covers approximately 3.9 acres. It is as thick as 10 to 11 ft in some locations and is present within the unsaturated zone and the saturated zone. Subsurface waste consists of ABM, burnt/stained soil, concrete, asphalt, brick, metal, glass, wood, solvents, and MEC-related scrap.

Soil

Constituents in surface and subsurface soil reflective of potential impacts from Site 2 were inorganics, polycyclic aromatic hydrocarbons (PAHs), pesticides, and dioxin. The inorganics in soil most indicative of site-related activities were characterized by samples located within the extent of waste and included; aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc. The highest concentrations of these inorganics were generally limited to the ABM waste areas; therefore, the waste is considered the source for this contamination. However, some inorganics may be naturally elevated in the subsurface. In surface soil, PAHs and pesticides were found at elevated concentrations across the site with no definitive pattern, suggesting that pesticides may have been applied historically across the site and PAHs may be the result of non-site-related activities (i.e. asphalt on road). In surface soil the polychlorinated biphenyl (PCB) aroclor-1260 was significantly elevated in the northern portion of the site, within the area of former Site 17. In subsurface soil, the pesticide 4,4'- dichlorodiphenyltrichloroethane (DDT) was significantly elevated at one location near the southeast corner of former Building 130. The former incinerator was located at this former building and pesticides may have been applied around equipment located in this area. Elevated PAHs were found in subsurface soil in a localized area adjacent to Cradock Street at SJS02-SB03 and SJS02-SB11; both are located within the extent of waste. Dioxin and total petroleum hydrocarbons (TPH) were limited to subsurface soil samples located in the northern extent of waste.

Shallow Groundwater

In shallow groundwater (Columbia aquifer), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, explosives, and inorganics have been detected. TCE and its breakdown products are the predominant VOCs detected in shallow groundwater and extend from the suspected release area near SJS02-MW10S to near St. Juliens Creek (SJS02-MW16). SVOCs were primarily detected in wells located in the west-northwest portion of the site, generally near the paved parking lot and Cradock Street. The source of VOCs in groundwater is likely a combination of buried waste near former storage

activities at former Building 257, and potential degreasing activities at former Buildings 278/279 and storm water and sewer influx from upgradient of Site 2. Pesticides were detected in shallow monitoring wells located along the site boundary and outside of the site boundary. Therefore, their presence is most likely related to application of pesticides across the site historically. Explosives were detected in shallow groundwater at monitoring well SJS02-MW10S. Inorganics were reported in almost all shallow monitoring wells above background values; since elevated concentrations were reported in the background well, some inorganics are most likely naturally occurring. Only three inorganics exceeded their respective maximum contaminant limit (MCL) or action level in the shallow groundwater; arsenic, lead, and thallium, all of which were detected sporadically. Additionally, only arsenic exceeded its MCL and background upper tolerance limit (UTL) at the well adjacent to the petroleum impacted area. The presence of arsenic in this location may be the result of reducing conditions created by the degradation of petroleum compounds. The highest concentrations of inorganics in general were reported in SJS02-MW02S, located adjacent to St. Juliens Creek. Concentrations in this well are likely influenced by the brackish tidal water flux and migration of groundwater under reducing conditions into this area.

Deep Groundwater

In deep groundwater (Yorktown aquifer), VOCs, SVOCs, pesticides, and inorganics have been detected. However, concentrations of VOCs are currently below their respective MCLs. SVOCs were estimated at very low concentrations. Based on the results of an aquifer test and numerous sampling events, the presence of VOCs and SVOCs in monitoring well SJS02-MW10D was the result of contamination being carried down during its installation. Pesticides were observed at very low levels in this well and in the eastern portion of the site. Inorganics were detected in all deep groundwater samples including the upgradient well, although all concentrations were below the MCLs. Therefore, inorganics in deep groundwater are most likely naturally occurring and not related to site activities.

Surface Water

In surface water, VOCs, SVOCs, inorganics, one pesticide, and one explosive were detected. VOC concentrations were highest at the upstream drainage outfall locations and decreased downstream, and all concentrations were below the Virginia Groundwater Quality Standards for Human Health. This suggests that the presence of VOCs in surface water is attributed to activities at former Building 278/279 or from drainage of storm water, sewer water, and runoff from the upgradient industrial area (Site 21) to the tidal inlet. Chlorinated VOCs (CVOCs) were the most frequent and highest concentration compounds detected. Only two SVOCs (benzaldehyde and bis[2-ethylhexyl]phthalate) were detected in the Site 2 surface water samples and only bis(2-ethylhexyl)phthalate exceeded the Virginia Water Quality Standard for Human Health at one location. The SVOCs were detected within the southern portion of the tidal inlet. 4,4′-dichlorodiphenyldichloroethane (DDD) was detected in samples inside the tidal inlet and exceeded the Virginia Water Quality Standards for Human Health at several locations. The source of these contaminants may be the transport of impacted sediment or soil from waste areas, since pesticides and SVOCs tend to sorb to these matrices. 3-nitrotoluene was reported in surface water samples located inside the central portion of the tidal inlet with the highest concentrations adjacent to the western drainage culvert. Inorganics were detected and exceeded Virginia Water Quality Standards

for Aquatic Life in samples collected across the inlet. The samples with the highest concentrations are the most downstream locations. The high inorganic concentrations in these samples are likely due to their proximity to St. Juliens Creek, a brackish water body.

Sediment

VOCs, SVOCs, pesticides, dioxins and furans, and inorganics were detected in the Site 2 sediment. The highest concentrations of VOCs were detected at SJS02-SD21, located in the western drainage ditch just south of the groundwater hot spot near MW10S. The highest SVOC concentrations were detected in sediment collected from SJS02-SD25, located near the center of the tidal inlet. Pesticides in sediment were at the highest concentrations to the southwest of former Building 130 and within the drainage ditch running along the east side of Cradock Street, suggesting historical pesticide application adjacent to the former building and along the edge of the road. Elevated dioxins and furans, and inorganics were found across the tidal inlet. The highest concentrations of inorganics occurred within the central portion of the Site 2 inlet; therefore, the source of these chemicals is likely the waste. Only a few inorganics, pesticides, and bis(2-ethylhexyl)phthalate were reported in the outfall transect sediment samples at concentrations above the background UTLs and with the exception of and bis(2-ethylhexyl)phthalate, these concentrations were significantly lower than the inlet sediment. Although Site 2 is potentially contributing, or has historically contributed, chemicals to St. Juliens Creek via tidal influx through the low-flow culvert, significant site-related effects are only indicated in a localized area directly at the outfall location.

Contaminant Fate and Transport

The primary contaminant release mechanism is attributed to the waste material placed over approximately 3.9 acres of the site. Since the disposal area was unlined and extends below the water table, CVOCs from solvents and other disposal materials were in direct contact with natural soil and groundwater if any leaching occurred or waste packaging was breached. Additional releases may have occurred as spills onto the ground surface during operational activities at the site. If CVOCs were released as free phase product, this could have migrated vertically downward, becoming trapped as residual dense non-aqueous phase liquid (DNAPL) in soil pore spaces, providing a secondary source of contamination to groundwater. Pesticides have been used base-wide historically. Grassed drainage ditches originate north of Site 2 along Cradock Street and discharge storm water runoff to the inlet. An underground storm drainage system originates approximately 1,000 ft northeast of the Site 2 area, within IR Site 21, and also outlets to the northernmost culvert to the inlet.

The principal mechanisms for constituent transport are from surface water runoff and erosion resulting in potential leaching and dissolution of constituents from soil, as well as physical transport to the inlet and St. Juliens Creek, where suspended particulates may settle to sediment.

The current primary migration pathways of representative contaminants in the site media from the primary release points at Site 2 are:

- Dissolved contaminant migration downgradient with groundwater flow (advection), additionally resulting in migration to residual pore space
- Back diffusion or dissolution of DNAPL sorbed or trapped in the residual pore space at the top of the Yorktown confining unit into shallow groundwater
- Surface water runoff erosion of metals, SVOCs, pesticides, and PCBs in surface soil and deposition as sediment
- Leaching of metals from surface soil and sediment into surface water
- Leaching of metals from buried wastes into groundwater; however, some inorganics are naturally elevated based on concentrations reported in the upgradient well
- Groundwater discharge to the leaking storm sewer system and to the south toward St. Juliens Creek

There is evidence that CVOCs in groundwater are biodegrading under reductive dechlorination. Concentrations of parent product (TCE) and daughter products (cis-1,2-di-chloroethene [DCE] and vinyl chloride [VC]), as well as natural attenuation indicator parameters (ethane) appear to indicate that reductive dechlorination is occurring at the site.

Simple remediation timeframe modeling for Site 2 indicated that it would take approximately 70 to over 200 years for CVOCs in the groundwater source area to attenuate to the MCLs. TCE is predicted to be the most extensive plume and may continue to migrate slightly beyond downgradient well SJS02-MW16S. The plume is estimated to reach steady-state between 14 and 50 years on average.

Baseline Human Health Risk Assessment

The baseline risk assessment was conducted to evaluate the potential human health risks associated with current and hypothetical future receptors and exposure scenarios if no remedial action is implemented for soil, groundwater, surface water and sediment. The receptors and exposure pathways evaluated quantitatively were:

- **Current Scenarios**
  - **Trespasser (adult and adolescent):** incidental ingestion of and dermal contact with surface soil, inhalation of fugitive dust from surface soil; incidental ingestion and dermal contact with sediment and surface water through wading
  - **Landscaper (adult):** incidental ingestion of and dermal contact with surface soil, inhalation of fugitive dust from surface soil
- **Future Scenarios**
  - **Resident (adult):** ingestion of and dermal contact with shallow or deep groundwater, and inhalation of volatiles from shallow or deep groundwater while showering; incidental ingestion of and dermal contact with soil (surface and

subsurface soil combined), inhalation of fugitive dust from soil; dermal contact with surface water through wading; and incidental ingestion of and dermal contact with sediment through wading

- **Resident (child):** ingestion of and dermal contact with shallow or deep groundwater while bathing; incidental ingestion of and dermal contact with soil (surface and subsurface soil combined), inhalation of fugitive dust from soil; dermal contact with surface water through wading; and incidental ingestion of and dermal contact with sediment through wading
- **Resident (adult and child):** inhalation of indoor air (vapor intrusion from shallow groundwater into future residential house)
- **Construction Worker:** dermal contact with shallow groundwater, and inhalation of volatile emissions from shallow groundwater while performing excavation and construction activities; incidental ingestion of and dermal contact with soil (surface and subsurface soil combined), and inhalation of fugitive dust from soil
- **Industrial Worker:** incidental ingestion of and dermal contact with soil (surface and subsurface soil combined), and inhalation of fugitive dust from soil

Surface Soil

There are no non-carcinogenic hazards above USEPA's target hazard index (HI) of 1.0 or carcinogenic risks above USEPA's acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$ for a current/future adult trespasser or landscaper worker exposed to surface soil. Exposure to surface soil may pose non-carcinogenic hazards for current/future adolescent trespassers based on dermal contact with vanadium. Based on the Integrated Exposure Uptake Biokinetic (IEUBK) Model, there may also be a potential risk associated with exposure to lead in surface soil.

Combined Surface and Subsurface Soil

Although there are non-carcinogenic hazards for a future adult resident, construction worker, and industrial worker exposed to combined surface and subsurface soil, there are no individual constituents or target organ/effects contributing an a HI above 1.0, and therefore the non-carcinogenic hazard is acceptable. Exposure to combined surface and subsurface soil may pose non-carcinogenic hazards for future child residents based on ingestion of antimony, iron, and vanadium. Based on the IEUBK Model, there may also be a potential risk associated with exposure to lead in combined soil.

Based on the qualitative evaluation of the unvalidated saturated subsurface soil samples there are potential risks from TCE, cis-1,2-DCE and VC for a future construction worker, and potentially, although less likely for a future industrial worker or resident, with exposure to subsurface soil.

Shallow Groundwater

Exposure to shallow aquifer groundwater may pose non-carcinogenic hazards and carcinogenic risks for future hypothetical residents and industrial workers. The non-carcinogenic hazard to the adult resident is based on ingestion of 1,1,2-TCA, TCE, VC, cis-

1,2-DCE, naphthalene, heptachlor epoxide, iron, and manganese; and dermal contact with TCE, VC, cis-1,2-DCE, naphthalene, and heptachlor epoxide. The non-carcinogenic hazards to the child resident are based on ingestion of 1,1,2-TCA, 1,1-DCE, TCE, VC, cis-1,2-DCE, trans-1,2-DCE, naphthalene, heptachlor epoxide, 2,6-Dinitrotolune, arsenic, iron, and manganese; and dermal contact with TCE, VC, cis-1,2-DCE, naphthalene, heptachlor epoxide, and manganese. The carcinogenic risk to the hypothetical future lifetime resident is associated with ingestion of PCE, TCE, VC, heptachlor epoxide, and arsenic; and dermal contact with PCE, TCE, and VC. The non-carcinogenic hazards to the future industrial worker are associated with ingestion of TCE, cis-1,2-DCE, and VC. The carcinogenic risk to the future industrial worker is primarily associated with ingestion of TCE and VC. Exposure to shallow groundwater by a construction worker during excavation activities may pose non-carcinogenic hazards associated with dermal contact with TCE and VC.

Deep Groundwater

For future land use, there are no non-carcinogenic hazards above USEPA's target HI of 1.0 or carcinogenic risks above USEPA's acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$ for any evaluated receptor exposed to deep groundwater.

Surface Water

For current or future land use, there are no non-carcinogenic hazards above USEPA's target HI of 1.0 or carcinogenic risks above USEPA's acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$ for any evaluated receptor exposed to surface water.

Sediment

There are no non-carcinogenic hazards above USEPA's target HI of 1.0 or carcinogenic risks above USEPA's acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$ for a future/current trespasser exposed to sediment. Exposure to sediment may pose non-carcinogenic hazards and carcinogenic risks for future residential land use. The non-carcinogenic hazard to the adult resident is associated with dermal contact with chromium. The non-carcinogenic hazards to the child resident are associated with dermal contact with chromium.

Ecological Risk Assessment

The ecological risk assessment was conducted to evaluate the potential risks associated with current receptors and exposure scenarios if no remedial action is implemented for soil, surface water and sediment. Terrestrial, aquatic (benthic and water column-dwelling organisms), and wildlife receptors were quantitatively evaluated.

Terrestrial Receptors

There are potential risks to terrestrial plants and soil invertebrates from the presence of inorganics, pesticides, one PCB, and PAHs in soil. However, the greatest potential risk is associated with isolated hotspots areas, located primarily in the soil in the northern portion of the site (former Site 17).

Aquatic Receptors

Benthic-Dwelling Organisms

There are potential risks to benthic-dwelling organisms from the presence of pesticides, PCBs, PAHs and inorganics in inlet sediment. Many of the organics in the drainage sediment are likely to be complexed with organic carbon and not bioavailable (or toxic) to benthic-dwelling organisms. The analytical results indicate that elevated concentrations are present in the inlet sediment with no definitive pattern of distribution.

The sediment pore water analysis indicated a very limited potential for CVOCs to adversely affect benthic-dwelling organisms. CVOCs were detected along the western branch of Site 2 inlet at concentrations that could adversely affect aquatic life. However, the highest concentrations were detected in the portion of the branch that serves as a drainage ditch and only contains water periodically. This area is unlikely to provide habitat for most benthic-dwelling organisms.

Water Column Dwelling Aquatic Life

There are limited potential risks to water column-dwelling aquatic life from the presence of inorganics and VOCs in Site 2 surface water. The sediment pore water samples indicate the highest concentrations of CVOCs are in the western drainage, where few benthic-dwelling organisms would be expected to occur, while the outfall discharge surface water samples indicate only a very limited exceedance at the point of discharge.

Wildlife

There are potential risks to avian piscivores from the presence of mercury in sediment and very low potential for risk to avian vermivore and reptiles from the presence of lead and zinc in the soil. However, the elevated concentrations in soil are localized, with the highest concentrations of inorganics triggering the potential risk detected in the central portion of Site 2, in the area identified as containing ABM.

Conclusions and Recommendations

The Expanded RI has sufficiently defined the nature and extent of contamination and potential risks to human health and ecological risk at Site 2. The results will be used to finalize remedial action objectives (RAOs) and develop and evaluate remedial alternatives in the Feasibility Study (FS). Based on the results of the risk assessments presented in Sections 7 and 8, as well as the risk management considerations presented in Section 9, the following potential risks and recommendations have been identified for each media.

Soil and Waste

The risk drivers identified in soil are listed below:

- Current/future adolescent trespasser, future child resident, and future industrial worker —dermal contact with vanadium
- Current child resident —ingestion of antimony, iron, and vanadium

- Current/future adolescent and adult trespasser, current/future landscaper, current/future construction worker, future industrial worker, and future child and adult resident exposure to lead
- Future construction worker, future industrial worker, and future resident—exposure to TCE, cis-1,2-DCE and VC in saturated subsurface soil
- Plants and soil invertebrates—exposure to six inorganics, 16 PAHs, four pesticides, and one PCB
- Avian vermivores—exposure to lead, zinc, and 4,4-dichlorodiphenyldichloroethene (DDE)

In addition, based on the nature of waste materials, the waste has not been fully characterized and is assumed to pose a potential risk to human health and the environment.

Based on the presence of these risks, a FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable human health and ecological risks in soil and waste at Site 2.

Shallow Groundwater

The risk drivers identified in shallow groundwater are listed below:

- Current/future construction worker—dermal contact with TCE and VC
- Future industrial worker—ingestion of TCE, cis-1,2-DCE, and VC
- Future resident—ingestion of nine VOCs (1,1,2-TCA, 1,1-DCE, chloroform, methylene chloride, cis-1,2-DCE, trans-1,2-DCE, PCE, TCE, and VC), one SVOC (naphthalene), and one pesticide (heptachlor epoxide); dermal contact with three VOCs (TCE, VC, cis-1,2-DCE) and one SVOC (naphthalene); and inhalation (showering) of TCE, VC, and trans-1,2-DCE

Based on these risks, a FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable human health risks in shallow groundwater at Site 2.

Deep Groundwater

No unacceptable risks have been identified in deep groundwater; therefore, no further action is recommended.

Sediment

The risk drivers identified in sediment are listed below:

- Future resident—dermal contact with chromium
- Aquatic organisms—16 PAHs and eight inorganics

A FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable human health and ecological risks in sediment at Site 2.

Surface Water

The risk drivers identified in surface water are listed below:

- Aquatic organisms—three VOCs and ten inorganics

A FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable ecological risks in surface water at Site 2.

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Acronyms and Abbreviations

ABM	abrasive blast media
amsl	above mean sea level
AOC	area of concern
AST	aboveground storage tank
atm-m^3/M	atmosphere-cubic meter per mole
ATSDR	Agency for Toxic Substances and Disease Registry
AVS/SEM	acid-volatile sulfides/simultaneously extractable metals
BAF	bioaccumulation factor
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BCF	bioconcentration factor
BTAG	Biological Technical Assistance Group
yd^3	cubic yards
Cal EPA	California EPA
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
COC	constituent of concern
COI	constituents of interest
COPC	constituent of potential concern
CSF	cancer slope factor
CSM	conceptual site model
CTE	central tendency exposure
CTO	Contract Task Order
CVOC	chlorinated volatile organic compound
°C	degrees Celsius
°F	degrees Fahrenheit
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DELCD	dry electrolytic conductivity detector
DI	deionized
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DPT	direct push technology
DRMO	Defense Reutilization and Marketing Office
ECD	electron capture device
E_H	redox potential
EPC	exposure point concentration

ERA	Ecological Risk Assessment
ESS	Explosives Safety Submission
FID	flame-ionization detector
FS	Feasibility Study
ft	feet, foot
ft/day	feet per day
ft/ft	feet per foot
ft/year	feet per year
ft^3	cubic feet
GIS	geographic information system
gm/ml	grams per cubic centimeter
gpd	gallons per day
HEAST	Health Effects Assessment Summary Table
HHRA	Human Health Risk Assessment
HI	hazard index
HMX	cyclotetramethylene-tetranitramine
HQ	hazard quotient
HRS	Hazard Ranking System
IAS	Initial Assessment Study
ID	inner diameter
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic Model
IR	Installation Restoration
IRIS	Integrated Risk Information System
LOAEL	lowest observed adverse effect level
µg/kg	micrograms per kilogram
MARMC	Mid-Atlantic Regional Maintenance Center
MATC	Maximum Acceptable Threshold Concentration
MCL	Maximum Contaminant Limit
MEC	munitions and explosives of concern
mg/kg	milligrams per kilograms
MGD	million gallons per day
mg/L	milligrams per liter
mi^2	square miles
MIP	membrane interface probe
ml	milliliter
ml/g	milliters per gram
MS/MSD	matrix spike/matrix spike duplicate
mV	millivolt
MVS	Mining Visualization Software
MVUE	minimum variance unbiased estimate
NA	natural attenuation
NACIP	Navy Assessment and Control of Installation Pollutants

NAPL	nonaqueous phase liquid
NAS	Natural Attenuation Software
NAVFAC	Naval Facilities Engineering Command
NCEA	National Center for Environmental Assessment
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
NTU	nephelometric turbidity unit
ORP	oxidation reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PETG	polyethylene terephalate glycol
PID	photoionization detector
PPRTV	Provisional Peer-Reviewed Toxicity value
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RAO	remedial action objective
RBC	risk-based criteria
RCRA	Resource Conservation Recovery Act
RDA	Recommended Dietary Allowance
RDX	cyclotrimethylene-trinitramine
RFA	RCRA Facility Assessment
RfD	reference dose
RFI	RCREA Facility Investigation
RI	Remedial Investigation
RME	reasonable maximum exposure
RRR	Relative Risk Ranking
SERA	Screening Ecological Risk Assessment
SI	Site Investigation
SJCA	St. Juliens Creek Annex
SPAWAR	Space and Naval Warfare Systems Command
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAL	target analyte list
TCDD	tetrachlorodibenzodioxin
TCE	trichloroethene
TCL	target compound list
TEF	toxicity equivalence factor
TEQ	toxicity equivalents
TOC	total organic carbon
TOR	time of remediation
TPH	total petroleum hydrocarbon

U.S.	United States
UCL	upper confidence level
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UTL	upper tolerance level
VC	vinyl chloride
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
WHO	World Health Organization

SECTION 1

Introduction

This report presents activities, results, and conclusions of the Expanded Remedial Investigation (RI) conducted at Installation Restoration (IR) Site 2, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. This report was prepared under the United States (U.S.) Navy, Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-term Environmental Action—Navy (CLEAN) III, Contract N62470-02-D-3052, Contract Task Order (CTO) 0024. The investigations summarized in this report were completed in response to recommendations included in *Remedial Investigation (RI)/Human Health Risk Assessment (HHRA)/Ecological Risk Assessment (ERA) Report for Site 2* (CH2M HILL, 2004a).

The field activities were completed in several phases between November 2003 and July 2007. Field activities were conducted in accordance with the following work plans:

- Work Plan for the Expanded Remedial Investigation at Site 2 and Site 5 (CH2M HILL, 2003)
- Phase II Expanded Remedial Investigation Work Plan for Site 2 (CH2M HILL, 2005b)
- Expanded Remedial Investigation Work Plan Addendum for Deep Groundwater at Site 2 (CH2M HILL, 2006)
- Dynamic Work Plan Triad Investigation for Site 2 (CH2M HILL, 2007a).

The technical approach for and specific objectives of each phase were jointly scoped by the SJCA Tier I Partnering Team, consisting of representatives from the Navy, U.S. Environmental Protection Agency (USEPA) Region III, and Virginia Department of Environmental Quality (VDEQ).

1.1 Objectives and Approach

The primary objective of the Expanded RI was to further define the nature and extent of contamination and re-evaluate potential human health and ecological risk at Site 2. Throughout the phased investigation, as additional data was collected, the conceptual site model (CSM) was updated and specific objectives were refined to include the following:

- Further delineate the horizontal and vertical extent of waste under the parking lot
- Determine the spatial extent and type of surface debris in the wetland area
- Further define the nature and extent of the shallow groundwater volatile organic compound (VOC) plume and source area
- Determine the presence/absence of natural attenuation indicators in shallow groundwater
- Evaluate the hydraulic characteristics of the shallow aquifer

- Determine if VOCs have impacted the deep groundwater
- Assess the source of VOC contamination in inlet surface water
- Characterize the toxicity of inlet sediment
- Evaluate the magnitude of VOC concentrations in sediment pore water
- Evaluate potential impacts from the Site 2 inlet to St. Juliens Creek

Results from these investigations will be used to finalize the remedial action objectives (RAOs) and develop and evaluate remedial alternatives in the Feasibility Study (FS). Data from the RI (CH2M HILL, 2004a) is included in this report in order to aid in the development of a comprehensive CSM and risk evaluation.

1.1.1 Report Organization

This Expanded RI report comprises the following sections:

- Section 1—Introduction
- Section 2—Site Background
- Section 3—Expanded RI Field Activities
- Section 4—Physical Characteristics
- Section 5—Nature and Extent of Contamination
- Section 6—Contaminant Fate and Transport
- Section 7—Human Health Risk Assessment
- Section 8—Ecological Risk Assessment
- Section 9—Risk Management Considerations
- Section 10—Conclusions and Recommendations
- Section 11—References

Figures and tables are provided at the end of each section following the text. Appendixes are provided at the end of the document.

SECTION 2

Site Background

2.1 SJCA Description and History

SJCA is situated at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake, southeastern Virginia (**Figure 2-1**). The facility covers approximately 490 acres and primarily consists of buildings used for administrative, industrial, and storage activities. Most surrounding areas are developed and include residences, schools, recreational areas, and shipping facilities for several large industries.

SJCA began operations as a naval ammunition facility in 1849. The facility was one of the largest ammunition depots in the United States involving wartime transfer of ammunitions to other naval facilities. Decontamination was performed in, around, and under ordnance-handling facilities at SJCA in 1977 after ordnance operations had ceased. The SJCA facility has also provided non-ordnance services, including degreasing; operation of paint shops, machine shops, vehicle and locomotive maintenance shops, pest control shops, battery shops, print shops, electrical shops, boiler plants, wash racks, and potable water and salt water fire-protection systems; fire-fighter training; and storage of oil and chemicals.

Activity at SJCA has decreased in recent years and many of the aging structures are being demolished. The current primary mission of SJCA is to provide a radar-testing range and various administrative and warehousing facilities and light industrial shops for nearby Norfolk Naval Shipyard and other local naval activities. Defense Reutilization and Marketing Office (DRMO) storage, Space and Naval Warfare Systems Command (SPAWAR), Mid-Atlantic Regional Maintenance Center (MARMC), and a cryogenics school are currently located on SJCA.

2.2 Site 2 Description and History

Site 2 is a former waste disposal area covering approximately 5.7 acres at the corner of St. Juliens Road and Cradock Street, in the southern portion of the SJCA (**Figure 2-2**). It is bounded to the north by a parking lot, to the east by a grass-covered field, to the west by a storm water drainage ditch and Cradock Street, and to the south by St. Juliens Road and St. Juliens Creek (**Figure 2-3**). In earlier documents, Site 2 was referred to as "Dump B" or "Landfill B."

A water body surrounded by brush, trees, and grass that is directly connected to St. Juliens Creek through a 36-inch culvert is located in the center of Site 2 (**Figure 2-3**). This inlet is tidally influenced and drains surface water from adjoining land into the creek. Grassed drainage ditches (approximately 2- to 3-feet [ft] deep) originate north of Site 2 along Cradock Street and discharge storm water runoff to the inlet (**Figure 2-3**). An underground storm drainage system originates approximately 1,000 ft northeast of the Site 2 area, within IR Site 21, and also outlets to the northernmost culvert to the inlet.

2.2.1 Historical Land Use

Operations at Site 2 began in 1921 and continued until sometime after 1947. Initially, refuse was burned openly onsite and was used to fill in the adjacent swampy area (Site 2 inlet) (**Figure 2-3**). In 1942, an incinerator was installed to replace the open burning practices. Mixed municipal wastes, abrasive blast media (ABM), waste ordnance, organics (including solvents), and inorganics were reportedly disposed of at Site 2. The total volume of waste accumulated prior to burning was estimated to be 35,000 cubic yards (yd^3), approximately half of which was disposed prior to 1942. The use of former Buildings 130 and 257 is unknown; however, ordnance wastewaters and rinse waters were reportedly discharged into the inlet in their vicinity, although no known discharge point has been documented (NEESA, 1981). In 1989, the site was used to store heavy equipment and machinery. Construction debris (concrete, brick, and wood), as well as ABM, are visible on the ground surface.

Former Buildings 278/279, located just north of and adjacent to the Site 2 inlet, were designated as former IR Site 17 (**Figure 2-3**). Lead-acid battery maintenance reportedly began at Building 279 in 1954 and the waste acid electrolyte was collected and hauled offsite for disposal. Two 55-gallon drums of PD-680, a commercial degreaser, were observed stored on the concrete storage pad located just outside of Building 279, which had a release onto nearby soil (A. T. Kearney, 1989). Buildings 278/279 were demolished in 2003 but the concrete foundation remains in place.

Four former revetted aboveground storage tanks (ASTs) (removed between 1986 and 1990) and one underground storage tank (UST) were located east of Site 2 (**Figure 2-3**). Fuel oil and diesel may have been stored in this area. The Site 2 inlet has historically received discharges from vehicle and equipment wash racks and ordnance degreasing operations, located north of Site 2. Upgradient buildings were historically used as machine, vehicle, and locomotive maintenance shops; electrical shops; and munitions loading facilities.

2.2.2 Existing and Future Land Use

The site currently consists of a storm water drainage inlet surrounded by a wetland, open field of mowed grass, and asphalt parking lot. Construction and excavation activities at the site are prohibited and controlled through site signs and notation in the Geographical Information System (GIS) Portal maintained by Commander Mid-Atlantic. Anticipated future land use for the site is to remain as is.

2.3 Previous Investigations

Several investigations have been conducted at Site 2 and at Site 17, which is now included within the Site 2 boundary. A summary of the investigations is provided below. **Table 2-1** summarizes the data collected at the site during each investigation.

2.3.1 Initial Assessment Study

In 1981, the Navy conducted the Initial Assessment Study (IAS) (NEESA, 1981) as part of the Navy Assessment and Control of Installation Pollutants (NACIP) Program. The purpose of the IAS was to identify environmental contamination resulting from past hazardous

material management practices, assess impacts of the contamination on public health and the environment, and provide corrective measures as required to mitigate adverse impacts. A site inspection was conducted, including a review of activity records and maps, interviews of employees and retires, and performance of a physical inspection. Several operations contributing to potential environmental contamination were identified in the Site 2 vicinity, as follows:

Landfilling

Dump B was identified as the primary garbage disposal area from 1921 to 1942, during which garbage was disposed via open burning and the ash was used to fill the wetland area. Prior to the 1930s, ordnance was disposed of with garbage. From 1942 to 1947 an incinerator replaced open burning practices. Broken glass, cinder, ash, deteriorated metal, and other residues of garbage burning operations were observed.

Battery Shop

Lead-acid battery maintenance operations were conducted at Building 279. Waste-acid electrolyte, which was collected in containers, was hauled off-station for disposal.

Ordnance Wastewater and Rinse Water Discharge

Ordnance wastewaters and rinse waters were discharged into the wetland by Buildings 257 and 130. These discharges were directed to the sanitary sewer system sometime between the 1950s and 1970s.

Wastewater Effluent

Until 1976, wastewater effluent from operations in the adjacent industrial area (Site 21) were released into storm drains that emptied into the wetland. In 1976 the wastewater was rerouted to the sanitary sewer system. The storm drains continue to collect surface runoff from the industrial area and empty in the wetland.

Based on the results of the IAS, no significant contamination posing a threat to human health and the environment was identified and no confirmation study was recommended.

2.3.2 Preliminary Assessment

A preliminary assessment was conducted (NUS, 1983) to identify sites that require further investigation based on potential threat to human health or the environment. During the preliminary assessment, ambient air at Dump B was monitored for VOCs and radiation. No readings above background were encountered.

2.3.3 Phase II RCRA Facility Assessment

A Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted to assess previously unregulated releases of hazardous materials from solid waste management units (SWMUs) or areas of concern (AOCs) (A. T. Kearney, 1989). The RFA included a preliminary review of all available relevant documents and a visual site inspection. In the Site 2 vicinity, SWMUs 2, 3, 4, and AOC A were identified and the wastes managed. A history of releases is as follows:

SWMU 2

Dump B operated from 1921 through 1947 and an estimated 950,000 cubic ft (ft^3) of garbage, acids, and waste ordnance were burned and disposed of. Remnants of ash, ABM, and stained soil were observed on the ground surface.

SWMU 3

The Dump B incinerator was in operation from 1942 through 1947 to burn garbage and some solvents, estimated at 15,000 yd^3 prior to burning. Potential air emissions were released while the incinerator was in operation.

SWMU 4

Piles of blast grit were identified on the ground surface at Dump B. The blast grit was used to strip paint from metal surfaces and consists of a commercial product, Black Beauty, and walnut hulls.

AOC A

A small concrete storage pad was identified just outside of Building 279, which was used to store two 55-gallon drums of PD-680, a commercial product used as a degreaser. A 2-gallon bucket was observed hanging under the tap of one of the barrels, apparently designed to catch barrel drippings. The bucket was overflowing, and there were stains on the concrete and nearby soil.

A RCRA Facility Investigation (RFI) was recommended at SWMUs 2, 3, and 4. AOC A was identified as a satellite storage area, Site 17. Further investigation and sampling were recommended because of the high potential for release to soil due to the unlined nature of the waste disposal area and the moderate to high potential for release to surface water via runoff and groundwater discharge due to the proximity to St. Juliens Creek.

2.3.4 Relative Risk Ranking System Data Collection Report

The Relative Risk Ranking (RRR) (CH2M HILL, 1996) was conducted to determine and prioritize sites identified for further investigation in the IAS and RFA. Surface soil and shallow groundwater samples were collected at Sites 2 and 17. Sample locations are shown on **Figure 2-4**. These data were not validated. Semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and inorganics were detected in surface soil; and one VOC, explosives, and inorganics were detected in groundwater at the sites.

2.3.5 Hazard Ranking System Sediment Sampling

A Hazard Ranking System (HRS) was used to assess whether SJCA should be proposed for the National Priorities List (NPL) (Tetra Tech, 2000). In order to complete the HRS, sediment samples were collected from St. Juliens Creek, adjacent to Site 2. Sample locations are shown on **Figure 2-4**. Organic and inorganic concentrations met the HRS criteria for observed releases and concluded that the presence of contaminants in St. Juliens Creek were partially attributable to Site 2. SJCA was assigned a score of 50 based on the potential for surface water migration. Those facilities with HRS scores exceeding 28.5 are proposed for the NPL. Subsequently, on February 4, 2000, USEPA proposed that SJCA be added to the NPL. The

proposed listing was followed by a minimum 60-day review and comment period prior to the inclusion of SJCA on the NPL on July 27, 2000.

2.3.6 Site 2 Remedial Investigation

RI activities were conducted in phases from June 1997 through August 2001 in order to further define the waste boundary and nature and extent of contamination at Site 2 and complete human health and ecological risk assessments (CH2M HILL, 2004a). A historical aerial photograph review and field investigation activities were conducted. Field activities consisted of electromagnetic, magnetometer, and tidal surveys; waste delineation through trenching; installation of permanent shallow and deep groundwater monitoring wells; aquifer slug testing; and collection of surface and subsurface soil, shallow and deep groundwater, sediment, and surface water samples. Copies of the field logs are included in **Appendix A**. The RI sample locations are shown on **Figure 2-4**. The investigation results are included in Section 5 of this report in order to present a comprehensive nature and extent of site contamination.

The human health risk assessment (HHRA) and ecological risk assessment (ERA) conducted as part of the RI concluded that there is potential risk to human and ecological receptors from exposure to chemicals in soil and sediment (primarily inorganics, pesticides, and polycyclic aromatic hydrocarbons [PAHs]). Elevated concentrations of VOCs were present in the surface water but because surface water is transient, there was no significant risk to human health or the environment identified. No human health risk drivers were identified in shallow or deep groundwater. The RI data is incorporated into the risk assessments in Sections 7 and 8 of this report.

The RI recommended further evaluation of the potential for adverse effects to aquatic life in the inlet sediment, investigation of the potential source of VOCs to surface water, and additional investigation of shallow groundwater because the existing shallow monitoring wells were located outside of, or on the outer limits of, the waste disposal area and did not sufficiently characterize potential groundwater contamination within the waste area.

2.3.7 Site 17 Site Investigation

Site Investigation (SI) activities were conducted in February 2001 to determine if there was contamination at Site 17 that required further investigation (CH2M HILL, 2001a). Surface soil samples were collected during the SI. The sample locations are shown on **Figure 2-4**. The investigation results are included in Section 5 of this report in order to present a comprehensive nature and extent of site contamination.

The qualitative HHRA and ERA conducted as part of the SI concluded that there is potential risk to human and ecological receptors from exposure to chemicals in soil (PAHs, pesticides, PCBs, and inorganics). Due to the proximity of Site 17 to Site 2, the SJCA Tier I Partnering Team (Navy, USEPA, and VDEQ) agreed in February 2003 to address the potential risks to human health and the environment identified during previous investigations at Site 17 as part of Site 2, and classified Site 17 as closed with no further action necessary. The Site 17 data is incorporated into the quantitative risk assessments in Sections 7 and 8 of this report.

Table 2-1
Sample Summary
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

	Analytical Suite																											
	TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Explosives	Dioxins/ Furans	TAL Total Metals & Cyanide	TAL Dissolved Metals	Nitrogen	TOC	COD	BOD	TDS	TSS	TPH - DRO	TPH - GRO	Toxicity Bioassay	AVS/SEM	Phosphorus	Ammonia	MEE	Sulfate	Sulfide	Nitrate/ Nitrite	Alkalinity	Grain Size	Hardness	pH	Ferrous Iron
Relative Risk Ranking (RRR) (1996)																												
Surface Soil																												
02SS01	X	X	X	X		X																						
02SS02	X	X	X	X		X																						
17SS01	X	X	X			X																						
Groundwater																												
02GW01	X	X	X	X		X																						
02GW02	X	X	X	X		X																						
17GW01	X	X	X			X																						
Hazard Ranking System (HRS)																												
Sediment																												
SD-11	X	X	X			X																						
SD-12	X	X	X			X																						
SD-13	X	X	X			X																						
SD-14	X	X	X			X																						
RI - Phase I (1997)																												
Surface Soil (Jun 1997)																												
SJS02-SS01-000	X	X	X			X												X										
SJS02-SS02-000	X	X	X			X												X										
SJS02-SS03-000	X	X	X			X												X										
SJS02-SS04-000	X	X	X			X												X										
SJS02-SS05-000	X	X	X			X												X										
SJS02-SS06-000	X	X	X			X												X										
SJS02-SS07-000	X	X	X			X												X										
SJS02-SS08-000	X	X	X			X												X										
SJS02-SS09-000	X	X	X			X												X										
SJS02-SS10-000	X	X	X	X		X												X										
Subsurface Soil (Jun 1997)																												
SJS02-SB01-003	X	X	X			X												X										
SJS02-SB02-002	X	X	X			X												X										
SJS02-SB03-000	X	X	X			X												X										
SJS02-SB04-004	X	X	X			X												X										
SJS02-SB05-002	X	X	X			X												X										
Shallow Groundwater (Jul 1997)																												
SJS02-GW1S-001	X	X	X			X	X											X										
SJS02-GW2S-001	X	X	X			X	X											X										
SJS02-GW3S-001	X	X	X	X		X	X											X										
Shallow Groundwater (Nov 1997)																												
SJS02-GW1S-002	X	X	X			X	X											X										
SJS02-GW2S-002	X	X	X			X	X											X										
SJS02-GW3S-002	X	X	X	X		X	X											X										
Deep Groundwater (Jul 1997)																												
SJS02-GW1D-001	X	X	X			X	X											X										
SJS02-GW2D-001	X	X	X	X		X	X											X										
Deep Groundwater (Nov 1997)																												
SJS02-GW1D-002	X	X	X			X	X											X										
SJS02-GW2D-002																												
Sediment (Jun-Jul 1997)																												
SJS02-SD01-000	X	X	X	X		X			X									X										
SJS02-SD02-000	X	X	X			X			X									X										
SJS02-SD03-000	X	X	X	X		X			X									X										
Surface Water (Jul 1997)																												
SJS02-SW02-000	X	X	X	X		X			X	X	X	X	X					X						X				
RI - Phase II (1999)																												
Surface Soil (Apr 1999)																												
SJS02-SS11-000	X	X	X	X		X												X									X	
SJS02-SS12-000	X	X	X	X		X												X									X	
SJS02-SS13-000	X	X	X	X		X												X									X	
SJS02-SS14-000	X	X	X	X		X												X									X	
SJS02-SS15-000	X	X	X	X		X												X									X	
SJS02-SS16-000	X	X	X	X		X												X									X	
SJS02-SS17-000	X	X	X	X		X												X									X	
SJS02-SS18-000	X	X	X	X		X												X									X	
SJS02-SS19-000	X	X	X	X		X												X									X	
SJS02-SS20-000	X	X	X	X		X												X									X	
Subsurface Soil (Apr 1999)																												
SJS02-SB06-001	X	X	X	X		X												X									X	

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Sample Summary
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	Analytical Suite																											
	TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Explosives	Dioxins/ Furans	TAL Total Metals & Cyanide	TAL Dissolved Metals	Nitrogen	TOC	COD	BOD	TDS	TSS	TPH - DRO	TPH - GRO	Toxicity Bioassay	AVS/SEM	Phosphorus	Ammonia	MEE	Sulfate	Sulfide	Nitrate/ Nitrite	Alkalinity	Grain Size	Hardness	pH	Ferrous Iron
SJS02-SB07-001	X	X	X	X		X												X									X	
SJS02-SB08-001	X	X	X	X		X												X									X	
SJS02-SB09-001	X	X	X	X		X												X									X	
SJS02-SB10-001	X	X	X	X		X												X									X	
SJS02-SB11-001	X	X	X	X		X												X									X	
Shallow Groundwater (May 1999)																												
SJS02-GW1S-003	X	X	X	X		X	X											X										
SJS02-GW2S-003	X	X	X	X		X	X											X										
SJS02-GW3S-003	X	X	X	X		X	X											X										
SJS02-GW4S-003	X	X	X	X		X	X											X										
SJS02-GW5S-003	X	X	X	X		X	X											X										
Deep Groundwater (May 1999)																												
SJS02-GW1D-003	X	X	X	X		X	X											X										
SJS02-GW2D-003	X	X	X	X		X	X											X										
SJS02-GW5D-003	X	X	X	X		X	X											X										
Sediment (Apr 1999)																												
SJS02-SD04-001	X	X	X	X		X			X									X									X	
SJS02-SD05-001	X	X	X	X		X			X									X									X	
SJS02-SD06-001	X	X	X	X		X			X									X									X	
SJS02-SD07-001	X	X	X	X		X			X									X									X	
SJS02-SD08-001	X	X	X	X		X			X									X									X	
SJS02-SD09-001	X	X	X	X		X			X																		X	
Surface Water (Apr 1999)																												
SJS02-SW03-001	X	X	X	X		X												X								X		
SJS02-SW04-001	X	X	X	X		X												X								X		
SJS02-SW05-001	X	X	X	X		X												X								X		
SJS02-SW06-001	X	X	X	X		X												X								X		
SJS02-SW07-001	X	X	X	X		X												X								X		
SJS02-SW08-001	X	X	X	X		X												X								X		
Surface Water (Oct 1999)																												
SJS02-SW08-002	X	X	X	X		X																						
RI - Phase III (Jun - Jul 2001)																												
Subsurface Soil																												
SJS02-SB12-001					X	X																						
SJS02-SB13-001						X																						
SJS02-SB14-001														X	X													
SJS02-SB15-001					X	X																						
SJS02-SB17-001					X																							
SJS02-SB18-001														X	X													
SJS02-SB19-001					X																							
SJS02-SB20-001					X																							
Sediment																												
SJS02-SD09	X	X	X	X	X	X																						
SJS02-SD10					X																							
SJS02-SD11					X																							
SJS02-SD12					X																							
SJS02-SD13					X																							
SJS02-SD14					X																							
Surface Water																												
SJS02-SW09	X	X	X	X		X	X																					
Site 17 SI (Feb 2001)																												
Surface Soil																												
SJS17-SS01-000	X	X	X			X																						
SJS17-SS02-000	X	X	X			X																						
SJS17-SS03-000	X	X	X			X																						
SJS17-SS04-000	X	X	X			X																						
Shallow Groundwater																												
17GW01	X	X	X			X																						
Expanded RI - Phase I (Dec 2003 - Jan 2004)																												
Shallow Groundwater																												
SJS02-MW06S-03D	X	X	X			X	X																					
SJS02-MW07S-03D	X	X	X			X	X																					
SJS02-MW08S-03D	X	X	X			X	X																					
SJS02-MW09S-03D	X	X	X			X	X																					
Surface Water																												
SJS02-SW10-03D	X																											
SJS02-SW11-03D	X																											
Sediment																												
SJS02-SD15-00-04A		X	X			X			X																			

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	Analytical Suite																											
	TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Explosives	Dioxins/ Furans	TAL Total Metals & Cyanide	TAL Dissolved Metals	Nitrogen	TOC	COD	BOD	TDS	TSS	TPH - DRO	TPH - GRO	Toxicity Bioassay	AVS/SEM	Phosphorus	Ammonia	MEE	Sulfate	Sulfide	Nitrate/ Nitrite	Alkalinity	Grain Size	Hardness	pH	Ferrous Iron
SJS02-SD16-00-04A		X	X			X			X																			
SJS02-SD17-00-04A		X	X			X			X																			
SJS02-SD18-00-04A		X	X			X			X																			
SJS02-SD19-00-04A		X	X			X			X																			
SJS02-SD20-00-04A		X	X			X			X																			
SJREF-SD01-00		X	X			X			X																X			
SJREF-SD02-00		X	X			X			X																X			
SJREF-SD04-00		X	X			X			X																X			
SJREF-SD05-00		X	X			X			X																X			
Expanded RI - Phase II (Oct 2004 - Mar 2005)																												
Sediment (Oct - Nov 2004)																												
SJS02-SD03-00-04D		X	X			X		X	X								X											
SJS02-SD05-00-04D		X	X			X		X	X								X											
SJS02-SD06-00-04D		X	X			X		X	X								X											
SJS02-SD24-00-04D		X	X			X		X	X								X											
SJS02-SD25-00-04D		X	X			X		X	X								X											
SJS02-SD26-00-04D		X	X			X		X	X								X											
SJS02-SD21-00-04D	X																											
SJS02-SD22-00-04D	X																											
SJS02-SD23-00-04D	X																											
SJREF-SD01-00-04D		X	X			X		X	X								X											
SJREF-SD04-00-04D		X	X			X		X	X								X											
SJREF-SD05-00-04D		X	X			X		X	X								X											
Deep Groundwater (Dec 2004)																												
SJS02-MW01D-04D	X																											
SJS02-MW10D-04D	X	X	X	X		X	X		X												X		X	X				X
Deep Groundwater (Jan 2005)																												
SJS02-MW10D-05A	X																											
Deep Groundwater (Mar 2005)																												
SJS02-MW01D-05A	X																											
SJS02-MW02D-05A	X																											
SJS02-MW10D-05A2	X																											
Shallow Groundwater (Dec 2004)																												
SJS02-MW10S-04D	X	X	X	X		X	X		X												X		X	X				X
SJS02-MW11S-04D	X	X	X	X		X	X		X												X		X	X				X
SJS02-MW12S-04D	X	X	X	X		X	X		X												X		X	X				X
SJS02-MW13S-04D	X	X	X	X		X	X		X												X		X	X				X
Expanded RI - Phase III																												
Deep Groundwater																												
SJS02-MW10D-06B	X																											
SJS02-MW10D-06B2	X																											
SJS02-MW10D-06B3	X																											
SJS02-MW10D-06D	X																											
Expanded RI - Triad Investigation Phase (Apr - Jul 2007)																												
Subsurface Soil																												
SJS02-SB201-07B	X																											
SJS02-SB202-07B	X																											
SJS02-SB203-4-07B	X																											
SJS02-SB203-16-07B	X																											
SJS02-SB203-17-07B	X								X																			
SJS02-SB203-19-07B	X								X																			
SJS02-SB204-6-07B	X								X																			
SJS02-SB204-12-07B	X																											
SJS02-SB205-10-07B	X																											
SJS02-SB206-18-07B	X								X																			
SJS02-SB207-13-07B	X																											
Shallow Groundwater																												
SJS02-MW01S-07B	X																											
SJS02-MW02S-07B	X																											
SJS02-MW03S-07B	X																											
SJS02-MW04S-07B	X																											
SJS02-MW05S-07B	X																											
SJS02-MW06S-07B	X																											
SJS02-MW07S-07B	X								X											X	X	X	X	X				X
SJS02-MW08S-07B	X																											
SJS02-MW09S-07B	X																											
SJS02-MW10S-07B	X								X											X	X	X	X	X				X
SJS02-MW11S-07B	X																											
SJS02-MW12S-07B	X																											

Table 2-1
Sample Summary
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Chesapeake, Virginia

	Analytical Suite																											
	TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Explosives	Dioxins/ Furans	TAL Total Metals & Cyanide	TAL Dissolved Metals	Nitrogen	TOC	COD	BOD	TDS	TSS	TPH - DRO	TPH - GRO	Toxicity Bioassay	AVS/SEM	Phosphorus	Ammonia	MEE	Sulfate	Sulfide	Nitrate/ Nitrite	Alkalinity	Grain Size	Hardness	pH	Ferrous Iron
SJS02-MW13S-07B	X																											
SJS02-MW14S-07B	X								X											X	X	X	X	X				X
SJS02-MW15S-07B	X								X											X	X	X	X	X				X
SJS02-MW16S-07B	X								X											X	X	X	X	X				X
SJS02-PZ01-07B	X																											
SJS02-PZ02-07B	X																											
SJS02-PZ02-19-07B	X																											
SJS02-PZ03-07B	X																											
SJS02-PZ04-07B	X																											
SJS02-PZ05-07B	X																											
SJS02-PZ06-07B	X																											
SJS02-PZ07-07B	X																											
SJS02-PZ08-07B	X																											
SJS02-PZ09-07B	X																											
SJS02-GW01-07B	X																											
SJS02-GW02-07B	X																											
SJS02-GW03-07B	X																											
SJS02-GW04-07B	X																											
SJS02-GW05-07B	X																											
SJS02-GW06-07B	X																											
SJS02-GW07-07B	X																											
SJS02-GW08-07B	X																											
SJS02-GW09-07B	X																											
SJS02-GW10-07B	X																											
SJS02-GW11-07B	X																											
SJS02-GW12-07B	X																											
SJS02-GW13-13-07B	X																											
SJS02-GW13-15-07B	X																											
SJS02-GW14-6-07B	X																											
SJS02-GW14-13-07B	X																											
SJS02-GW15-13-07B	X																											
SJS02-GW16-11-07B	X																											
SJS02-GW16-14-07B	X																											
SJS02-GW17-17-07B	X																											
SJS02-GW17-21-07B	X																											
SJS02-GW18-19-07B	X																											
SJS02-GW19-13-07B	X																											
SJS02-GW20-14-07B	X																											
Deep Groundwater																												
SJS02-MW01D-07B	X																											
SJS02-MW02D-07B	X																											
SJS02-MW05D-07B	X																											
SJS02-MW10D-07B	X																											
Pore Water																												
SJS02-PW01-07B	X																											
SJS02-PW02-07B	X																											
SJS02-PW03-07B	X																											
SJS02-PW04-07B	X																											
SJS02-PW05-07B	X																											
SJS02-PW06-07B	X																											
SJS02-PW07-07B	X																											
SJS02-PW08-07B	X																											
SJS02-PW09-07B	X																											
SJS02-PW10-07B	X																											
SJS02-PW11-07B	X																											
SJS02-PW12-07B	X																											
SJS02-PW13-07B	X																											
SJS02-PW14-07B	X																											
SJS02-PW15-07B	X																											

Notes:
NA - Analytical suite not analyzed
PCBs - Polychlorinated Biphenyls
SVOCs - Semi-volatile Organic Compounds
VOCs - Volatile Organic Compounds
TAL - Target Analyte List
TCL - Target Compound List
TOC - Total Organic Carbon
TPH- Total Petroleum Hydrocarbons
AVS/SEM-Acid Volatile Sulfide Simultaneously Extractable Metals

Table 2-2
Data Gaps and Triad Investigation Objectives and Scope
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Conceptual Site Model Data Gap	Associated Remedial Action Alternative Data Gaps	Triad Field Study Objective	Scope of Investigation
1. Source Delineation			
Groundwater concentrations at two shallow monitoring wells (SJS02-MW07S and -MW10S) reported values greater than one percent of the solubility for TCE. The extent of this potential source area is an approximately 200 ft by 150 ft area.	For the **in-situ treatment alternative**, data must be collected to refine the vertical and horizontal extent of the groundwater source area (if in-situ treatment is selected for this component of the plume) to determine if a remedy can be feasibly implemented and cost estimates can be developed.	Further refine source area through MIP investigation.	Conduct MIP investigation focused in the vicinity of the identified hot spot to the top of the Yorktown Confining Unit.
		Establish source length, width, and depth for future modeling.	Confirm MIP response by collecting depth-specific soil and groundwater samples.
MIP borings in the source area did not appear to advance deep enough to reach the Yorktown confining unit (suggested by the lack of high conductivity zone at the bottom of the borings). Therefore, there is uncertainty in the vertical definition of CVOCs at the interface of the Columbia Aquifer and confining unit.	For the **source removal alternative**, the horizontal and vertical extent of the groundwater source area must be well defined.	The Yorktown confining unit has been shown to be an effective barrier to vertical contaminant migration; therefore the top of this hydrogeologic zone will not be penetrated.	Collect groundwater and soil samples from ground surface to the top of the Yorktown Confining Unit (~20 ft bgs) in the identified source area for CVOC analysis.
The tidal inlet receives storm water runoff and drainage from upstream areas at SJCA. It is uncertain the exact location of these sources and the quantity this off-site storm- water contributes to the tidal inlet.		Determine if quantity of off-site storm water contribution can be estimated or prevented.	Review Navy storm sewer records.
2. Contaminant Mass and Distribution			
The mass of contamination in the saturated zone has not been calculated. Although a reliable estimate of mass may not be achievable, this information can still be useful in the design of a remedy or estimating a remediation timeframe. However, it should be noted that at DNAPL sites, mass estimates are subject to extreme uncertainty, such that the results may have limited usefulness.	For the **in-situ treatment alternative**, design information which may be required includes the magnitude of concentrations in soil and groundwater located within the groundwater source area.	Further define source area.	Conduct a MIP investigation and collect depth-specific soil and groundwater samples to assess extent and magnitude of the source area.
	For the **barrier wall alternative**, the magnitude of groundwater concentrations should be known.		
	For the **source removal alternative**, any soil, present above leachability concentrations or waste should be identified. Residual DNAPL will be difficult to locate and the excavation wil likely not address any CVOCs sorbed to the confining unit.		
The lithology, in which contaminant mass is located, has not been defined adequately. This may impact the feasibility of a selected remedy.		Define lithology where contaminant mass is present.	Collect DPT soil samples from select locations adjacent to MIP borings with elevated response and record lithology.
			Record continuous lithology at new monitoring well locations.
			Collect organic carbon data from selected soil samples to perform partitioning calculations.

Table 2-2
Data Gaps and Triad Investigation Objectives and Scope
Site 2 Expanded Remedial Investigation Report
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Chesapeake, Virginia

Conceptual Site Model Data Gap	Associated Remedial Action Alternative Data Gaps	Triad Field Study Objective	Scope of Investigation
3. Groundwater and Sediment CVOC Delineation			
The vertical and horizontal extent of CVOCs in groundwater may need additional delineation to select and design an appropriate remedy. This includes the area to the south of the plume (between SJS02-MW07S and MW02S) and to the east. Additional monitoring wells may also be needed at the site boundary to monitor contaminant flux to surface water or sediment.	For the monitored natural attenuation (MNA) alternative, a more thorough understanding of the horizontal and vertical extent and magnitude of the shallow groundwater CVOC plume is necessary prior to collection of MNA data to ensure adequate representation because conditions can vary across a site. If modeling is included as part of a MNA evaluation, the centerline of the shallow groundwater shallow groundwater CVOC plume should be identified.	Further delineate the horizontal and vertical presence of CVOCs in the Columbia aquifer and upper Yorktown confining unit and identify the relative location of the shallow groundwater CVOC plume.	Conduct MIP investigation to help delineate the shallow groundwater CVOC plume.
	For the **in-situ treatment alternative**, data must be collected to refine the vertical and horizontal extent of the groundwater plume (if the entire plume is treated) to determine if a remedy can be feasibly implemented and cost estimates can be developed. If a mass flux component is included in the remedy, the centerline of the groundwater plume should be identified.		Collect groundwater samples by DPT from ground surface to the Yorktown Confining Unit (~20 ft bgs) for CVOC analysis to define the vertical and horizontal extent of the plume.
	For the **barrier wall alternative**, the extent of the groundwater plume must be well defined.		Install piezometers within tidal inlet within the Columbia Aquifer and collect groundwater samples to define CVOC concentrations within tidal inlet and support identification of the plume centerline.
			Install shallow monitoring wells and collect groundwater samples for CVOC analysis from the new wells and existing wells.
4. Groundwater to Surface Water/Sediment Interactions in the Inlet			
The groundwater/surface water interface and the impact of the shallow groundwater CVOC plume discharging to sediment is unknown.	For **all alternatives**, the discharge of contaminants from groundwater to sediment impact the final RAOs, and thus selection of the remedial action alternative.	Determine the magnitude of CVOC concentrations in sediment pore water at the interface of groundwater discharge to sediment.	Install sediment diffusion samplers within the transition zone between groundwater and surface water in tidal inlet sediment; collect pore water samples for CVOC analysis.
		Confirm groundwater is discharging into the tidal inlet.	Measure groundwater elevations in piezometers installed within the tidal inlet and compare to surface water elevations.
5. Groundwater Flow Direction			
Additional investigation is necessary to further define the flow direction in the vicinity of the site.	For the **MNA alternative**, a more thorough understanding of the groundwater flow direction is necessary prior to collection of MNA data to ensure adequate representation.	Refine the groundwater flow model.	Collect groundwater level data from all new and existing monitoring wells (shallow and deep) and piezometers.
	For the **barrier wall alternative**, groundwater flow direction must be well defined to determine the location of the wall.		

Table 2-2
Data Gaps and Triad Investigation Objectives and Scope
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Conceptual Site Model Data Gap	Associated Remedial Action Alternative Data Gaps	Triad Field Study Objective	Scope of Investigation
6. Geotechnical and Aquifer Properties			
Geotechnical analyses have not been performed for site soil. Without organic carbon content, it is difficult to assess contaminant retardation or conditions that are detrimental to certain remediation technologies. Without porosity data, it can be difficult to assess fate and transport of contaminants. Additional data are helpful for the selection and design of a remedial alternative.	For the **MNA alternative**, additional data are needed on the organic carbon available for natural attenuation processes at Site 2.	Collect soil geotechnical data (including organic carbon content, total porosity, soil bulk density, moisture content, grain size analysis) in the identified source area and other areas which may be targeted for remedial treatment (such as site boundary or groundwater/sediment interface).	During DPT soil investigation and monitoring well installation, select soil samples for geotechnical analysis of parameters listed in Triad field study objective.
	For the **in-situ treatment alternative**, design information which may be required includes organic carbon content and geotechnical characteristics (porosity, moisture content).		
	For the **barrier wall alternative**, geotechnical properties of the soil must be well defined.		
	For the **source removal alternative**, soil geotechnical characterization would be necessary to ensure excavation stability.		
7. Natural Attenuation Indicators			
Although there is evidence of reduction of CVOCs in site groundwater, the oxidation-reduction reactions, natural attenuation capacity, and all of the competing electron acceptors have not been identified. This information would be helpful in estimating a possible timeframe for an MNA or an EA remedy.	For the **MNA alternative**, there is uncertainty as to whether the plume is at a steady state or whether conditions indicative of natural attenuation processes are present at Site 2 and will result in an acceptable reduction in contamination within a reasonable timeframe.	Collect NA indicator data to evaluate NA processes at the site; NA indicator data includes dissolved oxygen, nitrate, manganese (II), ferrous iron, sulfate, sulfide, carbon dioxide, methane, ethane, ethene, hydrogen, and alkalinity, and total/dissolved organic carbon concentrations	Select shallow monitoring wells, preferably along the shallow groundwater CVOC plume centerline and upgradient of the plume, and collect groundwater samples for geochemical parameters, indicative of NA and potential sustainability.
There is uncertainty if the contaminant plume is at steady state or will naturally attenuate within a reasonable timeframe.		Collect shallow groundwater CVOC concentration data.	Sample all shallow monitoring wells for CVOC analysis; develop groundwater trend data and statistically evaluate stability of plume.
8. Remedial Alternative Effectiveness			
There is uncertainty if the existing site conditions are favorable to the various treatment technologies.	For the **in-situ treatment alternative**, bench-scale or pilot testing of active treatment technologies is typically required to determine if the selected in-situ treatment will be effective at reducing contaminant concentrations to achieve the RAOs and finalize the remedy design.	Refine the CSM so that an initial screening of alternative effectiveness can be conducted during the FS.	Collect information on distribution and extent of CVOC contamination and lithologic and geochemical data which may impact remedy effectiveness.
	For the **barrier wall alternative**, pilot testing will likely be required to evaluate the effectiveness of a treatment wall.	Pilot testing will be conducted following the Triad investigation.	

Table 2-2
Data Gaps and Triad Investigation Objectives and Scope
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Conceptual Site Model Data Gap	Associated Remedial Action Alternative Data Gaps	Triad Field Study Objective	Scope of Investigation
9. Ecological Risk			
Additional investigation is necessary to further define potential ecological risks associated with the discharge of CVOCs in groundwater to surface water/sediment.	Whether or not the shallow groundwater CVOC plume is contributing to the risk identified in soil and sediment must be determined prior to evaluation of all Work Element B alternatives. If the shallow groundwater CVOC plume is determined to be a continuing source of contaminants causing unacceptable ecological risk, it will be factored into the overall remedial approach for Site 2. Navy policy requires that sources be identified and controlled prior to sediment cleanup.	Conduct additional investigation of CVOCs in groundwater and pore water which will enable completion of the ERA.	Compare pore water results against literature-based ecological screening values (ESVs) developed for the protection of aquatic life from the presence of CVOCs in surface water.
Other than the groundwater discharge pathway, the HHRA and ERA have been completed but will be further assessed based on additional data collected during this investigation.			Further assessment of human and ecological risk based on concentration data obtained during the Triad investigation.
10. Wetland Debris Delineation			
The spatial extent and type of surface debris present within the wetland area has not been delineated.	For the **partial removal and restoration alternative**, a better understanding of the spatial extent and type of surface debris present within the wetland area would be necessary to evaluate whether the debris is impacting the wetland ecosystem.	Determine the spatial extent and type of surface debris present within the wetland area.	Delineate the spatial extent and type of surface debris present within the wetland area.

CSM - conceptual site model
CVOC - chlorinated volatile organic compound
DPT - direct push technology
EA - enhanced attenuation
ERA - ecological risk assessment
ft bgs - feet below ground surface
MIP - membrane interface probe
MNA - monitored natural attenuation
NA - natural attenuation

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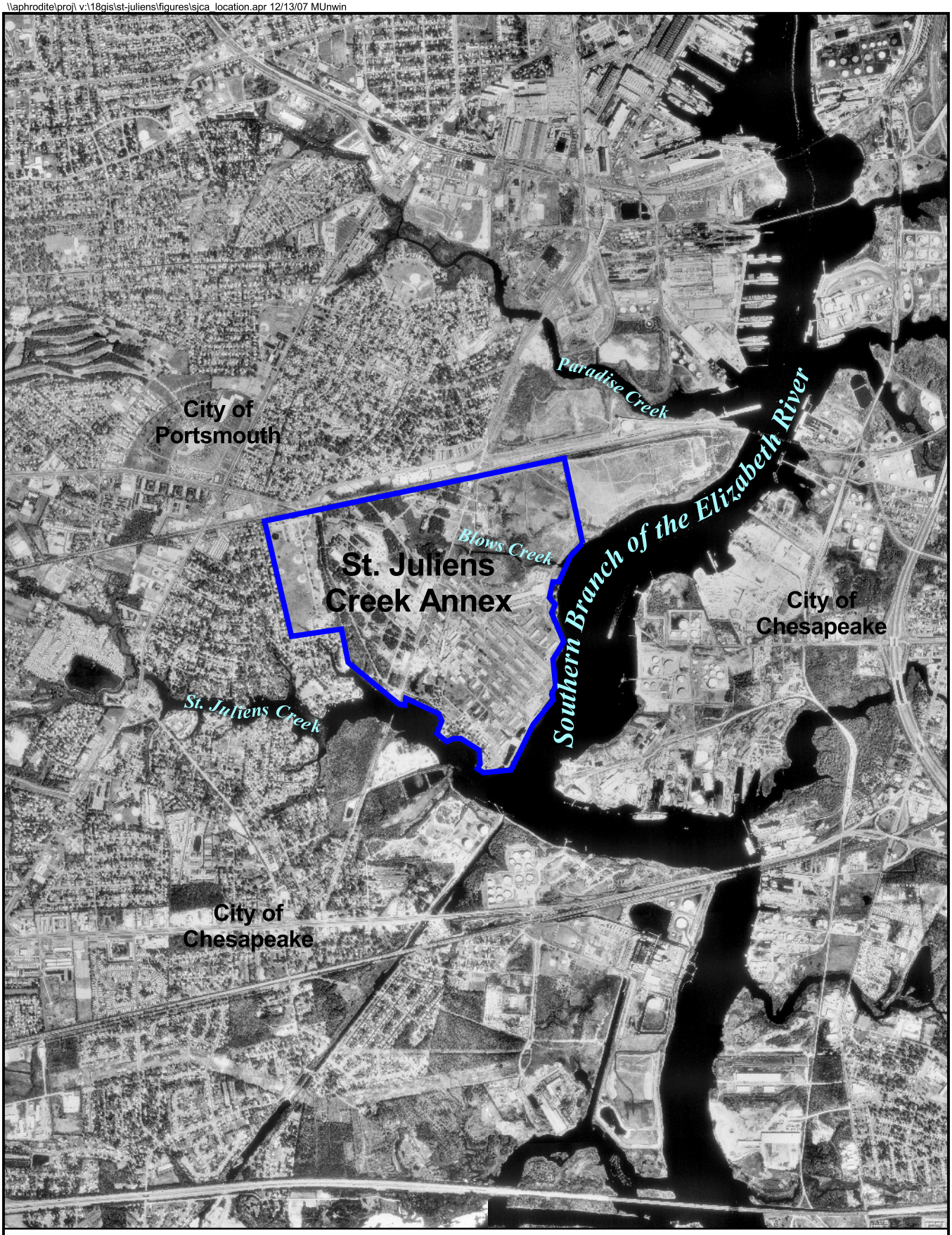

LEGEND

St. Juliens Creek Annex

N

0 1250 2500 Feet

Figure 2-1
Location of St. Juliens Creek Annex
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

LEGEND

St. Juliens Creek Annex

Site 2

N

0 500 1000 Feet

Figure 2-2
Site 2 Location Map
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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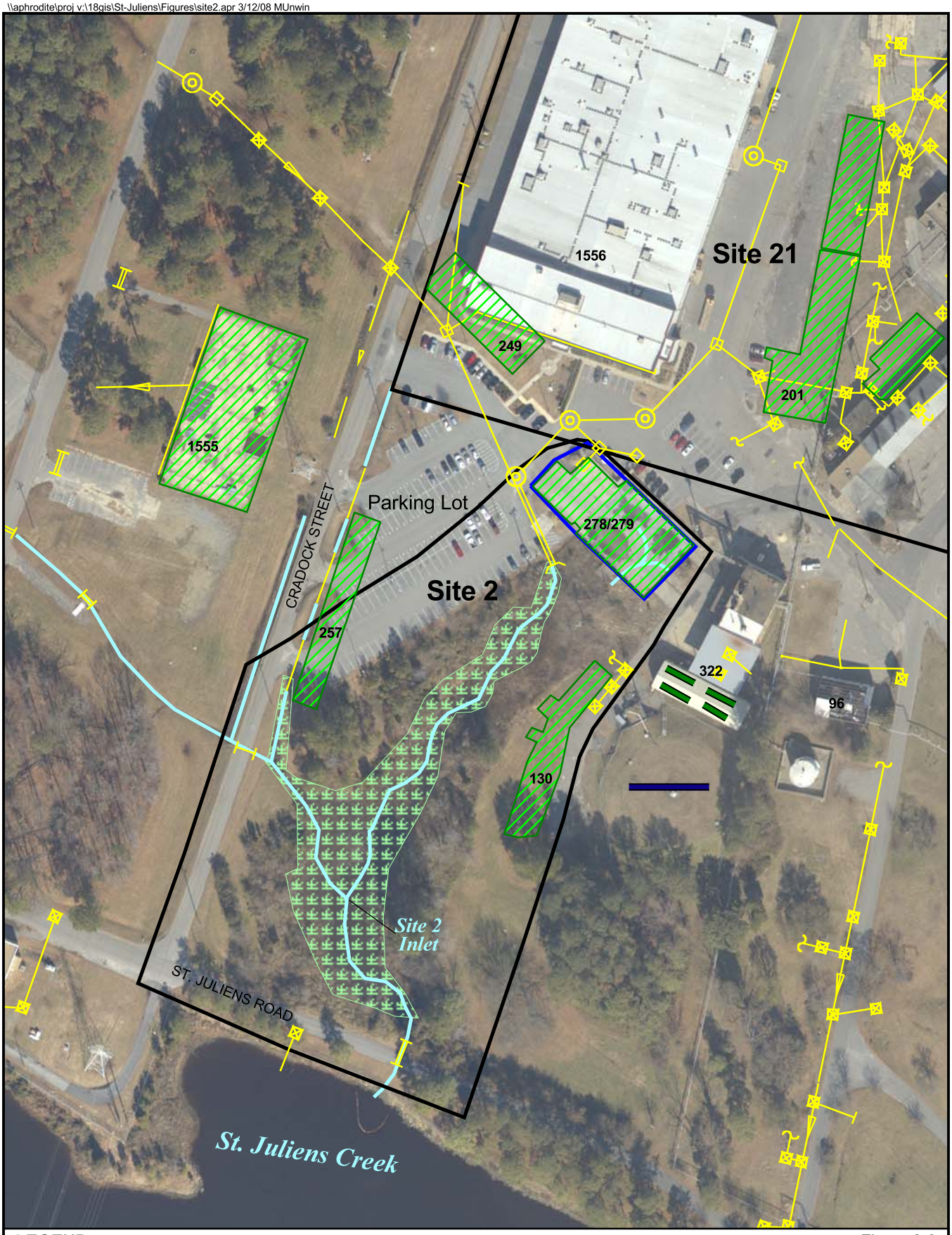

LEGEND

- Site Boundary
- Former Site 17 Boundary
- Drainage
- Demolished Buildings
- Wetland
- Storm Water Sewers
- Culverts
- Approximate Location of Former UST
- Approximate Location of Former ASTs

N

0 75 150 Feet

Figure 2-3
Site 2 Vicinity
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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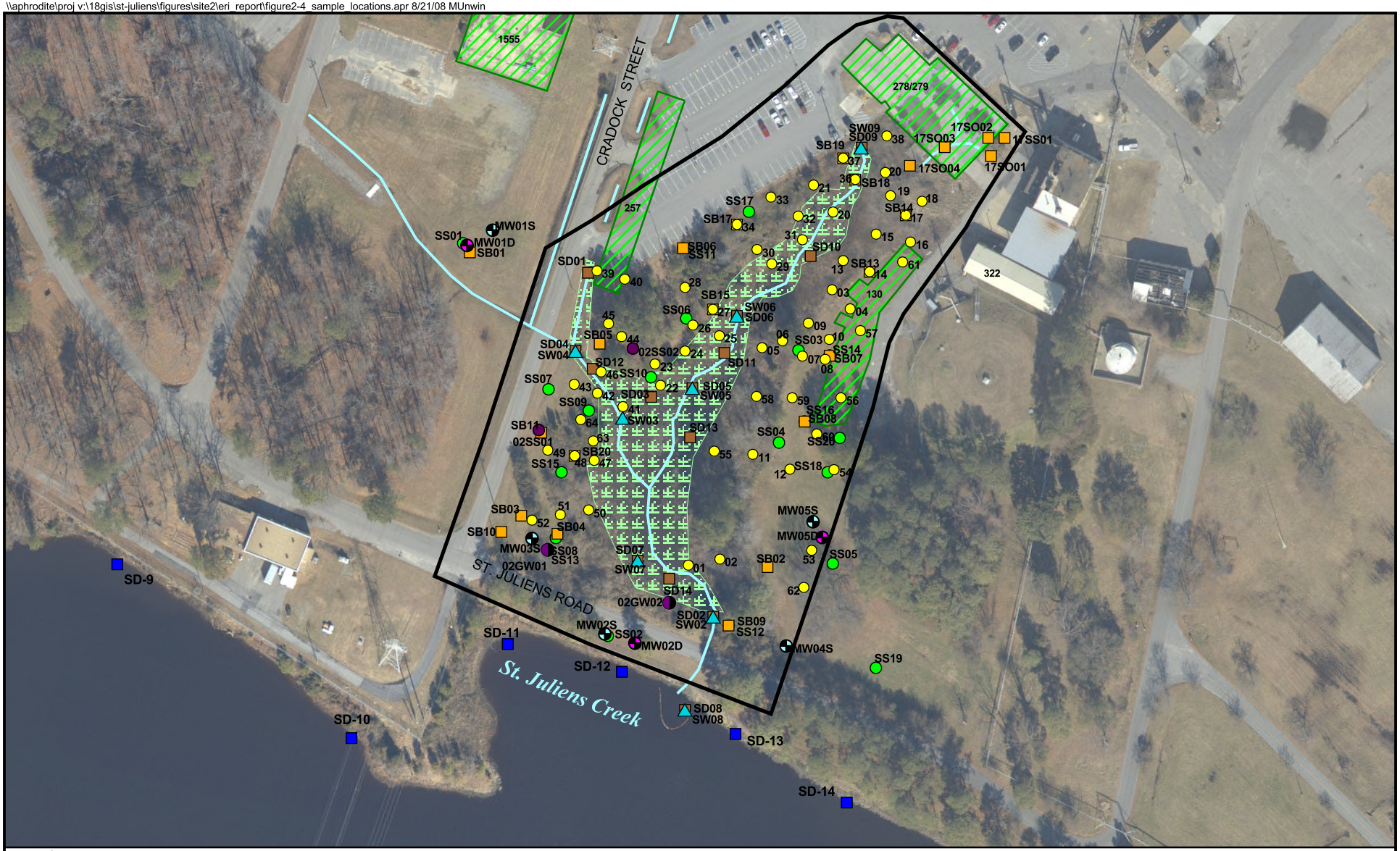

LEGEND

- Site Boundary
- Demolished Buildings
- Wetland
- Drainage
- RRR Surface Soil Sample Locations
- RRR Groundwater Sample Locations
- HRS Sediment Sample Locations
- Inlet Sediment Sample Locations
- Shallow Monitoring Well Locations
- Deep Monitoring Well Locations
- RI Surface Soil Sample Locations
- RI Subsurface Soil Sample Locations
- Test Pit Locations
- Surface Water Sample Locations

N

0 75 150 Feet

Figure 2-4
RRR, HRS, and RI Sample Locations
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

SECTION 3

Field Investigation Activities and Data Evaluation

The RI field activities, conducted in phases from June 1997 through August 2001, consisted of the activities listed below.

- Waste delineation
- Permanent shallow groundwater monitoring well installation
- Groundwater, surface soil, subsurface soil, surface water, and sediment sampling and analysis
- Shallow and deep aquifer slug testing
- Tidal survey

The RI field activities are presented in Section 3 of the RI report (CH2M HILL, 2004a).

The Expanded RI field activities were conducted in the following phases, listed below, in accordance with the work plans identified in Section 1.

November 2003 through January 2004

- Permanent shallow groundwater monitoring well installation
- Groundwater, surface water, sediment, and storm water sampling and analysis

November 2004 through March 2005

- Parking lot waste delineation
- Membrane interface probe (MIP) investigation
- Permanent shallow and deep groundwater monitoring well installation
- Groundwater and sediment sampling and analysis
- Shallow and deep aquifer slug testing

May through November 2006

- Deep aquifer testing (pump testing)
- Deep groundwater sampling and analysis

April through July 2007 (Triad Investigation)

- MIP investigation
- Wetland surface debris delineation
- Temporary and permanent shallow groundwater monitoring well installation
- Groundwater, pore water, and subsurface soil sampling and analysis

Details of the Expanded RI field activities are provided in the sections below. The data and results from both the RI and Expanded RI are provided in Section 5 of this report in order to present a comprehensive nature and extent of site contamination, with the exception of the performance and evaluation of the aquifer slug testing, which is included in Section 4.3.2. **Table 2-1** summarizes the data collected at the site to date. The RI sample locations are shown on **Figure 2-4** and the Expanded RI sample locations are shown on **Figures 3-1** and **3-2**.

3.1 Investigation Protocol

Prior to initiating intrusive activities, all sampling locations were cleared for utilities by third-party subcontractors and Miss Utility of Virginia. Locations were cleared of potential munitions and explosives of concern (MEC) hazards as necessary in accordance with the Explosives Safety Submissions (ESS) Waiver (NOSSA, 2004). No MEC hazards were encountered during any of these field activities. The summary reports from the MEC subcontractors are provided as **Appendix B**.

Samples collected during the investigations were submitted to pre-approved subcontracted laboratories. Offsite laboratories were used for all analyses, with the exception of the Triad investigation during which an onsite laboratory was used for analysis of direct-push technology (DPT) soil and groundwater, pore water, and temporary piezometer samples to provide real-time data[1].

Appropriate quality assurance/quality control (QA/QC) sampling was performed in accordance with Navy CLEAN and CH2M HILL protocols, including field blanks, equipment blanks, duplicates, and matrix spike/matrix spike duplicates (MS/MSDs). The QA/QC data collected are provided in **Appendix C**.

3.2 Investigation Activities

The following sections summarize the sampling activities and analyses. Copies of the field logs are included in **Appendix A**. **Table 2-1** provides a summary of all samples collected at Site 2 and their analytical parameters. The sample locations are identified on **Figures 3-1** and **3-2**. Results of the investigation activities are discussed in Section 5.

3.2.1 Parking Lot Waste Delineation

A waste delineation was conducted in order to confirm the presence/absence of waste beneath the parking lot in the northwest corner of the site and to determine its lateral and vertical extent. The delineation relied on visual observation of split spoon/acetate sleeve collection of material from the DPT and drill rig. Split spoons were logged and recorded in the field notebook. Eight DPT soil borings were collected; locations are shown on **Figure 3-1**.

3.2.2 Wetland Surface Debris Delineation

A delineation of the spatial extent and type of surface debris present within the wetland area was conducted to evaluate potential impacts to the wetland ecosystem. The delineation

[1] With the exception of one temporary piezometer sample which was analyzed by an off-site laboratory

was conducted during low tide to ensure that the maximum amount of surface debris was visible at the time of the delineation.

3.2.3 MIP Investigations

MIP investigations were performed to help identify the source(s) of VOCs, further delineate the horizontal and vertical extent of the VOC groundwater plume, determine the depth of confining and semi-confining clay layers, and guide placement of permanent monitoring wells. The same subcontractor was used for the investigations conducted in 2004 and 2007 to ensure that the data would be comparable. Real-time MIP logging was completed at 41 locations (MIP 201 through MIP 241) (**Figure 3-1**), at which continuous readings of the flame ionization detector (FID), photoionization detector (PID), electron capture detector (ECD), conductivity probe, and temperature were recorded with depth. The MIP logging extended from the ground surface to the confining clay layer (Yorktown confining unit), approximately 15 to 25 ft below ground surface (bgs). During the 2004 MIP investigation, VOC speciation, or trapping, data was collected at nine of the 20 locations at depths where the highest ECD responses were observed. The speciation data was collected by trapping the gas stream directly into the analytical column of a gas chromatograph for analysis. The column was temperature programmed to separate analytes and a PID, FID, and dry electrolytic conductivity detector (DELCD) were used to identify compounds based on the placement of peaks within established retention time windows.

3.2.4 DPT Groundwater Sampling

DPT grab groundwater sampling was conducted to confirm the MIP data, further delineate the horizontal and vertical extent of the shallow groundwater chlorinated VOC (CVOC) plume, support selection of permanent monitoring well locations, and aid in locating the centerline of the groundwater plume.

Twenty-four grab groundwater samples (from stations SJS02-GW01 through GW20) (**Figure 3-1**) were collected through DPT by advancing a 4-ft retractable stainless steel screen to the desired depth based on MIP response. Initially the screen was exposed only a few inches to provide the best correlation to MIP response, since the MIP records variability of VOC concentrations over very small vertical intervals. At locations without sufficient volume to collect a groundwater sample within limited intervals, the exposed portion of the screen was increased to 1 ft, thus drawing groundwater from a larger vertical interval. The screen length was increased up to 4 ft if there was significant difficulty collecting a sample. The groundwater was sampled directly through this screen using a peristaltic pump and low flow purging techniques (USEPA, 1996a) to minimize turbidity. The samples were analyzed by an onsite laboratory for CVOCs.

3.2.5 DPT Subsurface Soil Sampling

DPT subsurface soil sampling was conducted to confirm the MIP data and define geochemical, lithological, and geotechnical properties where contaminant mass is present. To confirm the MIP data, 11 subsurface soil samples were collected from seven locations (SJS02-SB201 through SB207) at various depths and analyzed for CVOCs. Sample depths were based on vertical depths indicating a low, medium, and high peak in MIP detector response. To evaluate the geochemical properties of site soil, four of the samples (SJS02-

SB203-17, SB203-19, SB204-6, and SB206-18) were analyzed for total organic carbon (TOC). Additionally, three samples (SJS02-SB08-17, SB08-19, and SB09) were collected for grain size, moisture content, bulk density, specific gravity, and porosity analysis in order to evaluate the geotechnical properties of the site soil. The sample locations were chosen based on areas indicating high electrical conductivity readings, high MIP responses, and/or visually observed organic materials.

The soil samples were logged and recorded in the field logbook. The samples were collected by DPT using a Geoprobe Macro-Core® Sampler with polyethylene terephalate glycol (PETG) liners. Soil collected for CVOC and TOC analysis were placed into laboratory provided sample jars. Samples collected for geotechnical analyses were planned to be collected with Shelby tubes, although attempts to collect the samples were unsuccessful due to the soil consistency. Therefore, the samples were collected in PETG liners and the ends were capped. Because the soil data were not collected for risk assessment purposes, it was not third party validated and reduced QA/QC samples were collected (i.e., duplicates and equipment blanks). The samples collected for CVOC analysis were submitted to the onsite laboratory and those collected for TOC and grain size analysis were submitted to offsite laboratories.

3.2.6 Temporary Piezometer Installation and Sampling

Temporary piezometer installation and sampling was conducted to define the horizontal and vertical extent of CVOC groundwater concentrations within the tidal inlet, refine the groundwater flow model, determine if groundwater is discharging into the tidal inlet, and aid in locating the centerline of the groundwater plume (**Figure 3-1**). Nine temporary piezometers (SJS02-PZ01 through PZ09) were installed so that the screened interval was placed just above the Yorktown confining unit. In order to determine the depth of the Yorktown confining unit, a continuous split-spoon sample was collected in the inlet, adjacent to SJS02-PZ01. The soil sample was logged and recorded in the field logbook.

The temporary piezometers were installed using a tripod and hammer method. The tripod was equipped with a motorized cathead, pulley, and hammer. A 2-inch diameter casing with a disposable end point was driven to the total well depth and a 1-inch diameter polyvinyl chloride (PVC) well with a 5-ft long, 0.010-inch slotted screen was installed inside the casing. The 2-inch diameter casing was removed, allowing natural materials to fall into the borehole. Any remaining annular space was filled with #1 silica pack sand. Development of the piezometers was not necessary because they were temporary and the data is not used to evaluate potential remedy effectiveness.

Groundwater samples were collected from the temporary piezometers using a peristaltic pump and disposable tubing following a low-flow sampling protocol (USEPA, 1996a). All samples were collected by placing the sample tubing intake in the middle of the screen interval. Water quality parameters (dissolved oxygen [DO], oxidation reduction potential [ORP], pH, temperature, conductivity, turbidity, and salinity) were measured in the field with a Horiba U-22 and flow-through cell to ensure aquifer stability prior to sample collection and recorded in the field notebook. Purging continued until water quality readings collected 5 minutes apart were stabilized to within 10 percent of one another. At some locations, parameters were not stabilized due to the low yield of water. In these instances, the piezometers were allowed to run dry and samples were collected upon

recharge. After the parameters stabilized/well recharged, samples were collected for analysis of CVOCs by an onsite laboratory, with the exception of SJS02-PZ09, which was analyzed by an offsite laboratory. Because this data was not third party validated and/or used as part of a risk assessment, reduced QA/QC samples for groundwater were collected (i.e., duplicates and equipment blanks).

Following sampling, the depth to groundwater and the surface water elevation at each piezometer was measured and recorded to determine if the tidal inlet is a discharge or recharge area for groundwater. The temporary piezometers were abandoned following sampling.

3.2.7 Aquifer Testing

In situ hydraulic conductivity ("slug") testing was conducted to determine horizontal hydraulic conductivity. Rising head slug tests were performed at five shallow groundwater monitoring wells (SJS02-MW01S, MW05S, MW07S, MW09S, and MW10S) and three deep groundwater monitoring wells (SJS02-MW01D, MW05D, and MW10D). Slug tests were performed using solid PVC slugs with clean bailer rope. A pressure transducer (MiniTroll) was used in combination with an electronic recording device (Hermit) to obtain water level readings during the slug testing activities. The test results were used to calculate the hydraulic conductivities (*K*) of the Columbia and Yorktown aquifers. The test data were evaluated using AQTESOLV software by HydroSOLVE, Inc. Test data were analyzed using the Bouwer-Rice (1976, 1989) method for unconfined and confined aquifers. The slug test results are incorporated into Section 4.3.2.

In order to investigate the presence of trichloroethene (TCE) detected in the Yorktown aquifer at deep groundwater monitoring well SJS02-MW10D, aquifer testing was conducted. The investigation included collection of background barometric pressure and water level measurements prior to the pump tests in order to compensate for potential fluctuations in the data due to natural site conditions (tidal influence or barometric pressure); conducting a well yield test to determine the production capacity of SJS02-MW10D; conducting a 9-hour aquifer pumping test at SJS02-MW10D to determine if the Yorktown confining unit was leaking; and purging /redeveloping the well prior to sampling. Recovery data was also collected upon completion of the pump test. A technical memorandum detailing the deep groundwater investigation is provided as **Appendix D**.

3.2.8 Permanent Monitoring Well Installation and Sampling

Permanent monitoring well installation and sampling was conducted to further delineate the nature and extent of contamination, determine the groundwater flow direction, aid in remedial alternative evaluation, and support shallow groundwater monitoring in association with future remedial activities. Eleven permanent shallow groundwater monitoring wells (SJS02-MW06S through SJS02-MW16S) and one permanent deep groundwater monitoring well (SJS02-MW10D) were installed using hollow stem augers (**Figure 3-1**). During drilling, 2- to 4-ft split spoon samples were collected continuously for the purpose of lithologic characterization. Soil borings were logged according to the Unified Soil Classification System (USCS). Grain size, color, moisture content, consistency, and other observations such as evidence of contamination were recorded in a field notebook. Boring logs are included in **Appendix E**.

Each new shallow groundwater monitoring well was constructed with 2-inch inside diameter (ID) Schedule 40 PVC screen and riser and 2-inch ID, 0.010-inch slotted monitoring well screens packed with #1 filter sand were set at the top of the Yorktown confining unit. For installation of the deep well, the depth of the top of the Yorktown confining unit was established and the well was double-cased to prevent a potential conduit for contamination. An 8-inch ID, Schedule 40 PVC casing was installed 2 ft into the top of the confining layer. The space between the native material and the PVC was grouted to the ground surface and allowed to set for 24 hours before drilling into the Yorktown Aquifer. Well construction diagrams are provided in **Appendix E**.

Monitoring well SJS02-MW12S was completed flush to ground surface with a watertight steel cover because the well was placed in the parking lot area. The remaining monitoring wells were completed abovegrade with a locked steel protective casing set in a concrete pad. Guard posts were installed in high-traffic areas for additional protection. A watertight cap was placed on the PVC pipe and the wells were clearly marked.

Following installation, each groundwater monitoring well was developed using a submersible Whale® pump. Conductivity, pH, turbidity, and flow rate were monitored during development.

Groundwater samples were collected from the new and existing shallow and deep monitoring wells, although not all wells were sampled during each investigation phase. **Table 2-1** identifies the monitoring wells sampled during each investigation and the analyses conducted. Prior to sample collection, depth to groundwater was measured and recorded at each well. All shallow and deep groundwater samples were analyzed for target compound list (TCL) VOCs, as well as additional analytical parameters as summarized in **Table 2-1**.

Groundwater samples were collected using a peristaltic pump following a low-flow sampling protocol (USEPA, 1996a). All groundwater samples were collected by placing the sample tubing intake in the middle of the screen interval. Water quality parameters (DO, ORP, pH, temperature, conductivity, turbidity, and salinity) were field measured and recorded with a Horiba U-22 and flow through cell to ensure aquifer stability prior to sample collection and recorded in the field notebook. The aquifer was considered stable after at least one well volume was purged and water quality readings collected 5 minutes apart were stabilized to within 10 percent of one another, with the exception of turbidity, which was reduced to the extent practical. Measurements indicated stabilization of most water quality parameters prior to sample collection.

During the Triad Investigation in 2007, carbon disulfide, hydrogen, ethane, ethene, and methane samples were collected using a bubble strip sampler at monitoring wells SJS02-MW07S, MW10S, MW14S, MW15S, and MW16S. Additionally, Chemets DO field test kits were used in order to obtain more accurate DO measurements at all monitoring wells and the results were recorded in the field notebook.

3.2.9 Storm Water and Surface Water Sampling

Storm water and surface water sampling was conducted to determine if VOCs in groundwater from Site 21 are discharging to the Site 2 inlet. Seven storm water samples (SJS02-ST01 through ST07) were collected from drop inlets in the storm water system at

Site 21 (**Figure 3-2**) using a peristaltic pump with disposable tubing. Two surface water samples (SJS02-SW10 and SJS02-SW11) were collected in the Site 2 inlet at the storm sewer system outfalls (**Figure 3-1**) by submersing the sampling container directly into the surface water.

Water quality parameters (DO, ORP, pH, temperature, conductivity, turbidity, and salinity) were field measured *in situ* using a Horiba U-22 prior to sample collection and recorded in the field notebook. The storm water and surface water samples were analyzed for TCL VOCs.

3.2.10 Sediment Sampling

Sediment sampling was conducted to evaluate potential impacts from the Site 2 inlet to St. Juliens Creek, characterize the toxicity of inlet sediment to benthic-dwelling organisms, and assess whether VOCs in groundwater are discharging to inlet sediment.

Sediment samples were collected from 11 locations within St. Juliens Creek to evaluate potential impacts from the Site 2 inlet to St. Juliens Creek (**Figure 3-1**). Five of the samples (SJREF-SD01 through SD05) were collected in St. Juliens Creek upstream of the Site 2 outfall as reference samples to represent baseline anthropogenic sediment conditions in St. Juliens Creek. The reference sample locations were based on field identification by a biologist based on the likeness of physical properties (apparent sediment grain size and organic content) as compared to inlet outfall sediment. Six of the sediment samples (SJS02-SD15 through SD20) were collected at the confluence of the Site 2 inlet and St. Juliens Creek. The samples were collected from 0 to 6 inches below sediment surface with a precleaned stainless steel hand auger. Water quality parameters (pH, temperature, conductivity, salinity, DO, turbidity, and ORP) of the overlying surface water were field measured using a Horiba U-22 prior to sample collection and recorded in the field notebook. The sediment samples were submitted to an offsite laboratory and analyzed for TCL SVOCs, TCL pesticides/PCBs, target analyte list (TAL) inorganics, TOC, and grain size based on the ecological constituents of potential concern (COPCs) identified in the RI.

Nine inlet sediment samples were collected to characterize the toxicity of inlet sediment to benthic-dwelling organisms; six were collected from potentially impacted areas within the Site 2 inlet (SJS02-SD03, SD05, SD06, SD24, SD25, and SD26) and three from reference locations identified previously (SJREF-SD01, SD04, and SD05) in adjacent non site-impacted areas (**Figure 3-1**). The samples were collected from 0 to 6 inches below sediment surface with a precleaned stainless steel hand auger. Each of the nine samples was split immediately following collection. Half of the samples were sent for 28-day sediment bioassay tests with the amphipod *Leptocheirus plumulosus* (*L. plumulosus*). The other half was sent to an analytical laboratory for analysis of TCL SVOCs, TCL pesticides/PCBs, TAL inorganics, cyanide, TOC, grain size, acid-volatile sulfides/simultaneously extractable metals (AVS/SEM), and ammonia. A technical memorandum detailing the sediment investigation is provided as **Appendix F**.

Three additional inlet sediment samples (SJS02-SD21 through SJS02-SD23) were collected from 0 to 6 inches below sediment surface to assess whether VOCs in groundwater were discharging to inlet sediment (**Figure 3-1**). The samples were collected using a precleaned stainless steel hand auger and analyzed by an offsite laboratory for TCL VOCs, TOC, and grain size.

3.2.11 Pore Water Sampling

Pore water sampling was conducted to evaluate the CVOC concentrations in the sediment pore water and screen the potential risk to ecological receptors at the sediment/surface water interface from groundwater CVOCs discharging through the tidal inlet sediment. Fifteen sediment diffusion samplers (SJS02-PW01 through PW15) were set within the tidal inlet (**Figure 3-1**). The sediment diffusion samplers were placed at approximately 100-ft intervals along the entire length of the inlet between former Building 278/279 and the culvert to St. Juliens Creek. To obtain more refined delineation in the vicinity of the identified shallow groundwater CVOC plume, sediment diffusion samplers were placed at a closer horizontal spacing of approximately 50 ft.

The sediment diffusion samplers consisted of passive diffusion bags pre-filled with 150 milliliters of deionized (DI) water. The passive diffusion bags were placed into 2-inch diameter, 12-inch long PVC protective casings with 10-inch long slotted screens. The sediment diffusion samplers were installed so that the screen length fell within the transition zone between surface water and groundwater (between approximately 2 and 12 inches bgs). At locations where surface water was present under high tide conditions, the diffusion samplers were pushed by hand so that the top of the protective casing was flush with the sediment to protect the diffusion sampler screen from any disturbance at the surface or being moved by the surface water. At locations where the water table was below the sediment surface, the sediment diffusion samplers were installed so that the entire screen was located below the water table. In locations where the sediment was too dense to install the sampler by hand, a precleaned stainless steel hand auger was used to dig a hole for the sampler. In order to obtain enough volume for QA/QC samples additional samplers were installed adjacent to each other at one sample location. The holes were backfilled with the displaced sediment.

The sediment diffusion samplers were retrieved after three weeks to allow sufficient time for equilibration, and a water sample was collected for onsite laboratory analysis of CVOCs. During retrieval, the sediment diffusion samplers were visually inspected and any observations, including coatings or deposits, were recorded in the field notebook.

3.2.12 Investigation-derived Waste Management

Investigation-derived waste (IDW) generated during the Expanded RI included drill cuttings from the soil borings and monitoring well installations, well development and purge water, and solutions used to decontaminate non-disposable sampling equipment. Approved 55-gallon drums, stored on secondary containment, were used to containerize IDW generated during the field activities, with the exception of the deep aquifer pump test, during which a Baker tank was used due to the high volume of IDW generated. The IDW was stored at the approved IDW staging location, located at Site 2, and properly labeled. The drums and Baker tank were sampled by an IDW subcontractor or CH2M HILL for disposal characterization. Based on the analytical results, both non-hazardous and hazardous wastes were identified and disposed of at an approved disposal facility.

3.3 Data Management and Evaluation

Data management and tracking, from the time of field collection to receipt of validated electronic analytical results, is of primary importance and reflects the overall quality of analytical results. Field samples and their corresponding analytical tests were recorded on executed chain-of-custody forms, which were submitted with the samples to the laboratory. Chain-of-custody entries were checked against the site-specific project instructions and work plans to verify that all designated field samples were collected and submitted for the appropriate analysis. Upon receipt of the samples by the laboratories, a comparison to the field information to verify that each sample was analyzed for the correct parameters and appropriate QA/QC samples were collected.

3.3.1 Data Qualifiers

Analytical data reports, in hardcopy and electronic format, were submitted to Navy-approved third-party data validators for select analyses. Data not validated by a third-party validator underwent an internal validation by the project chemist. Procedures used for validation were *Region III Modifications to the National Functional Guidelines for Organic Data Review, Multi-media, Multi-concentration* (USEPA, 1994a), and *Region III Modifications to Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis* (USEPA, 1993b). The data validation summaries are provided in **Appendix G**.

The data validation qualifiers, or flags, used for the Expanded RI data are the following:

- A "B" flag by the data validator indicates that the analytes have also been detected in a field, equipment, or trip blank, or in a laboratory QA/QC sample. The concentration of a "B"-qualified result is less than 10 times the concentration of the constituent for an associated QA/QC result. If the sample concentration is less than ten times the associated blank concentration, the conclusion is that the parameter was not detected. Section 3.3.2.1 provides further discussion of potential sources of blank contamination.
- A "J" flag indicates that the analyte is present but the value is estimated.
- A "K" flag indicates that the analyte is present but the reported value may be biased high and the actual value is expected to be lower.
- An "L" flag indicates that the analyte is present, but the reported value may be biased low and the actual value is expected to be higher.
- An "R" flag indicates an unusable result. The analyte may or may not have been present and the result was rejected.
- A "U" flag indicates that the analyte was not detected and the associated value indicates the approximate sample concentration necessary to be detected.

3.3.2 Potential Non-Site-Related Analytical Results

Some of the organic (e.g., PAHs) and inorganic constituents detected in soil and/or groundwater may be attributed to non-site-related conditions or sources such as laboratory contaminants, anthropogenic non-site release sources, and naturally occurring (background) concentrations of constituents.

Laboratory and Sample Blank Contamination

In some instances, constituents detected in samples may have been introduced during field sampling, transportation to the analytical laboratory, or during laboratory procedures. A variety of blank samples were analyzed and used in the QA/QC process to determine which of the constituents may or may not be attributed to the field sample.

Typically, a field blank is collected to account for ambient conditions during sample collection. An equipment/rinsate blank is collected to determine if the equipment used to collect the samples (e.g., augers, bailers, and sample containers) was adequately clean. Additionally, the laboratory analyzes a method blank in each batch of 20 samples to verify instrument cleanliness and function. Common phthalate compounds can be introduced during the analytical process and are often considered laboratory contaminants.

When blank samples are found to contain common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to 10 times the concentrations in the blanks are qualified during data validation with a "B" for that compound. A "B" qualifier means that the compound may not be attributed to the site at that sample location. When a sampling or laboratory blank contains contaminants other than the common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to 5 times the concentrations is qualified during data validation with a "B" for that compound.

To determine if a "B" qualifier should be assigned to a soil sample, a unit conversion is performed whereby soil sample concentrations relative to aqueous samples or laboratory blank concentrations are determined by dividing the soil concentration by the fraction of moisture, then dividing the result by five. A "B" qualifier designation, as described above for aqueous samples, can then be applied directly to the converted soil concentrations.

Background Data

To identify constituents present in shallow groundwater, soil, and sediment reflective of a potential site-related release, naturally occurring and anthropogenic compounds (inorganics, PAHs, and pesticides/PCBs) detected concentrations were compared to the background 95 percent upper tolerance levels (UTLs) established for SJCA. Site soil samples were representative of Munden-Tetotum soil. The background investigations are presented in the *Final Background Investigation Report* (CH2M HILL, 2001b), *Final Background Investigation Report Addendum for Groundwater* (CH2M HILL, 2004b), and *Final Technical Memorandum Site 2 Outfall Sediment Investigation Results and Development of Reference Sediment Data in St. Juliens Creek* (CH2M HILL, 2005a); all of which were approved by the partnering team. Background UTLs for deep groundwater were not established since a semi-impermeable confining unit (Yorktown) has been identified across SJCA, which separates the shallow and deep aquifers, and previous investigations at IR sites have shown no indication of site-related contamination.

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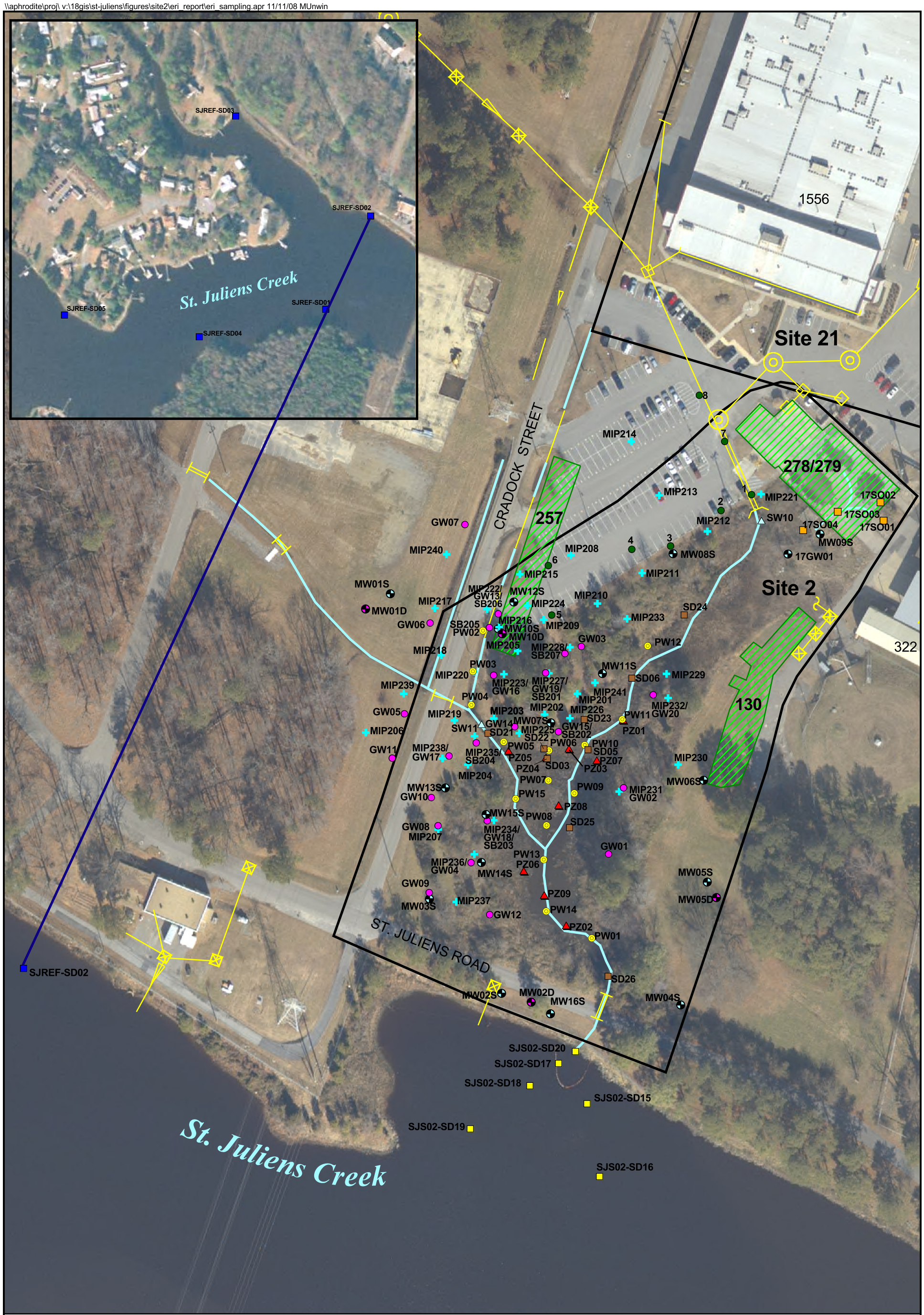

LEGEND

- Site Boundaries
- Storm Sewer System
- Drainage
- Wetland
- Demolished Buildings
- Surface Water Sample Locations
- Outfall Transect Sediment Sample Locations
- Reference Sediment Sample Locations
- Inlet Sediment Sample Locations
- Shallow Monitoring Well Locations
- Deep Monitoring Well Locations
- MIP Locations
- DPT Locations (Groundwater and/or Soil)
- DPT Soil Boring Locations (Waste Delineation)
- Piezometer Locations
- Pore Water Sample Locations

N

0 60 120 Feet

Figure 3-1
ERI Sample Locations
Waste Delineation, MIP, Soil, Groundwater, Surface Water, Sediment, and Sediment Pore Water Samples
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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LEGEND

- Site Boundaries
- Storm Water Sample Locations
- Storm Sewer System
- Drainage
- Wetland
- Demolished Buildings

N

0 120 240 Feet

Figure 3-2
ERI Sample Locations
Storm Water Samples
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

SECTION 4

Physical Characteristics

Section 4 summarizes the physical characteristics of the region, SJCA, and Site 2. Subsection 4.1 discusses the regional and facility-wide physiography, climate, and surface-water hydrology. Subsection 4.2 discusses the topography, drainage, and surface features at Site 2. Subsection 4.3 describes regional and site-specific geology and hydrogeology and water usage.

4.1 Regional and Facility-Wide Physiography, Climate, and Surface Water Hydrology

SJCA is located in the eastern part of the Atlantic Coastal Plain Physiographic Province in Chesapeake, Virginia, within the Tidewater Region (**Figure 4-1**). Low elevations (typically less than 25 ft above mean sea level [amsl]) and relatively flat relief characterize this part of the Coastal Plain (Oaks and Coch, 1973). SJCA lies within the Deep Creek Swale, with land surface elevations ranging from sea level to approximately 20 ft amsl in the northeastern portion of the facility (**Figure 4-2**) (Cederstrom, 1957).

The Southern Branch of the Elizabeth River defines the eastern boundary of the land occupied by SJCA. St. Juliens Creek, which is a west-to-east flowing tributary of the Southern Branch of the Elizabeth River, defines the southern boundary of SJCA. Blows Creek, also a tributary of the Southern Branch of the Elizabeth River, flows through the center of SJCA and drains into the Southern Branch of the Elizabeth River. The Southern Branch of the Elizabeth River and its tributaries (including Blows Creek and St. Juliens Creek) are part of a tidal estuary system. In the vicinity of SJCA, the mean tide range of the Elizabeth River is approximately 2.8 ft and the spring tide range is approximately 3.4 ft (NOAA, 2007).

The Tidewater Region has a maritime climate that is characterized by long, temperate summers and mild winters. The average annual temperature is 60.7 degrees Fahrenheit (°F) with average monthly temperatures ranging from 43.1°F in January to 78.7°F in July. Winds are generally easterly and range from 6 to 11 knots. On the average, two hurricanes a year come close enough to affect Virginia, but less than one per year comes ashore. Hurricanes passing close offshore may cause high, wind-set tides. Northeasters are also a cause of wind-set tides; these storms occur from late fall to spring.

Precipitation averages 43 inches annually. Precipitation is slightly higher from June to August because of the prevalence of conductive thunderstorms. October, November, and December are the driest months of a typical year. The average annual snowfall is 8.8 inches. Between 50 percent and 70 percent (22 to 30 inches) of the precipitation is removed from the area via runoff along the relatively flat topography and via evapotranspiration. The remaining 30 percent to 50 percent (13 to 22 inches) of precipitation recharges the surficial aquifer system by percolation through the upper soil (Siudyla, May, and Hawthorne, 1981). This recharge volume is approximately equivalent to 1.5 to 2.5 million gallons per day

(MGD) per square mile (mi^2). Approximately 90 percent of recharged groundwater returns to surface water streams as base flow.

4.2 Topography, Drainage, and Surface Features

The Site 2 water body is surrounded by brush, trees, and grass and is directly connected to St. Juliens Creek through a 36-inch culvert (**Figure 2-3**). This inlet is tidally influenced and drains surface water from adjoining land into the creek. An asphalt-paved parking lot is located adjacent to the inlet on the northwestern side and the concrete foundation of former Buildings 278/279 is located just north of the inlet. The corner of St. Juliens Road and Cradock Street is located to the southwest of the site and a grassy field is located to the east of the site.

The site topography ranges from 0 to 8 ft amsl, sloping towards the tidal inlet and St. Juliens Creek (**Figure 4-3**). Grass-lined drainage ditches (approximately 2 to 3 ft deep) originate north of Site 2 along Cradock Street and discharge storm water runoff to the inlet. The portions of the drainage ditch adjacent to Building 1556 flow through an underground storm water pipe under the parking lot and through the northernmost culvert to the inlet. A separate underground storm drainage system originates approximately 1,000 ft northeast of the Site 2 area, within IR Site 21, and outlets to the northernmost culvert to the inlet. The drainage ditches south of Building 1556 enter the inlet through a culvert on the west side of the inlet. Surface runoff from the parking lot to the northwest also drains into the inlet. Surface water in the tidal inlet flows towards St. Juliens Creek.

4.3 Geology and Hydrogeology

4.3.1 General Regional Geologic and Hydrogeologic Framework

Siudyla, May, and Hawthorne (1981), Hamilton and Larson (1988), Meng and Harsh (1988), and Harsh and Laczniak (1990) serve as the primary references for regional geology and hydrogeology for Site 2.

Regional Geology

The Southeastern Virginia Coastal Plain physiographic province is underlain by an eastward thickening wedge of marine and non-marine sediment ranging in age from early Cretaceous to Holocene (**Figure 4-4**). Along the coastline, several thousand feet of interlayered, unconsolidated sediment, consisting of gravel, sand, silt, and clay deposits, overlie pre-Cretaceous crystalline basement rock.

Differential subsidence produced a series of gently dipping regional structural highs and lows, known as arches and embayments (or basins). The Tidewater Area of Virginia is located along the axis of a regional structural feature known as the Norfolk Arch, as shown in **Figure 4-5**. The arch is an east-west structural ridge of crystalline basement rock that separates the Salisbury Embayment to the north from Albemarle Embayment to the south. Thicker accumulations of sediment, estimated to be 1,500 to 2,000 ft thick in the vicinity of Chesapeake, are present in the basins as compared to over the arches. The arches were partially responsible for characteristic depositional sequences (marine, alluvial, and

lagoonal) within the different basins. Based on the generalized regional column presented by Meng and Harsh, 1988 (**Figure 4-6**), geologic units present beneath SJCA include, from youngest to oldest:

- Holocene (Recent) deposits
- Undifferentiated Pleistocene deposits of the Columbia Group (Sand Bridge and Norfolk Formations)
- The Miocene to Pliocene Chesapeake Group of formations (including Yorktown Formation)
- The Paleocene to Eocene Pamunkey Group of formations (Nanjemoy Formation)
- Late Cretaceous undifferentiated sediment
- Early to Late Cretaceous Potomac Formation

The two geologic units of interest for the Site 2 investigation are the Columbia Group and Chesapeake Group. The Columbia Group, composed of Holocene deposits and undifferentiated Pleistocene deposits, is the uppermost geologic unit in the area and is approximately 60 ft thick. The upper 20 to 40 ft consists of unconsolidated fine sands and silts. The lower 20 to 40 ft consists of relatively impermeable silt, clay, and sandy clay. The Chesapeake Group underlies the Columbia Group. The uppermost unit in the Chesapeake Group is the Yorktown Formation. The Yorktown Formation is approximately 300 to 400 ft thick with major sand, gravel, and shell beds in the upper 50 to 100 ft of the formation.

Regional Hydrogeologic Framework

Corresponding to the regional geologic formations and groups listed above are 17 hydro-stratigraphic units: nine aquifers separated by eight aquitards or confining units. Of these regional hydrostratigraphic units, only the youngest three are likely to be affected by facility operations. The hydrostratigraphic units are, from youngest to oldest:

- Holocene to Pleistocene **Columbia aquifer**
- Late Pliocene **Yorktown confining unit**
- Late Miocene to Pliocene **Yorktown-Eastover aquifer** (referred to as the **Yorktown aquifer** in this report)
- Miocene **St. Marys confining unit and St. Marys-Choptank aquifer**
- Miocene **Calvert confining unit and Chickahominy-Piney Point aquifer**
- Late Paleocene to Early Eocene **Nanjemoy-Marlboro Clay confining unit and Aquia aquifer**
- Early Paleocene **Brightseat confining unit and Brightseat aquifer** (not present in Portsmouth/Chesapeake region)
- Late to Early Cretaceous **Upper, Middle, and Lower Potomac confining unit and Upper, Middle, and Lower Potomac aquifers**

Of these regional hydrostratigraphic units, only the youngest three (Columbia aquifer, Yorktown confining unit, and the Yorktown-Eastover aquifer) are likely to be affected by facility operations. The surficial Columbia aquifer, located in the upper 20 to 40 ft of the Columbia Group, consists of discontinuous, heterogeneous sand and shell lenses with generally low to moderate permeability deposited under fluvial-deltaic and estuarine environments (McFarland and Bruce, 2006). The aquifer is unconfined but clayey sediment within the unit may produce localized confined or leaky confined conditions and result in areas of perched groundwater. In the Chesapeake vicinity, transmissivity of the Columbia Aquifer is typically less than 3,000 gallons per day (gpd)/ft (approximately 400 ft^2/day). The Columbia aquifer is recharged primarily by infiltration of precipitation and minimally by stream infiltration. Most groundwater in the Columbia aquifer discharges into surface water and maintains base flow while some groundwater leaks into deeper aquifers.

The Yorktown confining unit consists predominantly of relatively impermeable silt and clay layers interbedded with quartz sands of the lower Columbia Group and the upper Yorktown Formation. Regionally, this unit varies in thickness from less than 50 ft to a maximum thickness of approximately 100 ft in northeastern Virginia. In the Chesapeake vicinity, the clay is approximately 20 to 40 ft thick. The low hydraulic conductivity of the silt and clay layers in the confining unit results in minimal leakage from the Columbia aquifer through the confining unit into the Yorktown aquifer from above. However, there is a potential for downward seepage where the confining unit thins or is discontinuous.

The Yorktown aquifer is semi-confined beneath the clay and silt layers of the Yorktown confining unit. The aquifer is heterogeneous. Water bearing zones in the Yorktown aquifer consist of fine to coarse sand, gravel, and shells. Locally, blue/green gray, plastic, clay with shell fragments are common. This aquifer is approximately 200-ft thick in the Chesapeake area with transmissivity values ranging from approximately 1,500 gpd/ft to 65,000 gpd/ft (200 to 8,700 ft^2/day).

4.3.2 Site-Specific Geologic and Hydrogeologic Framework

Geologic Framework

The three hydrostratigraphic units of interest at Site 2 are the Columbia aquifer, the Yorktown confining unit, and the Yorktown aquifer. The location of the hydrostratigraphic cross sections depicting the subsurface environment at Site 2 is shown in **Figure 4-7.** The cross sections are aligned in north-south and east-west directions across the site as presented in **Figure 4-8** and **Figure 4-9**, respectively.

The Columbia aquifer begins at 3 to 7 ft bgs and extends to approximately 15 to 25 ft bgs and is approximately 15 ft thick. The aquifer consists predominantly of silty, fine to coarse sands with some clay. Discontinuous organic, sandy clay with silt is present starting at a depth of 2 ft bgs and extending up to 20 ft bgs, dipping to the south. The layer thickness increases towards the southeast from 1 to 13 ft. Peat has been reported in this layer from approximately 14 to 18 ft bgs in two borings (SJS02-MW11S and SJS02-MW13S). This peat layer was found at the same depth as phragmites debris, indicating the location of the former tidal inlet elevation prior to filling activities. TOC analyses from two soil samples collected from this organic layer were greater than 17,000 milligrams per kilograms (mg/kg), confirming the high organic content of this layer. TOC concentrations from soil

samples collected in silty sand were less than 1,600 mg/kg, indicating that little to no organic matter is present in the sandier lithologic zones. The degree of organic matter in soil can have a significant impact on fate and transport of contaminants, discussed in Section 6. The Yorktown confining unit separating the aquifers is approximately 30-ft thick on average. This unit consists of a series of interbedded clay and fine sand layers overlying a thick (e.g., greater than 10 ft) clay layer. Silt, organic materials, and shell fragments have been observed in this layer. The top of the confining unit generally slopes towards St. Juliens Creek and the Southern Branch of the Elizabeth River and is believed to be competent beneath the tidal inlet bed due to the thickness of this layer and its presence in site and regional geologic borings.

The Yorktown aquifer consists primarily of fine to medium grained sand and/or silty sand with trace to abundant amounts of shell material, along with traces of gravel and organic material. The full thickness of the Yorktown aquifer was not penetrated anywhere onsite; the deepest well boring at Site 2 terminates at 70 ft bgs.

Hydrogeologic Framework

The 16 shallow groundwater monitoring wells screened in the Columbia aquifer and four deep groundwater monitoring wells screened in the Yorktown aquifer at the site (**Table 4-1**) were used to assess groundwater flow and aquifer properties at Site 2. Groundwater levels were collected from the permanent monitoring wells during the field activities (**Table 4-2**). Water levels were also collected from the temporary piezometers located within the tidal inlet during the 2007 monitoring event (**Table 4-3**). In the surficial Columbia aquifer, the water table is typically present at 3 to 7 ft bgs. Shallow groundwater flows from the east, west, and north towards the tidal inlet and then to the south towards St. Juliens Creek, mimicking the topography. **Figure 4-10** depicts the potentiometric surface of shallow groundwater observed in June 2007. The horizontal hydraulic gradient ranged between 0.01 to 0.02 feet per foot (ft/ft) during the June 2007 monitoring event. However, horizontal hydraulic gradients have been reported as low as 0.004 ft/ft. Based on the facility-wide groundwater levels, groundwater in the underlying Yorktown aquifer generally flows east towards the Southern Branch of the Elizabeth River at a flat horizontal hydraulic gradient of 0.0008 ft/ft (**Figure 4-11**).

Shallow groundwater temporally discharges into the tidal inlet. Based on a groundwater flux analysis, shallow groundwater discharges to the inlet at a rate of 0.010 ft^3 per second or 6,300 gpd during low tide (calculations are based on the June 2007 water levels and are included in **Appendix H**). In temporary piezometers installed in the tidal inlet, the depth to the top of surface water was measured in addition to the depth to groundwater in June 2007 to assess the direction of water flow (**Table 4-3**). Based on this data, it was suggested that shallow groundwater was discharging to the surface water inlet in the southern portion of the site and at the most upstream location (PZ01) while surface water was recharging groundwater in the central portion of the site. During high tide conditions, tidal inflow from St. Juliens Creek may potentially recharge shallow groundwater at Site 2. Shallow groundwater may also discharge to the nearby drainage ditches during extreme high water-table conditions.

Using groundwater elevation data, upward vertical gradients (0.002 to 0.047 ft/ft) were measured at all Columbia aquifer and Yorktown aquifer groundwater well pairs in June

2007 (**Table 4-2**). Historically, downward vertical flow has been observed at the eastern well cluster (MW05S/05D). Between the two shallow monitoring wells adjacent to St. Juliens Creek, the vertical gradient was downward from MW02S (screened 3 to 13 ft bgs) towards the deeper well, MW16S (screened 14 to 24 ft bgs). As shown on **Figure 4-8**, MW02S is screened primarily above the organic sandy clay while MW16S is screened within and below this lower permeability layer, which is causing some vertical gradients within the Columbia aquifer. However, the difference in groundwater elevations may also occur because MW16S is located closer to the tidal inlet culvert.

Rising head slug tests were performed in five shallow and three deep monitoring wells during the Expanded RI to evaluate aquifer hydraulic conductivities of the Columbia and Yorktown aquifers (**Appendix I**). The geometric average horizontal K and the standard deviation for the Columbia aquifer was interpreted to be about 3 feet per day (ft/day) (**Table 4-3**). The geometric average horizontal K for the Yorktown aquifer was calculated to be about 25 ft/day, with a standard deviation of about 37 ft/day (**Table 4-3**). Assuming an effective porosity of 0.20 (typical of silty sand), a K value of 3 ft/day, and a hydraulic gradient of 0.01 ft/ft, the average groundwater flow velocity is estimated at 55 feet per year (ft/yr) in the Columbia aquifer. Assuming the same effective porosity, a K value of 25 ft/day, and a hydraulic gradient of 0.0008 ft/ft, the average groundwater flow velocity is estimated at 37 ft/yr in the Yorktown aquifer.

An aquifer pump test in the deep (Yorktown) aquifer was conducted in May 2006; a detailed discussion is presented in **Appendix D**. Background measurements collected before the pump test indicated that potentiometric levels in the deep aquifer wells (SJS02-MW01D and MW10D) were influenced by the tidal cycle; however, potentiometric levels in shallow aquifer wells (SJS02-MW10S and MW12S) were not influenced. Time-drawdown data collected during the pump test were used to estimate a transmissivity of 1,521 ft^2/day and a storage coefficient of $3.4x10^{-4}$ in the deep aquifer. There was no influence observed on the shallow aquifer wells by the pumping activity in the deep zone.

4.3.3 Regional Water Usage

In southeastern Virginia, the Columbia aquifer may be utilized for watering lawns or filling swimming pools. However, groundwater in the Columbia aquifer is generally not utilized as potable or industrial water supply in the area because it typically has a poorer quality and lower yield than underlying aquifers.

Throughout the eastern portion of the Coastal Plain, the Yorktown aquifer is used extensively for domestic and public water supply, as well as for industrial purposes. There is only one commercial/industrial permitted groundwater withdrawal in the vicinity of SJCA from the Yorktown aquifer: northwest of SJCA, the Elizabeth Manor Golf Club is permitted for groundwater withdrawals for golf course maintenance. The only permitted municipal groundwater usage of significance (i.e., several MGD or more) is located approximately 10 miles to the southeast of SJCA on the east (opposite) side of the Southern Branch of the Elizabeth River. These permitted groundwater withdrawals should not be affected by past or current operations at SJCA given the depth and location of the permitted well and groundwater barrier formed by the Southern Branch of the Elizabeth River.

The groundwater at Site 2, and throughout SJCA, is not currently and is not expected to be used as a potable water supply. SJCA drinking and industrial water are supplied by the City of Chesapeake, which has four main sources; the Northwest River Water Treatment Plant, the Lake Gaston Water Treatment Plant, the City of Norfolk, and the City of Portsmouth; as well as an auxiliary source, which is used during peak demand periods. The City's Northwest River Water Treatment Plant treats water from the Northwest River and brackish groundwater from four deep groundwater wells. The Lake Gaston Water Treatment Plant treats raw water purchased from the City of Norfolk. The City of Norfolk treats water from the Eastern Branch and Little Creek Reservoirs; the Prince, Burnt Mills, Wright, Whitehurst, Smith, Lawson, and Gaston Lakes; the Nottoway and Blackwater Rivers; and four deep wells. The City of Portsmouth treats water from Lake Meade and five deep wells. The Western Branch Auxiliary Source is located near Hampton Roads Airport and pulls water from two deep groundwater wells and Aquifer Storage and Recovery water. Water from the auxiliary source is blended with Lake Gaston treated water before entering the distribution system.

Table 4-1
Monitoring Well Construction Summary
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Monitoring Well	Installation Date	Ground Elevation (ft msl)	Top of PVC Elevation (ft msl)	Total Well Depth (ft bgs)	Depth of Surface Casing (ft bgs)	Length of Screen (ft)	Depth of Top of Screen (ft bgs)	Depth of Bottom of Screen (ft bgs)	Depth to Base of Columbia Aquifer (ft bgs)	Depth to Base of Yorktown Confining Unit (ft bgs)	Thickness of Yorktown Confining Unit (ft)	Hydrogeologic Unit of Screened Interval	Description of Screened Lithology	Elevation of Top of Screen (ft msl)	Elevation of Bottom of Screen (ft msl)	Elevation of Base of Borehole (ft msl)	Elevation of Base of Columbia Aquifer (ft msl)	Elevation of Base of Yorktown Confining Unit (ft msl)
Shallow																		
SJS02-MW01S	07/01/97	5.19	7.72	15.1	NA	10	4.6	14.6	25	NA	NA	Columbia Aquifer	Columbia - sandy silt, silty fine sand, organics, interbedded clay, ~ last 3' soft silty clay - gray (fill materials)	0.59	-9.41	-9.91	NA	NA
SJS02-MW02S	06/30/97	4.59	6.98	13.5	NA	10	3	13	23	NA	NA	Columbia Aquifer	Columbia - silty fine sand, trace clay, trace shells/organics-gray to yellowish brown; 10-15' silty clay with fine sand and trace organics, soft, greenish gray; 10-12' petroleum odor no OVM hit	1.59	-8.41	-8.91	NA	NA
SJS02-MW03S	07/07/97	4.69	7.27	14	NA	10	3.2	13.2	23	NA	NA	Columbia Aquifer	Columbia - fill to ~3'; silty fine sand interbedded silty clay, yellowish brown, olive gray	1.49	-8.51	-9.31	NA	NA
SJS02-MW04S	04/27/99	4.6	5.53	13	NA	10	2	12	17	NA	NA	Columbia Aquifer	Columbia - silty fine sand, yellowish brown, some orange mottling and coarsening toward end of boring	2.6	-7.4	-8.4	NA	NA
SJS02-MW05S	04/27/99	5.87	8.52	13	NA	10	2	12	17	NA	NA	Columbia Aquifer	Columbia - silt and fine sand, trace clay (thin 2" interbedded layer), yellowish brown, 8' - oily odor no OVM hit	3.87	-6.13	-7.13	NA	NA
SJS02-MW06S	12/08/03	6.29	9.31	14	NA	10	4	14	14.5	NA	NA	Columbia Aquifer	Columbia- sand, mostly medium density, saturated, greenish yellow, at 4 4-.5' clay mixed w/ sand, no PID hit	2.29	-7.71	-7.71	NA	NA
SJS02-MW07S	12/09/03	6.79	6.87	15	NA	10	5	15	14.5	NA	NA	Columbia Aquifer	Columbia-medium sand, poorly sorted, pale yellowish brown, wet or saturated, some fines, PID hit 1.0 ppm	1.79	-8.21	-8.21	NA	NA
SJS02-MW08S	12/02/03	4.91	7.99	15	NA	10	5	15	15.5	NA	NA	Columbia Aquifer	Columbia-medium sand, pale yellowish brown, silty clay around 9', then silty sand, dark yellowish orange and saturated, medium density, no PID hit	-0.09	-10.09	-10.09	NA	NA
SJS02-MW09S	12/08/03	4.44	7.49	10	NA	5	5	10	10	NA	NA	Columbia Aquifer	Columbia-subrounded sand and silty sand, yellowish brown to light brown, wet, medium density, saturated at 9' with evidence of some oxidation, no PID hit	-0.56	-5.56	-5.56	NA	NA
SJS02-MW10S	11/16/04	6.2	9.18	16.5	NA	10	6.5	16.5	16	NA	NA	Columbia Aquifer	Columbia-fine sand (some clay from 5-7' and silty sand at 12-16'), saturated, loose, chemical odor, no PID hit	-0.3	-10.3	-10.3	NA	NA
SJS02-MW11S	11/16/04	2.5	5.68	20	NA	5	15	20	20	NA	NA	Columbia Aquifer	Columbia-peat with phragmites fibers, dark gray and moist with organic odor, silty peat with some fine sand and moist from 16.5-17.8, silty sand with some clay from 18-19, 19-20 fine sand with slight silt and then some and clay, olive brown, saturated, no PID hit	-12.5	-17.5	-17.5	NA	NA
SJS02-MW12S	11/17/04	6.68	6.13	16	NA	10	6	16	16	NA	NA	Columbia Aquifer	Columbia-fine sand, wet, light gray changing to light olive brown, olive yellow, and brown, medium dense to dense, saturated at 7.5'	0.68	-9.32	-9.32	NA	NA
SJS02-MW13S	11/17/2004	3.8	6.3	22	NA	15	7	22	21.7	NA	NA	Columbia Aquifer	Columbia-gravelly sands, dark gray/black and saturated, chemical odor, greenish gray clay at 10.5-14' with organic odor and wood fragment throughout, dark brown soft clayey peat with some organic and phragmites debris from 14-15', sandy peat and fine silty sand from 15.8-17.8', clayey sand with silty and sandy silt at 17.8-20', loose and saturated at 21.5', clay at 21.7', no PID hit	-3.2	-18.2	-18.2	NA	NA
SJS02-MW14S	5/30/2007	3.3	6.51	17	NA	10	7	17	17	NA	NA	Columbia Aquifer	Columbia-highly plastic and organic clay, medium dense, black, moist, from 7-15', silty fine sand and fine sand, grey, stiff, moist to saturated from 15-17'	-3.7	-13.7	-13.7	-13.7	NA
SJS02-MW15S	5/30/2007	2.6	5.59	19	NA	10	9	19	19	NA	NA	Columbia Aquifer	Columbia- silty and organic clay with gravel, dark greenish gray, very soft, saturated, medium plasticity, fine sand with silt, dark gray, saturated, dense at 17.5-19'	-6.4	-16.4	-16.4	-16.4	NA
SJS02-MW16S	6/1/2007	5	7.31	24	NA	10	14	24	22.5	NA	NA	Columbia Aquifer	Columbia- interbedded clay, sandy clay, clayey silt, and clayey sand, dark gray to dark greenish gray, generally loose or soft, moist, clay at 15-16' is stiff with medium plasticity, saturated at 23'10"	-9	-19	-19	-17.5	NA

Table 4-1
Monitoring Well Construction Summary
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Monitoring Well	Installation Date	Ground Elevation (ft msl)	Top of PVC Elevation (ft msl)	Total Well Depth (ft bgs)	Depth of Surface Casing (ft bgs)	Length of Screen (ft)	Depth of Top of Screen (ft bgs)	Depth of Bottom of Screen (ft bgs)	Depth to Base of Columbia Aquifer (ft bgs)	Depth to Base of Yorktown Confining Unit (ft bgs)	Thickness of Yorktown Confining Unit (ft)	Hydrogeologic Unit of Screened Interval	Description of Screened Lithology	Elevation of Top of Screen (ft msl)	Elevation of Bottom of Screen (ft msl)	Elevation of Base of Borehole (ft msl)	Elevation of Base of Columbia Aquifer (ft msl)	Elevation of Base of Yorktown Confining Unit (ft msl)
Deep																		
SJS02-MW01D	07/11/97	5.27	7.94	70	44	10	58	68	25	56	31	Yorktown Aquifer	YCU - clay greenish gray, some organics and mica, trace very fine sand, few shell frags; YF - very fine to fine sand greenish gray	-52.73	-62.73	-64.73	-19.73	-50.73
SJS02-MW02D	07/12/97	4.71	7.04	67	45	10	54.6	64.6	23	51.5	28.5	Yorktown Aquifer	YCU - dark greenish gray, soft, organics, stiff at 48"; YF - fine sand, shell frags abundant in some intervals, organics, dark greenish gray	-49.89	-59.89	-62.29	-18.29	-46.79
SJS02-MW05D	04/27/99	6.04	8.66	51	35.5	10	40	50	17	40	23	Yorktown Aquifer	YCU - clay greenish gray, some shells and interbedded sand, soft; YF - coarse shell frags, trace silt, light greenish gray, trace gravel	-33.96	-43.96	-44.96	-10.96	-33.96
SJS02-MW10D	11/12/04	6.5	9.24	68	19.6	5	63	68	17	54.5	37.5	Yorktown Aquifer	YCU-greenish gray, moist, clayey sand turning to fine silty sand with some clay at 64.2'; YF-fine grain saturated and loose sand at 64.7'; slag material from 65-65.2' and fine/medium sand with some silt, saturate	-56.5	-61.5	-61.5	-10.5	-48

NA - Not Available or Not Applicable
OVM - Organic Vapor Meter
YCU - Yorktown Confining Unit
YF - Yorktown Formation

Table 4-2
Monitoring Well Groundwater Elevation Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Well Identification	Screened Aquifer	Elevation Bottom of Screen (ft msl)	Vertical Distance Between Well Screens (ft)	Top of PVC Elevation (ft msl)	December-03			December-04			April-05			June-07		
					Depth to Water (ft)	Water Elevation (ft msl)	Vertical Gradient	Depth to Water (ft)	Water Elevation (ft msl)	Vertical Gradient	Depth to Water (ft)	Water Elevation (ft msl)	Vertical Gradient	Depth to Water (ft)	Water Elevation (ft msl)	Vertical Gradient
SJS02-MW01S	Columbia Aquifer	-9.41		7.72	4.46	**3.26**		5.74	**1.98**		5.44	**2.28**		6.17	**1.55**	
SJS02-MW01D	Yorktown Aquifer	-62.73	53.32	7.94	5.27	**2.67**	**-0.01**	5.99	**1.95**	**0.00**	5.42	**2.52**	**0.00**	5.90	**2.04**	**0.01**
SJS02-MW02S	Columbia Aquifer	-8.41		6.98	7.64	**-0.66**		7.09	**-0.11**		6.38	**0.6**		7.43	**-0.45**	
SJS02-MW02D	Yorktown Aquifer	-59.89	51.48	7.04	4.45	**2.59**	**0.06**	5.05	**1.99**	**0.04**	4.5	**2.54**	**0.04**	5.05	**1.99**	**0.05**
SJS02-MW03S	Columbia Aquifer	-8.51	NA	7.27	4.84	**2.43**	NA	5.57	**1.7**	NA	4.89	**2.38**	NA	6.23	**1.04**	NA
SJS02-MW04S	Columbia Aquifer	-7.4	NA	5.53	3.78	**1.75**	NA	5.78	**-0.25**	NA	5.58	**-0.05**	NA	6.67	**-1.14**	NA
SJS02-MW05S	Columbia Aquifer	-6.13		8.52	3.51	**5.01**		5.7	**2.82**		5.63	**2.89**		7.22	**1.3**	
SJS02-MW05D	Yorktown Aquifer	-43.96	37.83	8.66	5.96	**2.7**	**-0.06**	6.89	**1.77**	**-0.03**	6.27	**2.39**	**-0.01**	6.70	**1.96**	**0.02**
SJS02-MW06S	Columbia Aquifer	-7.71	NA	9.31	3.88	**5.43**	NA	5.9	**3.41**	NA	6.07	**3.24**	NA	7.30	**2.01**	NA
SJS02-MW07S	Columbia Aquifer	-8.21	NA	6.87	4.3	**2.57**	NA	5.65	**1.22**	NA	5.51	**1.36**	NA	5.92	**0.95**	NA
SJS02-MW08S	Columbia Aquifer	-10.09	NA	7.99	5.91	**2.08**	NA	5	**2.99**	NA	5.92	**2.07**	NA	6.23	**1.76**	NA
SJS02-MW09S	Columbia Aquifer	-5.56	NA	7.49	3.33	**4.16**	NA	4.24	**3.25**	NA	4.00	**3.49**	NA	4.50	**2.99**	NA
SJS02-MW10S	Columbia Aquifer	-10.3		9.18	NA	**NA**	NA	7.74	**1.44**		7.72	**1.46**		7.22	**1.96**	
SJS02-MW10D	Yorktown Aquifer	-61.5	51.2	9.24	NA	**NA**	NA	7.54	**1.7**	**0.01**	6.77	**2.47**	**0.02**	7.20	**2.04**	**0.00**
SJS02-MW11S	Columbia Aquifer	-17.5	NA	5.68	NA	**NA**	NA	4.14	**1.54**	NA	3.84	**1.84**	NA	6.76	**-1.08**	NA
SJS02-MW12S	Columbia Aquifer	-9.32	NA	6.13	NA	**NA**	NA	4.61	**1.52**	NA	4.63	**1.5**	NA	4.46	**1.67**	NA
SJS02-MW13S	Columbia Aquifer	-18.2	NA	6.3	NA	**NA**	NA	4.02	**2.28**	NA	3.68	**2.62**	NA	4.58	**1.72**	NA
SJS02-MW14S	Columbia Aquifer	-13.7	NA	6.51	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	5.70	**0.81**	NA
SJS02-MW15S	Columbia Aquifer	-16.4	NA	5.59	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	4.52	**1.07**	NA
SJS02-MW16S	Columbia Aquifer	-19	NA	7.31	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	12.50	**-5.19**	NA

Notes:
msl - mean sea level
ft - feet
NA - not applicable/analyzed

Table 4-3
Piezometer Groundwater Water Elevation Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Piezometer Identification	Top of PVC Elevation (ft msl)	June-07				
		Depth to Surface Water (ft)	Surface Water Elevation (ft msl)	Depth to Groundwater (ft)	Groundwater Elevation (ft msl)	Suggested Direction of Water Flow
SJS02-PZ01	3.28	2.19	1.09	2.15	1.13	GW to SW
SJS02-PZ02	2.24	1.30	0.94	0.9	1.34	GW to SW
SJS02-PZ03	2.69	1.62	1.07	1.62	1.07	No Gradient
SJS02-PZ04	3.56	2.50	1.06	2.6	0.96	SW to GW
SJS02-PZ05	2.70	1.80	0.90	1.9	0.8	SW to GW
SJS02-PZ06	3.54	2.60	0.94	2.24	1.3	GW to SW
SJS02-PZ07	3.36	2.30	1.06	4.45	-1.09	SW to GW
SJS02-PZ08	3.85	2.78	1.07	3.45	0.4	SW to GW
SJS02-PZ09	2.64	1.60	1.04	1.3	1.34	GW to SW

Notes:
msl - mean sea level
ft - feet
GW - groundwater
SW - surface water

Table 4-4
Slug Test Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Monitoring Well	Slug Test Type	Slug Test Analytical Method	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (feet/day)	Saturated Thickness (feet)	Transmissivity (cm^2/sec)	Transmissivity ($feet^2$/day)
Columbia Aquifer - Unconfined Aquifer							
SJS02-MW01S	Rising Head	Bouwer-Rice	9.28E-04	2.63	12	0.34	31.5
SJS02-MW05S	Rising Head	Bouwer-Rice	2.13E-03	6.03	12	0.78	72.3
SJS02-MW07S	Rising Head	Bouwer-Rice	4.34E-04	1.23	12	0.16	14.8
SJS02-MW09S	Rising Head	Bouwer-Rice	3.19E-03	9.03	8.85	0.86	80.0
SJS02-MW10S	Rising Head	Bouwer-Rice	1.00E-03	2.83	11	0.34	31.2
Columbia Aquifer Geometric Mean:			**1.22E-03**	**3**		**0.41**	**38**
Columbia Aquifer Standard Deviation:			**1.11E-03**	**3**		**0.31**	**29**
Yorktown Aquifer (Bouwer-Rice)							
SJS02-MW01D	Rising Head	Bouwer-Rice	1.78E-02	50.34	145	78.49	7299.8
SJS02-MW05D	Rising Head	Bouwer-Rice	2.72E-02	77.22	145	120.39	11196.3
SJS02-MW10D	Rising Head	Bouwer-Rice	1.45E-03	4.10	145	6.39	594.3
Yorktown Aquifer Geometric Mean:			**8.88E-03**	**25.16**		**39**	**3649**
Yorktown Aquifer Standard Deviation:			**1.30E-02**	**36.98**		**58**	**5363**

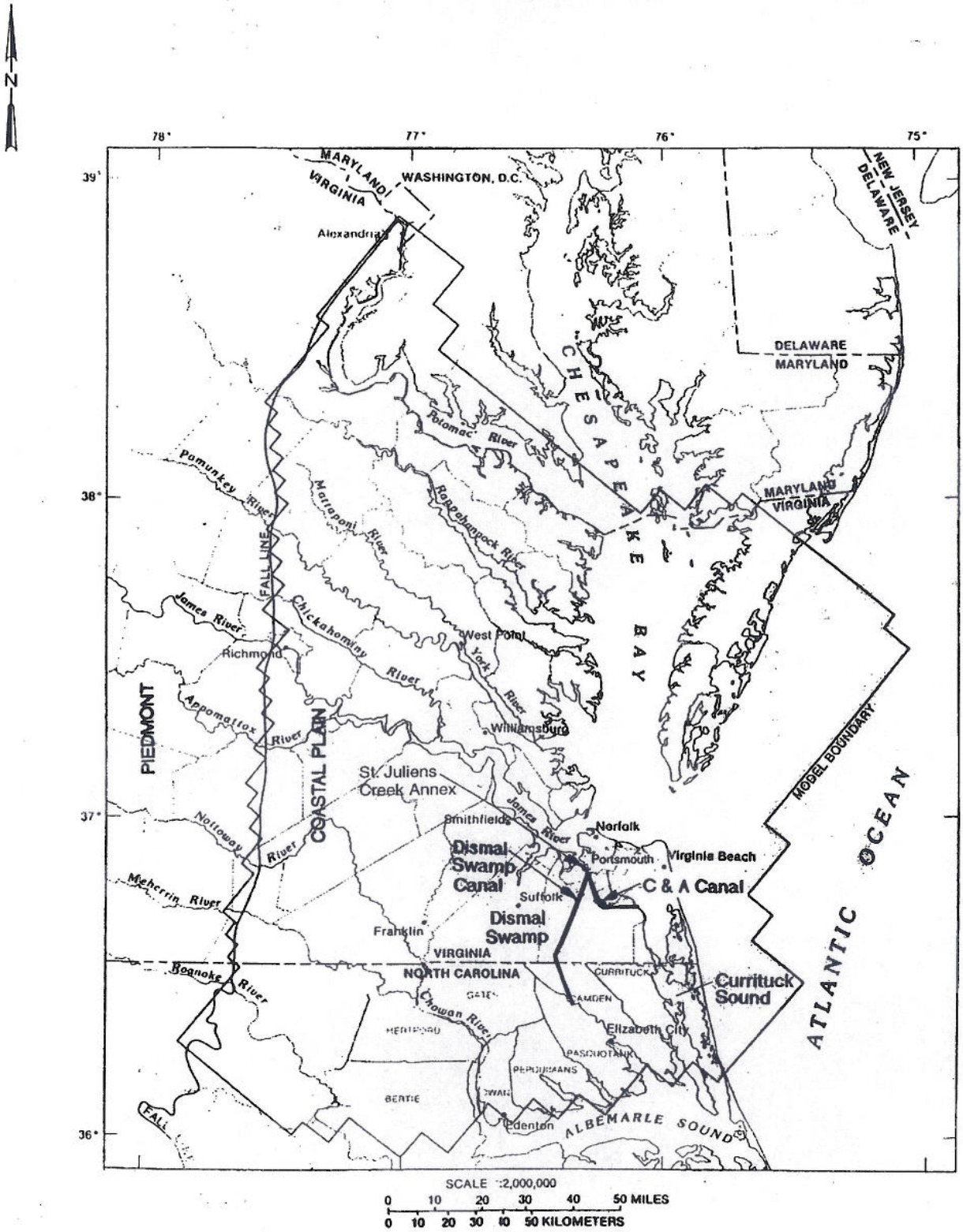

FIGURE 4-1

PHYSIOGRAPHIC PROVINCES
OF SOUTHERN VIRGINIA
SITE 2 EXPANDED REMEDIAL
INVESTIGATION REPORT
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VIRGINIA

SOURCES:

BASE FROM U.S. GEOLOGICAL SURVEY
STATE BASE MAPS 1:1,000,000 AND USGS
SURVEY PROFESSIONAL PAPER 1404-F.

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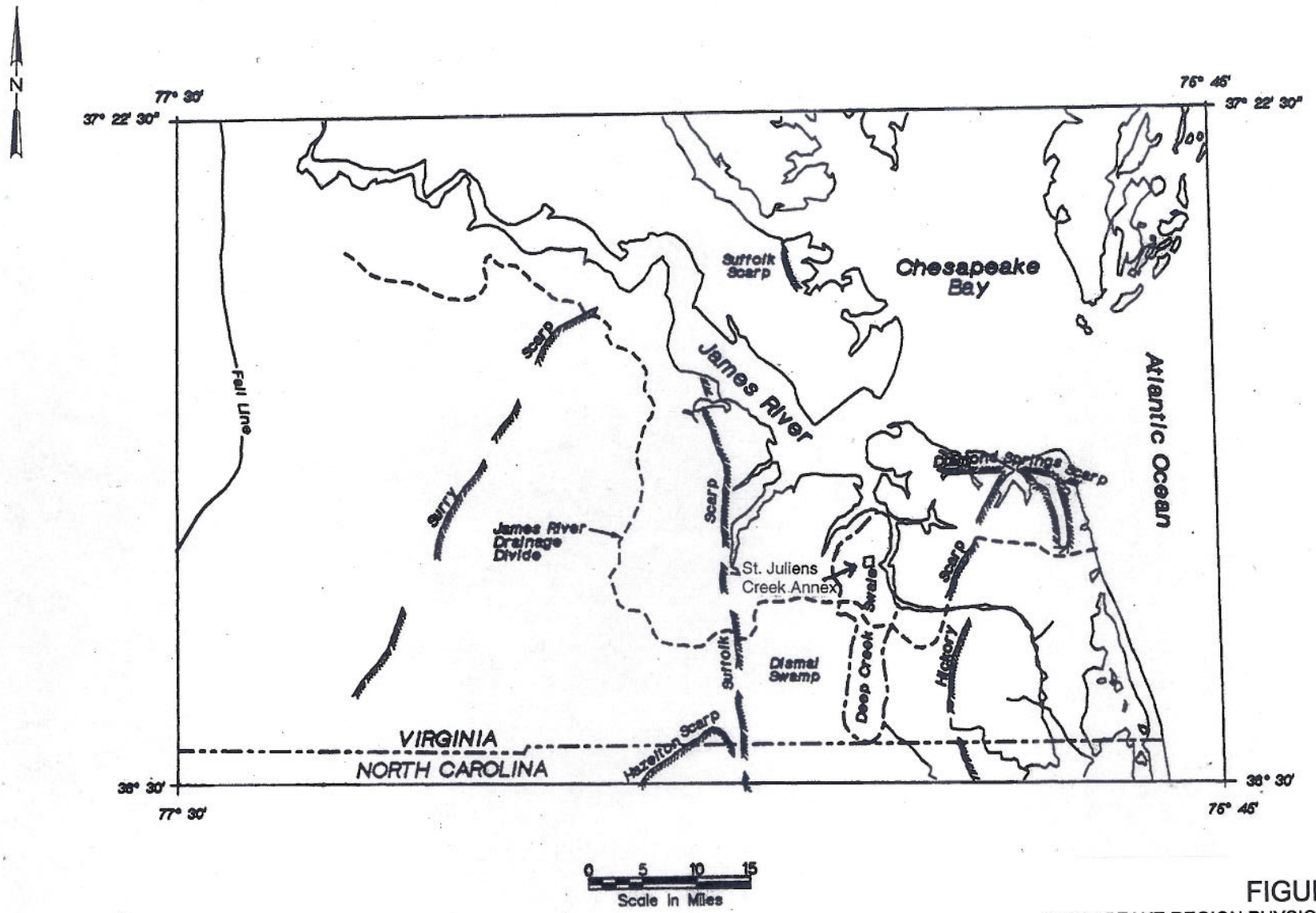

FIGURE 4-2
CHESAPEAKE REGION PHYSIOGRAPHY AND HYDROLOGY FEATURES
SITE 2 EXPANDED REMEDIAL INVESTIGATION REPORT
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VIRGINIA

SOURCE:

FIGURE 6" OF POST-MIOCENE STRATIGRAPHIC AND MORPHOLOGY, SOUTHERN VIRGINIA, BULLETIN 82, DATED 1973.

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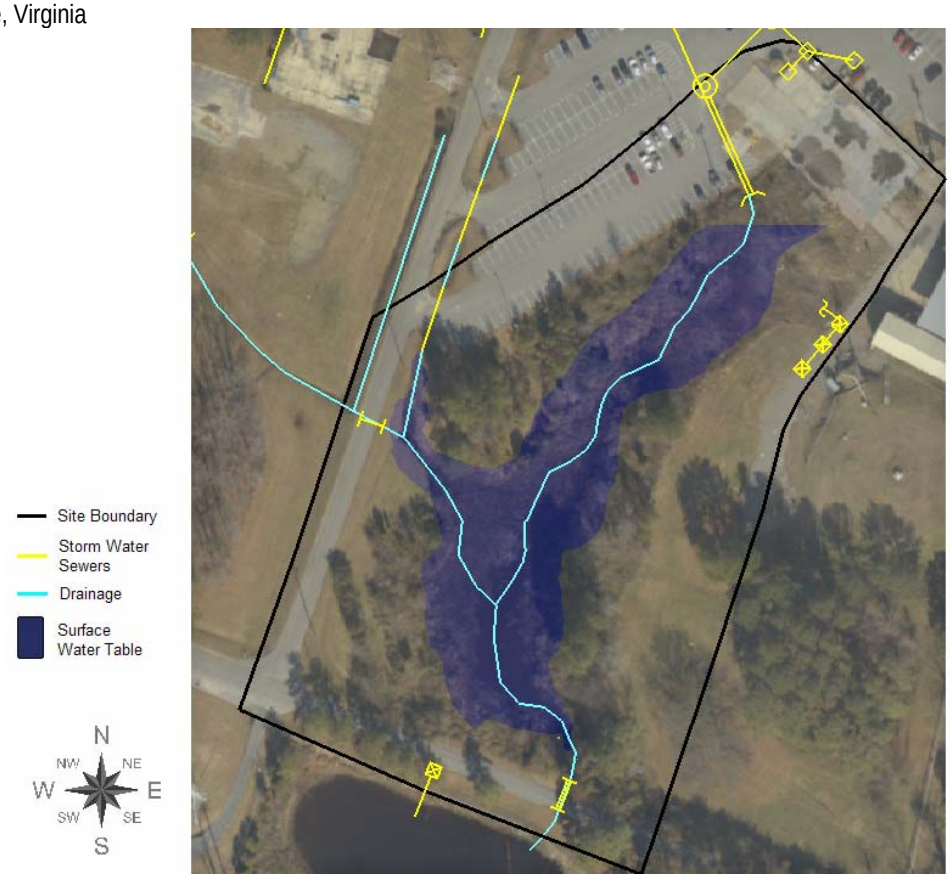
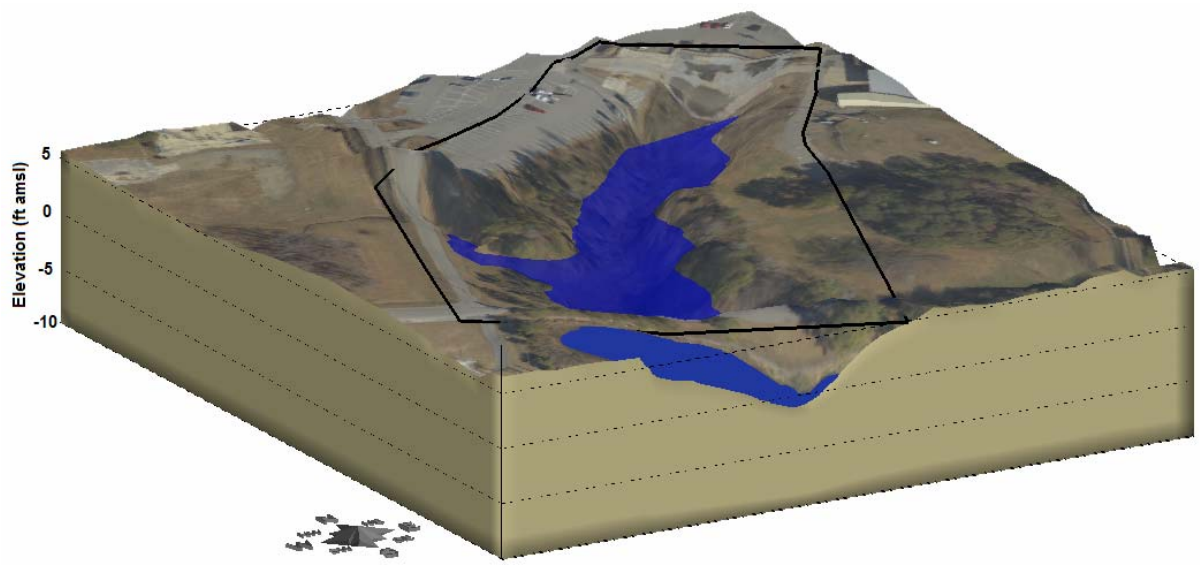
FIGURE 4-3
Exaggerated Topography and Intersection of Surface Water Table (June 2007)
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia





Note: Vertical exaggeration is ten times

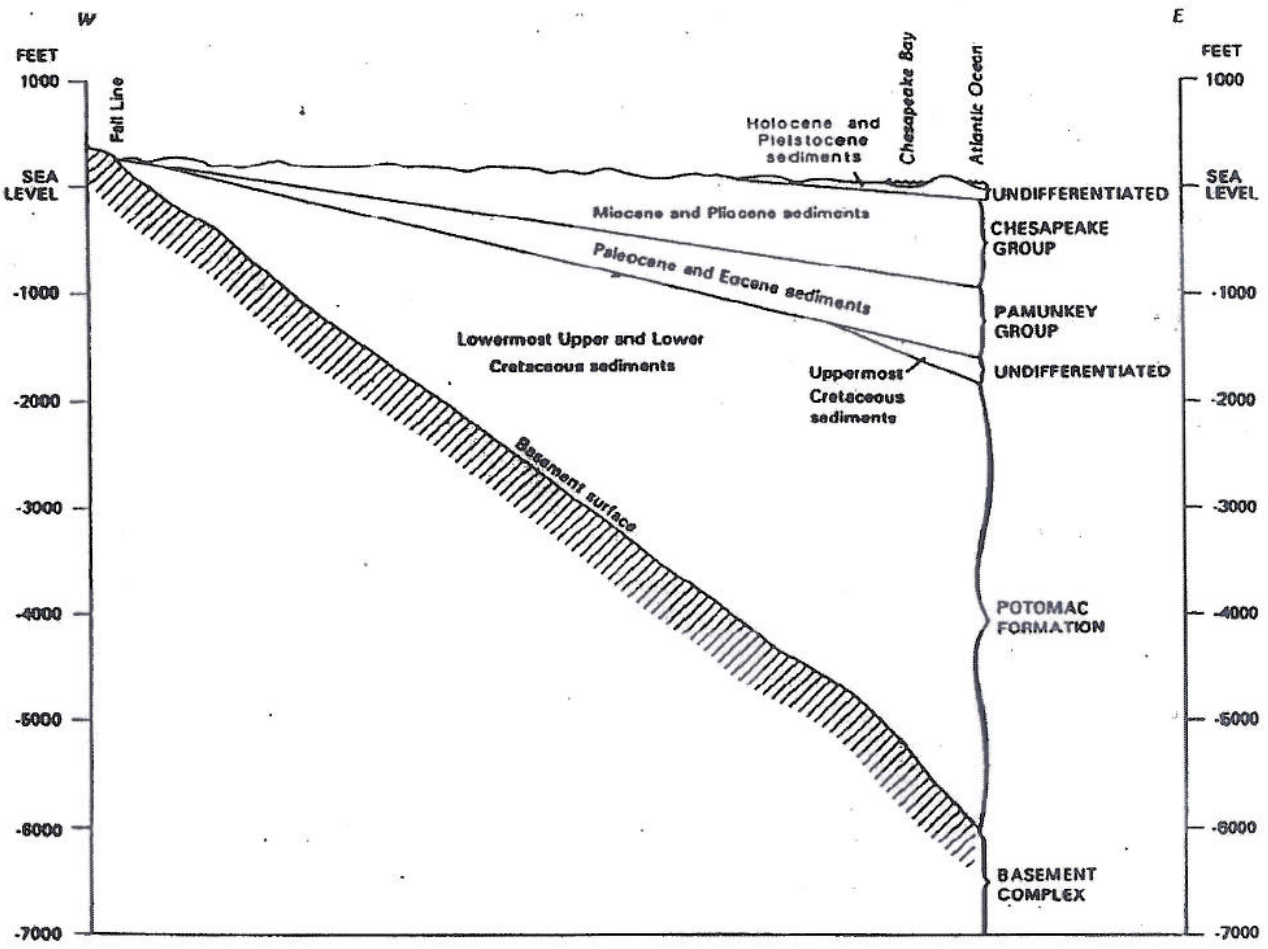


FIGURE 4-4
GENERALIZED GEOLOGIC SECTION
SHOWING EASTWARD-THICKENING SEDIMENTARY
WEDGE OF VIRGINIA COSTAL PLAIN
SITE 2 EXPANDED REMEDIAL
INVESTIGATION REPORT
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VIRGINIA

SOURCE:

FIGURE 5 OF REGIONAL AQUIFER-SYSTEM ANAYLSIS
USGS SURVEY PROFESSIONAL PAPER 1404-C.

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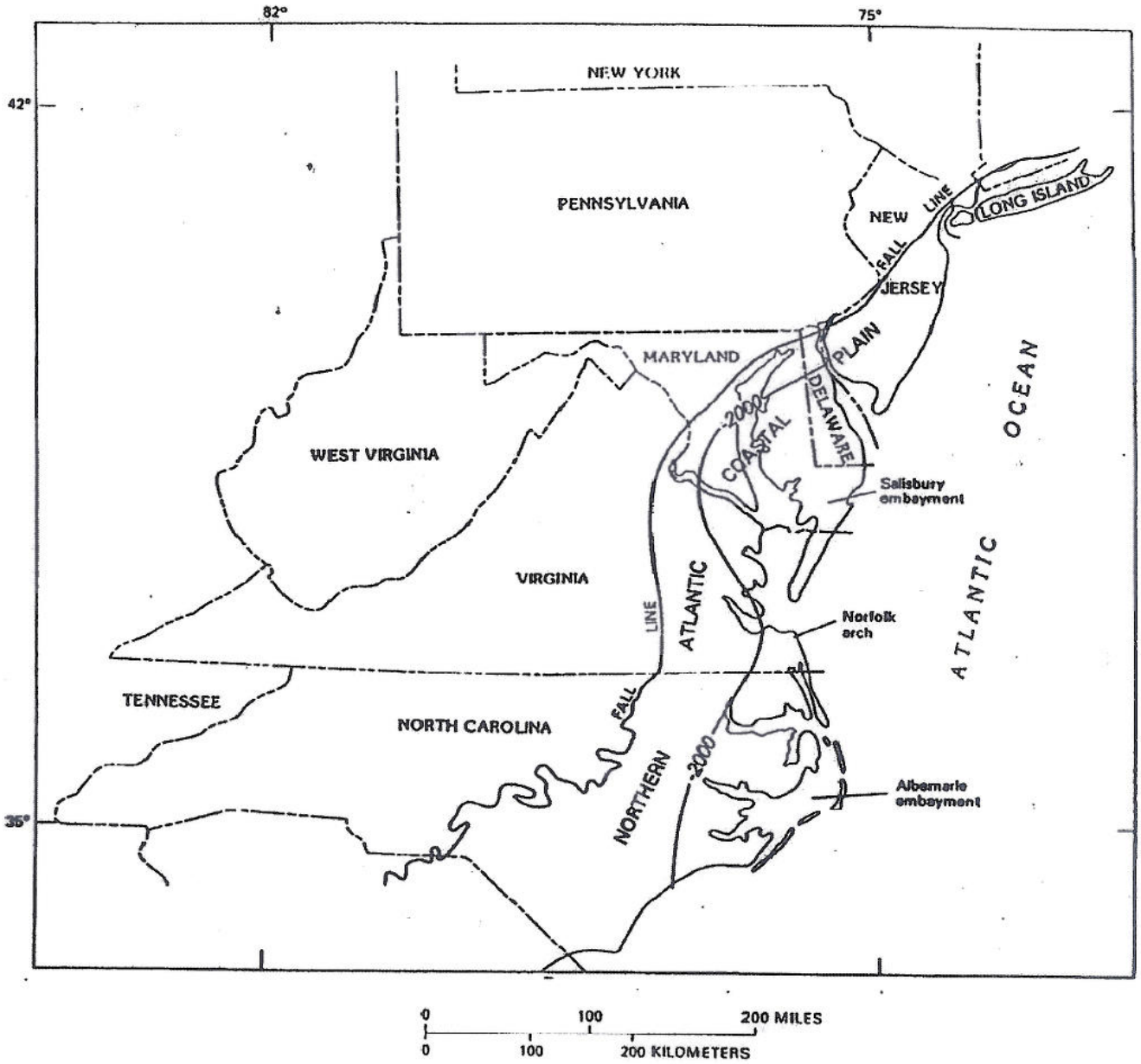

EXPLANATION

—-2000— STRUCTURE CONTOUR-Shows altitude of top of basement surface, in feet. Datum is sea level

FIGURE 4-5

MAJOR STRUCTURAL BASEMENT-DEFORMATION FEATURES OF THE VIRGINIA COASTAL PLAIN AND ADJOINING AREAS

SITE 2 EXPANDED REMEDIAL INVESTIGATION REPORT
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VIRGINIA

SOURCE:

FIGURE 6* OF REGIONAL AQUIFER-SYSTEM ANALYSIS
USGS SURVEY PROFESSIONAL PAPER 1404-C.

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SYSTEM	SERIES		Geological units this report	Hydrogeologic units: Meng and Harsh (1988)	Virginia RASA model unit	Laczniak and Meng (1988)	Brockman and others (1997): Lackey Plain	Brockman and others (1997): Croaker Flat
QUATERNARY	Holocene		Alluvium, swamp, + beach	Columbia aquifer	AQ10	Columbia aquifer	Columbia aquifer	Columbia aquifer
	Pleistocene	U	Tabb Formation					
		M	Shirley Formation					
			Chuckatuck Formation					
		L	Charles City Formation				Columbia aquifer	Yorktown confining unit[2]
			Windsor Formation					
TERTIARY	Pliocene	U	Bacons Castle Formation	Yorktown confining unit	CU9	Yorktown confining unit	Cornwallis Cave confining unit	
			CHESAPEAKE GROUP – Yorktown Formation: Moore House Member	Yorktown-Eastover aquifer	AQ9		Cornwallis Cave aquifer	
			Mogarts Beach Member				Yorktown confining unit	Yorktown confining unit
			Rushmere Member					
		L	Sunken Meadow Member			Yorktown-Eastover aquifer		Yorktown-Eastover aquifer
	Miocene	U	Eastover Formation: Unnamed beds[1] ?					
			Cobham Bay Member					
			Claremont Manor Member	St. Marys confining unit	CU8	St. Marys confining unit	Eastover-Calvert confining unit	
			St. Marys Formation					
		M	Calvert Formation: Choptank Formation (not present in study area)	St. Marys-Choptank aquifer	AQ8	Calvert confining unit		
			Calvert Beach Member	Calvert confining unit	CU7			
			Plum Point Member					
			Fairhaven Member					
		L	Newport News unit	Chickahominy-Piney Point aquifer	AQ7	Chickahominy-Piney Point aquifer	Not covered in report	
	Oligocene	U	Old Church Formation					

York County shallow aquifer system

[1]Unpublished data D.S. Powars and T. Cronin (1995).
[2]Yorktown-Eastover aquifer.

FIGURE 4-6
SIGNIFICANT STRATIGRAPHIC NOMENCLATURE IN RELATION TO HYDROGEOLOGIC FRAMEWORK
SITE 2 EXPANDED REMEDIAL INVESTIGATION REPORT
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VIRGINIA

NOTE:

TABLE COPIED FROM THE EFFECTS OF THE CHESAPEAKE BAY IMPACT CRATER ON THE GEOLOGICAL FRAMEWORK AND CORRELATION OF THE HYDROGEOLOGIC UNIT OF THE LOWER YORK-JAMES PENINSULA, VIRGINIA, BY: DAVID S. POWARS AND T. SCOTT BRUCE, U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1612.

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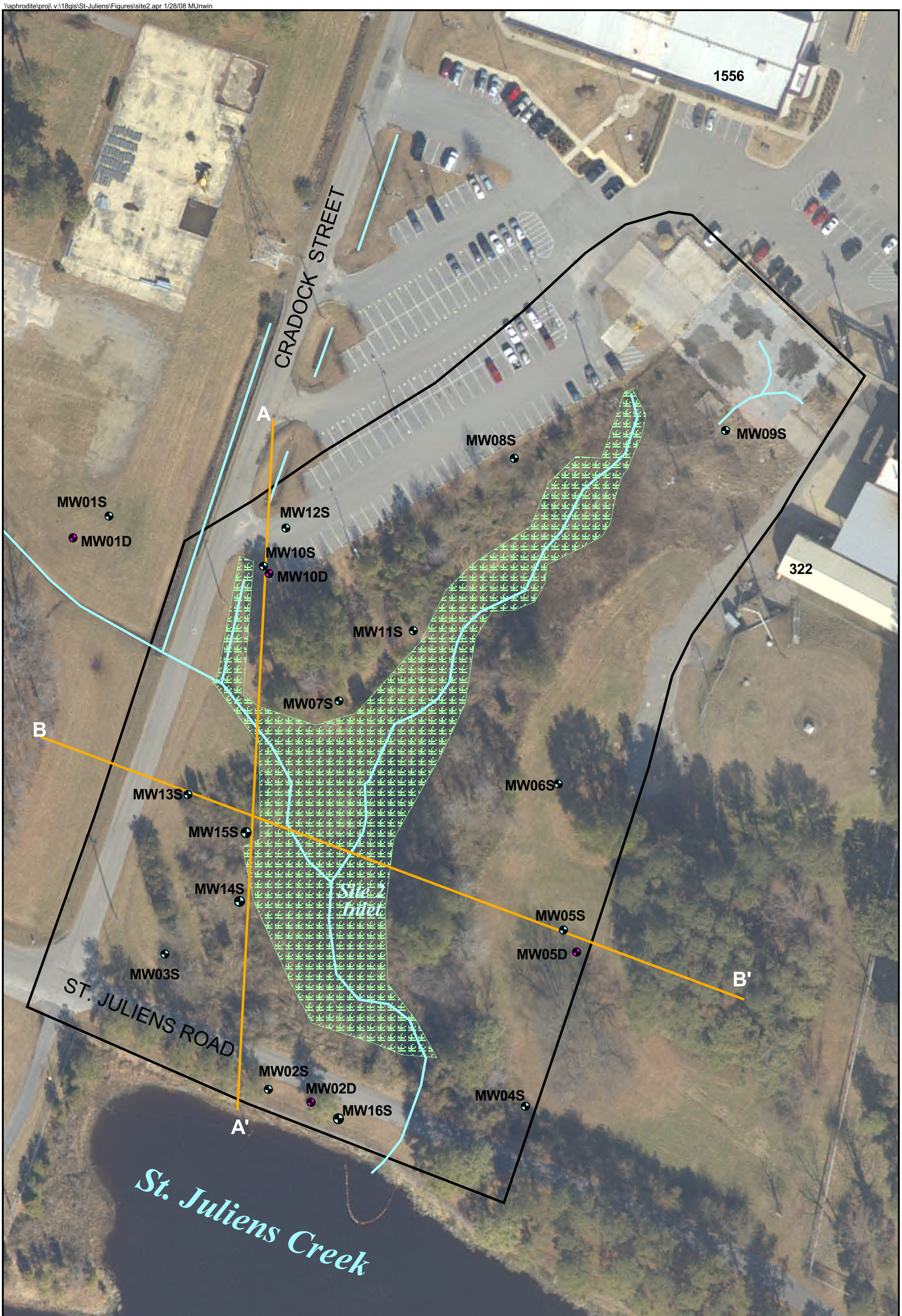

LEGEND

- Site Boundary
- Shallow Monitoring Well Locations
- Deep Monitoring Well Locations
- Cross Section Location
- Drainage
- Wetland

N

0 70 140 Feet

Figure 4-7
Hydrostratigraphic Cross-Section Locations
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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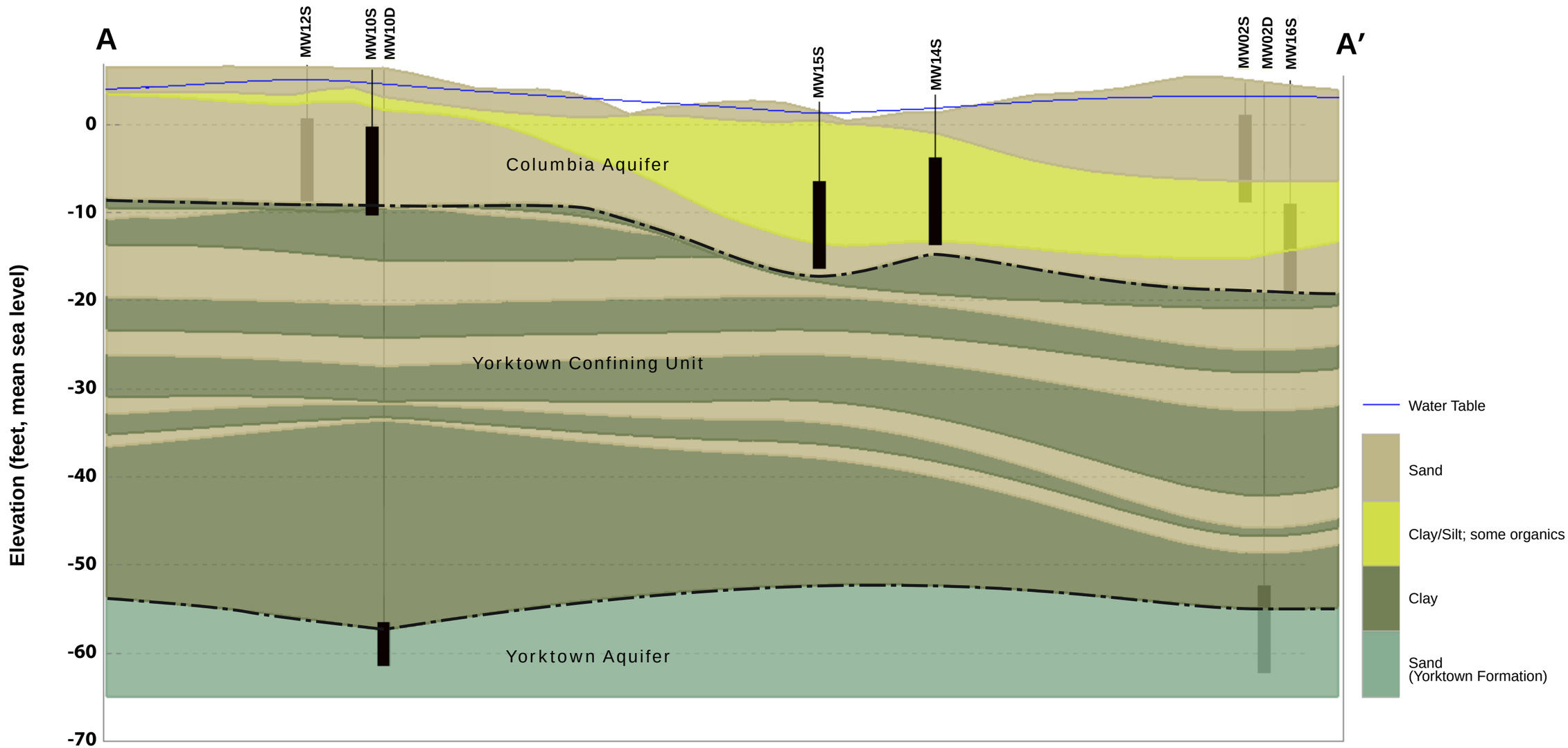

Figure 4-8
Hydrostatigraphic Cross-Section (North-South)
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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ES012008015GNV_Navy_Fig4-8_Cross-SectionA-A'

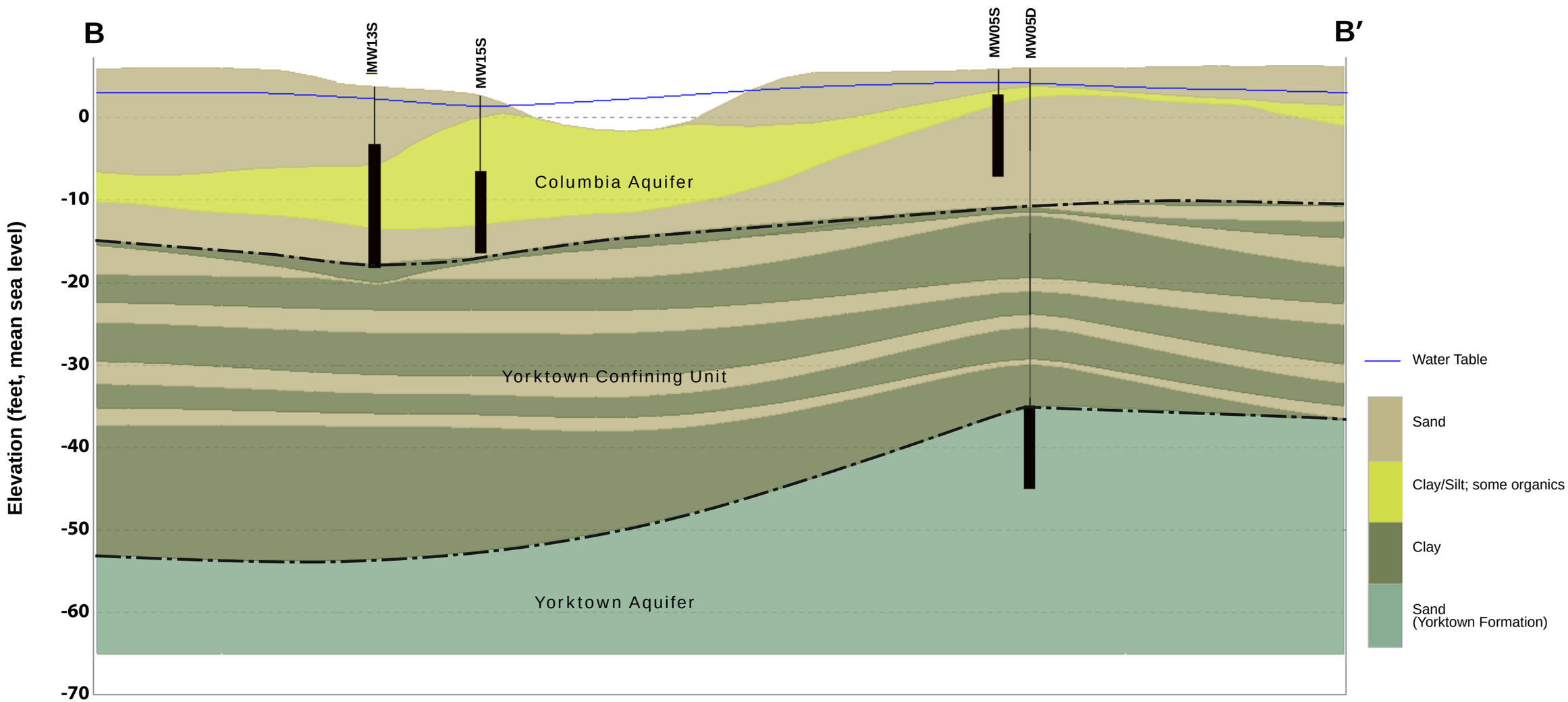

Figure 4-9
Hydrostatigraphic Cross-Section (East-West)
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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ES012008015GNV_Navy_Fig4-9_Cross-SectionB-B'

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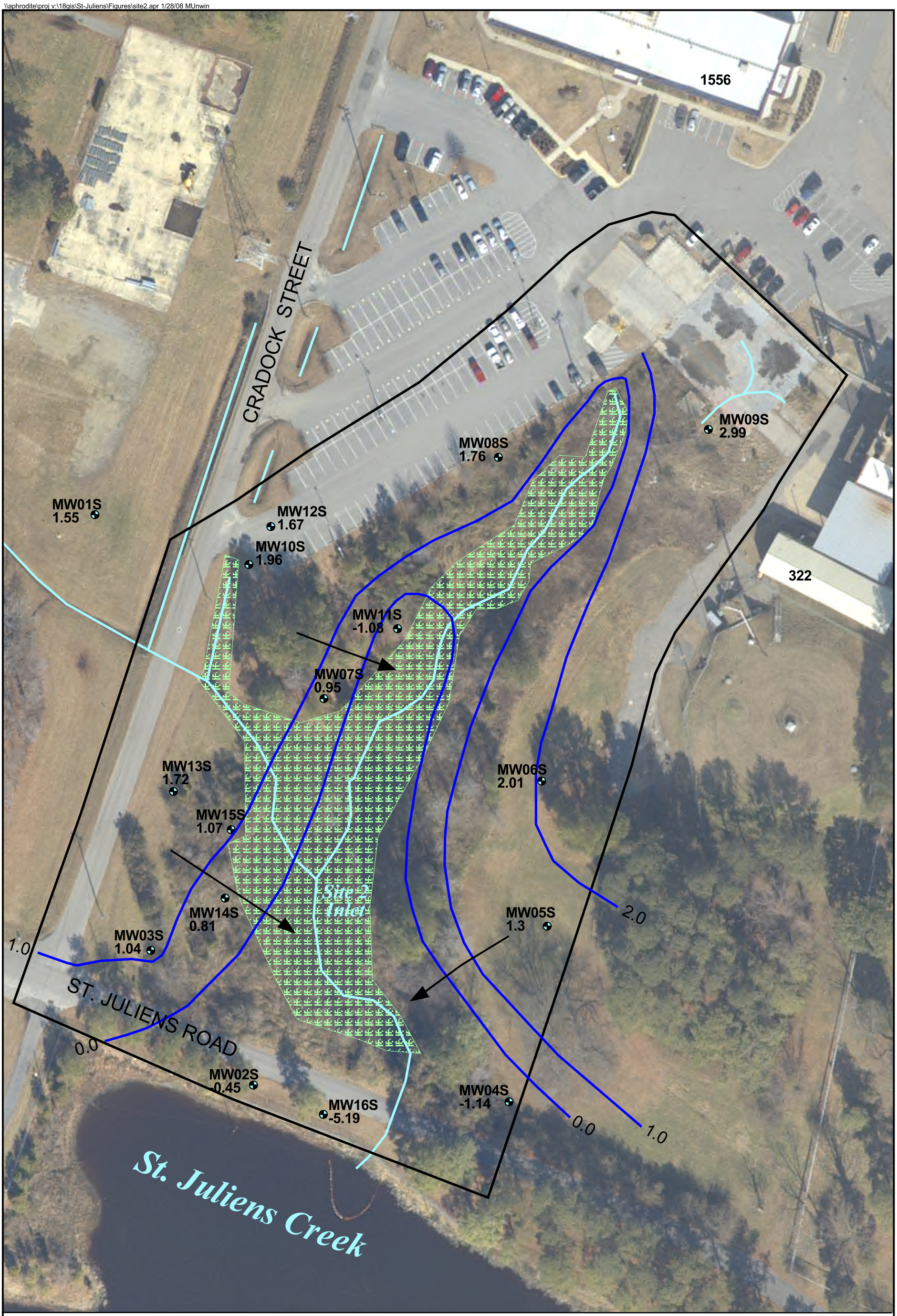

LEGEND

- Site Boundary
- Drainage
- Wetland
- Estimated Groundwater Flow Direction
- Potentiometric Surface Contours (June 2007)
- Shallow Monitoring Well Location
- 1.55 Groundwater Elevation (feet above mean sea level)

N

0 70 140 Feet

Figure 4-10
Columbia Aquifer Potentiometric Surface
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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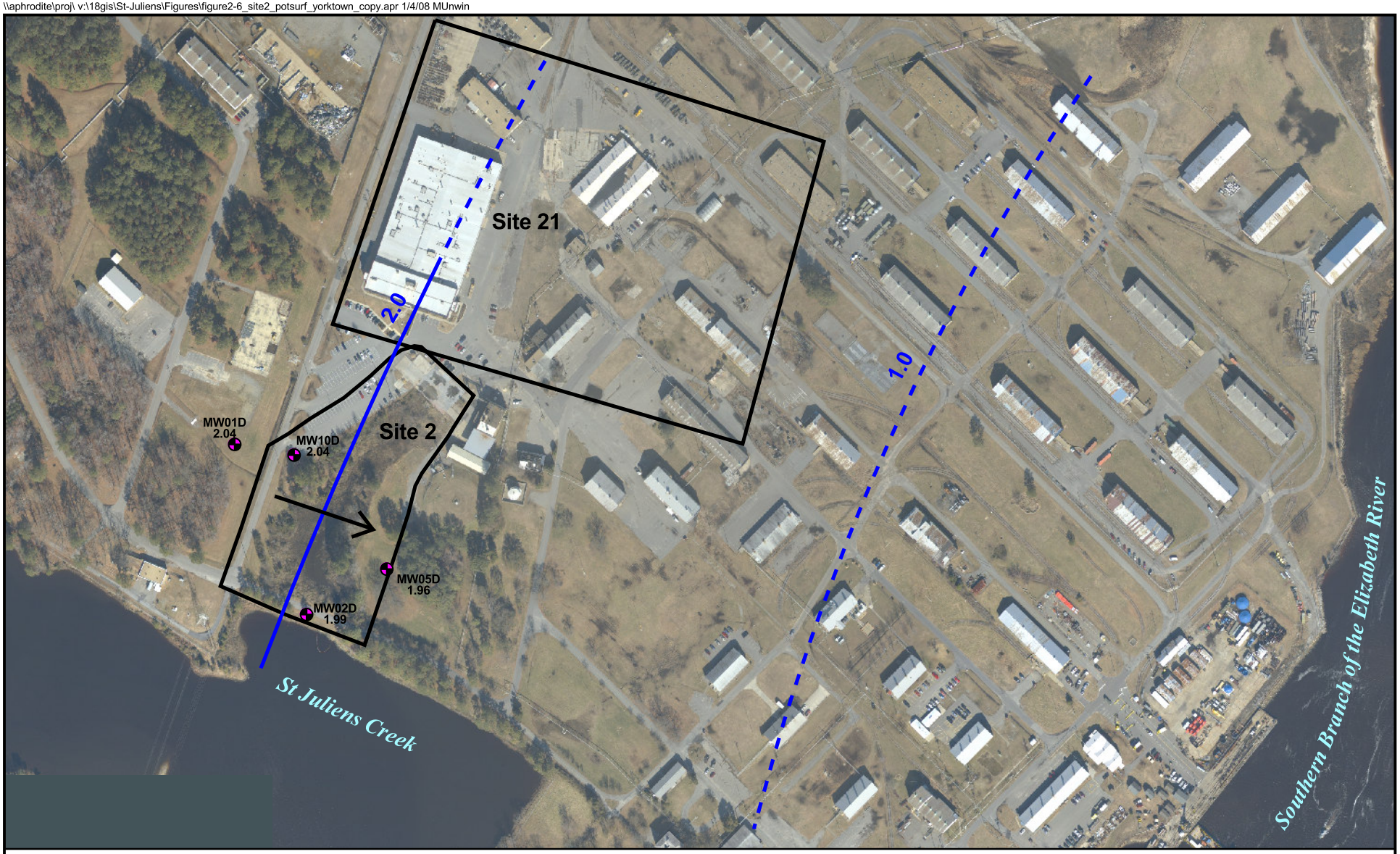

LEGEND

- Deep Monitoring Well Locations
- Site Boundaries
- Estimated Groundwater Flow Direction
- Potentiometric Surface Contours (June 2007)
- Inferred Potentiometric Surface Contours
- 2.04 Groundwater Elevation (feet above mean sea level)

N

0 175 350 Feet

Figure 4-11
Yorktown Aquifer Potentiometric Surface Map
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 5

Nature and Extent of Contamination

This section presents the results of the Site 2 RI, Site 17 SI, and Site 2 Expanded RI field investigation activities in order to present a comprehensive depiction of the nature and extent of contamination at the site. **Table 2-1** provides a summary of all samples collected at Site 2 and their analytical parameters. The sample locations are identified on **Figures 2-4**, **3-1**, and **3-2**.

Data were compared to screening criteria, where available. Shallow groundwater, soil, and sediment were compared to background UTLs to identify potential site-related releases, discussed previously in Section 3.3. In cases where no background UTLs are available (e.g., VOCs, certain SVOCs and inorganics, explosives, total petroleum hydrocarbons [TPH]) detections were treated as exceedances. Additionally, shallow and deep groundwater were compared to Federal Maximum Contaminant Levels (MCLs) and surface water was compared to Virginia Water Quality Criteria for human health and aquatic life. The complete analytical results are provided in **Appendix C**.

5.1 Investigation Results

5.1.1 Waste Delineation

A review of historic aerial photographs, electromagnetic and magnetometer geophysical surveys, and test pitting were conducted during the RI in order to delineate the extent of waste present at the site. The RI test pit locations are shown on **Figure 5-1** and the logs are provided in the RI (CH2M HILL, 2004a). The RI waste delineation activities delineated the extent of waste with the exception of the parking lot in the northwestern portion of Site 2. Therefore, soil borings were advanced below the parking lot during the Expanded RI (**Figure 5-1**). The soil boring locations are shown on **Figure 5-1** and the logs from the Expanded RI are presented in **Appendix J**.

Based on these investigations, the areal extent of the waste covers approximately 3.9 acres (**Figure 5-1**). The horizontal extent of waste beneath the parking lot to the west is inferred. Based on interpretation of historical aerial photographs of former site activities and locations of physical features (e.g., current or former buildings or roads), it is not likely that the waste extends much farther west of the area. The soil borings revealed that the layer of waste material is as thick as 10 to 11 ft in some locations and is present within the unsaturated zone and the saturated zone. Vertical delineation of the waste continued until waste was no longer encountered or test pitting could no longer continue (e.g., water table was encountered); therefore, it is possible that waste may be present deeper than the bottom of the test pits. Subsurface waste consists of ABM, burnt/stained soil, concrete, asphalt, brick, metal, glass, wood, solvents, and MEC-related scrap (one shell and three Mark 5 cartridge cases were found during test pitting). Three geologic cross sections were created to illustrate the spatial extent of waste. The locations of these cross sections are depicted in **Figure 5-2** and the cross sections are presented in **Figures 5-3**, **5-4**, and **5-5**.

5.1.2 Wetland Surface Debris Delineation

Several (10 to 15) concrete slabs within the tidal inlet were identified during the wetland surface debris delineation conducted as part of the Expanded RI. The concrete slabs are located along an approximate 50-ft long by 5-ft wide area at the southwestern and southeastern edges of tidal inlet, in the vicinity of the culvert (**Figure 5-1**). The historical use of the slabs has not been documented; however, it's possible that the slabs were related to the historical activity of filling the inlet in with debris or that they were placed as an erosion control measure. The concrete slabs have little impact on the wetland ecosystem, as they are composed of inert material.

5.1.3 MIP Investigations

The results of the MIP investigations were used to delineate the horizontal and vertical extent of the VOC groundwater plume and help locate the source. Elevated ECD response, an indicator of CVOC presence, was observed in MIP borings located along the western edge of the tidal inlet and in the wooded area northwest of the inlet, near monitoring well SJS02-MW07S (**Figures 5-6** and **5-7**). There was no significant ECD response observed in MIP borings located on the eastern side of the inlet. Since the MIP could not be utilized within the tidal inlet, ECD response in this area was interpolated using the three-dimensional software, Mining Visualization System (MVS), distributed by C Tech Development Corporation, based on the available data. Based on groundwater sample data collected within the inlet, the extent of elevated MIP response within the inlet may be overestimated. The MIP logs are provided in **Appendix K**.

The CVOC hot spot, the area with the highest CVOC concentrations, was defined by the MIP (ECD response greater than 5 million microvolts) in the western portion of the site over an approximately 250-ft long by 125-ft wide area and includes monitoring wells SJS02-MW07S, MW10S, and MW15S (**Figure 5-8**). Potential release points within the hot spot were identified at MIP 216, MIP 202, and MIP 235 based on the presence of very high ECD response at shallow depths (4 to 6 ft bgs) (**Figures 5-6** and **5-7**). The highest MIP response was observed at MIP 216 (adjacent to monitoring well SJS02-MW10S) between 9 and 11 ft bgs. This location is adjacent to a historic storage area (Building 257 and its vicinity) identified in aerial photographs. The MIP screening logs generally depict a vertical contaminant profile where concentrations were relatively low to a depth of approximately 8 ft bgs (with the exception of the two release points) and then increased with depth to the top of the Yorktown confining unit (11 to 25 ft bgs). The MIP borings did not extend into the confining unit; however, CVOCs are assumed to be sorbed or trapped as residual contamination in the finer-grained lithology of the confining unit.

The trapping data collected during the 2004 investigation indicated the presence of benzene at MIP 216 and TCE south of the parking lot adjacent to the Site 2 inlet. Based on the trapping data, the highest TCE concentrations were found at MIP 216, just south of the parking lot (**Figure 3-1**). With the exception of MIP locations 216 and 220, which were collected from 3 ft bgs down to the Yorktown confining unit (15 to 19 ft bgs), the traps were obtained from a depth in groundwater where elevated concentrations of VOCs were present (6 to 12 ft bgs) extending into the Yorktown confining unit.

DPT soil and groundwater samples were collected in May 2007 to confirm the MIP response and identify the magnitude of CVOC concentrations at Site 2 (**Figure 3-1**).

Correlation plots (provided in **Appendix K**) were developed to evaluate the reliability of the MIP as screening technology for site contaminants. These correlation plots represent total CVOC concentrations against MIP detector responses. Total CVOC concentrations were selected for the plots over an individual chemical since the MIP responds to all VOCs present in the subsurface; total CVOC concentrations were calculated using analytical laboratory results. Total CVOC concentrations in soil and groundwater were plotted against several MIP detector results (ECD maximum and average and PID maximum and average) to determine which of the MIP detector was most appropriate to use for site characterization. For the DPT soil samples, both the ECD and PID response correlated well. For the DPT groundwater samples, the ECD response correlated moderately well while the PID response correlated poorly. Both PID and ECD respond to the VOCs sorbed to soil, dissolved in groundwater, and present as vapor. Thus, analytical results for soil samples collected below the water table and groundwater samples may be lower than the ECD or PID response because the detections include response from VOCs located in both matrices. Soil and groundwater analytical results are discussed further in Sections 5.1.4 and 5.15, respectively.

5.1.4 Surface Soil Sampling

Surface soil samples collected during the Site 2 RI and Site 17 SI adequately defined the nature and extent of surface soil contamination. This section presents the results for field and laboratory analysis of geochemical parameters, VOCs, SVOCs, pesticides/PCBs, explosives, and inorganics in the surface soil.

Volatile Organic Compounds

Four VOCs (2-butanone, acetone, methylene chloride, and toluene) were detected sporadically in surface soil samples (**Table 5-1**). Detections are shown on **Figure 5-9**.

Semivolatile Organic Compounds

Twenty-two SVOCs were detected in surface soil samples (**Table 5-1**). Background UTLs have been established for 16 of the 22 detected SVOCs, and all 16 of these SVOCs exceeded the established background UTLs in at least one sample (**Figure 5-9**). The SVOCs detected most frequently and generally at the highest concentrations are benzo(a)anthracene, benzo-(a)pyrene, benzo(b)fluoranthene, chrysene, fluoranthene, and pyrene. SVOCs were detected at locations inside and outside of the extent of waste. The highest concentrations and the greatest number of SVOCs were reported in SJS02-SS03 (total SVOC concentration of approximately 30,000 micrograms per kilogram [µg/kg]), located on the eastern side of the tidal inlet.

Pesticides/Polychlorinated Biphenyls

Ten pesticides were detected in surface soil samples throughout the site, inside and outside the extent of waste (**Table 5-1**). Of these 10 detected pesticides, background UTLs have been established for nine and all nine were reported above their background UTLs (**Figure 5-9**). The pesticides detected most frequently and at the highest concentrations were 4,4′- di-

chlorodiphenyldichloroethane (DDD), 4,4′-dichlorodiphenyldichloroethene (DDE), and 4,4′-dichlorodiphenyltrichloroethane (DDT). The sample (SJS02-SS20) with the highest concentrations reported a total pesticide concentration of approximately 19,000 µg/kg. This surface soil sample is located just to the south of former Building 130.

One PCB (aroclor-1260) was detected in eight soil samples. The highest concentrations were found near former Building 278/279, ranging from 110 to 2,700 µg/kg (**Figure 5-9**). No background UTL was established for aroclor-1260.

Explosives

No explosives were detected in surface soil.

Inorganics

Twenty-four inorganics were detected in the surface soil (**Table 5-1**). Background UTLs have been established for 20 of the 24 detected inorganics, and all 20 were exceeded (**Figure 5-10**). Samples SJS02-SS03, SS06, SS16, and SS20 contained the greatest number of inorganics and generally at the highest concentrations. SJS02-SS03 and SS06 are located within the limits of ABM waste and SJS02-SS16 and SS20 are located just south of former Building 130.

5.1.5 Subsurface Soil Sampling

Subsurface soil samples collected during the Site 2 RI adequately defined the nature and extent of subsurface soil contamination. Subsurface soil samples were also collected during the Site 2 Expanded RI for MIP verification, as discussed in Section 5.1.3. This section presents the results for field and laboratory analysis of geochemical parameters, VOCs, SVOCs, pesticides/PCBs, explosives, and inorganics in the subsurface soil.

Volatile Organic Compounds

Four VOCs (2-butanone, acetone, carbon disulfide, and TCE) were detected sporadically in subsurface soil during the Site 2 RI (**Table 5-2**). TCE was only detected (12 µg/kg) in SJS02-SB06, adjacent to the paved parking area (**Figure 5-11**).

DPT soil samples were collected during the Triad investigation to confirm MIP readings at or below the water table (approximately 4 to 7 ft bgs), with the exception of SJS02-SB203 where a sample was collected just above the water table (4.5 to 5 ft bgs). TCE and/or its breakdown products (cis-1,2-dichloroethene [DCE], trans-1,2-DCE, and vinyl chloride [VC]) were detected in all 11 soil samples (**Table 5-2**) and correlate well with MIP results. Soil concentrations of dense non-aqueous phase liquid (DNAPL)-related compounds exceeding 10,000,000 µg/kg (or 1 percent of soil mass) indicate a strong likelihood of DNAPL contamination (USEPA, 2004b). However, a more accurate indicator of potential DNAPL presence in soil is determined based on the concentrations of DNAPL-related compounds above their soil saturation concentration, or the concentration at which the compound has reached its soil adsorption, water solubility, and air saturation limits (USEPA, 1996c). Resultantly, the soil saturation concentration incorporates the site-specific impact of organic carbon, soil porosity, and soil bulk density when evaluating the potential presence of DNAPL. Due to the high TOC concentrations measured at Site 2, the soil saturation

concentration for TCE ranges from 403,000 to 13,550,000 µg/kg (calculations presented in **Appendix H**).

The maximum total CVOC concentration was greater than 14,000,000 µg/kg adjacent to the MIP 216 source release point (SJS02-SB205 at 10 to 10.5 ft bgs). The TCE concentration was 14,000,000 µg/kg, which is similar to the maximum estimated soil saturation concentration and indicates the potential for DNAPL contamination. Adjacent to the MIP 235 source release point (SJS02-SB204), the total CVOC concentration of the shallower soil sample (5.5 to 6.5 ft bgs) was 848,000 µg/kg and TCE concentration was 500,000 µg/kg, which is similar to the minimum estimated soil saturation concentration, indicating potential DNAPL. The TCE concentration was more than 10 times lower in the deeper sample (11.5 to 12.5 ft bgs). Therefore, CVOCs sorbed to saturated soil, which may serve as a continuing source of contaminants to the groundwater, are relatively shallow and decrease significantly with depth in that area. Additionally, elevated CVOC concentrations were identified near MIP 234 in the samples collected from location SJS02-SB203 (from four depth intervals), which had total CVOC concentrations ranging from 5.7 to greater than 172, 000 µg/kg, with the lowest concentrations detected above the water table (4.5 to 5 ft bgs) and the highest concentrations detected just above the Yorktown confining unit (16.5 to 17.5 ft bgs). DNAPL in the saturated subsurface soil will be addressed with groundwater.

Semivolatile Organic Compounds

Fourteen SVOCs were detected in subsurface samples throughout the site (**Table 5-2**). Background UTLs have been established for 13 of the 14 detected SVOCs. Twelve of these SVOCs exceeded their background UTLs. The chemicals detected at the highest concentrations were benzo(b)fluoranthene, benzo(g,h,i)perylene, fluoranthene, and pyrene. The majority of the detections were located in the southwestern portion of the site (**Figure 5-11**). The highest concentrations were reported in SJS02-SB11 (total SVOC concentration of approximately 5,000 µg/kg).

Pesticides/Polychlorinated Biphenyls

Five pesticides were detected in subsurface soil samples throughout the site (**Table 5-2**). Background UTLs have been established for all of these pesticides, and four (4,4′-DDD, 4,4′-DDE, 4,4′-DDT, and gamma-chlordane) were reported above their background UTLs (**Figure 5-11**). The highest concentrations were detected at SJS02-SB08 with a total pesticide concentration of approximately 297,000 µg/kg. This subsurface soil sample is located at the southwest corner of former Building 130, in the same area as the surface soil sample with the highest concentrations.

One PCB, aroclor-1260, was detected (21 J µg/kg) in sample SJS02-SB03 (**Table 5-2**), located in the southwest corner of the site (**Figure 5-11**). No background UTL was established for aroclor-1260.

Dioxin and Furans

Twenty-four dioxins and furans were detected in the subsurface soil (**Table 5-2**). Dioxins and furans were detected in each of the five samples collected for dioxin and furans analysis. Total concentrations ranged from 0.25333 J at SJS02-SB12 to 2.1980 J at SJS02-SB15. SJS02-SB15 is located within the extent of ABM.

Explosives

No explosives were detected in subsurface soil.

Inorganics

Twenty-four inorganics were detected in the subsurface soil (**Table 5-2**). Background UTLs have been established for 20 of the 24 detected inorganics, and all 20 were exceeded (**Figure 5-12**). The highest concentrations were reported in samples SJS02-SB12 (southeast area on inlet) and SJS02-SB13 (adjacent to former Building 130) with total inorganic concentrations of approximately 265,000 mg/kg and approximately 101,000 mg/kg, respectively.

Total Petroleum Hydrocarbons

TPH was detected in two subsurface soil samples (**Table 5-2**). Two of the samples (SJS02-SB14 and SB18) were located in the northern portion of the site (**Figure 5-11**). TPH-diesel range organics (DRO) exceeded the VDEQ UST program action for TPH (100 mg/kg) at SJS02-SB14 (275 mg/kg).

5.1.6 Shallow Groundwater

This section presents the results for field and laboratory analysis of geochemical parameters, VOCs, SVOCs, pesticides/PCBs, explosives, and inorganics in the shallow groundwater samples collected during the RI and Expanded RI.

Water Quality Field Parameters

Temperature, turbidity, specific conductivity, pH, DO, and ORP were monitored in the field to ensure aquifer stabilization prior to sampling and to provide information about the conditions of the aquifer. Water quality parameter results for permanent and temporary monitoring wells are included in **Table 5-3** and **Table 5-4**, respectively, and the distribution of DO and ORP in the shallow aquifer is shown on **Figure 5-13**.

Shallow groundwater temperature is variable, ranging from 14 to 25 degrees Celsius (ºC). The variability appears to be influenced more by well location rather than seasonality. Turbidity values ranged from 10 to 210 nephelometric turbidity units (NTUs) in over half of the groundwater samples. Higher turbidity can potentially result in higher measured concentrations of total inorganics and hydrophobic organics, because of their tendency to sorb to particulates. The shallow groundwater was characterized by neutral to slightly acidic pH. DO concentrations in the earlier Expanded RI sampling events were below 1 milligram per liter (mg/L), suggesting slightly anoxic conditions, with the exception of a few upgradient wells. During the June 2007 monitoring event, DO concentrations indicated that shallow groundwater is currently under more aerobic conditions in general. However, this variation may be partly because a more accurate method (Chemets test kits) was used to measure DO levels during this event. ORP values were measured using a platinum silver/silver chloride (Ag/AgCl) electrode (http://www.horiba.com). This can be converted to redox potential (E_H), measured against the standard hydrogen electrode using the following equation:

$$E_H = ORP + E_{refererence}$$

Where:

Eh = reported redox potential (millivolts [mV])

$E_{refererence}$ = reference potential (mV) ~ 200 mV (for Ag/AgCl electrode)

ORP = half-cell potential (mV)

ORP values indicate that the shallow groundwater is predominantly between manganese reducing and iron reducing conditions. ORP values are higher in monitoring wells located to the east of the inlet and outside the extent of contamination, suggesting groundwater flowing from that direction is not as reduced. Measurable salinity levels were reported in downgradient monitoring wells, closer to the tidal influx.

Geochemical Parameters

Geochemical parameters (other than the field parameters) analyzed in groundwater samples from the Columbia aquifer included alkalinity, carbon dioxide, ferrous iron, nitrate/nitrite, nitrite, phosphorus, sulfate, sulfide, and TOC. These geochemical (wet chemistry) results are shown in **Table 5-5** and their distribution is shown on **Figure 5-13**. A discussion of these results and their relationship to the fate and transport of site contamination is included in Section 6.3.

Volatile Organic Compounds

Twenty-eight VOCs were detected in the shallow groundwater (**Table 5-5**). Nine VOCs were detected above their respective Federal MCLs (1,1,2-trichloroethane [TCA],tetrachloroethene [PCE], TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, VC, chloroform, and methylene chloride) (**Figure 5-14**), all of which are CVOCs.

The dominant CVOC detected at the site is TCE. TCE and its degradation products (cis-1,2-DCE and VC) were detected at varying concentrations across the site. TCE was detected at concentrations ranging from 0.32 J to 530,000 microgram per liter (µg/L). Cis-1,2-DCE was detected at concentrations ranging from 0.3 J to 130,000 µg/L. VC was detected at concentrations ranging from 0.35 J to 32,000 µg/L. 1,1-DCE, which is a theoretical breakdown product of TCE but is more commonly observed due to abiotic breakdown of 1,1,1-trichloroethane (TCA), was infrequently detected at concentrations ranging from 47 to 1,500 L µg/L. 1,1,2-TCA; PCE; trans-1,2-DCE; chloroform; and methylene chloride were detected sporadically (SJS02-MW07S, MW10S, PZ04, and/or GW18) in shallow groundwater (**Table 5-5**).

The highest CVOC concentrations were detected west of the inlet (**Figure 5-14**) in groundwater samples collected from monitoring wells SJS02-MW07S, MW10S, and MW15S and DPT samples SJS02-GW14, GW16, and GW18. This area correlates to the area of elevated ECD response by the MIP (**Figure 5-8**). Potential source release points within this groundwater hot spot were identified at SJS02-MIP216, MIP202, and MIP235 (**Figures 5-6** and **5-7**). The soil sample collected at SJS02-MIP216 (and adjacent to SJS02-MW10S) had the highest total CVOC concentrations (approximately 14,000,000 µg/kg) in soil. The TCE, cis-1,2-DCE, and VC plumes (**Figures 5-15**, **5-16**, and **5-17**, respectively) trend south-southeast following the direction of groundwater flow towards St. Juliens Creek. Plumes were delineated using the 2007 analytical data from the monitoring wells, DPT groundwater

samples, and temporary piezometers. If the reporting limit exceeded the MCL in the 2007 round and VOCs were reported as not detected, the most recent previously reported concentration was used. If there was no previous round of data with a detection limit below MCLs, then the reporting limit was used to define the plumes. TCE is the most horizontally extensive VOC, detected in the downgradient monitoring well SJS02-MW16S, extending approximately 420 ft from SJS02-MW10S. The plumes have not migrated to the east of the tidal inlet.

The CVOC plume centerline, which is the one-dimensional, advective pathway that the contaminant follows as it migrates from the source area (the area of contamination providing a continuous source of contamination to the groundwater plume and/or where the contaminant release has occurred), appears to follow the western edge of the tidal inlet (**Figure 5-14**). This is attributed to groundwater flow direction and the slope of finer-grained soil toward the inlet.

Vertically, the CVOC plume extends to the bottom of the Columbia aquifer (**Figure 5-18**). Concentrations are vertically stratified within the aquifer; the highest concentrations are generally located at the base of the aquifer/top of the confining unit. Since CVOCs are denser than water, they tend to "sink". Upon reaching a less permeable lithology, such as a clay, they can concentrate on top of this layer. In addition, if some of the CVOCs sorb to the clay matrix or get trapped in the residual pore space, some diffusion may occur. At Site 2, the highest dissolved CVOC concentrations were located between the discontinuous organic, sandy clay located in the Columbia aquifer and the interbedded clay layers, representing the top of the Yorktown confining unit. DNAPL was not physically observed during site investigations. However, one of the "rule of thumb" indicators that DNAPL may be present at a site is when chemicals that are known to behave as DNAPL (due to their hydrophobic nature and density) are found in concentrations above 1 percent of their pure phase solubility in water. The maximum TCE concentration in Columbia aquifer monitoring wells (330,000 μg/L) is approximately 30 percent of the TCE solubility level (11,000 μg/L), indicating the likely presence of DNAPL.

Semivolatile Organic Compounds

Nineteen SVOCs were detected in the shallow groundwater (**Table 5-4**). No MCLs have been established for the detected SVOCs. Twelve SVOCs (1,1-biphenyl, 2-methylnaphthalene, acenaphthene, anthracene, bis[2-ethylhexyl]phthalate, carbazole, dibenzofuran, fluor-anthene, fluorene, phenanthrene, pyrene, and naphthalene) were detected at concentrations above their respective background UTLs at monitoring well SJS02-MW10S (**Figure 5-19**). Three SVOCs (2-methylnaphthalene, carbazole, and naphthalene) were detected in groundwater at concentrations above the background UTLs at monitoring well SJS02-MW07S. These monitoring wells are located within the limits of waste and CVOC hot spot area, in the west-northwest portion of the site.

Pesticides/Polychlorinated Biphenyls

Four pesticides (4,4-DDE, endosulfan sulfate, heptachlor, and heptachlor epoxide) were detected in shallow groundwater (**Table 5-4**). Background UTLs were not established for any of the detected pesticides. Only heptachlor and heptachlor epoxide have MCLs. Heptachlor was not detected above the MCL and heptachlor epoxide was only detected

(1.1 µg/L) above the MCL (0.4 µg/L) at SJS02-MW08S (**Figure 5-19**). No pesticides were detected at SJS02-MW06S, which was installed at the same location as subsurface soil sample SJS02-SB08, where elevated concentrations of 4,4-DDD, 4,4-DDE, and 4,4-DDT were previously detected. No PCBs were detected in shallow groundwater.

Explosives

Three explosives (2,6-dinitrotoluene, cyclotetramethylene-tetranitramine [HMX], and cyclo-trimethylene-trinitramine [RDX]) were detected in shallow groundwater (**Table 5-4**). There are no MCLs or background UTLs established for explosives. 2,6-dinitrotoluene and RDX were detected at SJS02-MW10S; and HDX and RDX were detected at SJS02-MW04S (**Figure 5-19**).

Inorganics

Twenty-one total and dissolved inorganics were detected in shallow groundwater (**Table 5-4**). Aluminum, arsenic, barium, cadmium, cobalt, iron, lead, silver, sodium, vanadium, and zinc were detected at concentrations above corresponding background UTLs. Exceedances of background values were reported in all shallow monitoring wells with the exception of monitoring wells SJS02-MW05S and MW06S, both located on the eastern side of the site (**Figure 5-19**). Additionally, arsenic, thallium, and lead were above their MCL or established action level.

Generally, the highest concentrations of inorganics were detected at SJS02-MW02S, located adjacent to St. Juliens Creek. Concentrations in this well are likely influenced by the brackish tidal water flux and migration of groundwater under reducing conditions into this area. Brackish water has higher concentrations of inorganics than fresh water. The salinity and ORP levels support the presence of brackish water. The salinity of the groundwater measured in SJS02-MW02S was 3,000 ppm, which indicates slight to moderate salinity based on the fact that 1,000 ppm is indicative of a saline environment. ORP levels in this well and in wells located immediately upgradient (SJS02-MW14S, PZ02, PZ06, and PZ09) ranged from -199 to -11 and were lower than the ORP levels in background wells. During high tide, brackish water enters the tidal inlet at Site 2. A mixing zone between the fresh and brackish water most likely exists near the inlet culvert. Additionally, groundwater is observed to discharge to surface water in the inlet in the downgradient portion of the site. Since downgradient groundwater is under more reducing conditions, inorganics such as iron and manganese are more soluble and present at higher concentrations in the dissolved matrix. As a result, other inorganics, such as arsenic, which can complex or sorb to the iron, may also be present at higher concentrations.

5.1.7 Deep Groundwater

This section presents the results for field and laboratory analysis of geochemical parameters, VOCs, SVOCs, pesticides/PCBs, explosives, and metals in the deep groundwater samples collected during the RI and Expanded RI.

Water Quality Field Parameters

Temperature, turbidity, specific conductivity, pH, DO, and ORP were monitored in the field to ensure aquifer stabilization prior to sampling and to provide information about the

conditions of the aquifer. Water quality parameter results for deep groundwater are included in **Table 5-6**.

The temperature of deep groundwater is more consistent than shallow groundwater, typically ranging between 17 and 21°C. Turbidity is variable and was measured above 10 NTU in most deep groundwater samples. As stated previously, this could result in a higher concentration of inorganics or hydrophobic chemicals in groundwater. pH levels are characterized as neutral. DO concentrations, ranging from 0 to 4 mg/L, are variable suggesting anoxic and slightly aerobic conditions can be present at different times. ORP and E_H values indicate deep groundwater is under conditions between which manganese reduction and iron reduction are most favorable. Measurable salinity is less common than in shallow groundwater and was not reported in the June 2007 monitoring event.

Geochemical Parameters

Geochemical parameters analyzed in groundwater samples from the Yorktown aquifer included alkalinity, sulfate, and TOC. Fewer geochemical parameters were collected for deep groundwater than shallow groundwater since an extensive natural attenuation evaluation was not warranted due to the limited extent of VOCs (discussed below). These geochemical (wet chemistry) results are shown in **Table 5-7**. A discussion of these results and their relationship to the fate and transport of site contamination is included in Section 6.3.

Volatile Organic Compounds

Nine VOCs (1,1-DCE; acetone; carbon disulfide; chloroform; methylene chloride; toluene; TCE; VC; and cis-1,2-DCE) were detected in deep groundwater (**Table 5-7**). Seven of these VOCs were detected at monitoring well SJS02-MW10D, installed during the Expanded RI in December 2004. Only TCE and VC exceeded their MCLs at SJS02-MW10D (**Figure 5-20**). Because the Yorktown confining unit has been shown to be an effective barrier to vertical contaminant migration, an aquifer test and additional groundwater sampling events were conducted to investigate the presence of VOCs in this deep groundwater well; the results of this investigation are presented in detail in **Appendix D**. Based on the results, it is likely that the source of TCE in SJS02-MW10D was contaminated soil, free product, or a volume of contaminated groundwater carried from the shallow to the deep aquifer during the installation of the monitoring well. Analytical trend data following the pump test shows concentrations of TCE and VC decreasing to concentrations below the MCLs (shown on **Figure 6-3**).

Carbon disulfide, chloroform, methylene chloride, and toluene were detected in several of the wells, although they were detected below their MCLs (**Table 5-7**).

Semivolatile Organic Compounds

Four SVOCs (caprolactum, naphthalene, phenol, and bis[2-ethyhexyl]phthalate) were detected in deep groundwater (**Table 5-7** and **Figure 5-20**). Phenol was detected below its MCL. No MCLs have been established for caprolactum, naphthalene, and bis(2-Ethyhexyl) phthalate.

Pesticides/PCBs

Two pesticides were detected in deep groundwater (**Table 5-7**). Heptachlor was detected below the MCL**.** No MCL has been established for endosulfan sulfate.

Explosives

No explosives were detected in deep groundwater.

Inorganics

Sixteen total and 13 dissolved inorganics were detected in deep groundwater, although no MCLs were exceeded (**Table 5-7**). Concentrations of inorganics were similar in all of the wells, including the upgradient well SJS02-MW01D.

5.1.8 Surface Water

This section presents the results for field and laboratory analysis of geochemical parameters, VOCs, SVOCs, pesticides/PCBs, explosives, and inorganics in the surface water samples collected during the RI and Expanded RI.

Water Quality Field Parameters

Temperature, turbidity, conductivity, pH, DO, and ORP were monitored in the field prior to sampling. Water quality parameter results for surface water are included in **Table 5-8.**

Temperature ranged from 8.9 to 27 ºC. Turbidity ranged from 5 to 36 NTU. Conductivity from 0.636 to 26.1 ms/cm. pH levels were neutral to slightly acidic. DO levels indicate surface water is aerobic, which is expected for surface water since it is in contact with the air. ORP measurements indicate surface water conditions are favorable for manganese reduction; however surface water is not under as reduced conditions as shallow or deep groundwater.

Volatile Organic Compounds

Fifteen VOCs were detected in surface water, although no Virginia Water Quality Standards were exceeded (**Table 5-9**). VOCs were detected in all surface water samples with the exception of SJS02-SW02, located between the southern end of the tidal inlet and culvert leading to St. Juliens Creek (**Figure 5-21**). The most frequently detected compounds and those generally reported at the highest concentrations were TCE and its degradation products (cis-1,2-DCE and VC).

The highest VOC concentrations were observed in samples SJS02-SW04, SW09, and SW10 located in drainages to the inlet. Sample SJS02-SW04, located adjacent to the entrance to the western drainage outfall, had a total VOC concentration of 125 µg/L during the RI. The surface water sample collected adjacent to this location during the Expanded RI (SJS02-SW10) only had a total VOC concentration of 43 µg/L.

Surface water samples SJS02-SW09 and SW10 had total VOC concentrations of 220 µg/L and 189 µg/L, respectively. These samples were collected in the northernmost portion of the Site 2 inlet, where an upgradient storm sewer system discharges. This storm sewer system passes through a VOC groundwater plume (Site 21). Total VOC concentrations in SJS02-SW09 and SW10 were similar to those in the upstream storm water samples (concentrations

ranging from 124 to 202 µg/L). Detections of VOCs in the storm sewers and results from a storm sewer system video inspection (CH2M HILL, 2007b) indicate transport and possible release of VOCs from Site 21 to the Site 2 inlet.

SVOCs

Two SVOCs (benzaldehyde and bis[2-ethylhexyl]phthalate) were detected sporadically in surface water throughout the inlet (**Table 5-9**). Bis(2-ethylhexyl)phthalate exceeded the Virginia Water Quality Standard for human health (59 µg/L) at SJS02-SW07 (84 µg/L).

Pesticides/Polychlorinated Biphenyls

One pesticide (4,4′-DDD) was detected in the surface water samples (SJS02-SW03 through SJS02-SW07) collected inside the inlet and exceeded the Virginia Water Quality Standard for human health (0.0084 µg/L)(**Table 5-9**). Concentrations ranged from 0.013 J to 0.2 µg/L (**Figure 5-21**). PCBs were not detected in surface water.

Explosives

One explosive (3-nitrotoluene) was detected in the surface water samples (SJS02-SW04 through SJS02-SW06) collected inside the central portion of the inlet (**Table 5-9**). Concentrations ranged from 0.5 J to 3.5 J µg/L (**Figure 5-21**). No Virginia Water Quality Standard has been established for 3-nitrotoluene.

Inorganics

Twenty total inorganics were detected in at least one surface water sample (**Table 5-9**). Dissolved inorganics were only analyzed for one of the nine samples (SJS02-SW09), at which ten total and nine dissolved inorganics were detected. Several of detected inorganics exceeded Virginia Water Quality Standards for aquatic life. The highest concentrations were located at the most downstream location in the inlet (SJS02-SW02S) likely due to its proximity to St. Juliens Creek, a brackish water body (**Figure 5-21**).

5.1.9 Sediment and Sediment Pore Water Results

This section presents the results for field and laboratory analysis of geochemical parameters, VOCs, SVOCs, pesticides/PCBs, explosives, dioxins and furans, and inorganics in the sediment and sediment pore water samples collected during the RI and/or Expanded RI. The AVS/SEM results are discussed in Section 8. Results from sediment samples collected during the Expanded RI to establish reference UTLs are included in a technical memorandum, *Site 2 Outfall Sediment Investigation Results and Development of Reference Sediment Data in St. Juliens Creek* (CH2M HILL, 2005a), provided as **Appendix F** of this report. Results from sediment samples collected to characterize the toxicity of inlet sediment to benthic-dwelling organisms are presented in Section 8.

Water Quality Field Parameters

Temperature, turbidity, specific conductivity, pH, DO, ORP, and salinity were monitored in the surface water overlying the sediment. Water quality field parameter results are included in **Table 5-10**.

The overlying surface water temperatures were variable with a low of 11.9 ºC in January 2004 to a high of 22.4 ºC in October 2004. Turbidity values ranged from 0 to 999 NTU; however, this does not necessarily serve as an indicator of characteristics of the sediment below. The overlying water was characterized by neutral to slightly acidic pH. DO levels generally indicate that the water is aerobic (with the exception of the samples collected on the eastern side of the tidal inlet); which is expected for surface water since it is in contact with the air. ORP measurements indicate that the water is under conditions favorable between manganese and iron reduction. Salinity was greater than 0.5 percent in the majority of measurements due to the tidal influence of the brackish creek.

Volatile Organic Compounds

In the tidal inlet, 16 VOCs were detected in sediment samples (**Table 5-11**). The most frequently detected compounds were acetone, carbon disulfide, and TCE. The highest concentrations of VOCs were detected at SJS02-SD21, located in the western drainage ditch just south of the groundwater hot spot near MW10S (**Figure 5-22**). At this location, the TCE concentration was 9.8 J µg/kg and its degradation product, VC, was substantially higher at 9,800 µg/kg. This is also the vicinity of the May 2007 sediment pore water samples with the highest VOC concentrations (**Figure 5-23**). Pore water sample SJS02-PW04 had the highest concentrations with TCE at 5,100 µg/L and its degradation product cis-1,2-DCE at 87,000 µg/L.

In the outfall to St. Juliens Creek, the only VOCs reported in sediment were carbon disulfide and TCE in sample SJS02-SD08.

Semivolatile Organic Compounds

In the tidal inlet, 20 SVOCs were detected in the sediment (**Table 5-11**). Fifteen of the detected constituents have background UTLs, all of which were exceeded (**Figure 5-22**). The highest concentrations of SVOCs occurred at SJS02-SD25, located in the eastern portion of the inlet (**Figure 5-22**).

In the outfall to St. Juliens Creek, 13 SVOCs were detected (**Table 5-11**). Eleven of those constituents detected have background UTLs, six of which were exceeded (**Figure 5-22**).

Pesticides/PCBs

In the tidal inlet, eight pesticides were detected in sediment samples. 4,4′-DDD, 4,4′-DDE, 4,4′-DDT were reported above background UTLs. There are no UTLs established for the other six pesticides. The highest concentrations were reported at SJS02-SD26, located at the southernmost sample collected in the tidal inlet (**Figure 5-22**). Two PCBs (aroclor-1254 and aroclor-1260) were detected in two sediment samples: SJS02-SD02 (just upstream from the inlet outfall to St. Juliens Creek) and SJS02–SD03 (central portion of site). These PCBs do not have established background UTLs.

In the outfall to St. Juliens Creek, five pesticides were detected (**Table 5-11**). 4,4′-DDD and 4,4′-DDE were reported above background UTLs (**Figure 5-22**). There were no PCBs detected in the outfall sediment samples.

Explosives

No explosives were detected in sediment samples.

Dioxins and Furans

Twenty-five dioxins and furans were detected in the tidal inlet sediment samples (**Table 5-11**). Dioxins and furans were detected in each of the six samples collected for dioxin/furans analysis (**Figure 5-22**). Total concentrations ranged from 0.75 J at SJS02-SD12 to 6.4 J at SJS02-SD11.

Inorganics

Twenty-six inorganics were detected in the tidal inlet sediment. Of the 20 inorganics with established UTLs, 17 were detected above their respective UTLs (**Table 5-7**). The samples with the most detections and highest concentrations (SJS02-SD03 and SD05) were located adjacent to the identified ABM area on the western side of the inlet.

Twenty-two inorganics were detected in the sediment located in the outfall to St. Juliens Creek (**Table 5-11**). Of the 19 inorganics with background UTLs, 10 were detected above background UTLs (**Figure 5-22**).

5.2 Sources of Contamination

Several potential sources of contamination have been identified at Site 2. This includes 3.9 acres of buried waste; residues from the former waste incinerator; former ASTs and a former UST; former lead-acid battery maintenance activities, commercial degreasing, and drum storage at Building 279; surface runoff from an upgradient industrial area (Site 21) through a storm sewer system; and discharge from the storm sewer system which passes through a VOC groundwater plume at Site 21. Based on the subsurface soil and shallow groundwater concentrations and "rules of thumb," it is assumed that DNAPL is present.

Constituents in surface and subsurface soil reflective of potential impacts from Site 2 are inorganics, PAHs, pesticides, and dioxin. The inorganics in soil most indicative of site-related activities were characterized by samples located within the extent of waste and included aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc. The highest concentrations of these inorganics were generally limited to the ABM waste areas; therefore, the waste is considered the source for this contamination. However, some inorganics may be naturally elevated in the subsurface at Site 2. In surface soil, PAHs and pesticides were found at elevated concentrations across the site with no definitive pattern, suggesting that pesticides may have been applied historically across the site and PAHs may be the result of non-site-related activities (i.e. asphalt on road). In surface soil the PCB aroclor-1260 was significantly elevated in the northern portion of the site, within the area of former Site 17. Waste or a utility pole and transformer observed in the vicinity may be potential sources. In subsurface soil, the pesticide 4,4'-DDT was significantly elevated at one location near the southeast corner of former Building 130. The former incinerator was located at this former building and pesticides may have been applied around equipment located in this area. Elevated PAHs were found in subsurface soil in a localized area adjacent to Cradock Street at SJS02-SB03 and SJS02-SB11; both are located within the extent of waste. Dioxin and TPH were limited to subsurface soil samples located in the northern extent of waste.

In shallow groundwater (Columbia aquifer), VOCs, SVOCs, pesticides, explosives, and inorganics have been detected. TCE and its breakdown products are the predominant VOCs detected in shallow groundwater and extend from the suspected release area near SJS02-MW10S to near St. Juliens Creek (SJS02-MW16). SVOCs were primarily detected in wells located in the west-northwest portion of the site, generally near the paved parking lot and Cradock Street. The source of VOCs in groundwater is likely a combination of buried waste near former storage activities at former Building 257, and potential degreasing activities at former Buildings 278/279 and storm water and sewer influx from upgradient of Site 2. Pesticides were detected in shallow monitoring wells located along the site boundary and outside of the site boundary. Therefore, their presence is most likely related to application of pesticides across the site historically. Explosives were detected in shallow groundwater at monitoring well SJS02-MW10S. Inorganics were reported in almost all shallow monitoring wells above background values; since elevated concentrations were reported in the background well, some inorganics are most likely naturally occurring. Only three inorganics exceeded their respective MCL or action level in the shallow groundwater; arsenic, lead, and thallium, all of which were detected sporadically. Additionally, only arsenic exceeded its MCL and background UTL at the well adjacent to the petroleum impacted area. The presence of arsenic in this location may be the result of reducing conditions created by the degradation of petroleum compounds. The highest concentrations of inorganics in general were reported in SJS02-MW02S, located adjacent to St. Juliens Creek. Concentrations in this well are likely influenced by the brackish tidal water flux and migration of groundwater under reducing conditions into this area.

In deep groundwater (Yorktown aquifer), VOCs, SVOCs, pesticides, and inorganics have been detected. However, concentrations of VOCs are currently below their respective MCLs. SVOCs were estimated at very low concentrations. Based on the results of an aquifer test and numerous sampling events, the presence of VOCs and SVOCs in monitoring well SJS02-MW10D was the result of contamination being carried down during its installation. Pesticides were observed at very low levels in this well and in the eastern portion of the site. Inorganics were detected in all deep groundwater samples including the upgradient well, although all concentrations were below the MCLs. Therefore, inorganics in deep groundwater are most likely naturally occurring and not related to site activities.

In surface water, VOCs, SVOCs, inorganics, one pesticide, and one explosive were detected. VOC concentrations were highest at the upstream drainage outfall locations and decreased downstream. This suggests that the presence of VOCs in surface water is attributed to activities at former Building 278/279 or from drainage of storm water, sewer water, and runoff from the upgradient industrial area (Site 21) to the tidal inlet. CVOCs were the most frequent and highest concentration compounds detected. Only two SVOCs (benzaldehyde and bis(2-ethylhexyl)phthalate) were detected in the Site 2 surface water samples; in the southern portion of the tidal inlet and just downstream of that location. 4,4′-DDD was detected in samples inside the tidal inlet. The source of these contaminants may be the transport of impacted sediment or soil from waste areas, since pesticides and SVOCs tend to sorb to these matrices. 3-nitrotoluene was reported in surface water samples located inside the central portion of the tidal inlet with the highest concentrations adjacent to the western drainage culvert. Inorganics were detected in samples collected across the inlet. The samples with the highest concentrations are the most downstream locations. The high inorganic

concentrations in these samples are likely due to their proximity to St. Juliens Creek, a brackish water body.

VOCs, SVOCs, pesticides, dioxins and furans, and inorganics were detected in the Site 2 sediment. The highest concentrations of VOCs were detected at SJS02-SD21, located in the western drainage ditch just south of the groundwater hot spot near MW10S. The highest SVOC concentrations were detected in sediment collected from SJS02-SD25, located near the center of the tidal inlet. Pesticides in sediment were at the highest concentrations to the southwest of former Building 130 and within the drainage ditch running along the east side of Cradock Street, suggesting historical pesticide application adjacent to the former building and along the edge of the road. Elevated dioxins and furans, and inorganics were found across the tidal inlet. The highest concentrations of inorganics occurred within the central portion of the Site 2 inlet; therefore, the source of these chemical is likely the waste. Only a few inorganics, pesticides, and bis(2-ethylhexyl)phthalate were reported in the outfall transect sediment samples at concentrations above the background UTLs and with the exception of and bis(2-ethylhexyl)phthalate, these concentrations were significantly lower than the inlet sediment. Although Site 2 is potentially contributing, or has historically contributed, chemicals to St. Juliens Creek via tidal influx through the low-flow culvert, significant site-related effects are only indicated in a localized area directly at the outfall location.

Table 5-1
Surface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Munden-Tetotum Background UTL	SJS02-SS01	SJS02-SS02	SJS02-SS03	SJS02-SS04	SJS02-SS05	SJS02-SS06	SJS02-SS07	SJS02-SS08	SJS02-SS09	SJS02-SS10	SJS02-SS11	SJS02-SS12	SJS02-SS13	SJS02-SS14
Sample ID		SJS02-SS01-000	SJS02-SS02-000	SJS02-SS03-000	SJS02-SS04-000	SJS02-SS05-000*	SJS02-SS06-000	SJS02-SS07-000	SJS02-SS08-000	SJS02-SS09-000	SJS02-SS10-000	SJS02-SS11-000	SJS02-SS12-000	SJS02-SS13-000	SJS02-SS14-000
Sample Depth		0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs
Sample Date		06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99
Chemical Name															
Volatile Organic Compounds (ug/kg)															
2-Butanone	--	11 U	11 U	10 U	10 U	11 U	10 U	10 U	11 U	11 U	10 U	200	12 U	11 U	12 U
Acetone	--	11 U	11 B	3 B	9 B	11 U	12 B	10 U	7 B	7 J	35	23	12 U	11 U	12 U
Methylene chloride	--	5 B	26 B	17 B	25 B	24 B	23 B	39 B	65 B	33 B	20 B	8 B	5 B	8 B	7 B
Toluene	--	11 U	11 U	10 U	10 U	11 U	1 J	10 U	2 J	11 U	10 U	10 U	12 U	11 U	12 U
Semivolatile Organic Compounds (ug/kg)															
2-Methylnaphthalene	--	370 U	350 U	310 J	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	380 UJ	390 UJ
Acenaphthene	92	370 U	100 J	170 J	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	380 UJ	390 UJ
Acenaphthylene	95	370 U	350 U	820 J	1,700 U	700 U	1,600 U	1,600 U	1,700 U	37 J	89 J	350 UJ	76 J	130 J	390 UJ
Anthracene	91	370 U	150 J	590 J	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	92 J	390 UJ
Benzo(a)anthracene	6.9	370 U	430	2,300	290 J	220 J	1,600 U	390 J	1,700 U	140 J	120 J	350 UJ	160 J	440 J	390 UJ
Benzo(a)pyrene	91	370 U	360	1,400 J	370 J	190 J	1,600 U	340 J	1,700 U	130 J	130 J	350 UJ	270 J	450 J	390 UJ
Benzo(b)fluoranthene	91	370 U	580	1,700 J	660 J	270 J	1,600 U	440 J	1,700 U	280 J	240 J	350 UJ	310 J	670 J	390 UJ
Benzo(g,h,i)perylene	91	370 U	160 J	890 J	280 J	78 J	1,600 U	1,600 U	1,700 U	76 J	160 J	350 UJ	250 J	400 J	390 UJ
Benzo(k)fluoranthene	91	370 U	290 J	1,100 J	320 J	150 J	1,600 U	270 J	1,700 U	87 J	120 J	350 UJ	89 J	220 J	390 UJ
Butylbenzylphthalate	--	370 U	350 U	1,700 U	1,700 U	700 U	280 J	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	380 UJ	390 UJ
Carbazole	--	370 U	120 J	300 J	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	380 UJ	390 UJ
Chrysene	102	370 U	470	2,700	400 J	210 J	1,600 U	370 J	1,700 U	150 J	150 J	350 UJ	170 J	420 J	390 UJ
Di-n-butylphthalate	--	370 U	350 U	210 J	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	120 J	47 J	380 UJ	390 UJ
Dibenz(a,h)anthracene	91	370 U	54 J	1,700 U	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 UJ	350 UJ	410 UJ	380 UJ	390 UJ
Dibenzofuran	--	370 U	70 J	1,700 U	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	380 UJ	390 UJ
Fluoranthene	103	370 U	910	5,000	460 J	340 J	1,600 U	650 J	1,700 U	200 J	140 J	350 UJ	130 J	530 J	390 UJ
Fluorene	92	370 U	110 J	380 J	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	380 UJ	390 UJ
Indeno(1,2,3-cd)pyrene	91	370 U	180 J	800 J	310 J	86 J	1,600 U	210 J	1,700 U	88 J	110 J	350 UJ	200 J	320 J	390 UJ
Naphthalene	92	370 U	52 J	1,700 U	1,700 U	700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ	380 UJ	390 UJ
Phenanthrene	91	370 U	850	4,400	1,700 U	94 J	1,600 U	310 J	1,700 U	53 J	41 J	350 UJ	56 J	160 J	390 UJ
Pyrene	125	370 U	350 U	7,200	550 J	320 J	1,600 U	590 J	220 J	240 J	230 J	350 UJ	210 J	100 J	390 UJ
bis(2-Ethylhexyl)phthalate	--	49 B	140 B	1,700 U	1,700 U	72 B	570 B	1,600 U	1,700 U	54 J	35	350 UJ	410 UJ	380 UJ	390 UJ
Pesticide/Polychlorinated Biphenyls (ug/kg)															
4,4'-DDD	10.6	19	2.8 J	84 J	30 J	13 J	8.9 J	24	5.7 J	4,200	7 J	1.60 J	4.10 UJ	230 J	3.90 UJ
4,4'-DDE	532	82 J	19	260 J	210	110	3.3 U	120	25	460	37	1.60 J	1,400 J	1,200 J	12 J
4,4'-DDT	237	54	9.2 J	NA	170 J	30	12 J	23	13 J	900	79	3 J	2,100 J	2,100 J	4.90 J
Aroclor-1260	--	74 U	15 J	110 J	110 J	70 U	54 J	160 U	17 J	350 U	33 U	35 UJ	41 UJ	38 UJ	39 UJ
Dieldrin	11.5	7.4 U	3.8 J	17 U	17 U	7 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ	3.80 UJ	3.90 UJ
Endosulfan II	13.5	7.4 U	3.6 U	17 U	17 U	17 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ	3.80 UJ	3.90 UJ
Endrin	13.4	7.4 U	3.6 U	17 U	17 U	17 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ	3.80 UJ	3.90 UJ
Endrin aldehyde	11.6	7.4 U	3.6 U	17 U	17 U	17 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ	3.80 UJ	3.90 UJ
Heptachlor	--	3.8 U	1.8 U	8.9 U	8.8 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2.20 J	1.90 UJ	1.90 UJ
alpha-chlordane	9.8	3.8 U	1.8 U	8.9 U	8.8 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	50 J	5 J	1.90 UJ
gamma-chlordane	6.1	3.8 U	1.8 U	8.9 U	8.8 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	29 J	1.90 UJ	1.90 UJ
Explosives (ug/kg)															
No Detections															
Total Metals (mg/kg)															
Aluminum	7,669	5,120	8,810	6,590	3,470	3,110	18,600	4,350	4,920	6,160	2,680	1,960	4,400	5,960	2,750
Antimony	0.7	0.38 U	0.35 U	7 J	0.41 B	0.5 B	4.1 B	0.9 B	0.4 U	NA	NA	0.540 U	0.520 U	1.5 J	0.570 U
Arsenic	5.7	3.4	2.2	12	7.7	2.3	0.52 U	3.6	5.1	5.3 K	2.5 K	1.40 J	3	18	1.30 J
Barium	40	14.6 J	59.6	306	37.4	27.2 J	245	47.3	40.8	35.9 J	22.5 J	9.80 J	83.6	101	12 J
Beryllium	0.28	0.19 U	0.23 J	2.5	0.17 U	0.18 U	13.4	0.19 U	0.2 U	0.34 J	0.34 J	0.170 J	0.200 J	0.690 J	0.240 J
Cadmium	--	0.1 U	0.25 J	0.1 U	0.68 J	0.27 J	0.65 J	0.29 J	0.33 J	0.09 U	0.15 B	0.200 J	0.680 J	0.920 J	0.100 J
Calcium	1,225	541 J	1,060	2,450	1,800	1,310	8,980	4,730	3,670	646 J	702 J	2,270	479 J	1,880	15,900
Chromium	7	10.4	10.7	232	12.1	13.5	246	10.8	12.8	23.2	9.1	2.5	13.7	48.8	6.10
Cobalt	2.2	1.7 J	1.41 U	20.4	1.35 U	2.1 J	62.6	1.52 U	2.3 J	1.5 J	2.3 J	0.570 J	1.5 J	4.5 J	2.60 J
Copper	17.1	5.1	8.4	421	30.4	27.9	4,260	46.9	64.9	25.6	54.6	5.70	28.5	99.4	5.90
Cyanide	--	0.53 U	0.51 U	0.85 J	0.52 U	0.53 U	0.5 U	0.51 U	0.52 U	0.53 U	0.5 U	0.176 U	0.208 U	0.203	0.265 U
Iron	3,669	6,120	2,560	106,000	5,460	5,850	106,000	6,170	7,630	7,280	6,060	2,600	4,000	16,200	5,740
Lead	61	8.8	23.8	450	82.6	96.3	2,370	97.8	87.1	49.3	84.6	17.9	305	203	13.1
Magnesium	527	496 J	478 J	869 J	433 J	520 J	2,570	719 J	841 J	734 J	470 J	331 J	229 J	1,040	751 J
Manganese	42	18.1	27.2	688	49.8	59.6	470	50.3	77.9	61.8 K	42.6 K	53.4	36.3	157	353
Mercury	--	0.07 J	0.23	0.24	0.17	0.42	0.11	0.56	0.4	0.19 L	0.36 L	0.01000 U	0.0800	0.110	0.0400
Nickel	6.9	3.4 J	3.6 J	158	5.6 J	11.7	246	4.5 J	9	3.5 J	5 J	0.890 J	10.6	32.6	5 J

Table 5-1
Surface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Munden-Tetotum Background UTL**	SJS02-SS01	SJS02-SS02	SJS02-SS03	SJS02-SS04	SJS02-SS05	SJS02-SS06	SJS02-SS07	SJS02-SS08	SJS02-SS09	SJS02-SS10	SJS02-SS11	SJS02-SS12	SJS02-SS13	SJS02-SS14
Sample ID		SJS02-SS01-000	SJS02-SS02-000	SJS02-SS03-000	SJS02-SS04-000	SJS02-SS05-000*	SJS02-SS06-000	SJS02-SS07-000	SJS02-SS08-000	SJS02-SS09-000	SJS02-SS10-000	SJS02-SS11-000	SJS02-SS12-000	SJS02-SS13-000	SJS02-SS14-000
Sample Depth		0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-3" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs
Sample Date		06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99
Chemical Name															
Potassium	368	398 J	562 J	426 J	367 J	407 J	1,900	417 J	539 J	901 J	391 J	265 J	216 J	488 J	498 J
Selenium	1	0.58 U	1	0.58 U	0.51 U	0.54 U	0.52 U	0.57 U	0.6 U	0.55 U	0.55 U	0.520 UL	0.760 L	0.540 L	0.550 UL
Silver	0.62	0.9 B	0.71 B	2.1 B	0.74 B	0.69 B	2.9 B	0.98 B	1.5 B	0.97 B	0.64 B	0.180 U	0.170 U	0.180 U	0.190 U
Sodium	174	42.4 B	76.1 B	166 B	37.9 B	46.5 B	533 J	82.2 B	54.6 B	82.3 B	59.8 B	29.4 U	28.3 U	126 J	83.3 J
Thallium	--	0.38 U	0.35 U	6.2	0.34 U	0.36 U	5.5	0.38 U	0.4 U	0.76 J	0.94 J	0.640 U	0.610 U	0.640 U	0.670 U
Vanadium	26.6	15.6	12.5	66.1	20.9	22.2	40.2	12.9	23.9	19.7	19.9	3.80 J	57.4	25.7	7.80 J
Zinc	38	13.2 B	54.6	2,020	127	118	7,560	185	147	41.5	164	36.3	273	626	31.7
Wet Chemistry															
Phosphorus (MG/KG)	--	1.5	2.3	26.5	11.7	10.3	153	7	3.1	32	18.6	3.36 UL	2.99 UL	2.26 UL	3.88 UL
pH	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.35	5.40	6.67	7.91

Notes:

Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest/PCBs, and inorganicss), or detections constituents not sampled/detected during the Background Investigation.

-- No criteria established

*A duplicate sample was collected at this location; the most conservative result is shown.

NA - Not analyzed

ND - Compounds analyzed but not detected during Background Investigation

NS -Compounds not analyzed during Background Investigation

B - Analyte not detected above the associated blank

J - Reported value is estimated

K - Reported value may be biased high

L - Reported value may be biased low

U - Analyte not detected

Table 5-1
Surface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Munden-Tetotum Background UTL	SJS02-SS15	SJS02-SS16	SJS02-SS17	SJS02-SS18	SJS02-SS19	SJS02-SS20	SJS17-SO01	SJS17-SO02	SJS17-SO03	SJS17-SO04
Sample ID		SJS02-SS15-000	SJS02-SS16-000*	SJS02-SS17-000	SJS02-SS18-000	SJS02-SS19-000	SJS02-SS20-000	SJS17-SS01-000	SJS17-SS02-000*	SJS17-SS03-000	SJS17-SS04-000
Sample Depth		0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs
Sample Date		04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	02/14/01	02/14/01	02/14/01	02/14/01
Chemical Name											
Volatile Organic Compounds (ug/kg)											
2-Butanone	--	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	14 U	15 U
Acetone	--	12 U	12 U	12 U	11 U	11 U	10 U	7 B	5.5 B	8 B	7.9 B
Methylene chloride	--	2 B	11 B	8 B	7 B	6 B	5 B	1.6 J	2.8 J	3.6 B	3.3 B
Toluene	--	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	14 U	15 U
Semivolatile Organic Compounds (ug/kg)											
2-Methylnaphthalene	--	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	35 J	37 J	210 J
Acenaphthene	92	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	410 UJ	63 J	85 J	64 J	370
Acenaphthylene	95	110 J	420 UJ	390 UJ	78 J	380 UJ	74 J	140	120	600	110
Anthracene	91	43 J	420 UJ	65 J	360 UJ	380 UJ	52 J	160	190	320	790
Benzo(a)anthracene	6.9	200 J	140 J	530 J	220 J	380 UJ	360 J	690	720	1,500	2,000
Benzo(a)pyrene	91	270 J	140 J	500 J	280 J	380 UJ	380 J	680	640	1,600	2,100
Benzo(b)fluoranthene	91	350 J	210 J	570 J	400 J	57 J	590 J	710	590	2,000	1,400
Benzo(g,h,i)perylene	91	250 J	120 J	330 J	270 J	380 UJ	340 J	650	590	1,600	1,500
Benzo(k)fluoranthene	91	110 J	62 J	170 J	140 J	380 UJ	200 J	620	490	1,600	1,300
Butylbenzylphthalate	--	400 UJ	57 J	390 UJ	360 UJ	380 UJ	410 UJ	65 J	33 J	430 J	510 UJ
Carbazole	--	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	410 UJ	79 J	63 J	130 J	350 J
Chrysene	102	220 J	130 J	550 J	210 J	380 UJ	390 J	770	840	1,900	2,200
Di-n-butylphthalate	--	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	510 J	41 J	440 U	70 J	84 J
Dibenz(a,h)anthracene	91	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	410 UJ	190	180	400	440
Dibenzofuran	--	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	410 UJ	25 J	33 J	44 J	220 J
Fluoranthene	103	250 J	160 J	920 J	230 J	45 J	510 J	1,400	1,700	2,700	4,400
Fluorene	92	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	410 UJ	48 J	72 J	62 J	380 L
Indeno(1,2,3-cd)pyrene	91	200 J	96 J	250 J	210 J	380 UJ	290 J	540	460	1,500	1,300
Naphthalene	92	400 UJ	420 UJ	390 UJ	360 UJ	380 UJ	410 UJ	14 J	42 J	53 J	250
Phenanthrene	91	110 J	87 J	610 J	45 J	380 UJ	180 J	650	1,100	620	4,000
Pyrene	125	420 J	170 J	1,200 J	460 J	48 J	740 J	1,300	1,700	2,900	4,600
bis(2-Ethylhexyl)phthalate	--	400 UJ	420 UJ	390 UJ	39 J	380 UJ	70 J	120 J	56 J	1,700 J	55 J
Pesticide/Polychlorinated Biphenyls (ug/kg)											
4,4'-DDD	10.6	5.5 J	4.10 UJ	20 J	30 J	3.80 UJ	4.10 UJ	61 J	120	710	140
4,4'-DDE	532	120 J	42 J	110 J	510 J	560 J	7,200 J	1,300	160	210	1,100
4,4'-DDT	237	110 J	34 J	49 J	150 J	230 J	12,000 J	1,300	320	300	1,200
Aroclor-1260	--	40 UJ	41 UJ	39 UJ	36 UJ	38 UJ	41 UJ	150	44 U	2,700 C	110
Dieldrin	11.5	4 UJ	4.10 UJ	0.790 J	1.10 J	3.80 UJ	4.10 UJ	12 U	4.4 U	23 U	10 U
Endosulfan II	13.5	4 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	8 J	4.4 U	53 J	7.9 J
Endrin	13.4	4 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	12 U	4.4 U	24 J	10 U
Endrin aldehyde	11.6	4 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	14	2.2 J	73 J	10 U
Heptachlor	--	2 UJ	2.10 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	12 U	5.2 U
alpha-chlordane	9.8	0.810 J	1.80 J	2.40 J	6.60 J	1.90 UJ	13 J	6.1 U	1.1 J	12 U	5.2 U
gamma-chlordane	6.1	2 UJ	2 J	2.80 J	7.90 J	1.90 UJ	8.90 J	6.1 U	2.2 U	6.3 J	5.2 U
Explosives (ug/kg)											
No Detections											
Total Metals (mg/kg)											
Aluminum	7,669	6,400	7,500	4,530	2,300	4,620	8,710	6,210	3,600	5,320	5,350
Antimony	0.7	0.570 U	1.10 J	0.530 J	2 J	0.580 U	2.40 J	1.1 J	0.53 UL	3.5 J	6.3 J
Arsenic	5.7	2.40	6.40	3.10	4.60	2.90	9.70	8.7	9	10.6	15.5
Barium	40	50.6	104	146	49.8	27.6 J	469	63.1	116	122	404
Beryllium	0.28	0.220 J	0.5 J	0.230 J	0.420 J	0.150 J	0.480 J	0.27 B	0.2 B	0.32 B	0.04 U
Cadmium	--	0.380 J	0.740 J	1.30	0.630 J	0.180 J	3.10	3.7 B	1.7 B	9.3 K	5.3 K
Calcium	1,225	1,560	6,090	2,410	886 J	808 J	1,430	2,460	4,730	9,630	4,730
Chromium	7	9.20	20.2	11.3	28.9	6	139	20.6 K	11.1 K	105 K	45.4 K
Cobalt	2.2	0.990 J	5.70 J	1.30 J	2.80 J	0.550 J	9 J	2.8 B	2.4 B	10.2 J	10.2 J
Copper	17.1	17.4	113	56.5	90.7	7.10	87.2	102 J	183 J	569 J	5,030 J
Cyanide	--	0.344	0.232 U	0.184 U	0.213 U	0.186 U	0.25 U	NA	NA	NA	NA
Iron	3,669	3,750	11,700	5,580	8,910	2,800	15,000	8,850 K	8,980 K	45,200 K	24,800 K
Lead	61	60.2	282	87.9	159	24.4	793	144 K	331 K	1,270 K	3,130 K
Magnesium	527	563 J	1,630	980	498 J	274 J	606 J	890 J	442 J	1,480	1,140 J
Manganese	42	45.8	126	83.7	91.1	34.8	274	93.3 J	144 J	307 J	451 J
Mercury	--	0.0800	0.700	0.130	0.0800	0.0500	0.240	0.4 L	0.97 L	1.8 L	0.78 L
Nickel	6.9	7 J	32.7	7.20	16.3	3.60 J	31.2	17.1 K	12 J	40.3 K	193 K

Table 5-1
Surface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Munden-Tetotum Background UTL**	SJS02-SS15	SJS02-SS16	SJS02-SS17	SJS02-SS18	SJS02-SS19	SJS02-SS20	SJS17-SO01	SJS17-SO02	SJS17-SO03	SJS17-SO04
Sample ID		SJS02-SS15-000	SJS02-SS16-000*	SJS02-SS17-000	SJS02-SS18-000	SJS02-SS19-000	SJS02-SS20-000	SJS17-SS01-000	SJS17-SS02-000*	SJS17-SS03-000	SJS17-SS04-000
Sample Depth		0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs	0-6" bgs
Sample Date		04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	02/14/01	02/14/01	02/14/01	02/14/01
Chemical Name											
Potassium	368	370 J	855 J	506 J	333 J	236 J	360 J	542 J	263 J	554 J	362 J
Selenium	1	0.900 L	0.580 UL	0.590 L	0.560 UL	0.560 UL	0.75 L	0.65 UL	0.71 UL	1.2 J	1.7 L
Silver	0.62	0.190 U	2.5	0.150 U	0.190 U	0.190 U	0.200 J	0.51 UL	0.56 UL	0.59 UL	1.3 J
Sodium	174	31.5 U	157 J	54.7 J	58.6 J	31.9 U	147 J	5 J	3.3 U	52.1 J	141 J
Thallium	--	0.680 U	0.710 U	0.540 U	0.690 U	0.690 U	0.690 U	1.4 U	1.6 U	1.7 U	1.8 U
Vanadium	26.6	23.3	27.5	18.7	24.7	16.9	138	76.7	20.7	75.3	1,410
Zinc	38	76.1	508	126	445	45.9	1,020	221 K	404 K	1,570 K	2,150 K
Wet Chemistry											
Phosphorus (MG/KG)	--	2.73 UL	2.26 UL	2.40 UL	2.62 UL	2.60 UL	2.39 UL	NA	NA	NA	NA
pH	--	5.74	7.99	6.49	6.38	6.37	6.03	NA	NA	NA	NA

Notes:

Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest
inorganicss), or detections constituents not sampled/detected during the Backgr
Investigation.

-- No criteria established

*A duplicate sample was collected at this location; the most conservative result is shown.

NA - Not analyzed

ND - Compounds analyzed but not detected during Background Investigation

NS -Compounds not analyzed during Background Investigation

B - Analyte not detected above the associated blank

J - Reported value is estimated

K - Reported value may be biased high

L - Reported value may be biased low

U - Analyte not detected

Table 5-2
Subsurface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Munden-Tetotum Background UTL	SJS02-SB01	SJS02-SB02	SJS02-SB03	SJS02-SB04	SJS02-SB05	SJS02-SB06	SJS02-SB07	SJS02-SB08	SJS02-SB09	SJS02-SB10	SJS02-SB11	SJS02-SB12	SJS02-SB13	SJS02-SB14	SJS02-SB15	SJS02-SB17	SJS02-SB18	SJS02-SB19
Sample ID		SJS02-SB01-003	SJS02-SB02-002	SJS02-SB03-000	SJS02-SB04-004*	SJS02-SB05-002	SJS02-SB06-001	SJS02-SB07-001	SJS02-SB08-001	SJS02-SB09-001	SJS02-SB10-001	SJS02-SB11-001*	SJS02-SB12-001	SJS02-SB13-001	SJS02-SB14-001	SJS02-SB15-001	SJS02-SB17-001	SJS02-SB18-001	SJS02-SB19-001
Sample Depth		3-5' bgs	0-4' bgs	3-5' bgs	0-4' bgs	0-3' bgs	NA	0-4' bgs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sample Date		06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	06/28/01	06/29/01	06/30/01	06/30/01	07/02/01	07/02/01	07/03/01
Chemical Name																			
Volatile Organic Compounds (ug/kg)																			
2-Butanone	--	14 U	11 U	11 U	43 J	11 U	14	12 UJ	11 UJ	12 U	11 U	12 U	NA	NA	NA	NA	NA	NA	NA
Acetone	--	28 B	11 U	6 J	210	6 B	11 U	12 UJ	11 UJ	12 U	11 U	12 U	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	14 U	11 U	11 U	16 U	11 U	11 U	33	11 UJ	12 U	11 U	12 U	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	--	14 U	11 U	11 U	16 U	11 U	12	12 UJ	11 UJ	12 U	11 U	12 U	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	--	14 U	11 U	11 U	16 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (ug/kg)																			
Acenaphthylene	81	460 U	360 U	350 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	150 J	NA	NA	NA	NA	NA	NA	NA
Anthracene	81	460 U	360 U	45 J	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	62 J	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	6.9	460 U	360 U	290 J	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 J	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	91	460 U	360 U	290 J	370 U	350 U	380 UJ	48 J	380 UJ	390 UJ	380 UJ	270 J	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	91	460 U	360 U	530	370 U	350 U	380 UJ	88 J	380 UJ	390 UJ	48 J	1,100 J	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	91	460 U	360 U	170 J	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	580 J	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	91	460 U	360 U	210 J	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	290 J	NA	NA	NA	NA	NA	NA	NA
Chrysene	102	460 U	360 U	360	370 U	350 U	380 UJ	65 J	380 UJ	390 UJ	380 UJ	470 J	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	81	460 U	360 U	55 J	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	130 J	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	103	460 U	360 U	640	51 J	350 U	380 UJ	390 UJ	380 UJ	390 UJ	52 J	580 J	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	91	460 U	360 U	200 J	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	440 J	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	91	460 U	360 U	410	38 J	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	170 J	NA	NA	NA	NA	NA	NA	NA
Pyrene	125	460 U	360 U	590	67 J	350 U	380 UJ	390 UJ	380 UJ	390 UJ	63 J	760 J	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	--	94 B	39	49 J	91 B	39 B	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (ug/kg)																			
4,4'-DDD	4	3 J	22	5.6	83	3.5 U	3.80 UJ	3.90 UJ	2,100 J	1 J	7.10 J	38 J	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	18	32	40	110	33 J	31	0.440 J	6.90 J	4,600 J	26 J	46 J	6.20 J	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	7.8	4.4 J	6.3	20 J	6.9 J	36 J	0.690 J	5.5 J	290,000 J	48 J	27 J	18 J	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	--	46 U	36 U	21 J	75 U	35 U	38 UJ	39 UJ	38 UJ	39 UJ	39 UJ	40 UJ	NA	NA	NA	NA	NA	NA	NA
Dieldrin	4	4.6 U	3.6 U	3.5 U	7.5 U	3.5 U	0.840 J	3.90 UJ	3.80 UJ	3.90 UJ	3.90 UJ	4 UJ	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	2	2.3 U	1.9 U	1.8 U	3.9 U	1.8 U	1.90 UJ	1.90 UJ	38 J	1.90 UJ	1.90 UJ	2 UJ	NA	NA	NA	NA	NA	NA	NA
Dioxin/Furans (ug/kg)																			
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00795 J	NA	NA	0.118 J	0.0359 J	NA	0.0250 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.02E-04 UJ	NA	NA	0.0435 J	0.00806 J	NA	0.00251 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.50E-04 UJ	NA	NA	0.00322 J	2.00E-04 UJ	NA	3.45E-04 UJ
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.46E-04 UJ	NA	NA	0.00202 J	6.06E-04 J	NA	2.35E-04 UJ
1,2,3,4,7,8-Hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.19E-04 UJ	NA	NA	0.0087 J	0.00127 J	NA	0.00112 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.27E-04 UJ	NA	NA	0.00449 J	0.00299 J	NA	7.11E-04 J
1,2,3,6,7,8-Hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.15E-04 UJ	NA	NA	0.00388 NJ	0.00161 I	NA	2.91E-04 UJ
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.23E-04 J	NA	NA	0.00534 J	0.00274 J	NA	0.00148 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.04E-04 UJ	NA	NA	0.00146 J	1.02E-04 UJ	NA	1.92E-04 UJ
1,2,3,7,8-Pentachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.29E-04 UJ	NA	NA	0.00440 J	1.56E-04 UJ	NA	2.68E-04 UJ
2,3,4,6,7,8-Hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.28E-04 U	NA	NA	0.00370 J	5.06E-04 J	NA	3.25E-04 UJ
2,3,4,7,8-Pentachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.24E-04 UJ	NA	NA	0.00435 J	4.77E-04 J	NA	5.37E-04 NJ
2,3,7,8-TCDD (dioxin)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.80E-05 UJ	NA	NA	3.28E-04 NJ	8.70E-05 UJ	NA	1.58E-04 UJ
2,3,7,8-Tetrachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.06E-04 UJ	NA	NA	0.00636 J	8.48E-04 NJ	NA	7.75E-04 NJ
Octachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.219 J	NA	NA	1.40 J	0.261 J	NA	1.5 J
Octachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.16E-04 B	NA	NA	0.0794 J	0.00505 J	NA	0.00313 J
Total heptachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0211 J	NA	NA	0.281 J	0.0772 J	NA	0.0752 J
Total heptachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.02E-04 UJ	NA	NA	0.0467 J	0.00806 J	NA	0.00460 J
Total hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00476 J	NA	NA	0.0392 J	0.0221 J	NA	0.0244 J
Total hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.15E-04 UJ	NA	NA	0.0745 J	0.00938 J	NA	0.00279 J
Total pentachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.04E-04 UJ	NA	NA	0.00315 J	5.36E-04 J	NA	1.92E-04 UJ
Total pentachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.24E-04 UJ	NA	NA	0.0290 J	0.00271 J	NA	0.00408 J
Total tetrachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.80E-05 UJ	NA	NA	0.00328 J	2.99E-04 J	NA	1.58E-04 UJ
Total tetrachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.06E-04 UJ	NA	NA	0.0306 J	0.00383 J	NA	0.00194 J
Explosives (ug/kg)																			
No Detections																			
Total Metals (mg/kg)																			
Aluminum	15,599	7,220	2,260	5,510	11,900	2,000	2,670	21,700	16,400	10,700	21,000	14,100	8,990	10,100	NA	10,900	NA	NA	NA
Antimony	0.6	0.37 U	NA	NA	0.63 J	0.33 U	0.600 UL	0.540 UL	0.450 UL	0.580 UL	0.560 UL	0.680 L	77.7	53.1	NA	2.2	NA	NA	NA
Arsenic	5.7	2.4	1.2 K	4.5 K	6.3	1.2 J	2 J	2.90	5.60	2.20	3	6.10	41.7	25.2	NA	6.9	NA	NA	NA
Barium	61	41.3	8.7 J	291	55.3	8.4 J	12.3 J	41.4	36	38.7 J	49.7	88.4	459	335	NA	134	NA	NA	NA
Beryllium	0.28	0.24 J	0.18 U	0.35 J	0.34 J	0.17 U	0.100 J	0.180 J	0.170 J	0.220 J	0.270 J	0.630 J	1.1	8	NA	4.6	NA	NA	NA

Table 5-2
Subsurface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Munden-Tetotum Background UTL**	SJS02-SB01	SJS02-SB02	SJS02-SB03	SJS02-SB04	SJS02-SB05	SJS02-SB06	SJS02-SB07	SJS02-SB08	SJS02-SB09	SJS02-SB10	SJS02-SB11	SJS02-SB12	SJS02-SB13	SJS02-SB14	SJS02-SB15	SJS02-SB17	SJS02-SB18	SJS02-SB19
Sample ID		SJS02-SB01-003	SJS02-SB02-002	SJS02-SB03-000	SJS02-SB04-004*	SJS02-SB05-002	SJS02-SB06-001	SJS02-SB07-001	SJS02-SB08-001	SJS02-SB09-001	SJS02-SB10-001	SJS02-SB11-001*	SJS02-SB12-001	SJS02-SB13-001	SJS02-SB14-001	SJS02-SB15-001	SJS02-SB17-001	SJS02-SB18-001	SJS02-SB19-001
Sample Depth		3-5' bgs	0-4' bgs	3-5' bgs	0-4' bgs	0-3' bgs	NA	0-4' bgs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sample Date		06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	06/28/01	06/29/01	06/30/01	06/30/01	07/02/01	07/02/01	07/03/01
Chemical Name																			
Cadmium	NS	0.09 U	0.09 U	4.4	0.47 B	0.43 J	0.0700 U	0.0600 U	0.170 J	0.0600 U	0.0600 U	0.190 J	11.2	2.5	NA	3	NA	NA	NA
Calcium	1,225	2,540	569 J	1,720 J	2,970	346 B	269 J	332 J	1,100	2,270	1,720	6,010	15,900	4,880	NA	4,730	NA	NA	NA
Chromium	18	16.7	5.3	30.8	21.6	4.6	3.70	21.3	17.6	12	24.2	29.9	110	335	NA	95.2	NA	NA	NA
Cobalt	2.2	2.9 J	1.43 U	3.6 J	4 J	1.32 U	0.5 J	1.60 J	1.60 J	1.30 J	6.5 J	7.90 J	27.6	95.3	NA	27.2	NA	NA	NA
Copper	5.1	33.7	3.8 J	433	60.5	7.1	2.5 J	5.10	7.20	8.70	46.5	173	926	3,100	NA	1,470	NA	NA	NA
Cyanide	NS	0.6 U	0.55 U	0.52 U	0.68 U	0.54 U	0.238 U	0.180 U	0.230 U	0.25 U	0.220 U	0.360	NA	NA	NA	NA	NA	NA	NA
Iron	8,412	15,000	2,360	16,700	11,700	1,850	2,230	8,950	7,890	7,030	10,100	21,000	210,000	66,400	NA	48,700	NA	NA	NA
Lead	12	74.3	10.3	885	55.8	5.3	3.10	13	31.7	23.8	50.1	185	8,850	1,670	NA	1,210	NA	NA	NA
Magnesium	587	876 J	243 B	711 J	1,610	250 J	126 J	772 J	638 J	751 J	1,050	3,220	12,300	1,930	NA	2,330	NA	NA	NA
Manganese	14	114	11.9 K	134 K	70.7	8.2	5.90	13.1 L	22.1 L	67.9 L	39.8 L	203 L	1,260	409	NA	368	NA	NA	NA
Mercury	0.1	0.28	0.06 L	0.55 L	0.24	0.08 J	0.0200 U	0.0700	0.0400	0.0300 J	0.270	1	0.7	6.3	NA	0.75	NA	NA	NA
Nickel	6.9	20.9	1.25 U	31.8	9 J	1.9 J	1 J	5.90 J	6.70	5.40 J	9.30	13.9	106	243	NA	107	NA	NA	NA
Potassium	368	479 J	196 J	289 J	968 J	229 J	149 J	582 J	502 J	526 J	648 J	2,020	1,660	988	NA	2,270	NA	NA	NA
Selenium	0.7	0.55 U	0.54 U	0.57 U	0.75 U	0.5 U	0.580 U	0.520 U	0.530 J	0.560 U	0.640 J	0.440 U	1.7 U	0.53 U	NA	0.34 U	NA	NA	NA
Silver	0.52	1.1 B	0.18 U	0.9 B	1.5 B	0.87 B	0.200 U	0.180 U	0.150 U	0.190 U	0.190 U	0.150 U	1.7	1.5	NA	0.36 U	NA	NA	NA
Sodium	174	77.2 B	27.9 B	48.5 B	657 J	95 B	32.8 U	49.2 J	77.8 J	129 J	107 J	216 J	1,780	1,770	NA	451	NA	NA	NA
Thallium	NS	0.5 J	0.36 U	1.1 J	0.5 U	0.33 U	0.710 U	0.640 U	0.530 U	0.690 U	0.660 U	0.540 U	1.9 U	1.4 U	NA	0.91 U	NA	NA	NA
Vanadium	26.6	24	6.5 J	27.5	21.5	5.3 J	6 J	29.5	26.6	17.8	29.8	38.6	21.8	73	NA	34.2	NA	NA	NA
Zinc	13	136	14.7 B	2,420	95.7	44.9	4.20 J	27.7 L	140 L	29.4 L	157 L	208 L	2,410	9,070	NA	2,940	NA	NA	NA
Wet Chemistry (mg/kg)																			
Carbon	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	--	4.5	19.9	11.6	7.6	4.1	3.23 UL	25.7	18.4	39	48.8	63.6	NA	NA	NA	NA	NA	NA	NA
pH	--	NA	NA	NA	NA	NA	7.71	5.34	6.80	7.94	7.72	8.15	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (mg/kg)																			
TPH-diesel range	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	275	NA	NA	28 U	NA
TPH-gas range	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8	NA	NA	0.11	NA

Notes:

Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest/PCBs, and inorganicss), or detections constituents not sampled/detected during the Background Investigation.

-- No criteria established
is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
K - Reported value may be biased high
L - Reported value may be biased low
I - Interferences present which may cause the results to be biased high
NJ - Qualitative identification questionable due to poor resolution
UJ - Analyte not detected, result may be estimated
UL - Analyte not detected, quantitation limit is probably higher

Table 5-2
Subsurface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Munden-Tetotum Background UTL**	SJS02-SB20	SJS02-SB201	SJS02-SB202	SJS02-SB203				SJS02-SB204		SJS02-SB205	SJS02-SB206	SJS02-SB207
Sample ID		SJS02-SB20-001	SJS02-SB201-07B	SJS02-SB202-07B	SJS02-SB203-16-07B	SJS02-SB203-17-07B	SJS02-SB203-19-07B	SJS02-SB203-4-07B	SJS02-SB204-12-07B*	SJS02-SB204-6-07B	SJS02-SB205-10-07B	SJS02-SB206-18-07B	SJS02-SB207-13-07B*
Sample Depth		NA	15-16' bgs	15-16' bgs	15.5-16.5' bgs	16.5-17.5' bgs	19-20' bgs	4.5-5' bgs	11.5-12.5' bgs	5.5-6.5' bgs	10-10.5' bgs	17.5-18.5' bgs	13-14' bgs
Sample Date		07/06/01	05/15/07	05/15/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07
Chemical Name													
Volatile Organic Compounds (ug/kg)													
2-Butanone	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	--	NA	1,600	7,900	403 U	13,000	65,000	5.7	29,000 J	500,000	14,000,000	98	350
Vinyl chloride	--	NA	4.8 J	267 U	12,000	9,000	410 J	6.1 U	1,700 J	28,000	121,591 U	0.62 J	2.8 J
cis-1,2-Dichloroethene	--	NA	1,200	2,500	30,000	150,000	10,000	3 U	22,000 J	320,000	21,000 J	28	170
trans-1,2-Dichloroethene	--	NA	14 U	133 U	340 J	870 J	597 U	3 U	607 U	4,023 U	60,795 U	1 U	3.6
Semi-volatile Organic Compounds (ug/kg)													
Acenaphthylene	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	6.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	102	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	103	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	125	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (ug/kg)													
4,4'-DDD	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	7.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxin/Furans (ug/kg)													
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	0.03 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--	3.00E-04 NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--	6.40E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	4.00E-04 NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	--	5.30E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	5.60E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	--	5.10E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	1.00E-03 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	9.40E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	--	7.10E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	--	5.70E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	--	6.80E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	--	8.00E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	--	8.60E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	--	0.98 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	--	6.80E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	--	0.065 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	--	4.30E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	--	0.011 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	--	5.10E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	--	9.40E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	--	6.80E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	--	8.00E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	--	8.60E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (ug/kg)													
No Detections													
Total Metals (mg/kg)													
Aluminum	15,599	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	0.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	61	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Subsurface Soil Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Munden-Tetotum Background UTL**	SJS02-SB20	SJS02-SB201	SJS02-SB202	SJS02-SB203				SJS02-SB204		SJS02-SB205	SJS02-SB206	SJS02-SB207
Sample ID		SJS02-SB20-001	SJS02-SB201-07B	SJS02-SB202-07B	SJS02-SB203-16-07B	SJS02-SB203-17-07B	SJS02-SB203-19-07B	SJS02-SB203-4-07B	SJS02-SB204-12-07B*	SJS02-SB204-6-07B	SJS02-SB205-10-07B	SJS02-SB206-18-07B	SJS02-SB207-13-07B*
Sample Depth		NA	15-16' bgs	15-16' bgs	15.5-16.5' bgs	16.5-17.5' bgs	19-20' bgs	4.5-5' bgs	11.5-12.5' bgs	5.5-6.5' bgs	10-10.5' bgs	17.5-18.5' bgs	13-14' bgs
Sample Date		07/06/01	05/15/07	05/15/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07
Chemical Name													
Cadmium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	1,225	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	5.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	8,412	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	587	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	6.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	368	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	174	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	26.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg/kg)													
Carbon	--	NA	NA	NA	NA	73,500	998 J	NA	NA	17,500	NA	1,600 U	NA
Phosphorus	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (mg/kg)													
TPH-diesel range	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-gas range	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest/
inorganicss), or detections constituents not sampled/detected during the Backgr
Investigation.

-- No criteria established
is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
K - Reported value may be biased high
L - Reported value may be biased low
I - Interferences present which may cause the results to be biased high
NJ - Qualitative identification questionable due to poor resolution
UJ - Analyte not detected, result may be estimated
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Table 5-3
Shallow Groundwater Quality Parameters
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW01S				SJS02-MW02S				SJS02-MW03S				SJS02-MW04S		SJS02-MW05S	
Sample Date	7/1/1997	11/1/1997	5/1/1999	6/4/2007	7/1/1997	11/1/1997	5/1/1999	6/1/2007	7/1/1997	11/1/1997	5/1/1999	6/1/2007	5/1/1999	6/1/2007	5/1/1999	5/31/2007
Field Parameters																
Dissolved Oxygen (mg/L)	24.7	8.77	NA	1.5*	16.9	3.28	NA	4.0*	15.5	2.4	NA	2.5*	NA	3.8	NA	1.5*
Oxidation Reduction Potential (mV)	NA	NA	NA	-81	NA	NA	-48	-106	NA	NA	94	-32	200	81	109	2
Redox Potential (mV)	NA	NA	NA	119	NA	NA	152	94	NA	NA	294	168	400	281	309	202
pH	7.12	6.01	6.46	6.6	5.43	6.77	5.88	6.5	6.67	6.2	6.83	6.97	5.07	4.78	5.55	5.58
Specific Conductance (mS/cm)	0.6	0.778	0.762	0.807	6.9	4.15	8.2	5.81	2.4	1.2	1.1	3.34	0.322	0.351	0.314	0.219
Temperature (C)	18.6	19.3	16.6	18.97	22.2	20.7	18.2	20.48	21.1	19.7	17.5	17.71	16.6	16.57	16.5	16.52
Turbidity (NTU)	62	7	-10	2.3	127	16	27	3.9	176	0	10	23.8	3	16.8	9	7.1
Salinity	NA	NA	NA	0.0	NA	NA	NA	0.3	NA	NA	NA	0.2	NA	0.0	NA	0.0

Station ID	SJS02-MW06S		SJS02-MW07S				SJS02-MW08S		SJS02-MW09S		SJS02-MW10S		SJS02-MW11S		SJS02-MW12S	
Sample Date	12/11/2003	5/29/2007	12/12/2003	12/2/2004	3/28/2005	6/4/2007	12/12/2003	5/29/2007	12/11/2003	6/1/2007	12/3/2004	6/6/2007	12/2/2004	6/4/2007	12/2/2004	5/30/2007
Field Parameters																
Dissolved Oxygen (mg/L)	3.05	1.0*	0.61	0.32	0	3.5*	2.28	0.0*	0.36	0.1*	0.36	1.5*	0.55	0.2*	0.55	0
Oxidation Reduction Potential (mV)	183	128	-8	-32	81	-49	48	147	-122	-93	7	-75	-62	-96	-13	25
Redox Potential (mV)	383	328	192	168	281	151	248	347	78	107	207	125	138	104	187	225
pH	6	6.2	5.99	6.53	5.77	6.17	6.04	6.46	6.5	6.63	6.11	5.93	6.71	6.36	6.35	5.53
Specific Conductance (mS/cm)	0.35	0.364	2.11	1.37	0.175	1.48	1.1	0.67	0.519	0.354	0.332	0.212	3.68	0.356	0.62	1.48
Temperature (C)	15.5	16.2	17.5	18.2	13.9	18.02	17.7	19.3	16.7	16.6	18.8	19.39	16.8	17.4	21.4	21.4
Turbidity (NTU)	7	0	157	28.4	21.9	31.8	188	0	11.6	210	9.1	38.1	29.5	6	32.9	4.7
Salinity	0.0	0.0	0.1	0.1	0.01	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.1

Station ID	SJS02-MW13S		SJS02-MW14S	SJS02-MW15S	SJS02-MW16S		SJS02-PZ01	SJS02-PZ02	SJS02-PZ02-19	SJS02-PZ03	SJS02-PZ04	SJS02-PZ05	SJS02-PZ06**	SJS02-PZ07**	SJS02-PZ08**	SJS02-PZ09
Sample Date	12/2/2004	6/1/2007	6/6/2007	6/5/2007	6/5/2007	7/13/2007	5/22/2007	5/23/2007	5/24/2007	5/23/2007	5/23/2007	5/24/2007	5/23/2007	5/29/2007	5/24/2007	5/24/2007
Field Parameters																
Dissolved Oxygen (mg/L)	0.24	2.5*	1.0*	0.55	0.8*	0	0.0	0.0	4.0*	0.0	0.0	1.0*	0.0	0.0	0.0	0.05*
Oxidation Reduction Potential (mV)	-149	-163	-11	-61	-34	-134	-165	-199	-87	-118	-6	-13	-91	-6	-76	-135
Redox Potential (mV)	51	37	189	139	166	66	35	1	113	82	194	187	109	194	124	65
pH	7.16	7.03	6.04	6.33	6.02	6.5	6.78	7.03	6.52	6.46	5.83	5.95	6.42	6.53	6.6	6.61
Specific Conductance (mS/cm)	1.87	1.47	0.247	3.68	0.454	0.409	0.93	0.897	0.813	2.31	1.76	1.99	4.87	7.66	19.2	2.08
Temperature (C)	16.9	17.75	16.8	24.99	20.3	23.9	19	19.6	21.6	17.5	21.9	19.3	26.1	22.6	19.8	25.3
Turbidity (NTU)	100	5.1	16	4	159	45.1	125	297	-5	120	267	-5	207	202	975	345
Salinity	0.1	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.4	1.1	0.1

Notes:
*Dissolved Oxygen measured using Chemets Test Kits
**Piezometers continued to run dry
NA- Not analyzed
Redox potential is estimated by adding the silver/silver chloride electrode reference potential (~200 mV) to the oxidation reduction potential value

Table 5-4
Shallow Groundwater Detections and Exceedances - SVOCs, Pesticides, PCBs, Explosives, Inorganics, Geochemical Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL[1]	Background UTLs	SJS02-MW01S			SJS02-MW02S			SJS02-MW03S			SJS02-MW04S	SJS02-MW05S	SJS02-MW06S	SJS02-MW07S			SJS02-MW08S
Sample ID			SJS02-GW1S-001	SJS02-GW1S-002	SJS02-GW1S-003	SJS02-GW2S-001	SJS02-GW2S-002	SJS02-GW2S-003	SJS02-GW3S-001	SJS02-GW3S-002	SJS02-GW3S-003	SJS02-GW4S-001*	SJS02-GW5S-001	SJS02-MW06S-03D	SJS02-MW07S-03D	SJS02-MW07S-04D	SJS02-MW07S-07B	SJS02-MW08S-03D*
Sample Date			07/16/97	11/06/97	05/18/99	07/23/97	11/06/97	05/18/99	07/17/97	11/06/97	05/19/99	05/19/99	05/18/99	12/11/03	12/12/03	12/02/04	06/04/07	12/12/03
Chemical Name																		
Semi-volatile Organic Compounds (µg/L)																		
1,1-Biphenyl	--	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	2 J	NA	NA	5 U
1,2-Dichlorobenzene	600	--	NA	NA	11 U	NA	NA	10 U	NA	NA	11 U	12 U	6 J	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	2 J	NA	NA	5 U
2-Methylnaphthalene	--	2.5	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	8	NA	NA	5 U
4-Methylphenol	--	--	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	5 U	NA	NA	5 U
Acenaphthene	--	15	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	8	NA	NA	5 U
Acetophenone	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	NA	NA	5 U
Anthracene	--	1.7	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	0.8 J	NA	NA	5 U
Caprolactam	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	NA	NA	5 U
Carbazole	--	2	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	6	NA	NA	5 U
Di-n-butylphthalate	--	--	10 U	10 U	1 B	10 U	10 U	1 B	10 U	10 U	11 U	4 J	1 B	5 U	5 U	NA	NA	0.7 J
Dibenzofuran	--	8	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	5	NA	NA	5 U
Fluoranthene	--	1	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	5 U	NA	NA	5 U
Fluorene	--	9	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	5	NA	NA	5 U
Naphthalene	--	19	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	120	NA	NA	5 U
Phenanthrene	--	8.6	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	4 J	NA	NA	5 U
Phenol	--	--	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	5 U	NA	NA	5 U
Pyrene	--	0.72	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	11 U	12 U	11 U	5 U	5 U	NA	NA	5 U
bis(2-Ethylhexyl)phthalate	6	1	10 U	10 U	2 B	10 U	10 U	2 B	10 U	10 U	11 U	1 J	2 B	5 U	0.6 J	NA	NA	0.5 J
Pesticide/Polychlorinated Biphenyls (µg/L)																		
4,4'-DDE	--	--	0.1 U	0.1 U	0.00510 J	0.1 U	0.1 U	0.130 U	0.1 U	0.1 U	0.110 U	0.120 U	0.110 U	0.1 U	0.1 U	NA	NA	0.1 U
Endosulfan sulfate	--	--	0.1 U	0.1 U	0.120 U	0.1 U	0.1 U	0.0110 J	0.1 U	0.1 U	0.110 U	0.120 U	0.00860 J	0.1 U	0.1 U	NA	NA	0.1 U
Heptachlor	0.4	--	0.05 U	0.05 U	0.0580 U	0.05 U	0.05 U	0.0660 U	0.05 U	0.05 U	0.0570 U	0.0920	0.0550 U	0.05 U	0.05 U	NA	NA	0.05 U
Heptachlor epoxide	0.2	--	0.05 U	0.05 U	0.0580 U	0.05 U	0.05 U	0.0660 U	0.05 U	0.05 U	0.0570 U	0.0590 U	0.0550 U	0.05 U	0.05 U	NA	NA	**1.11**
Explosives (µg/L)																		
2,6-Dinitrotoluene	--	--	NA	NA	1.20 U	NA	NA	1.20 U	25 U	NA	1.20 U	1.20 U	1.20 U	NA	NA	NA	NA	NA
HMX	--	--	NA	NA	2.60 U	NA	NA	2.60 U	25 U	25 U	2.60 U	0.400 J	2.60 U	NA	NA	NA	NA	NA
RDX	--	--	NA	NA	2.60 U	NA	NA	2.60 U	25 U	25 U	2.60 U	2.70	2.60 U	0.2 U	0.2 U	NA	NA	0.2 U
Total Metals (µg/L)																		
Aluminum	--	1,710	4,400	365	1,370 K	35,500 J	1,170	211 K	6,890	130 J	38.2 U	303	304	286	102 J	NA	NA	67.8 J
Arsenic	10	8	3.8 J	5.1 B	3.20 B	3 U	3.2 U	12.2 B	10.5 B	6.2 J	8.10 B	2.20 B	2.80 B	2 U	9.2 J	NA	NA	2.8 J
Barium	2,000	77.1	54.5 J	39.6 J	35 J	726	575	568	127 B	55.1 J	75.5 J	63.7 J	56.5 J	30.1 J	124 J	NA	NA	81.1 J
Beryllium	4	1.4	1 U	0.58 J	0.100 U	1.4 B	0.77 J	0.100 U	1 U	0.58 J	0.100 U	0.200 J	0.100 U	0.2 U	0.2 U	NA	NA	0.2 U
Boron	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	531,000	75,600	149,000	162,000	110,000 J	169,000	225,000	86,300	217,000	207,000	20,900	25,100	41,800	34,400	NA	NA	66,300
Chromium	100	3.2	13.2 K	23	7.10 J	56.3 J	14.3	3.20 J	12 K	4.6 U	1.10 U	1.70 J	1.10 U	0.6 U	0.6 U	NA	NA	0.6 U
Cobalt	--	15.8	13.2 J	12.4 J	1.40 B	8 U	15.4 J	0.5 U	8 U	6 U	3.20 J	35.9 J	13.6 J	4.3 J	18.7 J	NA	NA	6 J
Copper	1,300	6.3	6 U	5.8 U	5.5 B	21.4 B	5.8 U	5.10 B	6 U	6.3 J	35.9	10.3 B	4.30 B	3.4 B	1.8 B	NA	NA	15.6 J
Cyanide	200	--	5 U	5 U	5 U	5 U	5 U	5 U	5 UL	5 U	5 U	5 U	5 U	13.2 L	4.7 L	NA	NA	3 UL
Iron	--	107,000	8,870	5,990	5,510	377,000 J	203,000	115,000	26,700	1,240	1,290	55.4 J	314	427	20,700	NA	NA	7,870
Lead	15	3.5	3.6	1.9 J	2.70 J	**36.7 L**	8.2	1 U	4.8 B	1.3 U	**17.1**	1 U	1 U	0.7 U	0.7 U	NA	NA	0.7 U
Magnesium	--	296,000	21,400	16,200	14,000	123,000 J	125,000	126,000	67,600	25,300	19,300	9,110	9,360	4,960 J	44,200	NA	NA	37,900
Manganese	--	13,700	988	405	442	797 L	843	978	1,380	197	272	625	723	125	1,340	NA	NA	1,850
Nickel	--	20.1	14.8 K	16.5 J	4.90 J	9.3 J	8.2 J	1.5 B	7 U	11.2 J	29.8 J	8.10 B	3.80 B	3 J	0.6 U	NA	NA	0.91 J
Potassium	--	85,400	4,720 J	3,880 J	3,550 J	14,100	18,500	23,600	21,900	6,970	8,400	4,880 J	2,790 J	2,340 J	11,900	NA	NA	12,700
Silver	--	1.9	4.7 B	1.1 U	0.900 U	1.5 J	2.5 B	0.900 U	4.6 B	1.2 B	0.900 U	0.900 U	0.900 U	0.4 U	1.5 J	NA	NA	0.4 U
Sodium	--	810,000	44,600	20,900	18,800	883,000 J	691,000	619,000	295,000	23,800	37,800	36,500	34,400	14,900	256,000	NA	NA	116,000
Thallium	2	7.6	2 U	2.6 B	2 UL	**6.9 J**	5.8 B	10 UL	2 U	4.3 B	2 U	2 U	2 UL	2 U	2 U	NA	NA	2 U
Vanadium	--	13.7	14.1 J	6.8 U	3.90 J	79.6	12.3 J	0.600 U	19.4 J	6.8 U	0.920 J	0.600 U	0.600 U	1.1 J	0.4 U	NA	NA	0.4 U
Zinc	--	241	28 B	18 B	11.8 B	74.9 B	15.3 J	14.2 B	23.4 B	319	638	222	52.1	48.8	7.9 B	NA	NA	69.5
Dissolved Metals (µg/L)																		
Aluminum	--	399	44 U	38.1 U	38.2 U	44 U	38.1 U	114 J	44 U	38.1 U	50.4 J	202	52.4 J	69.5 J	26.1 J	NA	NA	30.2 J
Arsenic	10	2.4	3 U	3.4 B	6.40 B	3 UL	32 U	9.90 B	5.6 J	6 J	4.5 B	3.10 B	2.70 B	2 U	7.7 J	NA	NA	2 U
Barium	2,000	93.3	42.1 J	40.2 J	36.4 J	495	697	519	110 B	54.8 J	74.3 J	64.9 J	52.7 J	28.8 J	118 J	NA	NA	77.6 J
Beryllium	4	0.31	1 U	0.58 J	0.100 U	1 U	0.58 J	0.100 U	1 U	0.58 U	0.100 U	0.210 J	0.100 U	0.2 U	0.2 U	NA	NA	0.2 U
Boron	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	0.78	0.5 U	0.4 U	0.300 U	0.5 UL	4 U	0.310 B	0.5 U	0.4 U	0.770 B	0.990 J	0.320 B	0.22 J	0.2 U	NA	NA	0.2 U
Calcium	--	464,000	67,700	152,000	148,000	90,200 J	135,000	242,000	90,800	211,000	204,000	20,000	20,000	43,900	34,900	NA	NA	68,700
Chromium	100	5.8	7 U	4.8 J	1.30 J	7 U	9.9 J	1.40 J	7 U	4.6 U	1.10 U	1.10 U	2.40 J	0.6 U	0.6 U	NA	NA	0.6 U
Cobalt	--	15	8.1 J	48 J	0.770 B	8 U	67.9	0.5 U	9.1 J	11.3 J	3.30 J	38.3 J	13.7 J	4.1 J	18.8 J	NA	NA	5.8 J
Copper	1,300	--	6 U	5.8 U	3.80 B	6 U	5.8 U	7.5 B	6 U	5.8 U	29.7	5.5 J	8 B	2.4 B	0.7 U	NA	NA	11.9 J
Iron	--	94,000	2,530	5,460	5,360	267,000 J	367,000	64,600	32,000	689	736	38.6 J	944	84.3 J	20,700 J	NA	NA	8,740 J
Lead	15	2.1	1 U	1.3 U	1 U	1 U	**15.5**	1 U	1 U	1.3 U	2.10 J	1 U	1 U	1.7 B	1.3 J	NA	NA	2.1 J
Magnesium	--	256,000	21,000	16,600	11,600	99,800 J	128,000	127,000	83,100	23,700	18,900	9,350	9,280	5,050 J	43,400 J	NA	NA	38,800 J
Manganese	--	11,800	1,020	416	509	612 J	807	1,010	1,720	174	247	697	751	121 J	1,330 J	NA	NA	1,880 J
Nickel	--	13.2	16.8 K	11.2 J	2 J	7 U	7.1 J	0.900 U	7 U	11.6 J	30 J	8.70 J	6.60 J	2.7 J	0.6 U	NA	NA	0.6 U
Potassium	--	73,300	4,170 J	3,980 J	2,930 J	9,980	14,500	25,100 J	25,400	6,330	8,190	4,730 J	2,630 J	2,020 J	11,900 J	NA	NA	12,800 J

Table 5-4
Shallow Groundwater Detections and Exceedances - SVOCs, Pesticides, PCBs, Explosives, Inorganics, Geochemical Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**MCL[1]**	**Background UTLs**	SJS02-MW01S			SJS02-MW02S			SJS02-MW03S			SJS02-MW04S	SJS02-MW05S	SJS02-MW06S	SJS02-MW07S			SJS02-MW08S
Sample ID			SJS02-GW1S-001	SJS02-GW1S-002	SJS02-GW1S-003	SJS02-GW2S-001	SJS02-GW2S-002	SJS02-GW2S-003	SJS02-GW3S-001	SJS02-GW3S-002	SJS02-GW3S-003	SJS02-GW4S-001*	SJS02-GW5S-001	SJS02-MW06S-03D	SJS02-MW07S-03D	SJS02-MW07S-04D	SJS02-MW07S-07B	SJS02-MW08S-03D*
Sample Date			07/16/97	11/06/97	05/18/99	07/23/97	11/06/97	05/18/99	07/17/97	11/06/97	05/19/99	05/19/99	05/18/99	12/11/03	12/12/03	12/02/04	06/04/07	12/12/03
Chemical Name																		
Silver	--	2.4	2.8 J	1.8 B	0.900 U	2 J	4.3 B	0.900 U	3.1 B	1.1 U	1 J	0.900 U	0.900 U	0.4 U	1.5 J	NA	NA	0.4 U
Sodium	--	582,000	43,900	21,600	29,700	720,000 J	876,000	556,000	375,000	22,200	37,400	37,600	33,400	14,700	252,000	NA	NA	124,000
Thallium	2	7.9	2 U	2.5 B	2 UL	**9.6 J**	1.5 U	10 UL	2 U	3.2 B	2 U	2 U	2 UL	**2.3 J**	2 U	NA	NA	2 U
Vanadium	--	7.1	9 U	6.8 U	1 J	9 U	14.2 J	0.600 U	9 U	6.8 U	0.600 U	0.600 U	0.600 U	0.97 J	0.4 U	NA	NA	0.4 U
Zinc	--	109	17.8 B	21.9 B	5.60 B	33.8 B	33.5 B	4.20 B	8.7 B	330	642	213	64.9	52.2	6.5 B	NA	NA	67.3
Wet Chemistry (mg_L)																		
Alkalinity	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80	108	NA
Carbon	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31	20.8 J	NA
Nitrite	1	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.03 U	NA
Phosphorus	--	--	0.146	0.073	0.0320	0.338	0.082	0.0200 U	0.105	0.05 U	0.0200 U	0.0200 U	0.0200 U	NA	NA	NA	NA	NA
Sulfate	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160	42.1	NA
Sulfide	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.3 U	NA
Total organic carbon (TOC)	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.4	3.5	NA

Notes:
[1]June 2003 MCLs
Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest/PCBs, and inorganicss), or detections constituents not sampled/detected during the Background Investigation.
Blue bold exceeds MCL
-- No critieria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
K - Reported value may be biased high
L - Reported value may be biased low
UJ - Analyte not detected, result may be estimated
UL - Analyte not detected, quantitation limit is probably higher

Table 5-4
Shallow Groundwater Detections and Exceedances - SVOCs, Pesticides, PCBs, Explosives, Inorganics, Geochemical Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL[1]	Background UTLs	SJS02-MW09S	SJS02-MW10S		SJS02-MW11S	SJS02-MW12S	SJS02-MW13S	SJS02-MW14S	SJS02-MW15S	SJS02-MW16S	SJS17-GW01
Sample ID			SJS02-MW09S-03D	SJS02-MW10S-04D	SJS02-MW10S-07B	SJS02-MW11S-04D	SJS02-MW12S-04D	SJS02-MW13S-04D*	SJS02-MW14S-07B	SJS02-MW15S-07B	SJS02-MW16S-07B	SJS17-GW01
Sample Date			12/11/03	12/03/04	06/06/07	12/02/04	12/02/04	12/02/04	06/06/07	06/05/07	06/05/07	04/04/96
Chemical Name												
Semi-volatile Organic Compounds (µg/L)												
1,1-Biphenyl	--	1.4	5 U	16	NA	11 U	11 U	11 U	NA	NA	NA	NA
1,2-Dichlorobenzene	600	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 U
2,4-Dimethylphenol	--	--	5 U	2.6 J	NA	11 U	11 U	11 U	NA	NA	NA	20 U
2-Methylnaphthalene	--	2.5	5 U	75	NA	11 U	11 U	11 U	NA	NA	NA	20 U
4-Methylphenol	--	--	5 U	2.1 J	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Acenaphthene	--	15	2 J	85	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Acetophenone	--	--	5 U	1.7 J	NA	11 U	11 U	11 U	NA	NA	NA	NA
Anthracene	--	1.7	5 U	11	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Caprolactam	--	--	5 U	11 U	NA	11 U	3.4 J	2.7 J	NA	NA	NA	NA
Carbazole	--	2	5 U	240	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Di-n-butylphthalate	--	--	5 U	11 U	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Dibenzofuran	--	8	5 U	54	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Fluoranthene	--	1	5 U	5.9 J	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Fluorene	--	9	5 U	62	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Naphthalene	--	19	5 U	1,300	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Phenanthrene	--	8.6	5 U	56	NA	11 U	11 U	11 U	NA	NA	NA	20 U
Phenol	--	--	5 U	11 U	NA	11 U	11 U	3 J	NA	NA	NA	20 U
Pyrene	--	0.72	5 U	4.1 J	NA	11 U	11 U	11 U	NA	NA	NA	20 U
bis(2-Ethylhexyl)phthalate	6	1	5 U	1.1 J	NA	11 U	2.2 B	1.6 B	NA	NA	NA	20 U
Pesticide/Polychlorinated Biphenyls (µg/L)												
4,4'-DDE	--	--	0.1 U	0.11 UJ	NA	0.12 UJ	0.11 UJ	0.1 U	NA	NA	NA	0.12 U
Endosulfan sulfate	--	--	0.1 U	0.11 UJ	NA	0.12 UJ	0.11 UJ	0.1 U	NA	NA	NA	0.12 U
Heptachlor	0.4	--	0.05 U	0.06 UJ	NA	0.06 UJ	0.02 UJ	0.07 J	NA	NA	NA	0.062 U
Heptachlor epoxide	0.2	--	0.05 U	0.06 UJ	NA	0.06 UJ	0.06 UJ	0.05 U	NA	NA	NA	0.062 U
Explosives (µg/L)												
2,6-Dinitrotoluene	--	--	NA	20	NA	0.26 U	0.26 U	0.26 U	NA	NA	NA	--
HMX	--	--	NA	0.52 U	NA	0.52 U	0.52 U	0.52 U	NA	NA	NA	--
RDX	--	--	0.2 U	0.79	NA	0.52 U	0.52 U	0.52 U	NA	NA	NA	--
Total Metals (µg/L)												
Aluminum	--	1,710	91.2 J	134 B	NA	81.4 B	45.6 B	47.4 B	NA	NA	NA	547
Arsenic	10	8	**31**	5.3 U	NA	3.8 UJ	14.3 B	3.8 UJ	NA	NA	NA	2 U
Barium	2,000	77.1	66 J	33.1 J	NA	121 J	42.3 J	166 J	NA	NA	NA	24.8 B
Beryllium	4	1.4	0.2 U	0.4 U	NA	0.26 L	0.21 L	0.2 UL	NA	NA	NA	1 U
Boron	--	--	NA	50	NA	126 J	90.8 J	170 J	NA	NA	NA	--
Calcium	--	531,000	22,700	18,100	NA	152,000	38,400	162,000	NA	NA	NA	13,800
Chromium	100	3.2	0.6 U	1.5 U	NA	2.3 L	0.9 UL	1.3 L	NA	NA	NA	5 U
Cobalt	--	15.8	5 J	1.9 J	NA	1.1 UL	10.7 J	1.1 UL	NA	NA	NA	12.3 B
Copper	1,300	6.3	3.8 B	1.1 U	NA	3.3 B	1.3 U	1.9 B	NA	NA	NA	6.1 B
Cyanide	200	--	3 UL	5 U	NA	5 U	5 U	5 U	NA	NA	NA	5 U
Iron	--	107,000	41,900	12,500 L	NA	8,090	25,600	36,700	NA	NA	NA	1,320
Lead	15	3.5	4.8	1.6 U	NA	2 UL	2 UL	2 UL	NA	NA	NA	3.3
Magnesium	--	296,000	11,000	6,180	NA	43,600	13,300	48,300	NA	NA	NA	10,500
Manganese	--	13,700	1,210	306	NA	883	760	953	NA	NA	NA	2,550
Nickel	--	20.1	3.4 J	1.1 U	NA	1.4 B	1.6 B	3 B	NA	NA	NA	10.6 B
Potassium	--	85,400	3,410 J	2,790 J	NA	27,900	4,290 J	18,500	NA	NA	NA	2,030 B
Silver	--	1.9	5.9 J	1.2 U	NA	1.3 UL	1.3 UL	1.3 UL	NA	NA	NA	5 U
Sodium	--	810,000	43,700	28,200	NA	470,000	55,000 J	171,000	NA	NA	NA	72,800
Thallium	2	7.6	2 U	6.5 U	NA	5.6 U	5.6 U	5.6 U	NA	NA	NA	4 U
Vanadium	--	13.7	0.4 U	1.7 U	NA	1.2 L	1.1 UL	2.5 L	NA	NA	NA	2 U
Zinc	--	241	158	26.8	NA	3.9 B	8.4 B	4.8 B	NA	NA	NA	23.6
Dissolved Metals (µg/L)												
Aluminum	--	399	26 U	17.9 U	NA	30.3 B	21.4 U	21.4 U	NA	NA	NA	--
Arsenic	10	2.4	**28.8**	5.3 U	NA	3.8 U	12 B	3.8 U	NA	NA	NA	--
Barium	2,000	93.3	62.6 J	30.5 J	NA	120 J	50.4 J	161 J	NA	NA	NA	--
Beryllium	4	0.31	0.2 U	0.4 U	NA	0.2 UL	0.28 L	0.24 L	NA	NA	NA	--
Boron	--	--	NA	46.9	NA	122 J	88.5 J	168 J	NA	NA	NA	--
Cadmium	5	0.78	0.2 U	0.3 U	NA	0.3 U	0.31 B	0.42 B	NA	NA	NA	--
Calcium	--	464,000	23,100	16,800	NA	149,000	40,000	160,000	NA	NA	NA	--
Chromium	100	5.8	0.6 U	1.5 U	NA	0.94 L	0.9 UL	1.2 L	NA	NA	NA	--
Cobalt	--	15	4.9 J	2 J	NA	1.1 UL	20.6 J	1.1 UL	NA	NA	NA	--
Copper	1,300	--	0.91 B	1.1 U	NA	1.3 U	1.3 U	1.3 U	NA	NA	NA	--
Iron	--	94,000	41,600 J	11,400	NA	7,220	25,700	35,600	NA	NA	NA	--
Lead	15	2.1	3.4 B	1.6 U	NA	2 UL	2 UL	2 UL	NA	NA	NA	--
Magnesium	--	256,000	11,000 J	5,780	NA	41,500	14,500	47,200	NA	NA	NA	--
Manganese	--	11,800	1,210 J	285	NA	845	1,050	952	NA	NA	NA	--
Nickel	--	13.2	3.4 J	1.1 U	NA	0.95 B	3.6 B	2.1 B	NA	NA	NA	--
Potassium	--	73,300	3,100 J	2,620 J	NA	28,000	4,470 J	18,400	NA	NA	NA	--

Table 5-4
Shallow Groundwater Detections and Exceedances - SVOCs, Pesticides, PCBs, Explosives, Inorganics, Geochemical Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**MCL[1]**	**Background UTLs**	SJS02-MW09S	SJS02-MW10S		SJS02-MW11S	SJS02-MW12S	SJS02-MW13S	SJS02-MW14S	SJS02-MW15S	SJS02-MW16S	SJS17-GW01
Sample ID			SJS02-MW09S-03D	SJS02-MW10S-04D	SJS02-MW10S-07B	SJS02-MW11S-04D	SJS02-MW12S-04D	SJS02-MW13S-04D*	SJS02-MW14S-07B	SJS02-MW15S-07B	SJS02-MW16S-07B	SJS17-GW01
Sample Date			12/11/03	12/03/04	06/06/07	12/02/04	12/02/04	12/02/04	06/06/07	06/05/07	06/05/07	04/04/96
Chemical Name												
Silver	--	2.4	5.6 J	1.2 U	NA	1.3 UL	1.3 UL	1.3 UL	NA	NA	NA	--
Sodium	--	582,000	44,000	26,500	NA	469,000	69,800	167,000	NA	NA	NA	--
Thallium	2	7.9	2 U	6.5 U	NA	5.6 U	5.6 U	5.6 U	NA	NA	NA	--
Vanadium	--	7.1	0.4 U	1.7 U	NA	1.2 L	1.1 UL	2 L	NA	NA	NA	--
Zinc	--	109	157	9.6 J	NA	2.1 B	10.4 B	4.7 B	NA	NA	NA	--
Wet Chemistry (mg_L)												
Alkalinity	--	--	NA	47	56.8	250	96	500	102	190	281	--
Carbon	--	--	NA	NA	3.8 K	NA	NA	NA	4.8 K	NA	NA	--
Ferrous iron	--	--	NA	12	2.6 J	3.1	33	10 U	12.2 J	9 J	26.6 J	--
Nitrite	1	--	NA	NA	0.03	NA	NA	NA	0.03	0.03 U	0.03 U	--
Phosphorus	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Sulfate	--	--	NA	33	5.1	4.8	38	130	13	4.4	28.2	--
Sulfide	--	--	NA	NA	2.2	NA	NA	NA	2.3	2.4 U	2.3 U	--
Total organic carbon (TOC)	--	--	NA	4.8	NA	4.7	1 U	13	NA	6.3 K	6.4 K	--

Notes:
[1]June 2003 MCLs
Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest/PCBs, and inorganicss), or detections constituents not sampled/detected during the Background Investigation.
Blue bold exceeds MCL
-- No critieria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
K - Reported value may be biased high
L - Reported value may be biased low
UJ - Analyte not detected, result may be estimated
UL - Analyte not detected, quantitation limit is probably higher

Table 5-5
Shallow Groundwater Detections and Exceedances of Screening Criteria - VOCs
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL[1]	SJS02-GW01	SJS02-GW02	SJS02-GW03	SJS02-GW04	SJS02-GW05	SJS02-GW06	SJS02-GW07	SJS02-GW08	SJS02-GW09	SJS02-GW10	SJS02-GW11	SJS02-GW12	SJS02-GW13		SJS02-GW14	
Sample ID		SJS02-GW01-07B	SJS02-GW02-07B	SJS02-GW03-07B	SJS02-GW04-07B	SJS02-GW05-07B	SJS02-GW06-07B	SJS02-GW07-07B	SJS02-GW08-07B	SJS02-GW09-07B*	SJS02-GW10-07B	SJS02-GW11-07B	SJS02-GW12-07B	SJS02-GW13-13-07B	SJS02-GW13-15-07B	SJS02-GW14-13-07B*	SJS02-GW14-6-07B
Sample Date		05/14/07	05/14/07	05/14/07	05/14/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/16/07	05/16/07	05/17/07	05/17/07	05/17/07	05/17/07
Sample Depth		11.5-13.5	5.5-6.5	13-14	16.5-18.5	11-14	13-14	13-14	15.5-18.5	16-18	15.5-18.5	13-15	12-13.5	12-13.5	15-15.5	12-13.5	5.5-6
Chemical Name																	
Volatile Organic Compounds (µg/L)																	
1,1,2-Trichloroethane	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U	2,500 U	500 U
1,1-Dichloroethene	7	1 U	1 U	1 U	**110**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U	2,500 U	500 U
1,2-Dichlorobenzene	600	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U	5,000 U	1,000 U
1,4-Dichlorobenzene	75	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U	5,000 U	1,000 U
Acetone	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U	2,500 U	500 U
Chloroform	80	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U	2,500 U	500 U
Chloromethane	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U	12,500 U	2,500 U
Cyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U	12,500 U	2,500 U
Styrene	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U	2,500 U	500 U
Toluene	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	5	0.42 J	1 U	1 U	**3,900**	1 U	1 U	0.78 J	1 U	0.46 J	0.59 J	0.44 J	0.57 J	**3,600**	**950 J**	**530,000 J**	**28,000**
Vinyl chloride	2	2 U	2 U	1.3 J	**160**	2 U	2 U	2 U	**3.2**	0.6 J	**17**	2 U	**7.3**	**280**	10,000 U	**2,200 J**	**310 J**
Xylene, total	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	70	1 U	1 U	5	**5,300**	1 U	1 U	1.1	6.5	1.8	2.2	1 U	4.4	**940**	**12,000**	**75,000 J**	**24,000**
cis-1,3-Dichloropropene	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U	2,500 U	500 U
trans-1,2-Dichloroethene	100	1 U	1 U	1 U	42	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	19 J	5,000 U	2,500 U	500 U

Notes:
[1]June 2003 MCLs
Blue bold exceeds MCL
-- No criteria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
R - Unreliable result
L - Reported value may be biased low
UJ - Analyte not detected, result may be estimated
UL - Analyte not detected, quantitation limit is probably higher

Table 5-5
Shallow Groundwater Detections and Exceedances of Screening Criteria - VOCs
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL[1]	SJS02-GW15	SJS02-GW16		SJS02-GW17		SJS02-GW18	SJS02-GW19	SJS02-GW20	SJS02-MW01S				SJS02-MW02S			
Sample ID		SJS02-GW15-13-07B	SJS02-GW16-11-07B	SJS02-GW16-14-07B	SJS02-GW17-17-07B	SJS02-GW17-21-07B	SJS02-GW18-19-07B*	SJS02-GW19-13-07B	SJS02-GW20-14-07B	SJS02-GW1S-001	SJS02-GW1S-002	SJS02-GW1S-003	SJS02-MW01S-07B	SJS02-GW2S-001	SJS02-GW2S-002	SJS02-GW2S-003	SJS02-MW02S-07I
Sample Date		05/17/07	05/17/07	05/17/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	07/16/97	11/06/97	05/18/99	06/04/07	07/23/97	11/06/97	05/18/99	06/01/07
Sample Depth		13-13.5	11-11.5	13-14	16.5-17.5	19.5-21	18.5-19	12.5-13		4.6-14.6				3-13			
Chemical Name																	
Volatile Organic Compounds (µg/L)																	
1,1,2-Trichloroethane	5	500 U	2,500 U	20,000 U	5 U	50 U	**1,400 J**	5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
1,1-Dichloroethene	7	500 U	2,500 U	20,000 U	5 U	**200**	1,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
1,2-Dichlorobenzene	600	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	10 U	2 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
1,4-Dichlorobenzene	75	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	10 U	2 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
Acetone	--	NA	NA	NA	NA	NA	NA	NA	NA	7 B	NA	NA	NA	10 B	6 B	NA	NA
Carbon dioxide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA
Chlorobenzene	100	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
Chloroform	80	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
Chloromethane	--	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	25 U	5 U	1 U	1 U	1 U	0.25 B	1 U	1 U	1 U	0.5
Cyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	80	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA
Ethane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA
Isopropylbenzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	25 U	5 U	2 B	2 B	2 U	0.17 B	1 B	2 B	2 U	0.35
Styrene	100	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA
Tetrachloroethene	5	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
Toluene	1,000	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA
Trichloroethene	5	**89,000**	**64,000**	**370,000**	1.7 J	**2,000**	**210,000**	**540**	1.2	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
Vinyl chloride	2	**2,100**	5,000 U	40,000 U	**1,000**	**1,900**	**7,200**	**11**	2 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
Xylene, total	10,000	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA
cis-1,2-Dichloroethene	70	**36,000**	**5,000**	**6,900 J**	68	**7,100**	**87,000**	**410**	1.7	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
cis-1,3-Dichloropropene	--	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5
trans-1,2-Dichloroethene	100	500 U	2,500 U	20,000 U	0.74 J	92	**1,200 J**	5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U	0.5

Notes:
[1]June 2003 MCLs
Blue bold exceeds MCL
-- No criteria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
R - Unreliable result
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Table 5-5
Shallow Groundwater Detections and Exceedances of Screening Criteria - VOCs
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**MCL[1]**		SJS02-MW03S				SJS02-MW04S		SJS02-MW05S		SJS02-MW06S		SJS02-MW07S			SJS02-MW08S		SJS02-
Sample ID		B	SJS02-GW3S-001	SJS02-GW3S-002	SJS02-GW3S-003	SJS02-MW03S-07B	SJS02-GW4S-001*	SJS02-MW04S-07B	SJS02-GW5S-001	SJS02-MW05S-07B*	SJS02-MW06S-03D	SJS02-MW06S-07B	SJS02-MW07S-03D	SJS02-MW07S-04D	SJS02-MW07S-07B	SJS02-MW08S-03D*	SJS02-MW08S-07B	SJS02-MW09S-03D
Sample Date			07/17/97	11/06/97	05/19/99	06/01/07	05/19/99	06/01/07	05/18/99	05/31/07	12/11/03	05/29/07	12/12/03	12/02/04	06/04/07	12/12/03	05/29/07	12/11/03
Sample Depth			3.2-13.2				2-12		2-12		4-14		5-15			5-15		5-
Chemical Name																		
Volatile Organic Compounds (µg/L)																		
1,1,2-Trichloroethane	5	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	**10**	13,000 R	**31**	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	7	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	**200 J**	**1,500 L**	**300 J**	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	600	U	1 U	1 U	1 U	0.5 U	0.300 J	0.5 U	7.80	5.6	0.44 J	0.13 J	0.5 U	13,000 R	10 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	75	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	0.800 J	0.5 U	0.5 U	0.5 U	0.5 U	13,000 R	10 U	0.5 U	0.5 U	0.5 U
Acetone	--		5 B	22 B	NA	NA	NA	NA	NA	NA	5 U	NA	25,000 R	130,000 R	NA	17	NA	5 U
Carbon dioxide	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12,000	NA	NA	NA
Carbon disulfide	--		1 U	1 U	4.10	NA	3.40	NA	1 U	NA	0.5 U	NA	0.5 UL	14,000	NA	0.5 U	NA	0.5 U
Chlorobenzene	100	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	2.40	1.8	0.5 U	0.28 J	0.5 U	13,000 R	10 U	0.5 U	0.5 U	0.5 U
Chloroform	80	U	1 U	1 U	1 U	0.5 U	0.200 B	0.5 U	0.600 B	0.5 U	1.1	0.5 U	2,500 R	5.5 L	0.8 J	0.71	0.5 U	0.5 U
Chloromethane	--	U	1 U	1 U	1 U	0.12 B	1 U	0.5 U	1 U	0.5 U	0.46 B	0.13 J	0.5 UL	1.6 L	10 U	0.55 B	0.5 U	0.65 B
Cyclohexane	--		NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	NA	0.5 U	13,000 R	NA	0.5 U	NA	0.5 U
Dibromochloromethane	80		1 U	1 U	1 U	NA	1 U	NA	1 U	NA	0.5 U	NA	0.5 U	13,000 R	10 U	0.5 U	NA	0.5 U
Ethane	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8	NA	NA	NA
Ethene	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NA	NA	NA
Ethylbenzene	700		1 U	1 U	1 U	NA	1 U	NA	1 U	NA	0.5 U	NA	2	5.4 L	NA	0.5 U	NA	0.5 U
Isopropylbenzene	--		NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	NA	0.5 U	0.56 L	NA	0.5 U	NA	0.5 U
Methane	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390	NA	NA	NA
Methylcyclohexane	--		NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	NA	0.5 U	13,000 R	NA	0.5 U	NA	0.5 U
Methylene chloride	5	B	2 B	2 B	0.5 B	0.31 B	0.700 B	0.17 B	2 U	0.18 B	0.67 B	0.28 B	1.5 B	**26 L**	5 B	0.75 B	0.11 B	0.87 B
Styrene	100		1 U	1 U	1 U	NA	1 U	NA	1 U	NA	0.5 U	NA	0.35 J	13,000 R	NA	0.5 U	NA	0.5 U
Tetrachloroethene	5	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	**21**	**34 L**	**26**	0.5 U	0.5 U	0.5 U
Toluene	1,000		1 U	1 U	1 U	NA	1 U	NA	1 U	NA	0.5 U	NA	4.9	16 L	NA	0.5 U	NA	0.5 U
Trichloroethene	5	U	1 U	1 U	1 U	0.5 U	0.800 J	0.5 U	0.800 J	0.67	0.5 U	0.5 U	**82,000**	**270,000**	**210,000**	0.32 J	0.5 U	0.5 U
Vinyl chloride	2	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	**3,600**	13,000 R	**2,600 J**	0.5 U	0.5 U	0.5 U
Xylene, total	10,000		1 U	1 U	1 U	NA	1 U	NA	1 U	NA	0.5 U	NA	11	12 L	NA	0.5 U	NA	0.5 U
cis-1,2-Dichloroethene	70	U	1 U	1 U	1 U	0.5 U	0.300 J	0.5 U	1 U	0.34 J	0.5 U	0.5 U	**34,000**	**34,000**	**30,000**	0.59	0.5 U	0.5 U
cis-1,3-Dichloropropene	--	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	13,000 R	10 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	U	1 U	1 U	1 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	**160 J**	**540 L**	**550 J**	0.5 U	0.5 U	0.5 U

Notes:
[1]June 2003 MCLs
Blue bold exceeds MCL
-- No criteria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
R - Unreliable result
L - Reported value may be biased low
UJ - Analyte not detected, result may be estimated
UL - Analyte not detected, quantitation limit is probably higher

Table 5-5
Shallow Groundwater Detections and Exceedances of Screening Criteria - VOCs
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**MCL[1]**	MW09S	SJS02-MW10S		SJS02-MW11S		SJS02-MW12S		SJS02-MW13S		SJS02-MW14S	SJS02-MW15S	SJS02-MW16S		SJS02-PZ01
Sample ID		SJS02-MW09S-07B	SJS02-MW10S-04D	SJS02-MW10S-07B	SJS02-MW11S-04D	SJS02-MW11S-07B	SJS02-MW12S-04D	SJS02-MW12S-07B	SJS02-MW13S-04D*	SJS02-MW13S-07B	SJS02-MW14S-07B	SJS02-MW15S-07B	SJS02-MW16S-07B	SJS02-MW16S-07C*	SJS02-PZ01-07B*
Sample Date		06/01/07	12/03/04	06/06/07	12/02/04	06/04/07	12/02/04	05/30/07	12/02/04	06/01/07	06/06/07	06/05/07	06/05/07	07/13/07	05/22/07
Sample Depth		10	6.5-16.5		15-20		6-16		7-22		7-17	9-19	14-24		19-24
Chemical Name															
Volatile Organic Compounds (µg/L)															
1,1,2-Trichloroethane	5	0.5 U	**170 L**	**63**	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	1 U
1,1-Dichloroethene	7	0.5 U	**280 L**	**47**	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	1 U
1,2-Dichlorobenzene	600	0.62	500 UL	10 U	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	2 U
1,4-Dichlorobenzene	75	0.5 U	500 UL	10 U	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	2 U
Acetone	--	NA	5,000 UL	NA	10 R	NA	5.5 J	NA	6.9	NA	NA	NA	NA	NA	NA
Carbon dioxide	--	NA	NA	75,000	NA	NA	NA	NA	NA	NA	110,000	130,000	280,000	NA	NA
Carbon disulfide	--	NA	9.7 L	NA	2.1 B	NA	0.5 U	NA	0.5 UJ	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	0.1 J	500 UL	10 U	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	1 U
Chloroform	80	0.5 U	**130 L**	6 J	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	1 U
Chloromethane	--	0.1 B	500 UL	10 U	0.5 U	10 U	0.57 J	0.5 U	0.5 UJ	0.17 B	13,000 U	25,000 U	10 U	0.5 U	5 U
Cyclohexane	--	NA	500 UL	NA	0.5 U	NA	0.5 U	NA	1.3	NA	NA	NA	NA	NA	NA
Dibromochloromethane	80	NA	44 L	10 U	0.5 U	10 U	0.5 U	NA	0.5 UJ	NA	13,000 U	25,000 U	10 U	NA	NA
Ethane	--	NA	NA	0.12 B	NA	NA	NA	NA	NA	NA	11	66	0.01 U	NA	NA
Ethene	--	NA	NA	43	NA	NA	NA	NA	NA	NA	76	660	0.047	NA	NA
Ethylbenzene	700	NA	22 L	NA	0.5 U	NA	0.5 U	NA	0.5 UJ	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	NA	2.5 L	NA	0.5 U	NA	0.5 U	NA	0.5 UJ	NA	NA	NA	NA	NA	NA
Methane	--	NA	NA	840	NA	NA	NA	NA	NA	NA	2,800	8,500	6,800	NA	NA
Methylcyclohexane	--	NA	500 UL	NA	0.5 U	NA	0.5 U	NA	0.8 J	NA	NA	NA	NA	NA	NA
Methylene chloride	5	0.2 B	4.1 L	3 B	0.5 U	10 U	0.5 U	0.16 B	0.5 UJ	0.34 B	1,300 B	3,700 B	10 U	0.15 B	5 U
Styrene	100	NA	3.9 L	NA	0.5 U	NA	0.5 U	NA	0.5 UJ	NA	NA	NA	NA	NA	NA
Tetrachloroethene	5	0.5 U	**39 L**	**22**	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	1 U
Toluene	1,000	NA	67 L	NA	0.5 U	NA	0.5 U	NA	0.5 UJ	NA	NA	NA	NA	NA	NA
Trichloroethene	5	0.5 U	**330,000 J**	**77,000**	**50**	10 U	1.6 B	0.49 J	1.2 B	0.5 U	**84,000**	**240,000**	**62**	**12**	1 U
Vinyl chloride	2	0.5 U	**960 L**	**1,900 J**	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	**32,000**	0.7 J	0.35 J	2 U
Xylene, total	10,000	NA	49 L	NA	0.5 U	NA	0.5 U	NA	0.5 UJ	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	70	0.5 U	**23,000 L**	**21,000**	0.5 J	10 U	1.2	3.1	0.5 UJ	0.5 U	**30,000**	**130,000**	9 J	6.2	1 U
cis-1,3-Dichloropropene	--	0.5 U	2.3 L	10 U	0.5 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	1 U
trans-1,2-Dichloroethene	100	0.5 U	**720 L**	**240 J**	0.5 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	13,000 U	25,000 U	10 U	0.5 U	1 U

Notes:
[1]June 2003 MCLs
Blue bold exceeds MCL
-- No criteria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
R - Unreliable result
L - Reported value may be biased low
UJ - Analyte not detected, result may be estimated
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Table 5-5
Shallow Groundwater Detections and Exceedances of Screening Criteria - VOCs
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**MCL[1]**	SJS02-PZ02		SJS02-PZ03	SJS02-PZ04	SJS02-PZ05	SJS02-PZ06	SJS02-PZ07	SJS02-PZ08	SJS02-PZ09	SJS17-GW01
Sample ID		SJS02-PZ02-07B	SJS02-PZ02-19-07B	SJS02-PZ03-07B	SJS02-PZ04-07B	SJS02-PZ05-07B	SJS02-PZ06-07B	SJS02-PZ07-07B	SJS02-PZ08-07B	SJS02-PZ09-07B	SJS17-GW01
Sample Date		05/23/07	05/24/07	05/23/07	05/23/07	05/24/07	05/23/07	05/29/07	05/24/07	05/24/07	04/04/96
Sample Depth		19-24	14-19	10-15	10-15	10-15	15-20	10-15	10-15	15-20	NA
Chemical Name											
Volatile Organic Compounds (µg/L)											
1,1,2-Trichloroethane	5	1 U	1 U	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U	10 U
1,1-Dichloroethene	7	1 U	1 U	**200**	**620**	1,000 U	1 U	0.5 U	1 U	1 U	10 U
1,2-Dichlorobenzene	600	2 U	2 U	100 U	1,000 U	2,000 U	2 U	0.5 U	2 U	2 U	NA
1,4-Dichlorobenzene	75	2 U	2 U	100 U	1,000 U	2,000 U	2 U	0.5 U	2 U	2 U	10 U
Acetone	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Carbon dioxide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	1 U	1 U	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U	10 U
Chloroform	80	1 U	1 U	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U	10 U
Chloromethane	--	5 U	5 U	250 U	2,500 U	5,000 U	5 U	0.5 U	5 U	5 U	10 U
Cyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Dibromochloromethane	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Ethane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Isopropylbenzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5	5 U	5 U	250 U	2,500 U	5,000 U	5 U	0.18 B	5 U	5 U	8 BJ
Styrene	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Tetrachloroethene	5	1 U	1 U	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U	10 U
Toluene	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Trichloroethene	5	1 U	1 U	**1,600**	**45,000**	**100,000**	1.3	0.5 U	0.8 J	1 U	10 U
Vinyl chloride	2	2 U	2 U	**3,500**	**6,100**	**1,000 J**	**7.9**	**22**	0.52 J	**3.4**	10 U
Xylene, total	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
cis-1,2-Dichloroethene	70	1 U	1 U	**7,700**	**48,000**	**17,000**	1.1	0.5 U	1 U	1 U	NA
cis-1,3-Dichloropropene	--	1 U	1 U	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U	10 U
trans-1,2-Dichloroethene	100	1 U	1 U	58	**1,100**	1,000 U	1 U	0.5 U	1 U	1 U	NA

Notes:
[1]June 2003 MCLs
Blue bold exceeds MCL
-- No criteria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
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Table 5-6
Deep Groundwater Quality Parameters
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW01D						SJS02-MW02D					SJS02-MW05D			SJS02-MW10D						
Sample Date	7/1/1997	11/1/1997	5/1/1999	12/1/2004	3/28/2005	6/4/2007	7/1/1997	11/1/1997	5/1/1999	3/28/2005	6/5/2007	5/1/1999	6/6/2007	6/5/2007	12/2/2004	1/18/2005	3/28/2005	5/16/2006	5/17/2006	6/22/2006	6/5/2007
Field Parameters																					
Dissolved Oxygen (mg/L)	5.6	9.1	NA	2.01	0	1*	6.2	2.2	NA	0	1.0*	NA	1.0*	0.18	0.31	NA	0	4	2.76	1.28	0.18
Oxidation Reduction Potential (mV)	NA	NA	124	-171	-126	0	NA	NA	-25	-108	-162	98	-168	-186	-131	NA	-247	-22	-68	-263	-186
Redox Potential (mV)	NA	NA	324	29	74	200	NA	NA	175	92	38	298	32	14	69	NA	-47	178	132	-63	14
pH	9.35	9.76	8.59	7.75	7.96	7.57	8.31	7.2	7.43	7.34	7.37	7.28	7.51	7.59	8.84	NA	8.47	7.2	6.49	7.91	7.59
Specific Conductance (mS/cm)	0.3	0.264	0.332	0.363	0.374	37.3	NA	0.39	0.368	0.457	40.6	0.358	37.9	38	0.458	NA	0.416	0.38	0.54	0.373	38
Temperature (C)	19	17.1	17.3	16.8	16.6	18.2	20.1	17	19.2	17.4	18.4	18.8	18.4	18.8	17.2	NA	17.15	24.7	20.9	19.87	18.8
Turbidity (NTU)	100	10	-10	31.1	113	2.6	0.6	0	4	24.6	54.3	23	18.6	4	52.8	NA	22.9	4	0	502	4
Salinity	NA	NA	NA	0	0.02	0	NA	NA	NA	0.02	0	NA	0	0	0	NA	0.02	0	0.2	0	0

Notes:
*Dissolved Oxygen measured using Chemets Test Kits
**Piezometers continued to run dry
NA- Not analyzed
Redox potential is estimated by adding the silver/silver chloride electrode reference potential (~200 mV) to the oxidation reduction potential value

Table 5-7
Deep Groundwater Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**MCL[1]**	SJS02-MW01D						SJS02-MW02D					SJS02-MW05D	
Sample ID		SJS02-GW1D-001	SJS02-GW1D-002	SJS02-GW1D-003	SJS02-MW01D-04D	SJS02-MW01D-05A	SJS02-MW01D-07B	SJS02-GW2D-001	SJS02-GW2D-002*	SJS02-GW2D-003	SJS02-MW02D-05A*	SJS02-MW02D-07B	SJS02-GW5D-001	SJS02-MW05D-07B
Sample Date		07/31/97	11/06/97	05/18/99	12/01/04	03/28/05	06/04/07	07/17/97	11/06/97	05/18/99	03/28/05	06/05/07	05/18/99	06/05/07
Chemical Name														
Volatile Organic Compounds (µg/L)														
1,1-Dichloroethene	7	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	10 U	0.5 U	1 U	0.5 U
Acetone	--	5 U	7 B	NA	5 R	10 U	NA	NA	NA	NA	10 U	NA	NA	NA
Carbon disulfide	--	1 U	0.2 J	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	10 U	NA	1 J	NA
Chloroform	80	0.6 J	1 U	1 U	0.5 UL	10 U	0.5 U	6	1 U	1 U	10 U	0.5 U	2.40 B	0.5 U
Chloromethane	--	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	10 U	0.5 U	1 U	0.32 B
Toluene	1,000	0.3 J	0.7 B	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	10 U	NA	1 U	NA
Trichloroethene	5	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	10 U	0.5 U	1 U	0.5 U
Vinyl chloride	2	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	10 U	0.5 U	1 U	0.5 U
cis-1,2-Dichloroethene	70	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	10 U	0.5 U	1 U	0.5 U
Semi-volatile Organic Compounds (µg/L)														
Caprolactam	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	11 U	NA	NA	11 U	NA
Phenol	--	10 U	5 J	11 U	NA	NA	NA	10 U	10 U	11 U	NA	NA	11 U	NA
bis(2-Ethylhexyl)phthalate	6	10 U	10 U	2 B	NA	NA	NA	10 U	5 B	2 B	NA	NA	1 B	NA
Pesticide/Polychlorinated Biphenyls (µg/L)														
Endosulfan sulfate	--	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.00960 J	NA	NA	0.00980 J	NA
Heptachlor	0.4	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.0590 U	NA	NA	0.0540 U	NA
Explosives (µg/L)														
No Detections														
Total Metals (µg/L)														
Aluminum	--	2,000	42.4 J	200 K	NA	NA	NA	45.8 B	38.1 U	304 K	NA	NA	321 K	NA
Arsenic	10	3.7 J	3.2 U	2.40 B	NA	NA	NA	4.5 B	3.2 U	2 U	NA	NA	9.20 B	NA
Barium	2,000	18.2 B	9.3 B	14.4 J	NA	NA	NA	18.3 B	22.7 B	16.4 J	NA	NA	39.8 J	NA
Boron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	57,900	53,600	60,100	NA	NA	NA	49,500	49,900	57,800	NA	NA	55,600	NA
Chromium	100	11.8 B	4.6 U	1.90 J	NA	NA	NA	7 U	4.6 U	1.5 J	NA	NA	1.30 J	NA
Iron	--	3,820 K	59 B	138	NA	NA	NA	87.4 B	876	1,050	NA	NA	398	NA
Lead	15	2.7 B	1.3 U	1 U	NA	NA	NA	1 U	1.3 U	1 U	NA	NA	1.5 J	NA
Magnesium	--	5,200	3,720 J	6,850	NA	NA	NA	13,600	20,200	15,300	NA	NA	8,450	NA
Manganese	--	45.5	5.6 B	36.1	NA	NA	NA	49.4 B	228	229	NA	NA	120	NA
Molybdenum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	7 U	6.3 U	2.20 J	NA	NA	NA	7 U	6.3 U	1.10 J	NA	NA	2.80 B	NA
Potassium	--	5,520	5,300	5,810	NA	NA	NA	8,800 B	11,600	8,240	NA	NA	5,850	NA
Sodium	--	11,400	12,600	13,300	NA	NA	NA	19,100	18,300	15,800	NA	NA	23,300	NA
Vanadium	--	9.6 K	6.8 U	0.600 U	NA	NA	NA	9 U	6.8 U	0.600 U	NA	NA	1 J	NA
Zinc	--	18.9 B	10.8 B	17.6 J	NA	NA	NA	5 U	23.6 B	3.5 B	NA	NA	7 B	NA
Dissolved Metals (µg/L)														
Aluminum	--	79.2 B	38.1 U	60.2 J	NA	NA	NA	44 U	38.1 U	38.2 U	NA	NA	46.4 J	NA
Antimony	6	3.1 J	1.7 U	2.70 U	NA	NA	NA	3 J	1.7 U	2.70 U	NA	NA	2.70 U	NA
Arsenic	10	3 U	3.4 J	2 U	NA	NA	NA	4.4 J	3.2 U	2 U	NA	NA	6.20 B	NA
Barium	2,000	11.7 B	6.7 B	15.1 J	NA	NA	NA	18.3 B	19.2 B	14.6 J	NA	NA	39 J	NA
Boron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	55,900	48,700	62,700	NA	NA	NA	49,300	45,600	52,300	NA	NA	54,700	NA
Iron	--	30.4 B	34.6 B	94.3 J	NA	NA	NA	45.3 B	715	855	NA	NA	203	NA
Magnesium	--	4,790 J	3,420 J	7,000	NA	NA	NA	13,200	18,500	13,700	NA	NA	8,480	NA
Manganese	--	3.3 B	4.8 B	35.5	NA	NA	NA	43.9 B	207	206	NA	NA	112	NA
Nickel	--	7 U	6.3 U	1.90 J	NA	NA	NA	7 U	6.3 U	1.30 J	NA	NA	1.30 B	NA
Potassium	--	5,330	4,730 J	6,190	NA	NA	NA	8,800 B	10,400	7,520 J	NA	NA	5,880 J	NA
Sodium	--	11,800	11,400	14,000	NA	NA	NA	19,600	16,600	14,500	NA	NA	23,700	NA
Vanadium	--	9 U	6.8 U	0.600 U	NA	NA	NA	9 U	6.8 U	0.600 U	NA	NA	0.600 U	NA
Wet Chemistry (mg_L)														
Alkalinity	--	NA	NA	NA	160 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	--	0.18	0.87	0.0750	NA	NA	NA	0.862	2.14	0.208	NA	NA	0.0410	NA
Sulfate	--	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	--	NA	NA	NA	3	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1]June 2003 MCLs
Blue bold exceeds criteria
-- No criteria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
R - Unreliable result
K - Reported value may be biased high
UL - Analyte not detected, quantitation limit is probably higher

Table 5-7
Deep Groundwater Detections and Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL[1]	SJS02-MW10D							
Sample ID		SJS02-MW10D-04D	SJS02-MW10D-05A	SJS02-MW10D-05A2	SJS02-MW10D-06B	SJS02-MW10D-06B2*	SJS02-MW10D-06B3*	SJS02-MW10D-06D*	SJS02-MW10D-07B*
Sample Date		12/03/04	01/18/05	03/28/05	05/16/06	05/17/06	06/22/06	11/28/06	06/06/07
Chemical Name									
Volatile Organic Compounds (µg/L)									
1,1-Dichloroethene	7	0.68	83 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U
Acetone	--	4.9 J	83 U	10 U	10 U	10 U	5 U	5 U	NA
Carbon disulfide	--	1 B	83 U	10 U	10 U	10 U	0.5 U	0.5 U	NA
Chloroform	80	7.8	83 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U
Chloromethane	--	0.5 U	83 U	10 U	10 U	10 U	0.3 J	0.5 U	0.19 B
Toluene	1,000	3	83 U	1 J	10 U	10 U	0.3 J	0.11 B	NA
Trichloroethene	5	**2,200**	**700**	**900**	3.9 J	10 U	0.26 J	0.5 U	0.5 U
Vinyl chloride	2	0.53	83 U	10 U	**3.6 J**	10 U	**6.5**	1.7	0.5 U
cis-1,2-Dichloroethene	70	19	83 U	35	52	10 U	5.4	1.6	1.4
Semi-volatile Organic Compounds (µg/L)									
Caprolactam	--	1.3 J	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	3.9 J	NA	NA	NA	NA	NA	NA	NA
Phenol	--	11 U	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	6	1.5 J	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)									
Endosulfan sulfate	--	0.11 UJ	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.4	0.06 J	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)									
No Detections									
Total Metals (µg/L)									
Aluminum	--	53.2 B	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	7 J	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	12.8 J	NA	NA	NA	NA	NA	NA	NA
Boron	--	147	NA	NA	NA	NA	NA	NA	NA
Calcium	--	41,100	NA	NA	NA	NA	NA	NA	NA
Chromium	100	1.5 U	NA	NA	NA	NA	NA	NA	NA
Iron	--	54.9 B	NA	NA	NA	NA	NA	NA	NA
Lead	15	1.6 U	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	3,920 J	NA	NA	NA	NA	NA	NA	NA
Manganese	--	17	NA	NA	NA	NA	NA	NA	NA
Molybdenum	--	17.6	NA	NA	NA	NA	NA	NA	NA
Nickel	--	1.1 U	NA	NA	NA	NA	NA	NA	NA
Potassium	--	6,340 J	NA	NA	NA	NA	NA	NA	NA
Sodium	--	47,200	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	2.8 J	NA	NA	NA	NA	NA	NA	NA
Zinc	--	2.4 B	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)									
Aluminum	--	17.9 U	NA	NA	NA	NA	NA	NA	NA
Antimony	6	6.4 U	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	7 J	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	12.1 J	NA	NA	NA	NA	NA	NA	NA
Boron	--	138	NA	NA	NA	NA	NA	NA	NA
Calcium	--	41,700	NA	NA	NA	NA	NA	NA	NA
Iron	--	15.7 U	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	3,960 J	NA	NA	NA	NA	NA	NA	NA
Manganese	--	16.4	NA	NA	NA	NA	NA	NA	NA
Nickel	--	1.1 U	NA	NA	NA	NA	NA	NA	NA
Potassium	--	6,070 J	NA	NA	NA	NA	NA	NA	NA
Sodium	--	40,000	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	2.5 J	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg_L)									
Alkalinity	--	130	NA	NA	NA	NA	NA	NA	NA
Phosphorus	--	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	--	63	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	--	8.5	NA	NA	NA	NA	NA	NA	NA

Notes:
[1]June 2003 MCLs
Blue bold exceeds criteria
-- No criteria established
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not analyzed
U - Analyte not detected
J - Result may be estimated
B - Possible blank contamination
R - Unreliable result
K - Reported value may be biased high
UL - Analyte not detected, quantitation limit is probably higher

Table 5-8
Surface Water Quality Parameters
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SW02	SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08	SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample Date	7/1/1997	4/1/1999	4/1/1999	4/1/1999	4/1/1999	4/1/1999	4/1/1999	12/9/2003	12/9/2003	12/9/2003
Field Parameters										
Dissolved Oxygen (mg/L)*	88-103	7.62	8.47	7.32	NA	5.86	7.01	4.01	9.03	11.59
Oxidation Reduction Potential (mV)	269.5	NA	NA	NA	NA	NA	NA	NA	161	227
Redox Potential (mV)	469.5	NA	NA	NA	NA	NA	NA	NA	361	427
Salinity (%)	NA	1.06	42	0.36	NA	1.11	1.13	0.02	0	0.2
pH	5.79	6.69	7	6.9	NA	7.29	7.07	7.18	6.34	5.75
Specific Conductance (ms/cm)	26.4	17.5	7.81	6.86	NA	18.6	19.2	0.636	0.44	3.82
Temperature (C)	25.4	15.4	22.4	21.4	NA	22.5	16.9	27	13.8	8.9
Turbidity (NTU)	NA	20	27	21	NA	5	36	NA	11	13

Notes:
NA- Not analyzed

Table 5-9
Surface Water Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	VA Water Quality Standards - Aquatic Life[1]	VA Water Quality Standards - Human Health[2]	SJS02-SW02	SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08		SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample ID			SJS02-SW02-000*	SJS02-SW03-001	SJS02-SW04-001	SJS02-SW05-001	SJS02-SW06-001	SJS02-SW07-001	SJS02-SW08-001*	SJS02-SW08-002	SJS02-SW09	SJS02-SW10-03D	SJS02-SW11-03D
Sample Date			07/14/97	04/13/99	04/16/99	04/16/99	04/16/99	04/16/99	04/14/99	10/27/99	07/18/01	12/09/03	12/09/03
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1-Dichloroethene	--	17,000	10 U	0.300 J	0.700 J	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	--	940	NA	1 U	0.100 J	1 U	1 U	1 U	0.400 J	1 U	10 U	0.5 U	0.5 U
Acetone	--	--	10 U	NA	5 U	NA	NA	NA	NA	1.60 J	10 U	4.5 B	0.5 U
Bromodichloromethane	--	460	10 U	1 U	1 U	0.800 J	1.30	1 U	1 U	1 U	10 U	4.2	0.5 U
Bromoform	--	3,600	10 U	1 U	1 U	1 U	1 U	0.400 J	0.800 J	1 U	10 U	0.5 U	0.5 U
Carbon disulfide	--	--	10 U	2.30 J	1.20 B	0.700 B	1.60 B	2.60 B	10.3	0.300 J	10 U	0.5 U	0.5 U
Chloroform	--	29,000	10 U	1 U	1 U	3.5	5.40	1 U	1 U	0.200 J	10 U	12	0.5 U
Dibromochloromethane	--	340	10 U	1 U	1 U	0.200 J	0.300 J	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Ethylbenzene	--	29,000	10 U	1 U	1 U	1 U	1 U	1 U	0.200 J	1 U	10 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.77
Trichloroethene	--	810	10 U	5.60	23.5	38.2	59.2	0.300 B	0.300 J	0.800 J	130	140	12
Vinyl chloride	--	61	10 U	7.5	21.9	1.40	1.80	1 U	1 U	1 U	5.7 J	1.4	5.2
Xylene, total	--	--	10 U	1 U	1 U	1 U	1 U	1 U	0.800 J	1 U	10 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	--	--	NA	18.4	78.6	10.7	16.1	0.200 J	1 U	0.300 J	84	31	25
trans-1,2-Dichloroethene	--	140,000	NA	0.300 J	0.5 J	0.200 J	0.200 J	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (UG/L)													
Benzaldehyde	--	--	NA	NA	NA	NA	NA	NA	NA	NA	3.6 J	NA	NA
bis(2-Ethylhexyl)phthalate	--	59	3 J	11 U	11 U	1 B	11 U	**84**	10 U	10 U	10 U	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/L)													
4,4'-DDD	--	0.0084	0.1 U	**0.0180 J**	**0.200**	**0.0570 J**	**0.0200 J**	**0.0130 J**	0.110 U	0.100 U	0.1 U	NA	NA
Explosives (UG/L)													
3-Nitrotoluene	--	--	25 U	2.60 U	3.5	0.5 J	0.5 J	0.800 J	2.10 U	2.60 U	1.3 U	NA	NA
Total Metals (UG/L)													
Aluminum	--	--	7,870	353	470	2,150	9,390	310	535	1,060	49.1	NA	NA
Antimony	--	4,300	2 J	2.70 U	2.70 U	2.70 U	2.70 U	2.70 U	2.70 U	3.30 J	3.7 U	NA	NA
Arsenic	36	--	3.1 J	2 U	4.40 J	4.40 B	2 U	4.40 B	2.70 B	3.60 U	5 U	NA	NA
Barium	--	--	70.7 J	27.9 J	35.2 B	59.7 J	16.5 J	30.4 J	32.9 J	40.7 J	61.4	NA	NA
Beryllium	--	--	1 U	0.100 U	0.100 U	0.100 U	3.5 J	0.100 U	0.100 U	0.200 U	0.1 U	NA	NA
Cadmium	1.1	--	1.9 L	0.890 J	0.440 J	2.5 J	1.5 J	0.450 J	0.530 J	0.330 J	3 U	NA	NA
Calcium	--	--	214,000	35,700	72,400	58,200	92,600	134,000	184,000	92,100	38,700	NA	NA
Chromium	74	--	166	4 J	2.20 J	83.6	2.10 J	3.40 J	4.90 J	2.80 J	5 U	NA	NA
Cobalt	--	--	8 U	1.20 B	0.560 B	1.10 B	55	0.900 B	0.730 B	1.10 J	1.8 U	NA	NA
Copper	6	--	203	13.8 J	12.1 J	107	17.9 J	20.9 J	17.5 J	12 J	6.5	NA	NA
Cyanide	1	220,000	5 U	18.9 L	5 U	5 U	5 U	5 U	18 L	5 U	NA	NA	NA
Iron	--	--	10,700	1,520	1,170	5,330	18,800	716	871	1,560	916	NA	NA
Lead	9.3	--	77.9 L	2.80 J	4.90 B	44.4	13.5	5.5 B	8	5.4	3 U	NA	NA
Magnesium	--	--	665,000	56,300	166,000	102,000	74,600	376,000	576,000	274,000	6,230	NA	NA
Manganese	50	--	120	78.1	61.9	148	2,490	86.9	92.1	71.9	339	NA	NA
Nickel	8.2	4,600	7 U	4 J	3.10 J	5.30 J	81.4	2.60 J	2.60 J	2.70 J	4 U	NA	NA
Potassium	--	--	237,000 J	22,200	61,600	40,500	28,200	148,000	205,000	101,000	4,420	NA	NA
Sodium	--	--	5,640,000	461,000	1,590,000 J	989,000 J	320,000 J	3,670,000 J	4,930,000	2,380,000	28,200	NA	NA
Vanadium	--	--	32.8 J	2.20 B	3.20 B	15.8 J	1.30 B	3.20 B	4.40 B	4.60 J	3.2 U	NA	NA
Zinc	81	69,000	268	44.1	23.4	131	1,310	30.8	35.4	46.4	68.6	NA	NA
Dissolved Metals (UG/L)													
Barium	--	--	NA	NA	NA	NA	NA	NA	NA	NA	62.3	NA	NA
Calcium	--	--	NA	NA	NA	NA	NA	NA	NA	NA	39,500	NA	NA
Copper	6	--	NA	NA	NA	NA	NA	NA	NA	NA	2.6	NA	NA
Iron	--	--	NA	NA	NA	NA	NA	NA	NA	NA	35.6	NA	NA
Magnesium	--	--	NA	NA	NA	NA	NA	NA	NA	NA	6,460	NA	NA
Manganese	50	--	NA	NA	NA	NA	NA	NA	NA	NA	376	NA	NA
Potassium	--	--	NA	NA	NA	NA	NA	NA	NA	NA	4,470	NA	NA
Sodium	--	--	NA	NA	NA	NA	NA	NA	NA	NA	29,900	NA	NA
Zinc	81	69,000	NA	NA	NA	NA	NA	NA	NA	NA	58.6	NA	NA

Table 5-9
Surface Water Exceedances of Screening Criteria
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**VA Water Quality Standards - Aquatic Life[1]**	**VA Water Quality Standards - Human Health[2]**	SJS02-SW02	SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08		SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample ID			SJS02-SW02-000*	SJS02-SW03-001	SJS02-SW04-001	SJS02-SW05-001	SJS02-SW06-001	SJS02-SW07-001	SJS02-SW08-001*	SJS02-SW08-002	SJS02-SW09	SJS02-SW10-03D	SJS02-SW11-03D
Sample Date			07/14/97	04/13/99	04/16/99	04/16/99	04/16/99	04/16/99	04/14/99	10/27/99	07/18/01	12/09/03	12/09/03
Chemical Name													
Wet Chemistry (MG/L)													
Alkalinity	--	--	107	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand	--	--	154	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hardness	--	--	NA	338	706	405	430	1,960	2,090	NA	NA	NA	NA
Phosphorus	--	--	0.202	0.0200 U	0.0650	0.0850	0.169	0.184	0.0200 U	NA	NA	NA	NA
Total dissolved solids (TDS)	--	--	26,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	--	--	24.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids (TSS)	--	--	124	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1]Most conservative value between Freshwater and Saltwater designations were used for screening
[2]All Other Surface Water values used for screening
Shaded cells represent exceedances of VA Water Quality Standards - Aquatic Life
Bold blue values represent exceedances of VA Water Quality Standards - Human Health
*A duplicate sample was collected at this location; the most conservative result is shown.
NA - Not Analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
U - Analyte not detected

Table 5-10
Surface Water Quality Parameters Overlying Sediment Samples
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD15	SJS02-SD16	SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20
Sample ID	SJS02-SD15-00-04A	SJS02-SD16-00-04A	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A
Sample Date	1/6/2004	1/6/2004	1/6/2004	1/6/2004	1/6/2004	1/6/2004
Field Parameters						
Dissolved Oxygen (mg/L)	10.2	10.27	10.57	9.7	9.2	9.43
Oxidation Reduction Potential (mV)	129	155	97	112	119	88
Redox Potential (mV)	329	355	297	312	319	288
Salinity (%)	1.22	1.57	1.17	1.28	1.28	1.08
pH	7.31	7.31	7.15	7.29	7.33	7.12
Specific Conductance (ms/cm)	20.5	26	20.4	21.4	21.4	18.3
Temperature (C)	13.4	11.9	13.4	13.5	13.7	13.1
Turbidity (NTU)	0	0	0	0	0	0

Station ID	SJS02-SD03	SJS02-SD05	SJS02-SD06	SJS02-SD21	SJS02-SD22	SJS02-SD23
Sample ID	SJS02-SD03-00-04D	SJS02-SD05-00-04D	SJS02-SD06-00-04D	SJS02-SD21-00-04D	SJS02-SD22-00-04D	SJS02-SD23-00-04D
Sample Date	10/6/2004	10/6/2004	10/6/2004	11/18/2004	11/18/2004	11/18/2004
Field Parameters						
Dissolved Oxygen (mg/L)	4.08	4.29	5.97	9.67	9.27	7.76
Oxidation Reduction Potential (mV)	-177	-247	-1.8	76	60	98
Redox Potential (mV)	23	-47	198.2	276	260	298
Salinity (%)	NA	1.27	0.61	0.5	0.4	0.1
pH	6.1	6.6	6.1	7.39	6.99	7.8
Specific Conductance (ms/cm)	6.19	20.3	8.85	8.68	6.84	1.46
Temperature (C)	20.23	22.4	20.77	16	17.5	17.4
Turbidity (NTU)	999	0	13.9	0	516	0

Station ID	SJS02-SD24	SJS02-SD25	SJS02-SD26
Sample ID	SJS02-SD24-00-04D	SJS02-SD25-00-04D	SJS02-SD26-00-04D
Sample Date	10/6/2004	10/6/2004	10/6/2004
Field Parameters			
Dissolved Oxygen (mg/L)	2.8	6.88	5.29
Oxidation Reduction Potential (mV)	-17	-16	-31
Redox Potential (mV)	183	184	169
Salinity (%)	1.14	1.25	0.02
pH	5.7	5.8	5.8
Specific Conductance (ms/cm)	19.1	18	0.493
Temperature (C)	20.4	22.14	20.76
Turbidity (NTU)	15.6	14.9	7.9

Redox potential is estimated by adding the silver/silver chloride electrode reference potential (~200 mV) to the oxidation reduction potential value

Table 5-11
Sediment Detections and Exceedances of Screening Criteria
Site Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Station ID	Background UTLs	SJS02-SD01	SJS02-SD02	SJS02-SD03		SJS02-SD04	SJS02-SD05		SJS02-SD06		SJS02-SD07	SJS02-SD08		SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13
Sample ID		SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000*	SJS02-SD03-00-04D	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD05-00-04D	SJS02-SD06-001	SJS02-SD06-00-04D	SJS02-SD07-001	SJS02-SD08-001	SJS02-SD08-002	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13
Sample Location		Site 2 Inlet	Site 2 Inlet	Site 2 Inlet		Site 2 Inlet	Site 2 Inlet		Site 2 Inlet		Site 2 Inlet	St. Juliens Creek Outfall		Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet
Sample Date		07/14/97	07/14/97	06/26/97	10/06/04	04/16/99	04/16/99	10/06/04	04/16/99	10/06/04	04/16/99	04/14/99	10/27/99	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01
Chemical Name																		
Volatile Organic Compounds (ug/kg)																		
1,1,1-Trichloroethane	--	11 U	31 U	32 U	NA	14 U	20 U	NA	7 J	NA	28 UJ	16 U	18 U	3.6 B	NA	NA	NA	NA
1,1-Dichloroethene	--	11 U	31 U	32 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U	13 U	NA	NA	NA	NA
1,2-Dichloroethene (total)	--	11 U	31 U	9 J	NA	14 U	20 U	NA	23 U	NA	3 J	16 U	18 U	NA	NA	NA	NA	NA
1,2-Dichloropropane	--	11 U	31 U	32 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U	13 U	NA	NA	NA	NA
4-Methyl-2-pentanone	--	11 U	5 J	32 U	NA	14 UJ	20 U	NA	23 U	NA	28 UJ	16 U	18 U	13 U	NA	NA	NA	NA
Acetone	--	11 U	92 J	450	NA	NA	21 J	NA	37 J	NA	28 UJ	16 U	NA	13 U	NA	NA	NA	NA
Benzene	--	11 U	31 U	32 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U	13 U	NA	NA	NA	NA
Bromomethane	--	11 U	31 U	32 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U	6.3 J	NA	NA	NA	NA
Carbon disulfide	--	11 U	31 U	81	NA	14 U	8 B	NA	3 B	NA	12 B	16 UJ	4 J	13 U	NA	NA	NA	NA
Chloroethane	--	11 U	31 U	32 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U	13 U	NA	NA	NA	NA
Chloroform	--	11 U	31 U	32 U	NA	14 U	20 U	NA	23 U	NA	3 J	16 U	18 U	13 U	NA	NA	NA	NA
Toluene	--	11 U	31 U	32 U	NA	4 J	20 U	NA	23 U	NA	28 UJ	16 U	18 U	13 U	NA	NA	NA	NA
Trichloroethene	--	11 U	31 U	32 U	NA	4 J	4 J	NA	23 U	NA	28 UJ	10 J	18 U	13 U	NA	NA	NA	NA
Vinyl chloride	--	11 U	31 U	32 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U	13 U	NA	NA	NA	NA
cis-1,2-Dichloroethene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA
trans-1,2-Dichloroethene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA
Semi-volatile Organic Compounds (ug/kg)																		
2-Methylnaphthalene	--	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Acenaphthene	71	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Acenaphthylene	--	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Anthracene	492	330 U	9,100 UJ	130 L	1,700 U	480 UJ	170 J	1,200 U	100 J	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Benzo(a)anthracene	1,300	87 J	9,100 UJ	440 L	1,700 U	480 UJ	1,300 J	150 J	380 J	280 J	930 UJ	86 J	160 L	100 J	NA	NA	NA	NA
Benzo(a)pyrene	1,100	79 J	9,100 UJ	660 L	1,700 U	480 UJ	910 J	200 J	360 J	380 J	930 UJ	91 J	100 L	100 J	NA	NA	NA	NA
Benzo(b)fluoranthene	3,300	160 J	1,200 J	1,300 L	170 J	480 UJ	1,200 J	370 J	460 J	610 J	930 UJ	170 J	260 L	110 J	NA	NA	NA	NA
Benzo(g,h,i)perylene	672	86 J	9,100 UJ	580 L	1,700 U	480 UJ	690 J	210 J	230 J	410 J	930 UJ	83 J	130 L	440 U	NA	NA	NA	NA
Benzo(k)fluoranthene	1,400	59 J	9,100 UJ	470 J	1,700 U	480 UJ	420 J	1,200 U	170 J	210 J	930 UJ	77 J	130 L	60 J	NA	NA	NA	NA
Butylbenzylphthalate	--	47 J	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Carbazole	644	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Chrysene	1,500	130 J	9,100 UJ	680 L	1,700 U	480 UJ	1,400 J	190 J	360 J	390 J	930 UJ	120 J	550 L	120 J	NA	NA	NA	NA
Di-n-butylphthalate	--	41 B	9,100 UJ	1,300 UL	1,700 U	480 UJ	89 J	1,200 U	94 J	130 B	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Dibenz(a,h)anthracene	410	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Dibenzofuran	--	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Diethylphthalate	608	330 U	9,100 UJ	250 L	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	100 L	440 U	NA	NA	NA	NA
Fluoranthene	2,600	330 U	930 J	850 L	180 J	480 UJ	2,200 J	270 J	880 J	540 J	930 UJ	150 J	240 L	190 J	NA	NA	NA	NA
Fluorene	--	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	79 J	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	624	84 J	9,100 UJ	530 L	1,700 U	480 UJ	500 J	160 J	180 J	320 J	930 UJ	78 J	100 L	440 U	NA	NA	NA	NA
Naphthalene	--	330 U	9,100 UJ	1,300 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA	440 U	NA	NA	NA	NA
Phenanthrene	920	47 J	9,100 UJ	190 L	1,700 U	480 UJ	1,100 J	1,200 U	530 J	190 J	930 UJ	550 UJ	160 L	150 J	NA	NA	NA	NA
Pyrene	1,900	230 J	1,200 J	1,100 L	170 J	48 J	3,100 J	290 J	850 J	720 J	930 UJ	130 J	230 L	220 J	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	440	49 B	9,100 UJ	360 B	1,700 U	480 UJ	160 J	130 B	170 J	330 B	930 UJ	550 UJ	110 L	660	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (ug/kg)																		
4,4'-DDD	7.2	3.7 J	310 J	210	150	110 R	620 J	180	980 J	350	NA	12 J	91 L	57	NA	NA	NA	NA
4,4'-DDE	100	7.5 J	71 J	130 J	71	13 J	61 J	44	70 J	49	34 J	3.80 J	NA	5.7 J	NA	NA	NA	NA
4,4'-DDT	13	9.3	28 J	8.8 J	24	25 J	73 J	26	3,200 J	47	12 J	3.40 J	NA	23	NA	NA	NA	NA
Aroclor-1254	--	33 U	110 J	120 U	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA	44 U	NA	NA	NA	NA
Aroclor-1260	--	33 U	110 UJ	69 J	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA	44 U	NA	NA	NA	NA
Dieldrin	--	3.3 U	11 UJ	36	1.3 J	4.70 UJ	6.5 UJ	1.8 J	7.5 UJ	1.4 J	9.30 UJ	5.40 UJ	NA	4.4 U	NA	NA	NA	NA
Endrin aldehyde	--	3.3 U	11 UJ	12 U	17 U	4.70 UJ	6.5 UJ	12 U	7.5 UJ	10 U	9.30 UJ	5.40 UJ	NA	4.4 U	NA	NA	NA	NA
Endrin ketone	--	3.3 U	11 UJ	12 U	17 U	4.70 UJ	6.5 UJ	12 U	7.5 UJ	10 U	9.30 UJ	5.40 UJ	NA	4.4 U	NA	NA	NA	NA
Methoxychlor	--	17 U	54 UJ	60 U	86 U	24 UJ	33 UJ	62 U	37 UJ	51 U	46 UJ	27 UJ	NA	22 U	NA	NA	NA	NA
alpha-Chlordane	--	1.7 U	7.3 J	28	8.6 U	2.40 UJ	79 J	7.6	40 J	21	7.70 J	0.820 J	NA	2.2 U	NA	NA	NA	NA
gamma-Chlordane	--	1.7 U	9.8 J	29 J	8.6 U	2.40 UJ	96 J	12	58 J	31 J	12 J	1.5 J	NA	2.2 U	NA	NA	NA	NA
Dioxin/Furans (ug/kg)																		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.42 J	0.13 J	0.34 J	0.016 J	0.19 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.23 J	0.056 J	0.087 J	0.0025 J	0.048 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 J	0.0044 J	0.0063 J	1.30E-04 UJ	0.0036 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0085 J	0.0023 J	0.0051 J	3.00E-04 J	0.0029 J
1,2,3,4,7,8-Hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.025 J	0.0099 J	0.019 J	7.40E-04 J	0.0082 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.018 J	0.0058 J	0.015 J	6.00E-04 J	0.008 J
1,2,3,6,7,8-Hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.06 J	0.0064 I	0.0094 J	5.00E-04 J	0.0044 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.016 J	0.0047 J	0.013 J	0.0011 J	0.008 J
1,2,3,7,8,9-Hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.002 J	1.00E-03 J	0.0023 J	1.50E-04 UJ	2.50E-04 UJ
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0036 J	0.0012 J	0.0028 J	1.70E-04 UJ	0.0012 J
1,2,3,7,8-Pentachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0043 J	0.0011 J	0.0027 J	2.40E-04 UJ	0.0014 J
2,3,4,6,7,8-Hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0093 J	0.0033 J	0.0068 J	3.60E-04 J	0.0024 J
2,3,4,7,8-Pentachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.007 J	0.003 J	0.0061 J	4.30E-04 J	0.002 J
2,3,7,8-TCDD (dioxin)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.80E-04 J	3.40E-04 J	9.60E-04 J	1.30E-04 UJ	4.30E-04 J

Table 5-11
Sediment Detections and Exceedances of Screening Criteria
Site Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Station ID	Background UTLs	SJS02-SD14	SJS02-SD15	SJS02-SD16	SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20	SJS02-SD21	SJS02-SD22	SJS02-SD23	SJS02-SD24	SJS02-SD25	SJS02-SD26
Sample ID		SJS02-SD14	SJS02-SD15-00-04A	SJS02-SD16-00-04A*	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A	SJS02-SD21-00-04D*	SJS02-SD22-00-04D	SJS02-SD23-00-04D	SJS02-SD24-00-04D	SJS02-SD25-00-04D	SJS02-SD26-00-04D
Sample Location		Site 2 Inlet	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet
Sample Date		07/18/01	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	11/18/04	11/18/04	11/18/04	10/06/04	10/06/04	10/06/04
Chemical Name														
Volatile Organic Compounds (ug/kg)														
1,1,1-Trichloroethane	--	NA	NA	NA	NA	NA	NA	NA	35 UJ	36 U	31 UJ	NA	NA	NA
1,1-Dichloroethene	--	NA	NA	NA	NA	NA	NA	NA	34 J	36 U	31 UJ	NA	NA	NA
1,2-Dichloroethene (total)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	--	NA	NA	NA	NA	NA	NA	NA	35 UJ	8.3 J	31 UJ	NA	NA	NA
4-Methyl-2-pentanone	--	NA	NA	NA	NA	NA	NA	NA	35 UJ	36 UJ	31 UJ	NA	NA	NA
Acetone	--	NA	NA	NA	NA	NA	NA	NA	35 UJ	25 B	27 B	NA	NA	NA
Benzene	--	NA	NA	NA	NA	NA	NA	NA	5.7 J	36 U	31 UJ	NA	NA	NA
Bromomethane	--	NA	NA	NA	NA	NA	NA	NA	35 UJ	36 U	31 UJ	NA	NA	NA
Carbon disulfide	--	NA	NA	NA	NA	NA	NA	NA	15 J	30 J	18 J	NA	NA	NA
Chloroethane	--	NA	NA	NA	NA	NA	NA	NA	4.2 J	36 U	31 UJ	NA	NA	NA
Chloroform	--	NA	NA	NA	NA	NA	NA	NA	35 UJ	36 U	31 UJ	NA	NA	NA
Toluene	--	NA	NA	NA	NA	NA	NA	NA	35 UJ	36 U	31 UJ	NA	NA	NA
Trichloroethene	--	NA	NA	NA	NA	NA	NA	NA	9.8 J	36 U	31 UJ	NA	NA	NA
Vinyl chloride	--	NA	NA	NA	NA	NA	NA	NA	9,800 J	4.8 J	4.4 J	NA	NA	NA
cis-1,2-Dichloroethene	--	NA	NA	NA	NA	NA	NA	NA	2,300	36 U	31 UJ	NA	NA	NA
trans-1,2-Dichloroethene	--	NA	NA	NA	NA	NA	NA	NA	38 J	36 U	31 UJ	NA	NA	NA
Semi-volatile Organic Compounds (ug/kg)														
2-Methylnaphthalene	--	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	250 J	1,100 U
Acenaphthene	71	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	490 J	1,100 U
Acenaphthylene	--	NA	96 J	180 J	80 J	180 J	640 U	220 J	NA	NA	NA	700 U	840 U	1,100 U
Anthracene	492	NA	83 J	140 J	81 J	120 J	640 U	410 J	NA	NA	NA	700 U	1,200	1,100 U
Benzo(a)anthracene	1,300	NA	250 J	540 J	250 J	470 J	99 J	1,100	NA	NA	NA	100 J	3,500	270 J
Benzo(a)pyrene	1,100	NA	610 J	880	520	1,100	84 J	1,600	NA	NA	NA	140 J	3,900	280 J
Benzo(b)fluoranthene	3,300	NA	1,200	1,600	870	1,700	230 J	2,800	NA	NA	NA	270 J	3,800	410 J
Benzo(g,h,i)perylene	672	NA	700 U	88 J	280 J	560 J	640 U	760	NA	NA	NA	150 J	2,700 J	230 J
Benzo(k)fluoranthene	1,400	NA	340 J	630 J	340 J	580 J	78 J	970	NA	NA	NA	78 J	1,000	150 J
Butylbenzylphthalate	--	NA	90 J	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	840 U	1,100 U
Carbazole	644	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	120 J	1,100 U
Chrysene	1,500	NA	350 J	610 J	370 J	680	82 J	1,800	NA	NA	NA	120 J	3,300	390 J
Di-n-butylphthalate	--	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	840 U	1,100 U
Dibenz(a,h)anthracene	410	NA	120 J	210 J	100 J	190 J	640 U	290 J	NA	NA	NA	700 U	500 J	1,100 U
Dibenzofuran	--	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	130 J	1,100 U
Diethylphthalate	608	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	840 U	1,100 U
Fluoranthene	2,600	NA	440 J	860	350 J	700	130 J	2,300	NA	NA	NA	180 J	4,300	430 J
Fluorene	--	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	550 J	1,100 U
Indeno(1,2,3-cd)pyrene	624	NA	330 J	470 J	270 J	500 J	640 U	750	NA	NA	NA	120 J	1,800 J	180 J
Naphthalene	--	NA	700 U	700 U	490 U	670 U	640 U	750 U	NA	NA	NA	700 U	280 J	1,100 U
Phenanthrene	920	NA	700 U	110 J	57 J	76 J	640 U	190 J	NA	NA	NA	700 U	5,300	260 J
Pyrene	1,900	NA	580 J	1,100	460 J	890	120 J	1,800	NA	NA	NA	210 J	9,400 J	610 J
bis(2-Ethylhexyl)phthalate	440	NA	5,900	1,600	250 B	1,900	95 B	110 B	NA	NA	NA	99 B	130 B	350 B
Pesticide/Polychlorinated Biphenyls (ug/kg)														
4,4'-DDD	7.2	NA	7 U	7 U	22	10	6.4 U	93	NA	NA	NA	93	340	400
4,4'-DDE	100	NA	7 U	7 U	9.2 J	6.5 J	6.4 U	200 J	NA	NA	NA	30	48 J	63 J
4,4'-DDT	13	NA	7 U	7 U	3 J	6.7 U	6.4 U	11 J	NA	NA	NA	26	77	100
Aroclor-1254	--	NA	70 U	70 U	49 U	67 U	64 U	75 U	NA	NA	NA	70 U	84 U	110 U
Aroclor-1260	--	NA	70 U	70 U	49 U	67 U	64 U	75 U	NA	NA	NA	70 U	84 U	110 U
Dieldrin	--	NA	7 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA	0.91 J	1.2 J	2.9 J
Endrin aldehyde	--	NA	7 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA	7 U	6.4 J	11 U
Endrin ketone	--	NA	7 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA	7 U	8.4 U	2.2 J
Methoxychlor	--	NA	36 U	36 U	25 U	34 U	33 U	39 U	NA	NA	NA	35 U	42 U	53 U
alpha-Chlordane	--	NA	3.6 U	3.6 U	1.6 J	3.4 U	3.3 U	6.7 J	NA	NA	NA	5.5 J	23	34
gamma-Chlordane	--	NA	3.6 U	3.6 U	2.1 J	3.4 U	3.3 U	19 J	NA	NA	NA	10	41 J	49
Dioxin/Furans (ug/kg)														
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	0.094 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--	0.014 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--	7.70E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	0.0024 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	--	0.0049 I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	0.004 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	--	7.60E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	0.0047 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	--	4.00E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	0.0012 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	--	0.0011 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	--	1.00E-03 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	--	0.0016 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	--	3.20E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-11
Sediment Detections and Exceedances of Screening Criteria
Site Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Station ID	**Background UTLs**	SJS02-SD01	SJS02-SD02	SJS02-SD03		SJS02-SD04	SJS02-SD05		SJS02-SD06		SJS02-SD07	SJS02-SD08		SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13
Sample ID		SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000*	SJS02-SD03-00-04D	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD05-00-04D	SJS02-SD06-001	SJS02-SD06-00-04D	SJS02-SD07-001	SJS02-SD08-001	SJS02-SD08-002	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13
Sample Location		Site 2 Inlet	Site 2 Inlet	Site 2 Inlet		Site 2 Inlet	Site 2 Inlet		Site 2 Inlet		Site 2 Inlet	St. Juliens Creek Outfall		Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet
Sample Date		07/14/97	07/14/97	06/26/97	10/06/04	04/16/99	04/16/99	10/06/04	04/16/99	10/06/04	04/16/99	04/14/99	10/27/99	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01
Chemical Name																		
2,3,7,8-Tetrachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0082 NJ	0.0034 J	0.0097 J	7.10E-04 NJ	0.0032 J
Octachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.2 J	1.6 J	4.4 J	0.66 J	1.9 J
Octachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.58 J	0.074 J	0.12 J	0.003 B	0.058 J
Total heptachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.75 J	0.26 J	0.9 J	0.051 J	0.52 J
Total heptachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.25 J	0.15 J	0.26 J	0.0046 J	0.13 J
Total hexachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.14 J	0.046 J	0.17 J	0.015 J	0.11 J
Total hexachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.3 J	0.091 J	0.19 J	0.0047 J	0.078 J
Total pentachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 J	0.0048 J	0.02 J	1.70E-04 UJ	0.0091 J
Total pentachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.08 J	0.031 J	0.091 J	0.002 J	0.023 J
Total tetrachlorodibenzo-p-dioxin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0067 J	0.0032 J	0.0066 J	3.70E-04 J	0.005 J
Total tetrachlorodibenzofuran	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.036 J	0.0056 J	0.024 J	0.0021 J	0.016 J
Explosives (ug/kg)																		
No Detections																		
Total Metals (mg/kg)																		
Aluminum	20,700	3,100	10,900	27,200	19,100	1,500	9,360	33,000	9,600	15,100	20,200	4,100	5,020	2,850	NA	NA	NA	NA
Antimony	--	0.42 UL	3.3 B	27.6 L	2.9 UL	0.400 UL	1.20 L	2.9 B	1.80 L	7.1 L	1.70 L	0.650 U	0.75 U	2.4	NA	NA	NA	NA
Arsenic	30.4	2.3	5.4 K	19.4	14	1.60 K	7.5 K	16.9	9.60 K	14	12 K	3.5	4.7	4	NA	NA	NA	NA
Barium	68.4	15.4 J	55.7 J	109 J	49.9 J	4.10 J	102	83.6 J	89.3	131	79.4 J	15.2 J	26 J	81.2	NA	NA	NA	NA
Beryllium	2.1	0.21 U	1.1 B	1.1 J	0.92 J	0.0700 J	0.590 J	1.5 J	0.620 J	0.87 J	0.900 J	0.300 J	0.370 J	0.3	NA	NA	NA	NA
Boron	--	NA	NA	NA	27.3	NA	NA	25.1	NA	17.2	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1.4	0.14 J	4	2.5 J	4.6	0.530 J	8.20	8.5	7.30	12.3	4.60	1.10 J	1.5	9.2	NA	NA	NA	NA
Calcium	5,200	393 J	2,300 J	24,300 J	2,720 J	207 J	6,230	3,140 J	4,300	4,880 J	2,390 J	1,640	1,100 J	4,580	NA	NA	NA	NA
Chromium	43.2	6.5	277	2,630	249	11.6	1,180	905	1,900	1,920	392	67.1	84.1	55.9	NA	NA	NA	NA
Cobalt	9.5	1.67 U	4.06 U	10.7 J	6.8 J	0.660 J	5.10 J	12.8 J	6 J	8.4 J	7.80 J	2.40 J	2.80 J	4.3	NA	NA	NA	NA
Copper	122	4.4 J	344	2,620	327	18.2	1,200	1,040	2,030	1,790	494	94.8	115	160	NA	NA	NA	NA
Cyanide	--	0.54 U	1.4 U	2.1 U	0.13 U	0.584	0.417 U	0.34	0.524 U	0.14 U	0.549 U	1.80 L	0.400 U	NA	NA	NA	NA	NA
Iron	32,700	3,150	18,500	31,100	21,800	2,050	12,700	38,200	18,100	25,800	28,000	8,630	9,520	6,470	NA	NA	NA	NA
Lead	128	15.5	161	545	201	14.9	312	408	366	495	250	54.2	64.8	211	NA	NA	NA	NA
Magnesium	6,380	309 J	4,710	6,890 J	5,150	364 J	3,710	6,680	2,950	4,330	4,970	1,680	2,090	1,370	NA	NA	NA	NA
Manganese	202	16 K	105	235	112	8.30 K	174 K	242	204 K	205	148 K	51.6	58.2	125	NA	NA	NA	NA
Mercury	1.4	0.05 U	0.45	0.79	0.78 K	0.0400 J	0.620	0.89 K	0.470	0.8 K	0.690	0.220	0.25	0.39	NA	NA	NA	NA
Molybdenum	--	NA	NA	NA	8.7	NA	NA	8.7	NA	7.1	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	24.2	1.8 B	16.4 K	41.5	23.6 J	2 J	32.6	45.8	35.9	41.2	29.1	7.10 J	8.60 J	8.3	NA	NA	NA	NA
Potassium	3,490	228 J	2,000 J	3,830	2,870 J	207 J	1,270 J	4,050	1,280	1,870	3,050	734 J	744 J	403	NA	NA	NA	NA
Selenium	1.5	0.63 UL	1.52 U	2.27 U	2.2 U	0.390 U	0.770 U	2.4	0.710 K	1.7	1.5 K	0.630 U	0.840 U	1.3 U	NA	NA	NA	NA
Silver	--	0.21 U	0.51 U	1.8 B	0.79 U	0.130 U	0.680 J	0.58 B	0.770 J	0.77 B	0.870 J	0.220 U	0.25 J	1.3 U	NA	NA	NA	NA
Sodium	9,410	33.7 B	11,800	17,800	14,200	1,040	3,830	10,300	4,820	6,540	9,550	3,280	2,320	144	NA	NA	NA	NA
Thallium	--	0.42 U	1.02 U	2.2 K	3.4 U	0.480 U	0.950 U	2.4 U	0.760 U	1.8 U	1.70 U	0.770 U	1.40 U	1.5 U	NA	NA	NA	NA
Vanadium	57	7.2 J	28.8	115	61	5 J	53	96.4	96.5	112	62.7	12.4	14.4	14.9	NA	NA	NA	NA
Zinc	418	19.2	416	1,400 L	424 J	42.8	888	991 J	1,120	1,470 J	539	173	203	405	NA	NA	NA	NA
Wet Chemistry																		
Nitrogen	--	NA	NA	NA	7.1	NA	NA	7.8	NA	3.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	--	10.5	13.5	20.2	NA	102	370	NA	177	NA	164	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	89,900	2,050	44,000	71,000 L	12,000	2,270	41,900	14,000	35,000	20,000	57,200	24,400	NA	NA	NA	NA	NA	NA
pH	--	NA	NA	NA	NA	7.49	7.45	NA	7.39	NA	7.20	7.37	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL_G)																		
Acid volatile sulfide	--	NA	NA	NA	13	NA	NA	3.9	NA	4.5	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	--	NA	NA	NA	0.0339	NA	NA	0.0359	NA	0.0689	NA	NA	NA	NA	NA	NA	NA	NA
Copper	--	NA	NA	NA	0.993	NA	NA	1.65	NA	0.252	NA	NA	NA	NA	NA	NA	NA	NA
Lead	--	NA	NA	NA	0.779	NA	NA	1.35	NA	1.9	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	0.103	NA	NA	0.119	NA	0.212	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	4.51	NA	NA	7.49	NA	16.9	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest/PCBs, and inorganicss), or detections constituents not sampled/detected during the Background Investigation.

*Duplicate sample collected at this location; the most conservative result shown

NA - Not Analyzed

B - Analyte not detected above associated blank

I - Interferences present which may cause the results to be biased high

J - Reported value is estimated

K - Reported value may be biased high

L - Reported value may be biased low

R - Unreliable result

U - Analyte not detected

Table 5-11
Sediment Detections and Exceedances of Screening Criteria
Site Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Station ID	**Background UTLs**	SJS02-SD14	SJS02-SD15	SJS02-SD16	SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20	SJS02-SD21	SJS02-SD22	SJS02-SD23	SJS02-SD24	SJS02-SD25	SJS02-SD26
Sample ID		SJS02-SD14	SJS02-SD15-00-04A	SJS02-SD16-00-04A*	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A	SJS02-SD21-00-04D*	SJS02-SD22-00-04D	SJS02-SD23-00-04D	SJS02-SD24-00-04D	SJS02-SD25-00-04D	SJS02-SD26-00-04D
Sample Location		Site 2 Inlet	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	St. Juliens Creek Outfall	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet	Site 2 Inlet
Sample Date		07/18/01	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	11/18/04	11/18/04	11/18/04	10/06/04	10/06/04	10/06/04
Chemical Name														
2,3,7,8-Tetrachlorodibenzofuran	--	0.0037 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	--	1.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	--	0.021 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	--	0.28 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	--	0.014 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	--	0.07 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	--	0.035 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	--	0.0097 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	--	0.02 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	--	0.0029 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	--	0.013 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (ug/kg)														
No Detections														
Total Metals (mg/kg)														
Aluminum	20,700	NA	16,600	19,600	6,540	15,700	18,600	17,600	NA	NA	NA	13,000	22,500	10,000
Antimony	--	NA	0.8 UL	0.73 UL	0.58 UL	0.7 UL	0.76 UL	0.75 UL	NA	NA	NA	2.9 B	3.1 B	3.7 B
Arsenic	30.4	NA	13.7	14.2	5.4	13.4	7.6	10.4	NA	NA	NA	7.7	16.9	16.9
Barium	68.4	NA	38.5 J	43.8 J	21.6 J	35.6 J	40 J	68.5 J	NA	NA	NA	59.9	74.1	121
Beryllium	2.1	NA	0.7 J	0.83 J	0.32 J	0.69 J	0.74 J	0.83 J	NA	NA	NA	0.77 L	1.1 J	0.54 L
Boron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14.6	21.1	7.9
Cadmium	1.4	NA	0.08 U	0.073 U	0.78 J	0.14 J	0.076 U	4.5	NA	NA	NA	3.6	4.4	10.9
Calcium	5,200	NA	1,920 J	2,010	1,210 J	3,920	1,890 J	4,380	NA	NA	NA	2,690 J	2,700 J	2,410 J
Chromium	43.2	NA	32.5	36.7	61.8	47.6	30.1	443	NA	NA	NA	600	387	260
Cobalt	9.5	NA	6.6 J	7.9 J	3.1 J	6.2 J	6.9 J	8.7 J	NA	NA	NA	6.7 J	9.5 J	5.1 J
Copper	122	NA	92.6 K	47.8 K	111 K	79.6 K	10.1 K	461 K	NA	NA	NA	692	521	421
Cyanide	--	NA	0.86 J	0.27 U	0.22 J	0.26 U	0.32 J	3	NA	NA	NA	0.4	0.55	0.14 U
Iron	32,700	NA	28,000	33,500	11,900	27,900	28,900	28,100	NA	NA	NA	19,300	29,900	24,900
Lead	128	NA	83.1	77.0	65.4	98.8	16.8	219	NA	NA	NA	260	323	351
Magnesium	6,380	NA	5,310	6,640	2,280	5,060	6,010	5,110	NA	NA	NA	3,640	5,650	2,050
Manganese	202	NA	178	223	77.8	165	211	181	NA	NA	NA	127	196	125
Mercury	1.4	NA	0.6	0.46	0.29	0.6	0.085 U	0.46	NA	NA	NA	0.46 K	0.94 K	0.51 K
Molybdenum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8	3.7	4.7
Nickel	24.2	NA	13.6 J	16.7	8.5 J	14.4	14.6 J	20	NA	NA	NA	23.3	25.3	21.2
Potassium	3,490	NA	2,900	3,580	1,100 J	2,690	3,390	2,880	NA	NA	NA	1,760	3,240	895 J
Selenium	1.5	NA	0.8 U	0.73 U	0.58 U	0.7 U	0.76 U	0.75 U	NA	NA	NA	1.7	1.7	1.3 U
Silver	--	NA	1.4 J	1.6 J	0.71 J	1.5 J	1.3 J	1.8 J	NA	NA	NA	0.46 B	0.58 B	0.69 B
Sodium	9,410	NA	6,690	7,610	3,100	6,930	6,850	6,910	NA	NA	NA	4,880	7,480	2,140
Thallium	--	NA	0.8 U	0.73 U	0.58 U	0.7 U	0.76 U	0.75 U	NA	NA	NA	1.4 U	1.7 U	1.9 U
Vanadium	57	NA	34.3	37.3	17.2	30.6	35.2	37	NA	NA	NA	50.2	44.4	147
Zinc	418	NA	249 K	173 K	225 K	251 K	61.6 K	609 K	NA	NA	NA	619 J	1,270 J	758 J
Wet Chemistry														
Nitrogen	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2	11	7
Phosphorus	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	89,900	NA	63,000	37,000	15,000	34,000	32,000	32,000	NA	NA	NA	14,000	15,000	15,000
pH	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL_G)														
Acid volatile sulfide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.1	5.6	4
Cadmium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0247	0.069	0.0696
Copper	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.683	0.507	3.44
Lead	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.784	2.3	1.49
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0676	0.196	0.163
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7	16.6	9.49

Notes:

Shaded cells represent exceedances of UTLs, (established only for PAHs, Pest/PCBs, and inorganicss), c
constituents not sampled/detected during the Background Investigation.

*Duplicate sample collected at this location; the most conservative result shown
NA - Not Analyzed
B - Analyte not detected above associated blank
I - Interferences present which may cause the results to be biased high
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
R - Unreliable result
U - Analyte not detected

Table 5-12
Sediment Pore Water Detections
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-PW01	SJS02-PW02	SJS02-PW03	SJS02-PW04	SJS02-PW05	SJS02-PW06	SJS02-PW07	SJS02-PW08	SJS02-PW09	SJS02-PW10	SJS02-PW11	SJS02-PW12	SJS02-PW13	SJS02-PW14	SJS02-PW15
Sample ID	SJS02-PW01-07B	SJS02-PW02-07B	SJS02-PW03-07B	SJS02-PW04-07B	SJS02-PW05-07B	SJS02-PW06-07B*	SJS02-PW07-07B	SJS02-PW08-07B	SJS02-PW09-07B	SJS02-PW10-07B	SJS02-PW11-07B	SJS02-PW12-07B	SJS02-PW13-07B*	SJS02-PW14-07B	SJS02-PW15-07B
Sample Date	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07
Chemical Name															
Volatile Organic Compounds (UG_L)															
1,1-Dichloroethene	1 U	1 U	50 U	730 J	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	0.26 J	1.3	38 J	5,100	79	2.9	0.23 J	1.6	1.6	5.1	0.4 J	1.5	0.89 J	3	2.2
Vinyl chloride	2 U	2 U	250	2,000 U	4,400	22	2 U	2 U	2.3	0.3 J	0.33 J	0.27 J	0.91 J	2 U	1.1 J
cis-1,2-Dichloroethene	0.93 J	1.5	4,600	87,000	3,800	45	0.8 J	0.72 J	9.5	1.8	1.7	0.72 J	3.9 J	1.9	1.1
trans-1,2-Dichloroethene	1 U	1 U	50 U	710 J	50 U	0.63 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:
Shaded cells represent detections
*A duplicate sample was collected at this location; the most conservative result is shown.
U - Analyte not detected
J - Result may be estimated
UJ - Analyte not detected, result may be estimated

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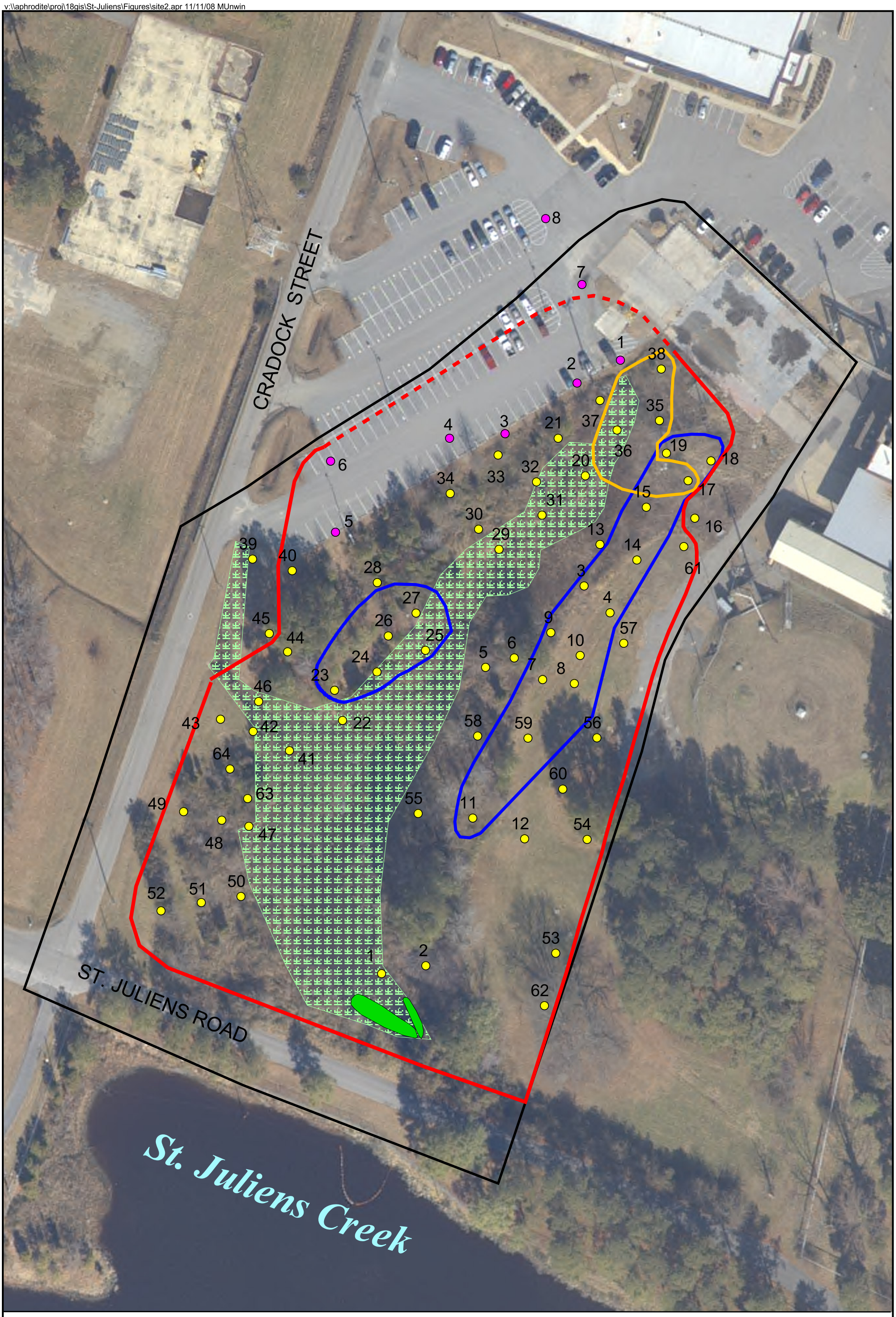

Figure 5-1
Extent of Waste
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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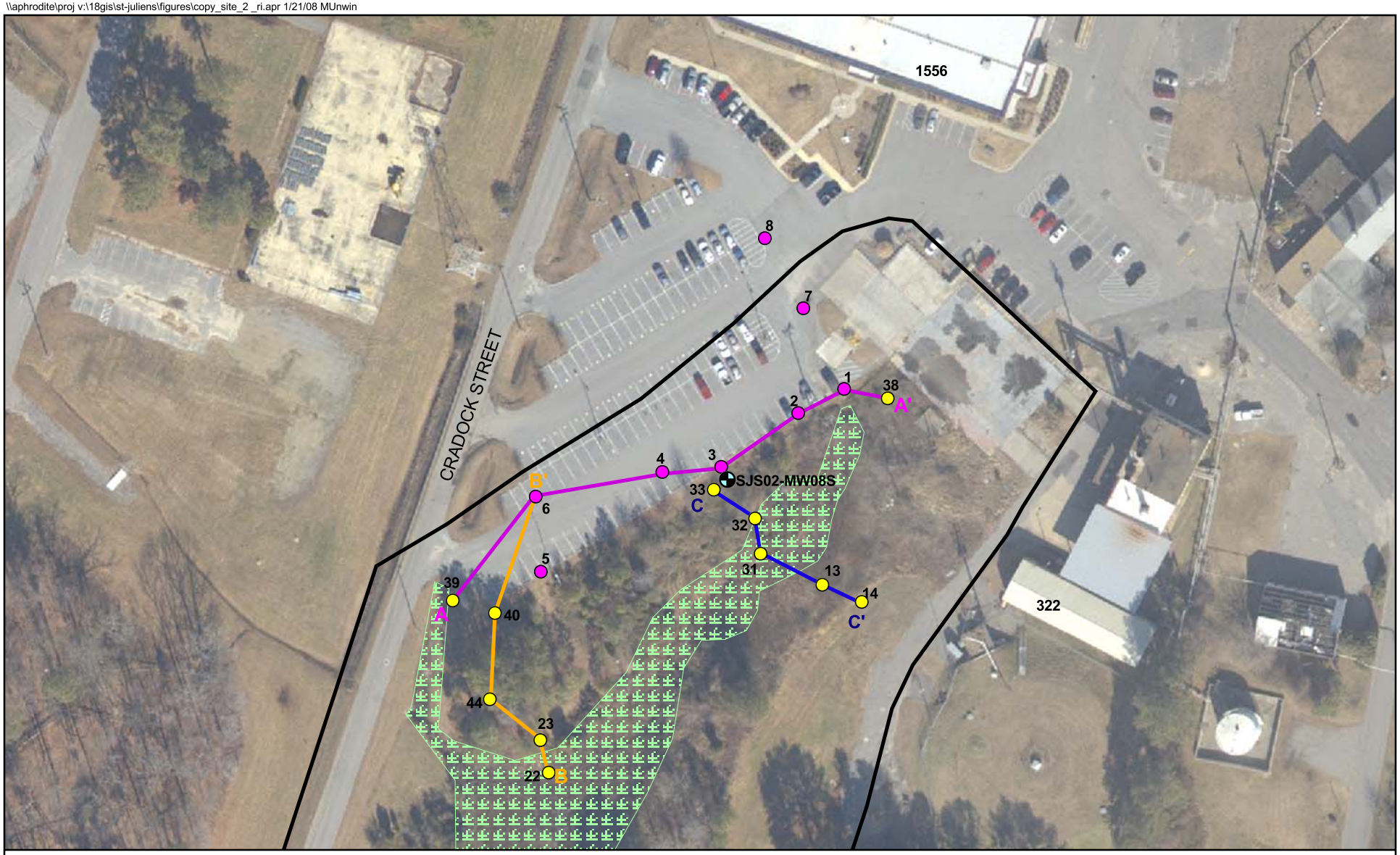

LEGEND

- Site Boundary
- Wetlands
- DPT Soil Boring Locations
- Monitoring Well Location
- Test Pit Locations
- A - A' Cross Section
- B - B' Cross Section
- C - C' Cross Section

N

0 50 100 Feet

Figure 5-2
Waste Delineation Cross-Section Locations
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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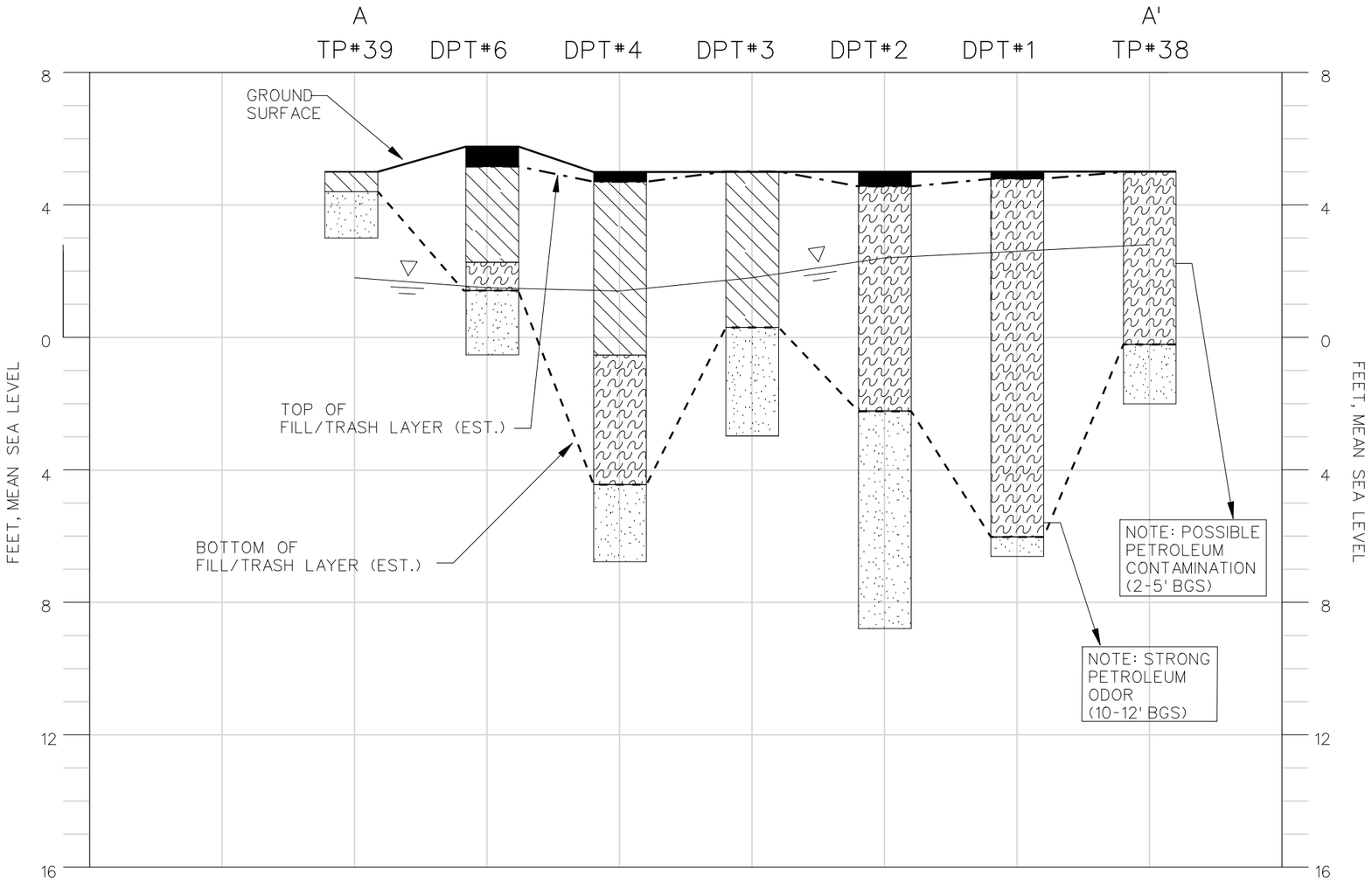
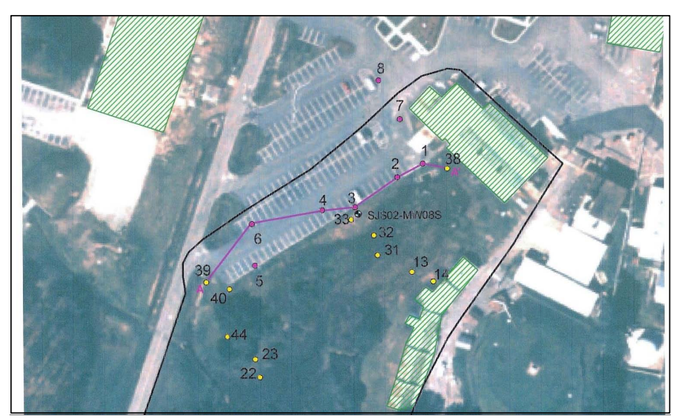


LEGEND

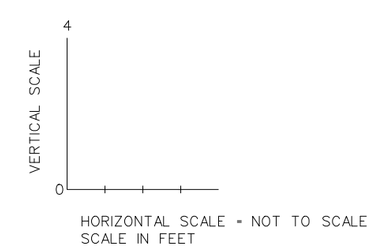
- FILL MATERIAL - SANDS, SILTS, GRAVELS
- NATIVE MATERIAL - SANDS/CLAYS
- TRASH - BRICK, METAL, ABM
- ASPHALT
- WATER TABLE (JUNE 2007)
- GROUND SURFACE
- TOP OF FILL/TRASH LAYER (EST.)
- BOTTOM OF FILL/TRASH LAYER (EST.)

TP - TEST PIT (2001)

DPT - DIRECT PUSH (2004)



MAP



NOTES

- ELEVATIONS OF DPTS AND TEST PITS ARE BASED ON FIELD OBSERVATIONS AND THE KNOWN ELEVATION OF SJS02-MW08S, 4.91 FT

FIGURE 5-3
WASTE DELINEATION CROSS-SECTION A-A'
SITE 2 EXPANDED REMEDIAL INVESTIGATION
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VA

CH2MHILL

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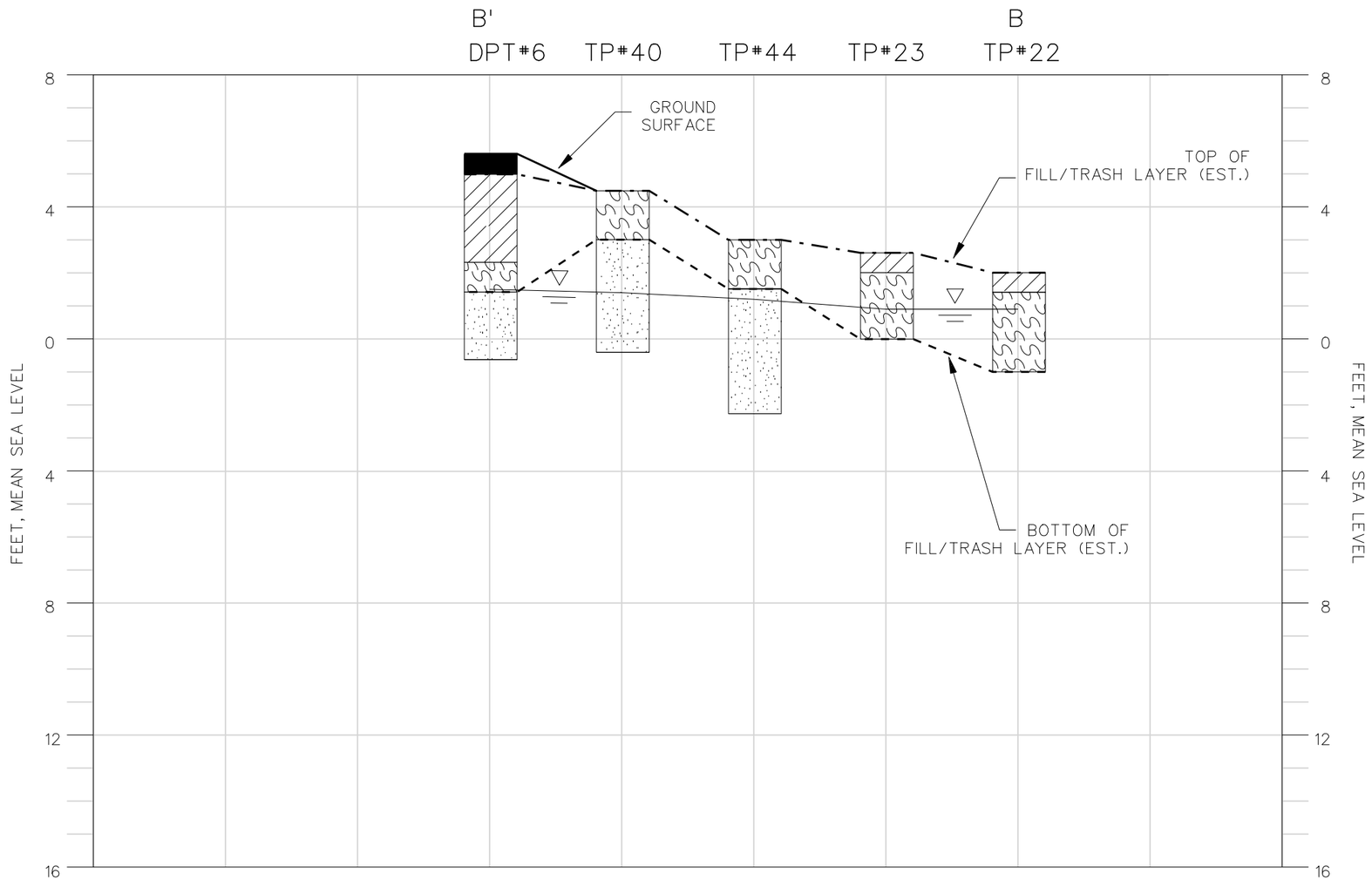
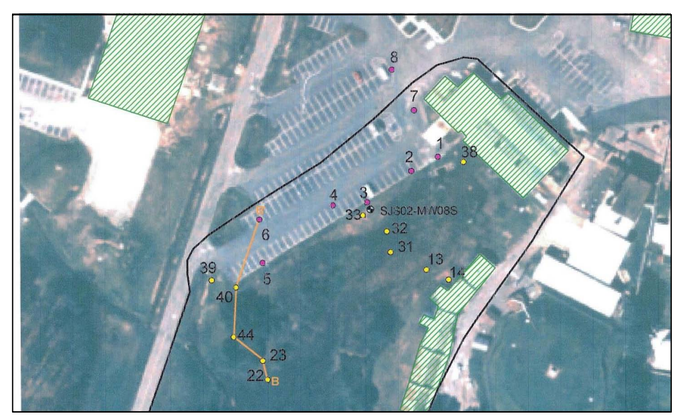


LEGEND

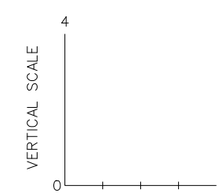
- FILL MATERIAL - SANDS, SILTS, GRAVELS
- NATIVE MATERIAL - SANDS/CLAYS
- TRASH - BRICK, METAL, ABM
- ASPHALT
- WATER TABLE (JUNE 2007)
- GROUND SURFACE
- TOP OF FILL/TRASH LAYER (EST.)
- BOTTOM OF FILL/TRASH LAYER (EST.)

TP - TEST PIT (2001)

DPT - DIRECT PUSH (2004)



MAP



HORIZONTAL SCALE = NOT TO SCALE
SCALE IN FEET

NOTES

- ELEVATIONS OF DPTS AND TEST PITS ARE BASED ON FIELD OBSERVATIONS AND THE KNOWN ELEVATION OF SJS02-MW08S, 4.91 FT

FIGURE 5-4
WASTE DELINEATION CROSS-SECTION B-B'
SITE 2 EXPANDED REMEDIAL INVESTIGATION
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VA

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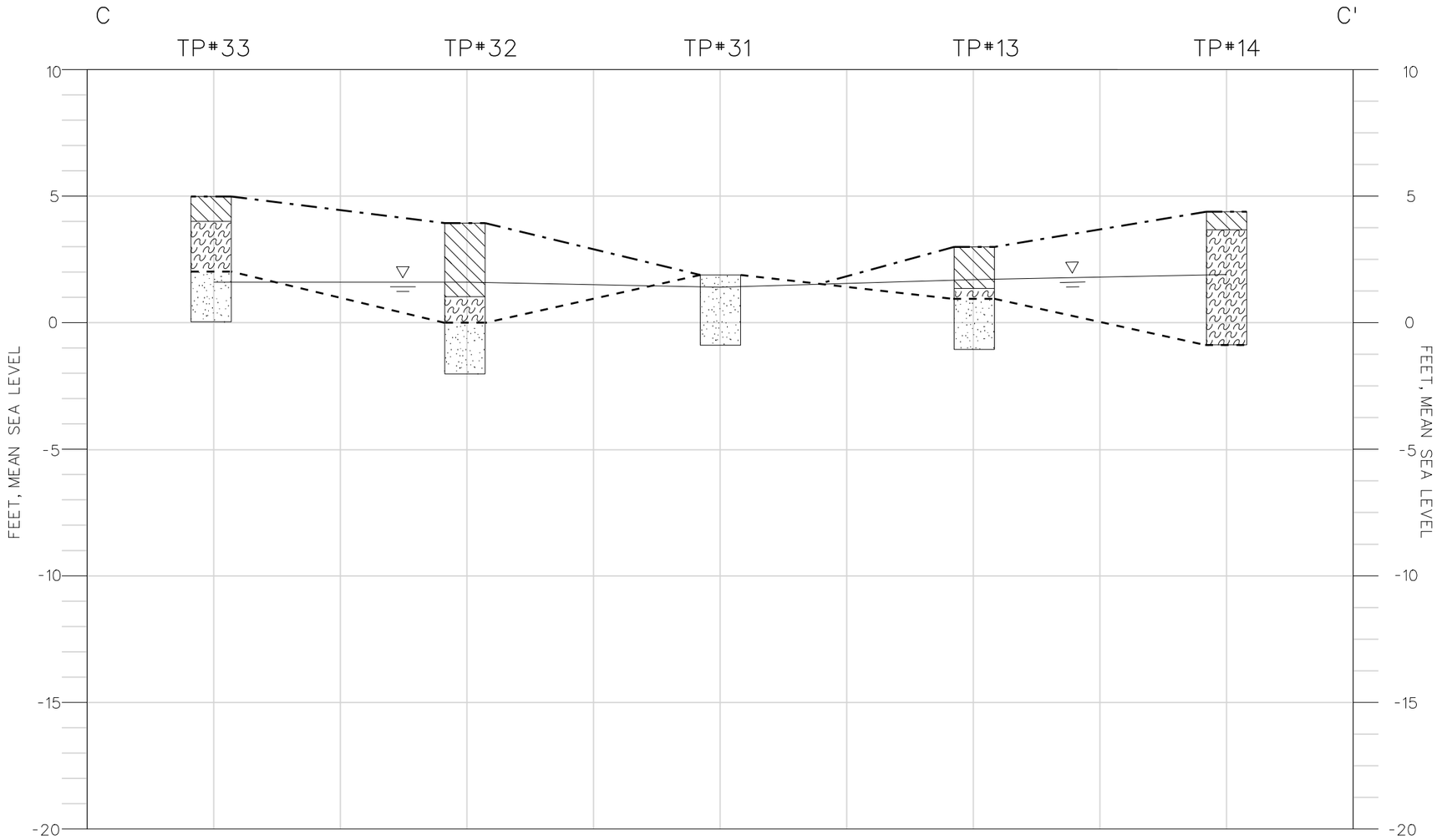
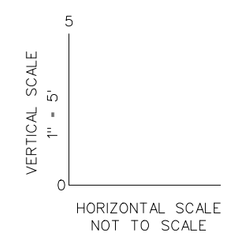


LEGEND

- FILL MATERIAL - SANDS, SILTS, GRAVELS
- NATIVE MATERIAL - SANDS/CLAYS
- TRASH - BRICK, METAL, ABM
- ASPHALT
- WATER TABLE (JUNE 2007)
- GROUND SURFACE
- TOP OF FILL/TRASH LAYER (EST.)
- BOTTOM OF FILL/TRASH LAYER (EST.)

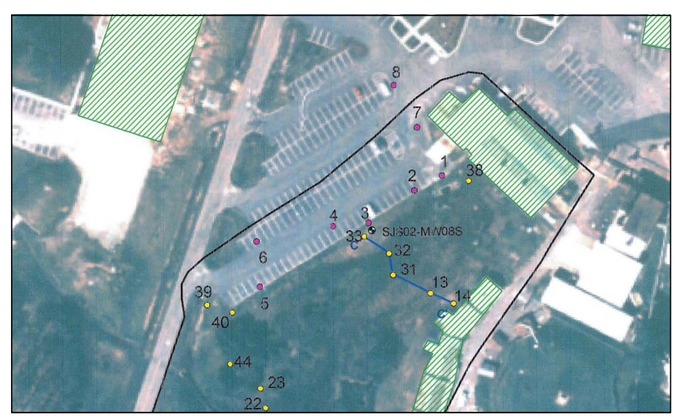
TP - TEST PIT (2001)

DPT - DIRECT PUSH (2004)



NOTES

- ELEVATIONS OF DPTS AND TEST PITS ARE BASED ON FIELD OBSERVATIONS AND THE KNOWN ELEVATION OF SJS02-MW08S, 4.91 FT



MAP

FIGURE 5-5
WASTE DELINEATION CROSS-SECTION C-C'
SITE 2 EXPANDED REMEDIAL INVESTIGATION
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VA

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FIGURE 5-6
ECD Response above 1,000,000 mV in MIP Borings (2004 and 2007) – Horizontal Extent
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

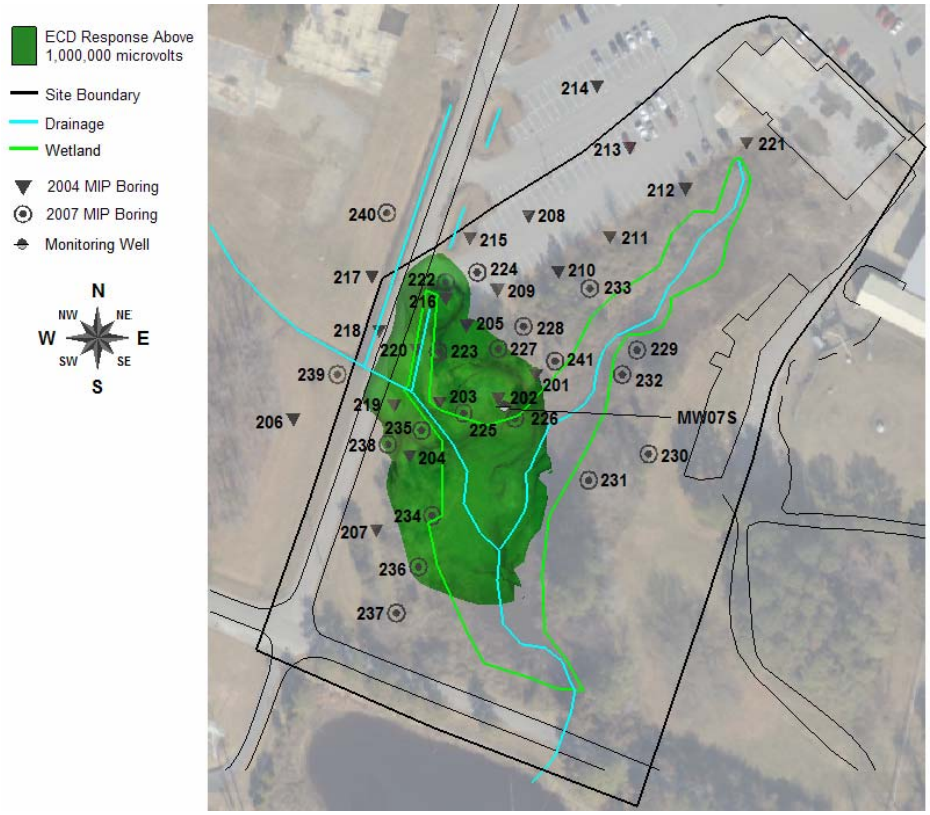


FIGURE 5-7
ECD Response above 1,000,000 mV in MIP Borings (2004 and 2007) – Vertical Extent
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

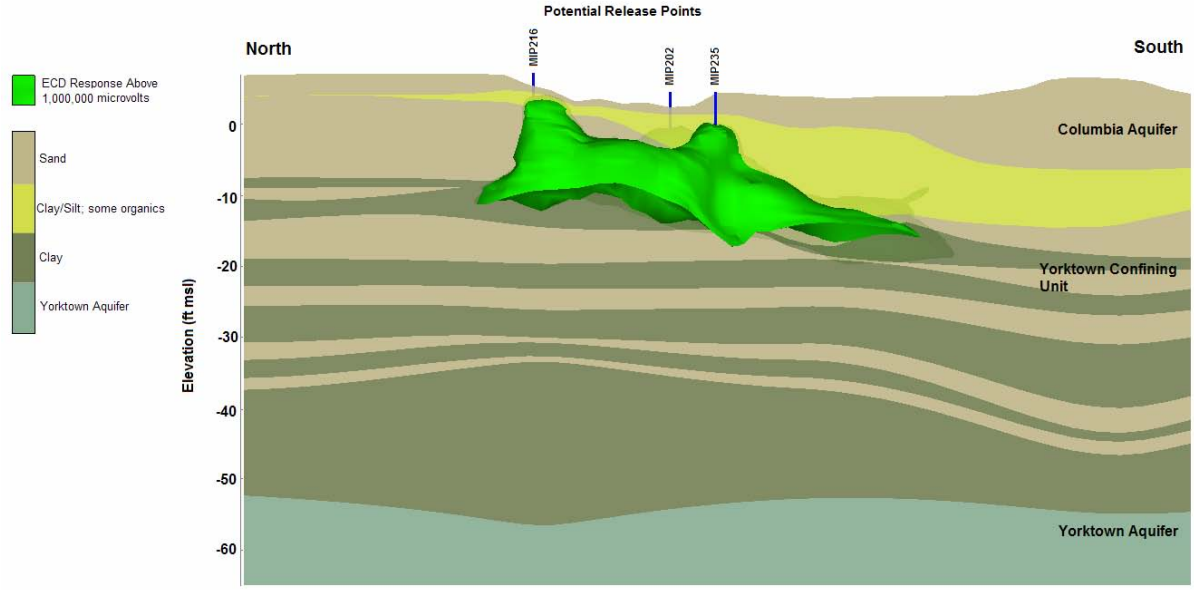
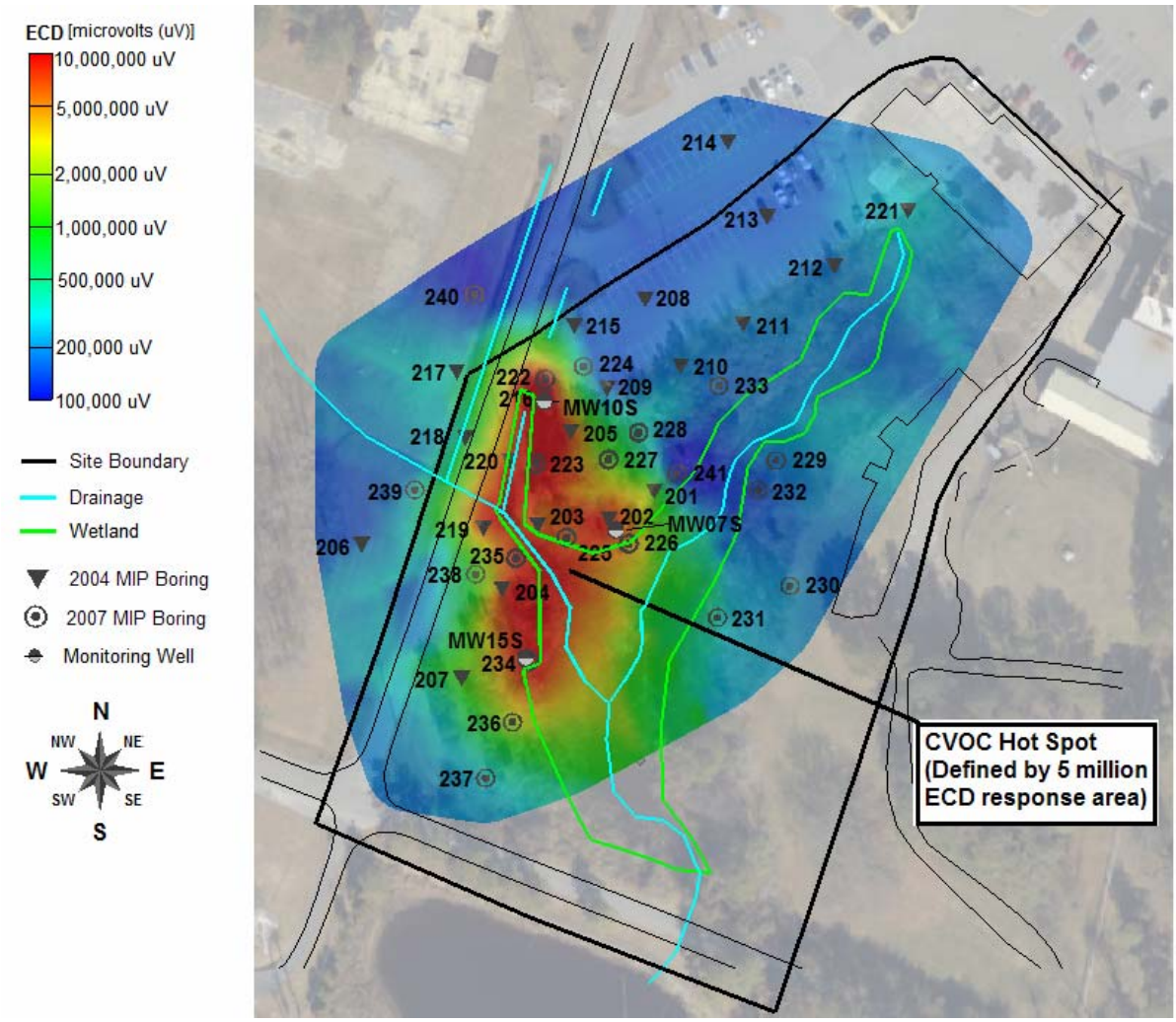


FIGURE 5-8
CVOC Hot Spot Identified by ECD Response (2004 and 2007)
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia



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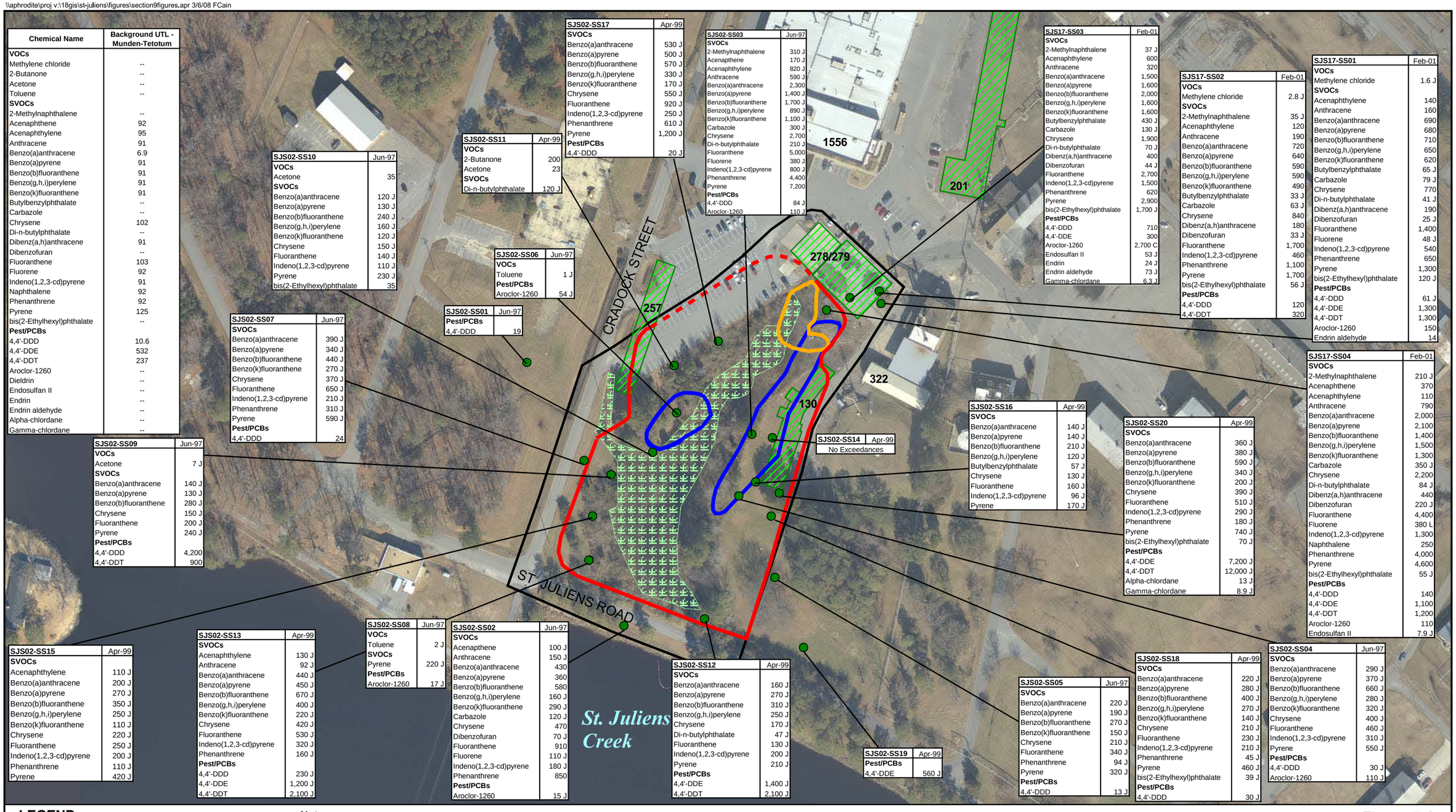

Chemical Name	Background UTL - Munden-Tetotum
VOCs	
Methylene chloride	--
2-Butanone	--
Acetone	--
Toluene	--
SVOCs	
2-Methylnaphthalene	--
Acenaphthene	92
Acenaphthylene	95
Anthracene	91
Benzo(a)anthracene	6.9
Benzo(a)pyrene	91
Benzo(b)fluoranthene	91
Benzo(g,h,i)perylene	91
Benzo(k)fluoranthene	91
Butylbenzylphthalate	--
Carbazole	--
Chrysene	102
Di-n-butylphthalate	--
Dibenz(a,h)anthracene	91
Dibenzofuran	--
Fluoranthene	103
Fluorene	92
Indeno(1,2,3-cd)pyrene	91
Naphthalene	92
Phenanthrene	92
Pyrene	125
bis(2-Ethylhexyl)phthalate	--
Pest/PCBs	
4,4'-DDD	10.6
4,4'-DDE	532
4,4'-DDT	237
Aroclor-1260	--
Dieldrin	--
Endosulfan II	--
Endrin	--
Endrin aldehyde	--
Alpha-chlordane	--
Gamma-chlordane	--

SJS02-SS17	Apr-99
SVOCs	
Benzo(a)anthracene	530 J
Benzo(a)pyrene	500 J
Benzo(b)fluoranthene	570 J
Benzo(g,h,i)perylene	330 J
Benzo(k)fluoranthene	170 J
Chrysene	550 J
Fluoranthene	920 J
Indeno(1,2,3-cd)pyrene	250 J
Phenanthrene	610 J
Pyrene	1,200 J
Pest/PCBs	
4,4'-DDD	20 J

SJS02-SS03	Jun-97
SVOCs	
2-Methylnaphthalene	310 J
Acenapthene	170 J
Acenaphthylene	820 J
Anthracene	590 J
Benzo(a)anthracene	2,300
Benzo(a)pyrene	1,400 J
Benzo(b)fluoranthene	1,700 J
Benzo(g,h,i)perylene	890 J
Benzo(k)fluoranthene	1,100 J
Carbazole	300 J
Chrysene	2,700
Di-n-butylphthalate	210 J
Fluoranthene	5,000
Fluorene	380 J
Indeno(1,2,3-cd)pyrene	800 J
Phenanthrene	4,400
Pyrene	7,200
Pest/PCBs	
4,4'-DDD	84 J
Aroclor-1260	110 J

SJS17-SS03	Feb-01
SVOCs	
2-Methylnaphthalene	37 J
Acenaphthylene	600
Anthracene	320
Benzo(a)anthracene	1,500
Benzo(a)pyrene	1,600
Benzo(b)fluoranthene	2,000
Benzo(g,h,i)perylene	1,600
Benzo(k)fluoranthene	1,600
Butylbenzylphthalate	430 J
Carbazole	130 J
Chrysene	1,900
Di-n-butylphthalate	70 J
Dibenz(a,h)anthracene	400
Dibenzofuran	44 J
Fluoranthene	2,700
Indeno(1,2,3-cd)pyrene	1,500
Phenanthrene	620
Pyrene	2,900
bis(2-Ethylhexyl)phthalate	1,700 J
Pest/PCBs	
4,4'-DDD	710
4,4'-DDE	300
Aroclor-1260	2,700 C
Endosulfan II	53 J
Endrin	24 J
Endrin aldehyde	73 J
Gamma-chlordane	6.3 J

SJS17-SS02	Feb-01
VOCs	
Methylene chloride	2.8 J
SVOCs	
2-Methylnaphthalene	35 J
Acenaphthylene	120
Anthracene	190
Benzo(a)anthracene	720
Benzo(a)pyrene	640
Benzo(b)fluoranthene	590
Benzo(g,h,i)perylene	590
Benzo(k)fluoranthene	490
Butylbenzylphthalate	33 J
Carbazole	63 J
Chrysene	840
Dibenz(a,h)anthracene	180
Dibenzofuran	33 J
Fluoranthene	1,700
Indeno(1,2,3-cd)pyrene	460
Phenanthrene	1,100
Pyrene	1,700
bis(2-Ethylhexyl)phthalate	56 J
Pest/PCBs	
4,4'-DDD	120
4,4'-DDT	320

SJS17-SS01	Feb-01
VOCs	
Methylene chloride	1.6 J
SVOCs	
Acenaphthylene	140
Anthracene	160
Benzo(a)anthracene	690
Benzo(a)pyrene	680
Benzo(b)fluoranthene	710
Benzo(g,h,i)perylene	650
Benzo(k)fluoranthene	620
Butylbenzylphthalate	65 J
Carbazole	79 J
Chrysene	770
Di-n-butylphthalate	41 J
Dibenz(a,h)anthracene	190
Dibenzofuran	25 J
Fluoranthene	1,400
Fluorene	48 J
Indeno(1,2,3-cd)pyrene	540
Phenanthrene	650
Pyrene	1,300
bis(2-Ethylhexyl)phthalate	120 J
Pest/PCBs	
4,4'-DDD	61 J
4,4'-DDE	1,300
4,4'-DDT	1,300
Aroclor-1260	150
Endrin aldehyde	14

SJS02-SS10	Jun-97
VOCs	
Acetone	35
SVOCs	
Benzo(a)anthracene	120 J
Benzo(a)pyrene	130 J
Benzo(b)fluoranthene	240 J
Benzo(g,h,i)perylene	160 J
Benzo(k)fluoranthene	120 J
Chrysene	150 J
Fluoranthene	140 J
Indeno(1,2,3-cd)pyrene	110 J
Pyrene	230 J
bis(2-Ethylhexyl)phthalate	35

SJS02-SS11	Apr-99
VOCs	
2-Butanone	200
Acetone	23
SVOCs	
Di-n-butylphthalate	120 J

SJS02-SS06	Jun-97
VOCs	
Toluene	1 J
Pest/PCBs	
Aroclor-1260	54 J

SJS02-SS01	Jun-97
Pest/PCBs	
4,4'-DDD	19

SJS02-SS07	Jun-97
SVOCs	
Benzo(a)anthracene	390 J
Benzo(a)pyrene	340 J
Benzo(b)fluoranthene	440 J
Benzo(k)fluoranthene	270 J
Chrysene	370 J
Fluoranthene	650 J
Indeno(1,2,3-cd)pyrene	210 J
Phenanthrene	310 J
Pyrene	590 J
Pest/PCBs	
4,4'-DDD	24

SJS02-SS09	Jun-97
VOCs	
Acetone	7 J
SVOCs	
Benzo(a)anthracene	140 J
Benzo(a)pyrene	130 J
Benzo(b)fluoranthene	280 J
Chrysene	150 J
Fluoranthene	200 J
Pyrene	240 J
Pest/PCBs	
4,4'-DDD	4,200
4,4'-DDT	900

SJS02-SS14	Apr-99
No Exceedances	

SJS02-SS16	Apr-99
SVOCs	
Benzo(a)anthracene	140 J
Benzo(a)pyrene	140 J
Benzo(b)fluoranthene	210 J
Benzo(g,h,i)perylene	120 J
Butylbenzylphthalate	57 J
Chrysene	130 J
Fluoranthene	160 J
Indeno(1,2,3-cd)pyrene	96 J
Pyrene	170 J

SJS02-SS20	Apr-99
SVOCs	
Benzo(a)anthracene	360 J
Benzo(a)pyrene	380 J
Benzo(b)fluoranthene	590 J
Benzo(g,h,i)perylene	340 J
Benzo(k)fluoranthene	200 J
Chrysene	390 J
Fluoranthene	510 J
Indeno(1,2,3-cd)pyrene	290 J
Phenanthrene	180 J
Pyrene	740 J
bis(2-Ethylhexyl)phthalate	70 J
Pest/PCBs	
4,4'-DDE	7,200 J
4,4'-DDT	12,000 J
Alpha-chlordane	13 J
Gamma-chlordane	8.9 J

SJS17-SS04	Feb-01
SVOCs	
2-Methylnaphthalene	210 J
Acenaphthene	370
Acenaphthylene	110
Anthracene	790
Benzo(a)anthracene	2,000
Benzo(a)pyrene	2,100
Benzo(b)fluoranthene	1,400
Benzo(g,h,i)perylene	1,500
Benzo(k)fluoranthene	1,300
Carbazole	350 J
Chrysene	2,200
Di-n-butylphthalate	84 J
Dibenz(a,h)anthracene	440
Dibenzofuran	220 J
Fluoranthene	4,400
Fluorene	380 L
Indeno(1,2,3-cd)pyrene	1,300
Naphthalene	250
Phenanthrene	4,000
Pyrene	4,600
bis(2-Ethylhexyl)phthalate	55 J
Pest/PCBs	
4,4'-DDD	140
4,4'-DDE	1,100
4,4'-DDT	1,200
Aroclor-1260	110
Endosulfan II	7.9 J

SJS02-SS15	Apr-99
SVOCs	
Acenaphthylene	110 J
Benzo(a)anthracene	200 J
Benzo(a)pyrene	270 J
Benzo(b)fluoranthene	350 J
Benzo(g,h,i)perylene	250 J
Benzo(k)fluoranthene	110 J
Chrysene	220 J
Fluoranthene	250 J
Indeno(1,2,3-cd)pyrene	200 J
Phenanthrene	110 J
Pyrene	420 J

SJS02-SS13	Apr-99
SVOCs	
Acenaphthylene	130 J
Anthracene	92 J
Benzo(a)anthracene	440 J
Benzo(a)pyrene	450 J
Benzo(b)fluoranthene	670 J
Benzo(g,h,i)perylene	400 J
Benzo(k)fluoranthene	220 J
Chrysene	420 J
Fluoranthene	530 J
Indeno(1,2,3-cd)pyrene	320 J
Phenanthrene	160 J
Pest/PCBs	
4,4'-DDD	230 J
4,4'-DDE	1,200 J
4,4'-DDT	2,100 J

SJS02-SS08	Jun-97
VOCs	
Toluene	2 J
SVOCs	
Pyrene	220 J
Pest/PCBs	
Aroclor-1260	17 J

SJS02-SS02	Jun-97
SVOCs	
Acenapthene	100 J
Anthracene	150 J
Benzo(a)anthracene	430
Benzo(a)pyrene	360
Benzo(b)fluoranthene	580
Benzo(g,h,i)perylene	160 J
Benzo(k)fluoranthene	290 J
Carbazole	120 J
Chrysene	470
Dibenzofuran	70 J
Fluoranthene	910
Fluorene	110 J
Indeno(1,2,3-cd)pyrene	180 J
Phenanthrene	850
Pest/PCBs	
Aroclor-1260	15 J

SJS02-SS12	Apr-99
SVOCs	
Benzo(a)anthracene	160 J
Benzo(a)pyrene	270 J
Benzo(b)fluoranthene	310 J
Benzo(g,h,i)perylene	250 J
Chrysene	170 J
Di-n-butylphthalate	47 J
Fluoranthene	130 J
Indeno(1,2,3-cd)pyrene	200 J
Pyrene	210 J
Pest/PCBs	
4,4'-DDE	1,400 J
4,4'-DDT	2,100 J

SJS02-SS19	Apr-99
Pest/PCBs	
4,4'-DDE	560 J

SJS02-SS05	Jun-97
SVOCs	
Benzo(a)anthracene	220 J
Benzo(a)pyrene	190 J
Benzo(b)fluoranthene	270 J
Benzo(k)fluoranthene	150 J
Chrysene	210 J
Fluoranthene	340 J
Phenanthrene	94 J
Pyrene	320 J
Pest/PCBs	
4,4'-DDD	13 J

SJS02-SS18	Apr-99
SVOCs	
Benzo(a)anthracene	220 J
Benzo(a)pyrene	280 J
Benzo(b)fluoranthene	400 J
Benzo(g,h,i)perylene	270 J
Benzo(k)fluoranthene	140 J
Chrysene	210 J
Fluoranthene	230 J
Indeno(1,2,3-cd)pyrene	210 J
Phenanthrene	45 J
Pyrene	460 J
bis(2-Ethylhexyl)phthalate	39 J
Pest/PCBs	
4,4'-DDD	30 J

SJS02-SS04	Jun-97
SVOCs	
Benzo(a)anthracene	290 J
Benzo(a)pyrene	370 J
Benzo(b)fluoranthene	660 J
Benzo(g,h,i)perylene	280 J
Benzo(k)fluoranthene	320 J
Chrysene	400 J
Fluoranthene	460 J
Indeno(1,2,3-cd)pyrene	310 J
Pyrene	550 J
Pest/PCBs	
4,4'-DDD	30 J
Aroclor-1260	110 J

LEGEND

- Site Boundary
- Surface Soil Sample Locations
- Demolished Buildings
- Wetland
- Extent of Blast Grit (ABM)
- Extent of Petroleum Impact
- Extent of Waste (3.3 acres)

Notes:
J - Reported value is estimated
L - Reported value may be biased low

Concentrations reported in µg/kg

This figure shows exceedances of background UTLs for PAHs and pesticides and detections of VOCs, non-PAH SVOCs, and PCBs

N

0 150 300 Feet

Figure 5-9
Surface Soil Exceedances
Organics
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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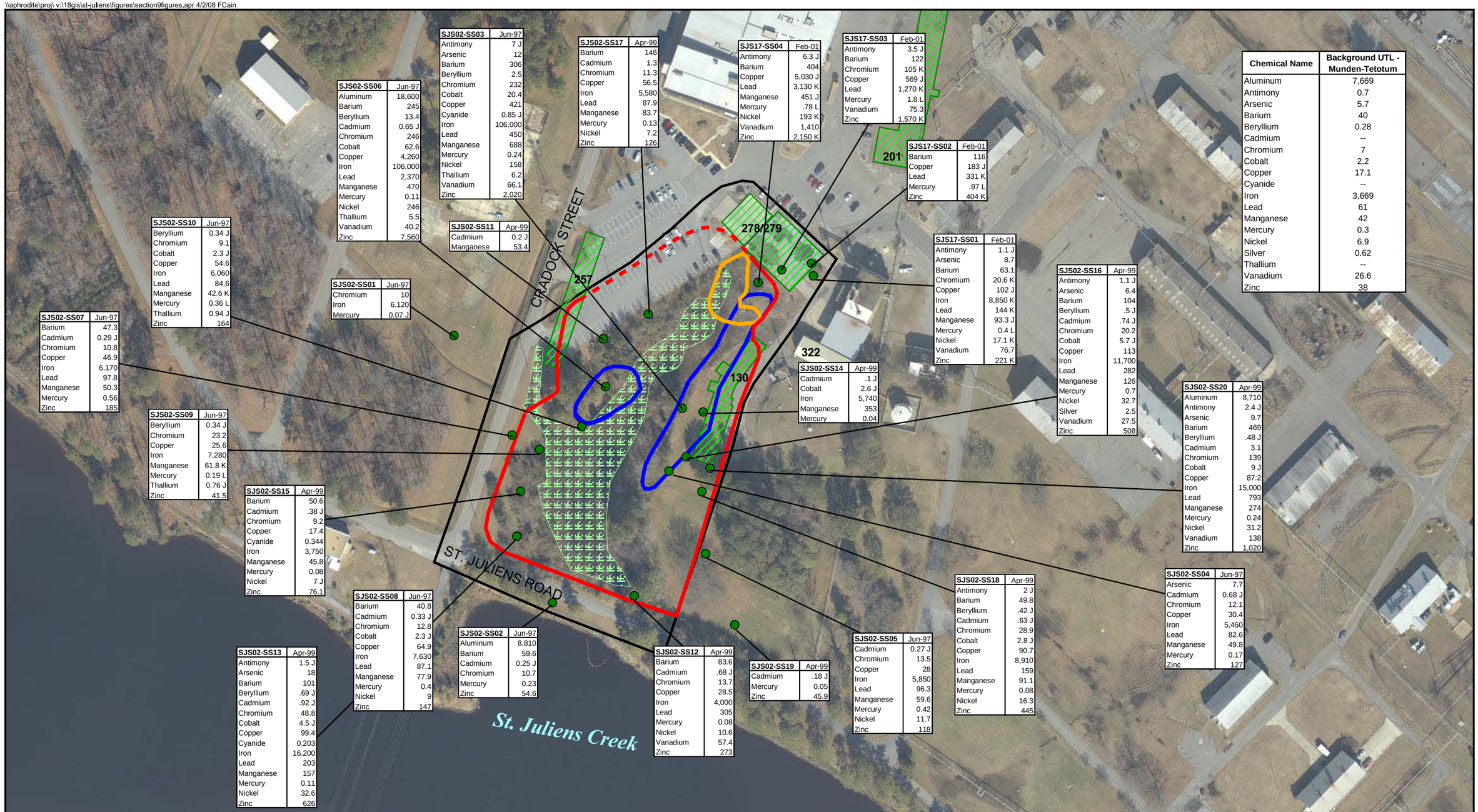

SJS02-SS03	Jun-97
Antimony	7 J
Arsenic	12
Barium	306
Beryllium	2.5
Chromium	232
Cobalt	20.4
Copper	421
Cyanide	0.85 J
Iron	106,000
Lead	450
Manganese	688
Mercury	0.24
Nickel	158
Thallium	6.2
Vanadium	66.1
Zinc	2,020

SJS02-SS17	Apr-99
Barium	146
Cadmium	1.3
Chromium	11.3
Copper	56.5
Iron	5,580
Lead	87.9
Manganese	83.7
Mercury	0.13
Nickel	7.2
Zinc	126

SJS17-SS04	Feb-01
Antimony	6.3 J
Barium	404
Copper	5,030 J
Lead	3,130 K
Manganese	451 J
Mercury	.78 L
Nickel	193 K
Vanadium	1,410
Zinc	2,150 K

SJS17-SS03	Feb-01
Antimony	3.5 J
Barium	122
Chromium	105 K
Copper	569 J
Lead	1,270 K
Mercury	1.8 L
Vanadium	75.3
Zinc	1,570 K

SJS02-SS06	Jun-97
Aluminum	18,600
Barium	245
Beryllium	13.4
Cadmium	0.65 J
Chromium	246
Cobalt	62.6
Copper	4,260
Iron	106,000
Lead	2,370
Manganese	470
Mercury	0.11
Nickel	246
Thallium	5.5
Vanadium	40.2
Zinc	7,560

SJS17-SS02	Feb-01
Barium	116
Copper	183 J
Lead	331 K
Mercury	.97 L
Zinc	404 K

Chemical Name	Background UTL - Munden-Tetotum
Aluminum	7,669
Antimony	0.7
Arsenic	5.7
Barium	40
Beryllium	0.28
Cadmium	--
Chromium	7
Cobalt	2.2
Copper	17.1
Cyanide	--
Iron	3,669
Lead	61
Manganese	42
Mercury	0.3
Nickel	6.9
Silver	0.62
Thallium	--
Vanadium	26.6
Zinc	38

SJS02-SS11	Apr-99
Cadmium	0.2 J
Manganese	53.4

SJS02-SS10	Jun-97
Beryllium	0.34 J
Chromium	9.1
Cobalt	2.3 J
Copper	54.6
Iron	6,060
Lead	84.6
Manganese	42.6 K
Mercury	0.36 L
Thallium	0.94 J
Zinc	164

SJS02-SS01	Jun-97
Chromium	10
Iron	6,120
Mercury	0.07 J

SJS17-SS01	Feb-01
Antimony	1.1 J
Arsenic	8.7
Barium	63.1
Chromium	20.6 K
Copper	102 J
Iron	8,850 K
Lead	144 K
Manganese	93.3 J
Mercury	0.4 L
Nickel	17.1 K
Vanadium	76.7
Zinc	221 K

SJS02-SS16	Apr-99
Antimony	1.1 J
Arsenic	6.4
Barium	104
Beryllium	.5 J
Cadmium	.74 J
Chromium	20.2
Cobalt	5.7 J
Copper	113
Iron	11,700
Lead	282
Manganese	126
Mercury	0.7
Nickel	32.7
Silver	2.5
Vanadium	27.5
Zinc	508

SJS02-SS07	Jun-97
Barium	47.3
Cadmium	0.29 J
Chromium	10.8
Copper	46.9
Iron	6,170
Lead	97.8
Manganese	50.3
Mercury	0.56
Zinc	185

SJS02-SS14	Apr-99
Cadmium	.1 J
Cobalt	2.6 J
Iron	5,740
Manganese	353
Mercury	0.04

SJS02-SS20	Apr-99
Aluminum	8,710
Antimony	2.4 J
Arsenic	9.7
Barium	469
Beryllium	.48 J
Cadmium	3.1
Chromium	139
Cobalt	9 J
Copper	87.2
Iron	15,000
Lead	793
Manganese	274
Mercury	0.24
Nickel	31.2
Vanadium	138
Zinc	1,020

SJS02-SS09	Jun-97
Beryllium	0.34 J
Chromium	23.2
Copper	25.6
Iron	7,280
Manganese	61.8 K
Mercury	0.19 L
Thallium	0.76 J
Zinc	41.5

SJS02-SS15	Apr-99
Barium	50.6
Cadmium	.38 J
Chromium	9.2
Copper	17.4
Cyanide	0.344
Iron	3,750
Manganese	45.8
Mercury	0.08
Nickel	7 J
Zinc	76.1

SJS02-SS18	Apr-99
Antimony	2 J
Barium	49.8
Beryllium	.42 J
Cadmium	.63 J
Chromium	28.9
Cobalt	2.8 J
Copper	90.7
Iron	8,910
Lead	159
Manganese	91.1
Mercury	0.08
Nickel	16.3
Zinc	445

SJS02-SS04	Jun-97
Arsenic	7.7
Cadmium	0.68 J
Chromium	12.1
Copper	30.4
Iron	5,460
Lead	82.6
Manganese	49.8
Mercury	0.17
Zinc	127

SJS02-SS08	Jun-97
Barium	40.8
Cadmium	0.33 J
Chromium	12.8
Cobalt	2.3 J
Copper	64.9
Iron	7,630
Lead	87.1
Manganese	77.9
Mercury	0.4
Nickel	9
Zinc	147

SJS02-SS02	Jun-97
Aluminum	8,810
Barium	59.6
Cadmium	0.25 J
Chromium	10.7
Mercury	0.23
Zinc	54.6

SJS02-SS13	Apr-99
Antimony	1.5 J
Arsenic	18
Barium	101
Beryllium	.69 J
Cadmium	.92 J
Chromium	48.8
Cobalt	4.5 J
Copper	99.4
Cyanide	0.203
Iron	16,200
Lead	203
Manganese	157
Mercury	0.11
Nickel	32.6
Zinc	626

SJS02-SS12	Apr-99
Barium	83.6
Cadmium	.68 J
Chromium	13.7
Copper	28.5
Iron	4,000
Lead	305
Mercury	0.08
Nickel	10.6
Vanadium	57.4
Zinc	273

SJS02-SS19	Apr-99
Cadmium	.18 J
Mercury	0.05
Zinc	45.9

SJS02-SS05	Jun-97
Cadmium	0.27 J
Chromium	13.5
Copper	28
Iron	5,850
Lead	96.3
Manganese	59.6
Mercury	0.42
Nickel	11.7
Zinc	118

LEGEND

- Site Boundary
- Surface Soil Sample Locations
- Demolished Buildings
- Wetland
- Extent of Blast Grit (ABM)
- Extent of Petroleum Impact
- Extent of Waste (3.3 acres)

Notes:
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
Concentrations reported in mg/kg

N

0 150 300 Feet

Figure 5-10
Surface Soil Exceedances
Inorganics
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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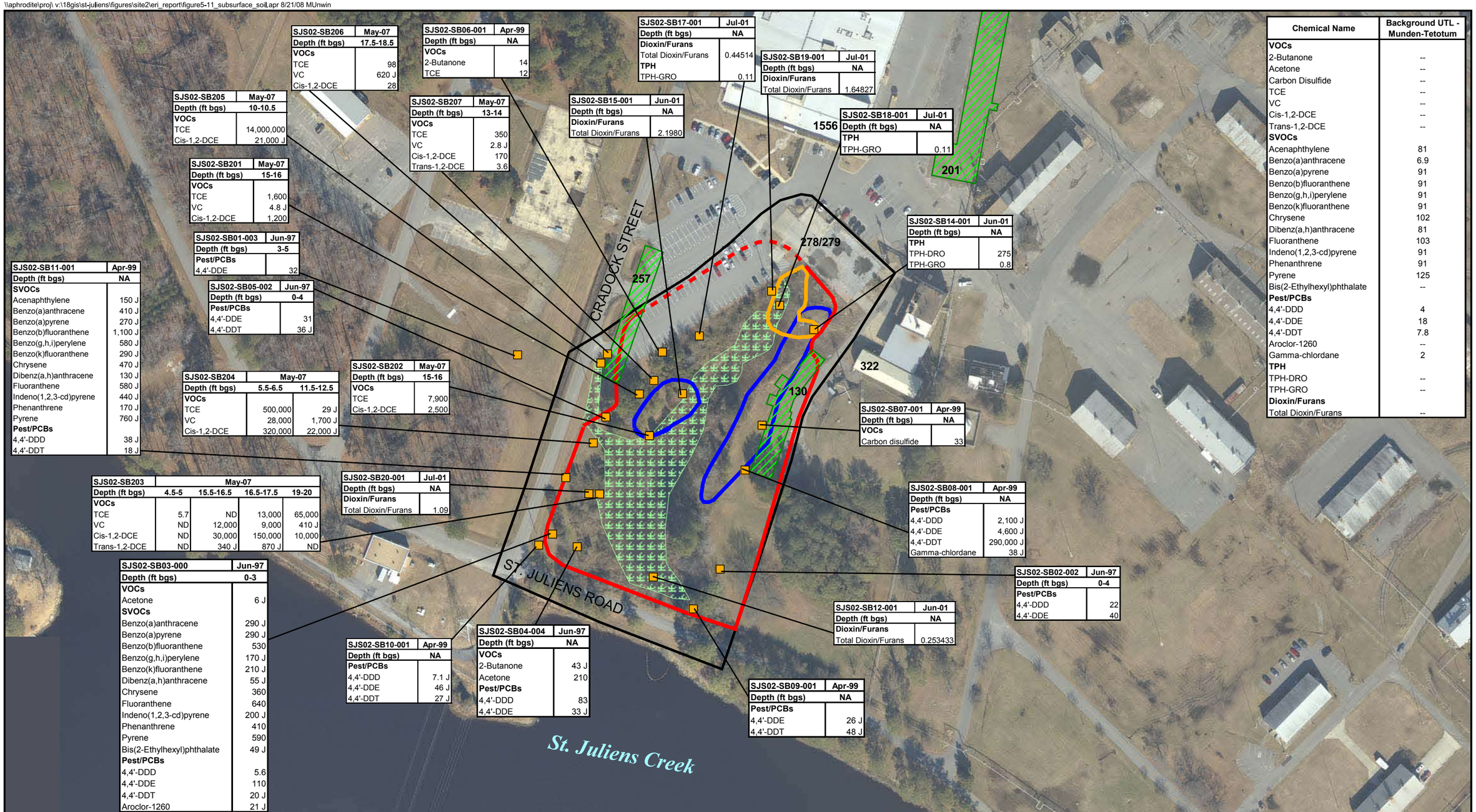

SJS02-SB206	May-07
Depth (ft bgs)	17.5-18.5
VOCs	
TCE	98
VC	620 J
Cis-1,2-DCE	28

SJS02-SB06-001	Apr-99
Depth (ft bgs)	NA
VOCs	
2-Butanone	14
TCE	12

SJS02-SB17-001	Jul-01
Depth (ft bgs)	NA
Dioxin/Furans	
Total Dioxin/Furans	0.44514
TPH	
TPH-GRO	0.11

SJS02-SB19-001	Jul-01
Depth (ft bgs)	NA
Dioxin/Furans	
Total Dioxin/Furans	1.64827

SJS02-SB205	May-07
Depth (ft bgs)	10-10.5
VOCs	
TCE	14,000,000
Cis-1,2-DCE	21,000 J

SJS02-SB207	May-07
Depth (ft bgs)	13-14
VOCs	
TCE	350
VC	2.8 J
Cis-1,2-DCE	170
Trans-1,2-DCE	3.6

SJS02-SB15-001	Jun-01
Depth (ft bgs)	NA
Dioxin/Furans	
Total Dioxin/Furans	2.1980

SJS02-SB18-001	Jul-01
Depth (ft bgs)	NA
TPH	
TPH-GRO	0.11

SJS02-SB201	May-07
Depth (ft bgs)	15-16
VOCs	
TCE	1,600
VC	4.8 J
Cis-1,2-DCE	1,200

SJS02-SB14-001	Jun-01
Depth (ft bgs)	NA
TPH	
TPH-DRO	275
TPH-GRO	0.8

SJS02-SB01-003	Jun-97
Depth (ft bgs)	3-5
Pest/PCBs	
4,4'-DDE	32

SJS02-SB11-001	Apr-99
Depth (ft bgs)	NA
SVOCs	
Acenaphthylene	150 J
Benzo(a)anthracene	410 J
Benzo(a)pyrene	270 J
Benzo(b)fluoranthene	1,100 J
Benzo(g,h,i)perylene	580 J
Benzo(k)fluoranthene	290 J
Chrysene	470 J
Dibenz(a,h)anthracene	130 J
Fluoranthene	580 J
Indeno(1,2,3-cd)pyrene	440 J
Phenanthrene	170 J
Pyrene	760 J
Pest/PCBs	
4,4'-DDD	38 J
4,4'-DDT	18 J

SJS02-SB05-002	Jun-97
Depth (ft bgs)	0-4
Pest/PCBs	
4,4'-DDE	31
4,4'-DDT	36 J

SJS02-SB204	May-07	
Depth (ft bgs)	5.5-6.5	11.5-12.5
VOCs		
TCE	500,000	29 J
VC	28,000	1,700 J
Cis-1,2-DCE	320,000	22,000 J

SJS02-SB202	May-07
Depth (ft bgs)	15-16
VOCs	
TCE	7,900
Cis-1,2-DCE	2,500

SJS02-SB07-001	Apr-99
Depth (ft bgs)	NA
VOCs	
Carbon disulfide	33

SJS02-SB203	May-07			
Depth (ft bgs)	4.5-5	15.5-16.5	16.5-17.5	19-20
VOCs				
TCE	5.7	ND	13,000	65,000
VC	ND	12,000	9,000	410 J
Cis-1,2-DCE	ND	30,000	150,000	10,000
Trans-1,2-DCE	ND	340 J	870 J	ND

SJS02-SB20-001	Jul-01
Depth (ft bgs)	NA
Dioxin/Furans	
Total Dioxin/Furans	1.09

SJS02-SB08-001	Apr-99
Depth (ft bgs)	NA
Pest/PCBs	
4,4'-DDD	2,100 J
4,4'-DDE	4,600 J
4,4'-DDT	290,000 J
Gamma-chlordane	38 J

SJS02-SB03-000	Jun-97
Depth (ft bgs)	0-3
VOCs	
Acetone	6 J
SVOCs	
Benzo(a)anthracene	290 J
Benzo(a)pyrene	290 J
Benzo(b)fluoranthene	530
Benzo(g,h,i)perylene	170 J
Benzo(k)fluoranthene	210 J
Dibenz(a,h)anthracene	55 J
Chrysene	360
Fluoranthene	640
Indeno(1,2,3-cd)pyrene	200 J
Phenanthrene	410
Pyrene	590
Bis(2-Ethylhexyl)phthalate	49 J
Pest/PCBs	
4,4'-DDD	5.6
4,4'-DDE	110
4,4'-DDT	20 J
Aroclor-1260	21 J

SJS02-SB02-002	Jun-97
Depth (ft bgs)	0-4
Pest/PCBs	
4,4'-DDD	22
4,4'-DDE	40

SJS02-SB12-001	Jun-01
Depth (ft bgs)	NA
Dioxin/Furans	
Total Dioxin/Furans	0.253433

SJS02-SB10-001	Apr-99
Depth (ft bgs)	NA
Pest/PCBs	
4,4'-DDD	7.1 J
4,4'-DDE	46 J
4,4'-DDT	27 J

SJS02-SB04-004	Jun-97
Depth (ft bgs)	NA
VOCs	
2-Butanone	43 J
Acetone	210
Pest/PCBs	
4,4'-DDD	83
4,4'-DDE	33 J

SJS02-SB09-001	Apr-99
Depth (ft bgs)	NA
Pest/PCBs	
4,4'-DDE	26 J
4,4'-DDT	48 J

Chemical Name	Background UTL - Munden-Tetotum
VOCs	
2-Butanone	--
Acetone	--
Carbon Disulfide	--
TCE	--
VC	--
Cis-1,2-DCE	--
Trans-1,2-DCE	--
SVOCs	
Acenaphthylene	81
Benzo(a)anthracene	6.9
Benzo(a)pyrene	91
Benzo(b)fluoranthene	91
Benzo(g,h,i)perylene	91
Benzo(k)fluoranthene	91
Chrysene	102
Dibenz(a,h)anthracene	81
Fluoranthene	103
Indeno(1,2,3-cd)pyrene	91
Phenanthrene	91
Pyrene	125
Bis(2-Ethylhexyl)phthalate	--
Pest/PCBs	
4,4'-DDD	4
4,4'-DDE	18
4,4'-DDT	7.8
Aroclor-1260	--
Gamma-chlordane	2
TPH	
TPH-DRO	--
TPH-GRO	--
Dioxin/Furans	
Total Dioxin/Furans	--

LEGEND

- Site Boundary
- Subsurface Soil Sample Locations
- Demolished Buildings
- Wetland
- Extent of Blast Grit (ABM)
- Extent of Petroleum Impact
- Extent of Waste (3.3 acres)

Notes:

J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
ND - Analyte not detected
NA - Not available
DCE - Dichloroethene
TCE - Trichloroethene
VC - Vinyl chloride
Concentrations reported in µg/kg, with the exception of mg/kg for TPH

This figure show exceedances of background UTLs for PAHs and pesticides and detections of VOCs, non-PAH SVOCs, and PCBs

N

0 150 300 Feet

Figure 5-11
Subsurface Soil Exceedances
Organics
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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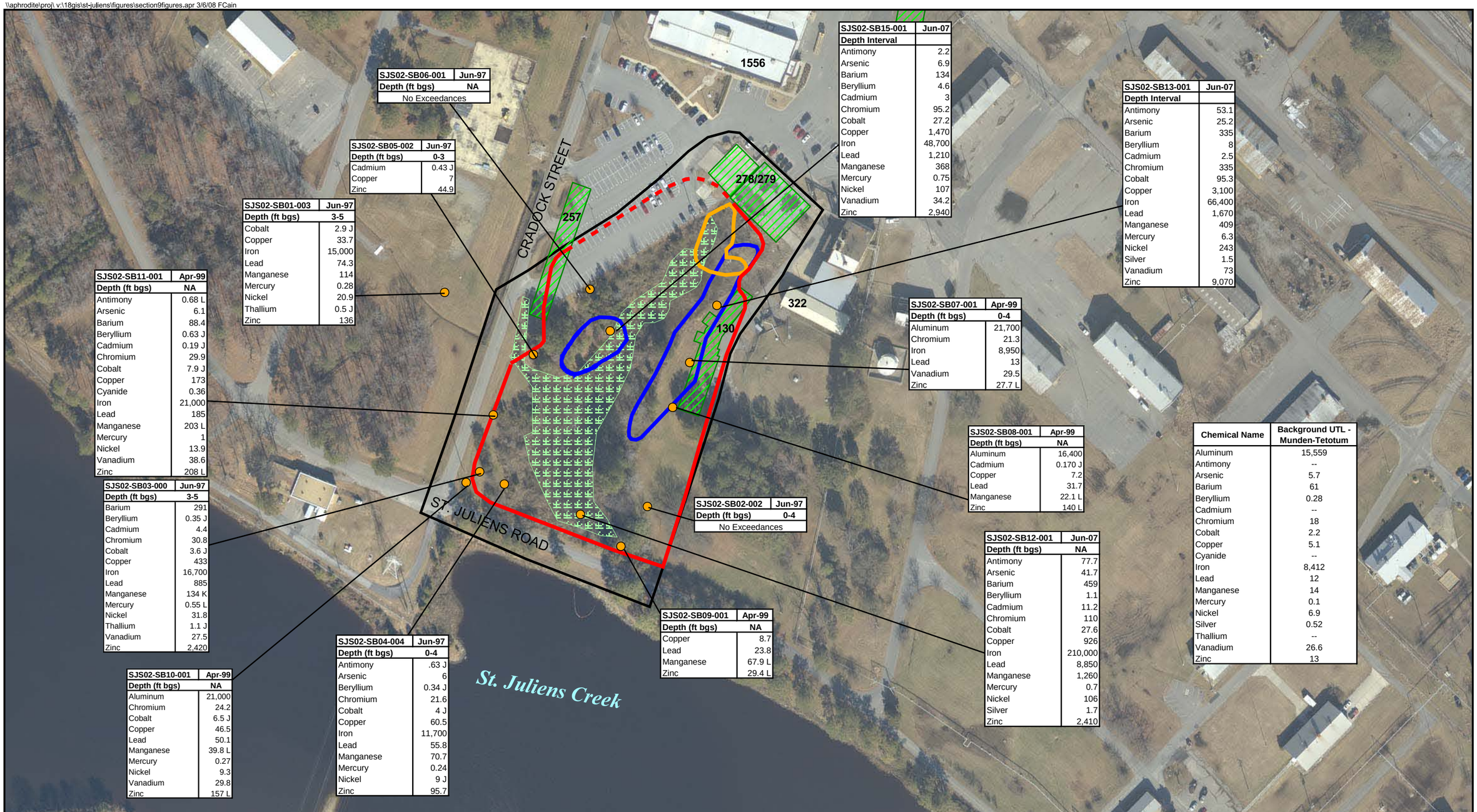

SJS02-SB15-001	Jun-07
Depth Interval	
Antimony	2.2
Arsenic	6.9
Barium	134
Beryllium	4.6
Cadmium	3
Chromium	95.2
Cobalt	27.2
Copper	1,470
Iron	48,700
Lead	1,210
Manganese	368
Mercury	0.75
Nickel	107
Vanadium	34.2
Zinc	2,940

SJS02-SB06-001	Jun-97
Depth (ft bgs)	NA
No Exceedances	

SJS02-SB05-002	Jun-97
Depth (ft bgs)	0-3
Cadmium	0.43 J
Copper	7
Zinc	44.9

SJS02-SB01-003	Jun-97
Depth (ft bgs)	3-5
Cobalt	2.9 J
Copper	33.7
Iron	15,000
Lead	74.3
Manganese	114
Mercury	0.28
Nickel	20.9
Thallium	0.5 J
Zinc	136

SJS02-SB13-001	Jun-07
Depth Interval	
Antimony	53.1
Arsenic	25.2
Barium	335
Beryllium	8
Cadmium	2.5
Chromium	335
Cobalt	95.3
Copper	3,100
Iron	66,400
Lead	1,670
Manganese	409
Mercury	6.3
Nickel	243
Silver	1.5
Vanadium	73
Zinc	9,070

SJS02-SB11-001	Apr-99
Depth (ft bgs)	NA
Antimony	0.68 L
Arsenic	6.1
Barium	88.4
Beryllium	0.63 J
Cadmium	0.19 J
Chromium	29.9
Cobalt	7.9 J
Copper	173
Cyanide	0.36
Iron	21,000
Lead	185
Manganese	203 L
Mercury	1
Nickel	13.9
Vanadium	38.6
Zinc	208 L

SJS02-SB07-001	Apr-99
Depth (ft bgs)	0-4
Aluminum	21,700
Chromium	21.3
Iron	8,950
Lead	13
Vanadium	29.5
Zinc	27.7 L

SJS02-SB08-001	Apr-99
Depth (ft bgs)	NA
Aluminum	16,400
Cadmium	0.170 J
Copper	7.2
Lead	31.7
Manganese	22.1 L
Zinc	140 L

Chemical Name	Background UTL - Munden-Tetotum
Aluminum	15,559
Antimony	--
Arsenic	5.7
Barium	61
Beryllium	0.28
Cadmium	--
Chromium	18
Cobalt	2.2
Copper	5.1
Cyanide	--
Iron	8,412
Lead	12
Manganese	14
Mercury	0.1
Nickel	6.9
Silver	0.52
Thallium	--
Vanadium	26.6
Zinc	13

SJS02-SB03-000	Jun-97
Depth (ft bgs)	3-5
Barium	291
Beryllium	0.35 J
Cadmium	4.4
Chromium	30.8
Cobalt	3.6 J
Copper	433
Iron	16,700
Lead	885
Manganese	134 K
Mercury	0.55 L
Nickel	31.8
Thallium	1.1 J
Vanadium	27.5
Zinc	2,420

SJS02-SB02-002	Jun-97
Depth (ft bgs)	0-4
No Exceedances	

SJS02-SB12-001	Jun-07
Depth (ft bgs)	NA
Antimony	77.7
Arsenic	41.7
Barium	459
Beryllium	1.1
Cadmium	11.2
Chromium	110
Cobalt	27.6
Copper	926
Iron	210,000
Lead	8,850
Manganese	1,260
Mercury	0.7
Nickel	106
Silver	1.7
Zinc	2,410

SJS02-SB09-001	Apr-99
Depth (ft bgs)	NA
Copper	8.7
Lead	23.8
Manganese	67.9 L
Zinc	29.4 L

SJS02-SB04-004	Jun-97
Depth (ft bgs)	0-4
Antimony	.63 J
Arsenic	6
Beryllium	0.34 J
Chromium	21.6
Cobalt	4 J
Copper	60.5
Iron	11,700
Lead	55.8
Manganese	70.7
Mercury	0.24
Nickel	9 J
Zinc	95.7

SJS02-SB10-001	Apr-99
Depth (ft bgs)	NA
Aluminum	21,000
Chromium	24.2
Cobalt	6.5 J
Copper	46.5
Lead	50.1
Manganese	39.8 L
Mercury	0.27
Nickel	9.3
Vanadium	29.8
Zinc	157 L

LEGEND

- Site Boundary
- Subsurface Soil Sample Locations
- Demolished Buildings
- Wetland
- Extent of Blast Grit (ABM)
- Extent of Petroleum Impact
- Extent of Waste (3.3 acres)

Notes:

J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
NA - Not available
Concentrations reported in mg/kg

N

0 150 300 Feet

Figure 5-12
Subsurface Soil Exceedances
Inorganics
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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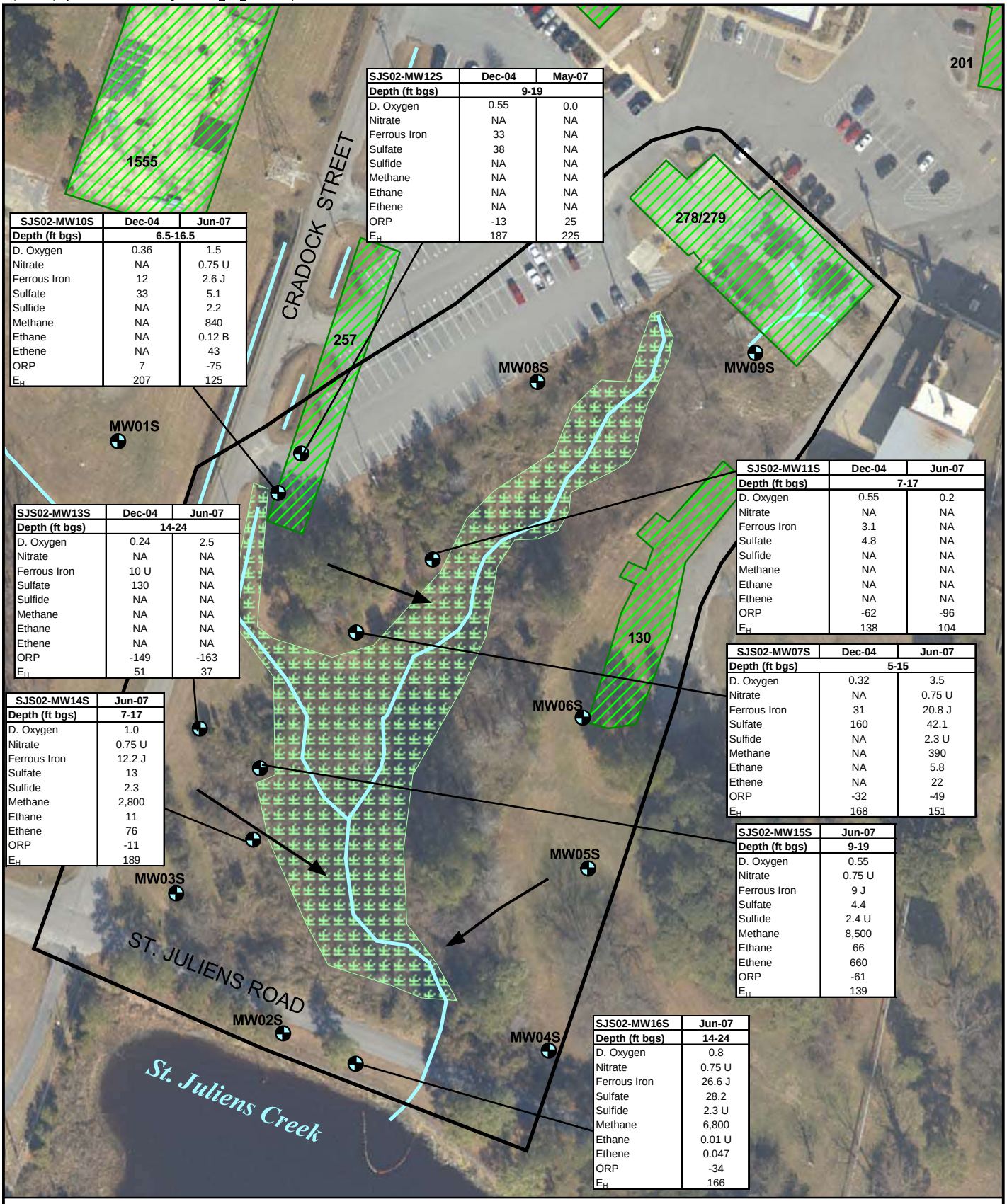

SJS02-MW12S	Dec-04	May-07
Depth (ft bgs)	9-19	
D. Oxygen	0.55	0.0
Nitrate	NA	NA
Ferrous Iron	33	NA
Sulfate	38	NA
Sulfide	NA	NA
Methane	NA	NA
Ethane	NA	NA
Ethene	NA	NA
ORP	-13	25
E_H	187	225

SJS02-MW10S	Dec-04	Jun-07
Depth (ft bgs)	6.5-16.5	
D. Oxygen	0.36	1.5
Nitrate	NA	0.75 U
Ferrous Iron	12	2.6 J
Sulfate	33	5.1
Sulfide	NA	2.2
Methane	NA	840
Ethane	NA	0.12 B
Ethene	NA	43
ORP	7	-75
E_H	207	125

SJS02-MW11S	Dec-04	Jun-07
Depth (ft bgs)	7-17	
D. Oxygen	0.55	0.2
Nitrate	NA	NA
Ferrous Iron	3.1	NA
Sulfate	4.8	NA
Sulfide	NA	NA
Methane	NA	NA
Ethane	NA	NA
Ethene	NA	NA
ORP	-62	-96
E_H	138	104

SJS02-MW13S	Dec-04	Jun-07
Depth (ft bgs)	14-24	
D. Oxygen	0.24	2.5
Nitrate	NA	NA
Ferrous Iron	10 U	NA
Sulfate	130	NA
Sulfide	NA	NA
Methane	NA	NA
Ethane	NA	NA
Ethene	NA	NA
ORP	-149	-163
E_H	51	37

SJS02-MW07S	Dec-04	Jun-07
Depth (ft bgs)	5-15	
D. Oxygen	0.32	3.5
Nitrate	NA	0.75 U
Ferrous Iron	31	20.8 J
Sulfate	160	42.1
Sulfide	NA	2.3 U
Methane	NA	390
Ethane	NA	5.8
Ethene	NA	22
ORP	-32	-49
E_H	168	151

SJS02-MW14S	Jun-07
Depth (ft bgs)	7-17
D. Oxygen	1.0
Nitrate	0.75 U
Ferrous Iron	12.2 J
Sulfate	13
Sulfide	2.3
Methane	2,800
Ethane	11
Ethene	76
ORP	-11
E_H	189

SJS02-MW15S	Jun-07
Depth (ft bgs)	9-19
D. Oxygen	0.55
Nitrate	0.75 U
Ferrous Iron	9 J
Sulfate	4.4
Sulfide	2.4 U
Methane	8,500
Ethane	66
Ethene	660
ORP	-61
E_H	139

SJS02-MW16S	Jun-07
Depth (ft bgs)	14-24
D. Oxygen	0.8
Nitrate	0.75 U
Ferrous Iron	26.6 J
Sulfate	28.2
Sulfide	2.3 U
Methane	6,800
Ethane	0.01 U
Ethene	0.047
ORP	-34
E_H	166

LEGEND

- Site Boundary
- Drainage
- Demolished Buildings
- Wetland
- Shallow Monitoring Well Locations
- Estimated Groundwater Flow Direction

B - Possible blank contamination
DO - Dissolved Oxygen
EH - Redox potential (standard hydrogen electrode)
J - Reported value is estimated
ORP - Oxidation-reduction potential
ND - Analyte not detected
All concentrations reported in mg/L, except for methane, ethane, and ethene (µg/L), and ORP (mV).

N

0 50 100 Feet

Figure 5-13
Distribution of Geochemical Parameters in Shallow Groundwater
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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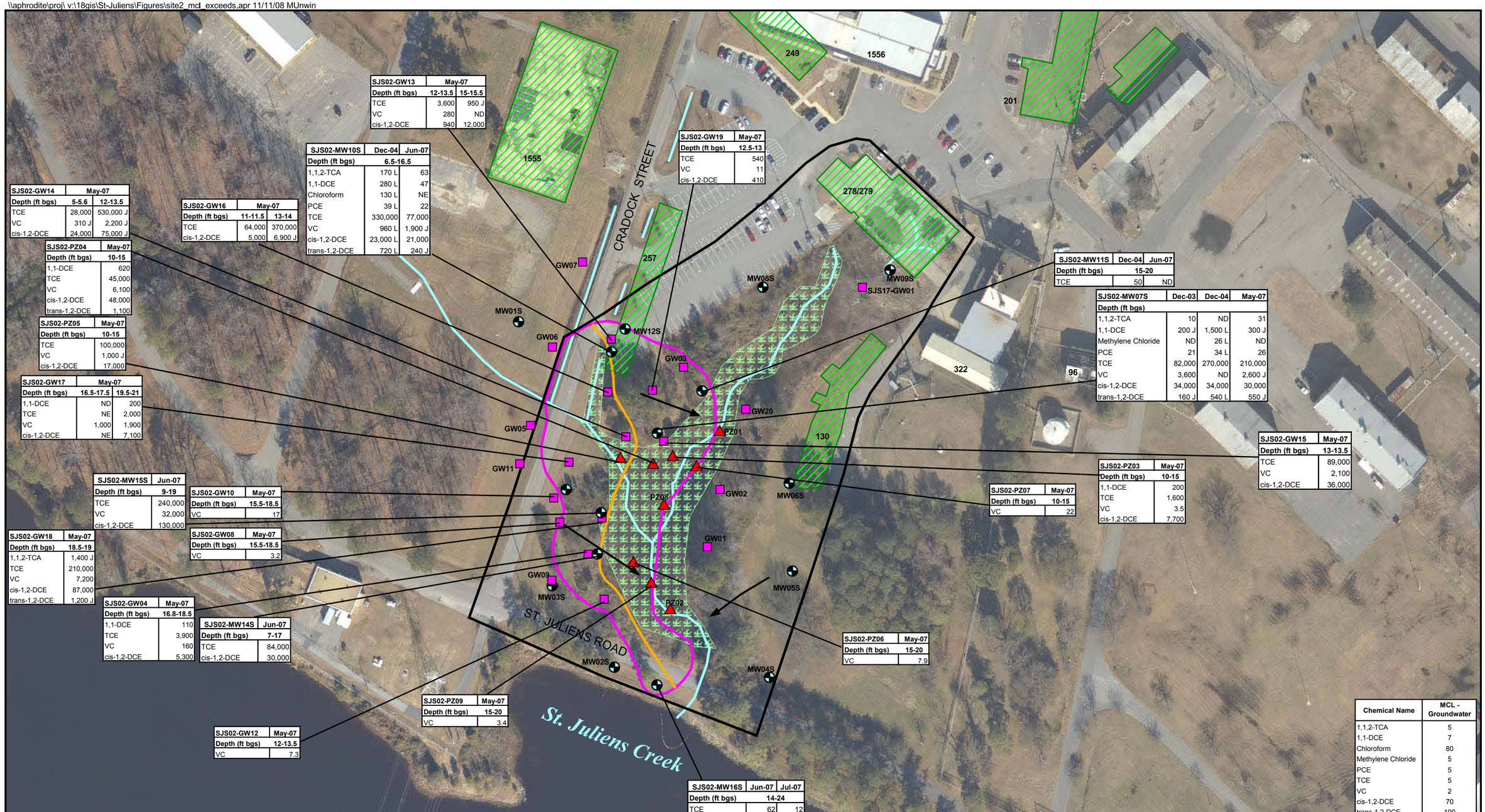

SJS02-GW13	May-07	
Depth (ft bgs)	12-13.5	15-15.5
TCE	3,600	950 J
VC	280	ND
cis-1,2-DCE	940	12,000

SJS02-MW10S	Dec-04	Jun-07
Depth (ft bgs)	6.5-16.5	
1,1,2-TCA	170 L	63
1,1-DCE	280 L	47
Chloroform	130 L	NE
PCE	39 L	22
TCE	330,000	77,000
VC	960 L	1,900 J
cis-1,2-DCE	23,000 L	21,000
trans-1,2-DCE	720 L	240 J

SJS02-GW19	May-07
Depth (ft bgs)	12.5-13
TCE	540
VC	11
cis-1,2-DCE	410

SJS02-GW14	May-07	
Depth (ft bgs)	5-5.6	12-13.5
TCE	28,000	530,000 J
VC	310 J	2,200 J
cis-1,2-DCE	24,000	75,000 J

SJS02-GW16	May-07	
Depth (ft bgs)	11-11.5	13-14
TCE	64,000	370,000
cis-1,2-DCE	5,000	6,900 J

SJS02-PZ04	May-07
Depth (ft bgs)	10-15
1,1-DCE	620
TCE	45,000
VC	6,100
cis-1,2-DCE	48,000
trans-1,2-DCE	1,100

SJS02-PZ05	May-07
Depth (ft bgs)	10-15
TCE	100,000
VC	1,000 J
cis-1,2-DCE	17,000

SJS02-GW17	May-07	
Depth (ft bgs)	16.5-17.5	19.5-21
1,1-DCE	ND	200
TCE	NE	2,000
VC	1,000	1,900
cis-1,2-DCE	NE	7,100

SJS02-MW11S	Dec-04	Jun-07
Depth (ft bgs)	15-20	
TCE	50	ND

SJS02-MW07S	Dec-03	Dec-04	May-07
Depth (ft bgs)			
1,1,2-TCA	10	ND	31
1,1-DCE	200 J	1,500 L	300 J
Methylene Chloride	ND	26 L	ND
PCE	21	34 L	26
TCE	82,000	270,000	210,000
VC	3,600	ND	2,600 J
cis-1,2-DCE	34,000	34,000	30,000
trans-1,2-DCE	160 J	540 L	550 J

SJS02-GW15	May-07
Depth (ft bgs)	13-13.5
TCE	89,000
VC	2,100
cis-1,2-DCE	36,000

SJS02-PZ03	May-07
Depth (ft bgs)	10-15
1,1-DCE	200
TCE	1,600
VC	3.5
cis-1,2-DCE	7,700

SJS02-PZ07	May-07
Depth (ft bgs)	10-15
VC	22

SJS02-MW15S	Jun-07
Depth (ft bgs)	9-19
TCE	240,000
VC	32,000
cis-1,2-DCE	130,000

SJS02-GW10	May-07
Depth (ft bgs)	15.5-18.5
VC	17

SJS02-GW08	May-07
Depth (ft bgs)	15.5-18.5
VC	3.2

SJS02-GW18	May-07
Depth (ft bgs)	18.5-19
1,1,2-TCA	1,400 J
TCE	210,000
VC	7,200
cis-1,2-DCE	87,000
trans-1,2-DCE	1,200 J

SJS02-GW04	May-07
Depth (ft bgs)	16.8-18.5
1,1-DCE	110
TCE	3,900
VC	160
cis-1,2-DCE	5,300

SJS02-MW14S	Jun-07
Depth (ft bgs)	7-17
TCE	84,000
cis-1,2-DCE	30,000

SJS02-PZ06	May-07
Depth (ft bgs)	15-20
VC	7.9

SJS02-PZ09	May-07
Depth (ft bgs)	15-20
VC	3.4

SJS02-GW12	May-07
Depth (ft bgs)	12-13.5
VC	7.3

SJS02-MW16S	Jun-07	Jul-07
Depth (ft bgs)	14-24	
TCE	62	12

Chemical Name	MCL - Groundwater
1,1,2-TCA	5
1,1-DCE	7
Chloroform	80
Methylene Chloride	5
PCE	5
TCE	5
VC	2
cis-1,2-DCE	70
trans-1,2-DCE	100

LEGEND

- Site Boundary
- Drainage
- Demolished Buildings
- Wetland
- TCE Plume Boundary
- TCE Plume Centerline
- Shallow Monitoring Well Locations
- Groundwater Sampling Locations
- Piezometer Sampling Locations
- Estimated Groundwater Flow Direction

Notes:
NE - Screening criteria not exceeded
ND - Analyte not detected
J - Reported value is estimated
Sample Locations without text boxes have no exceedances
Concentrations reported in µg/L
DCE - Dichloroethene
PCE - Tetrachloroethene
TCA - Trichloroethane
TCE - Trichloroethene
VC - Vinyl chloride

N

0 120 240 Feet

Figure 5-14
Shallow Groundwater Exceedances
VOCs
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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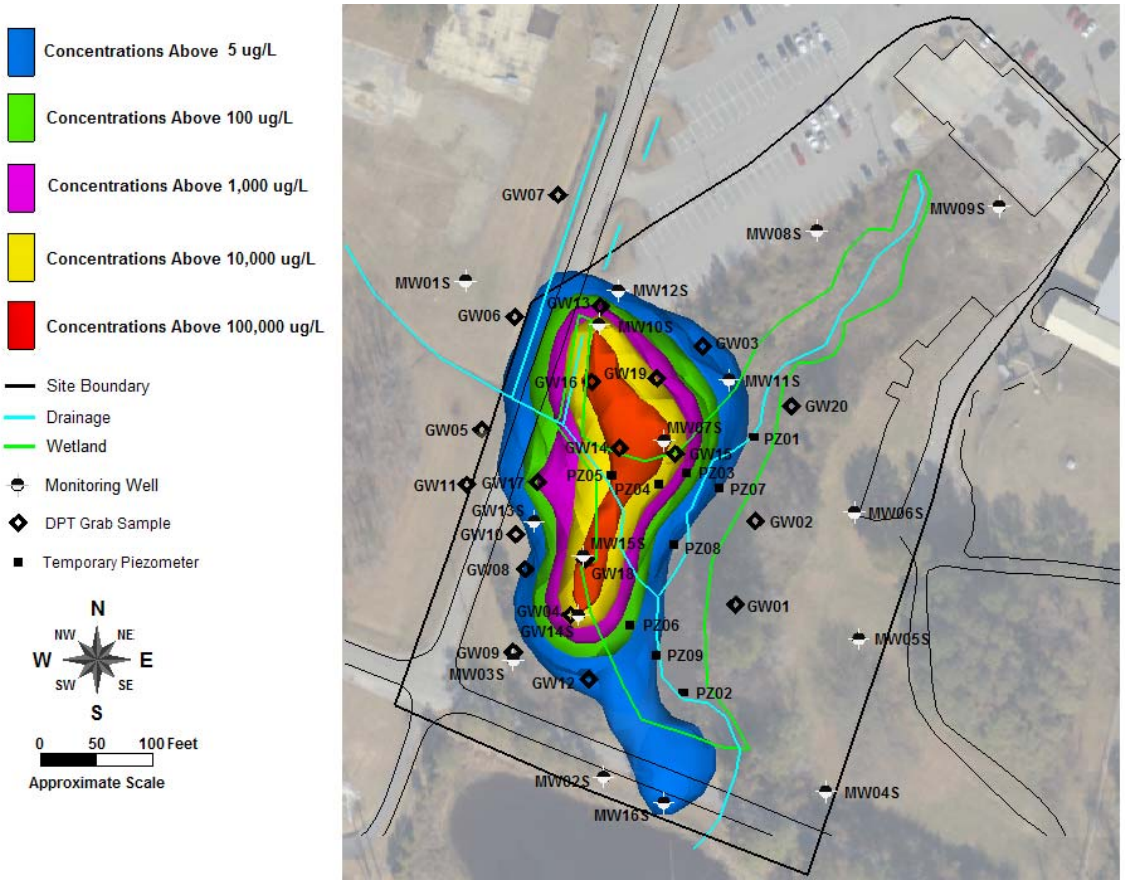
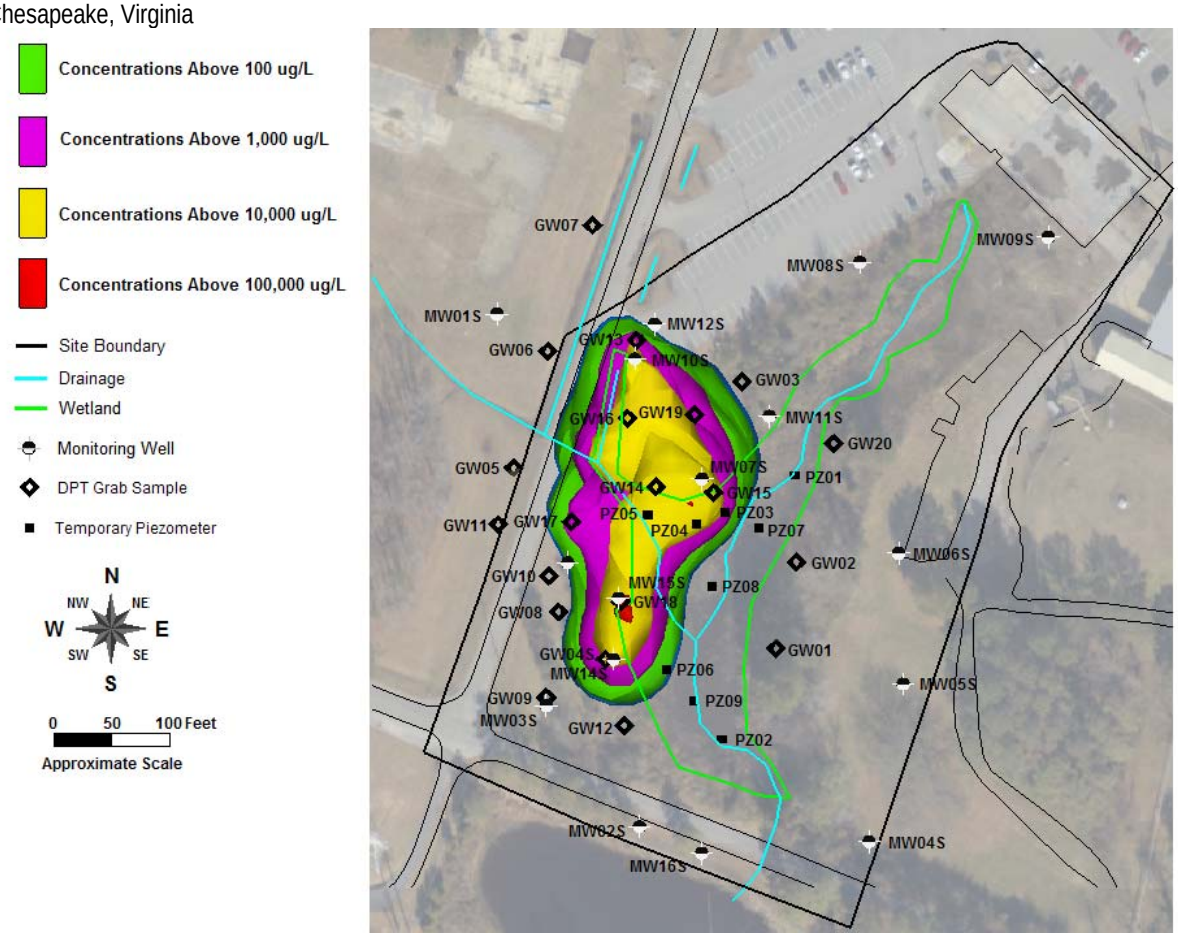
FIGURE 5-15
Horizontal Extent of TCE in Groundwater
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia



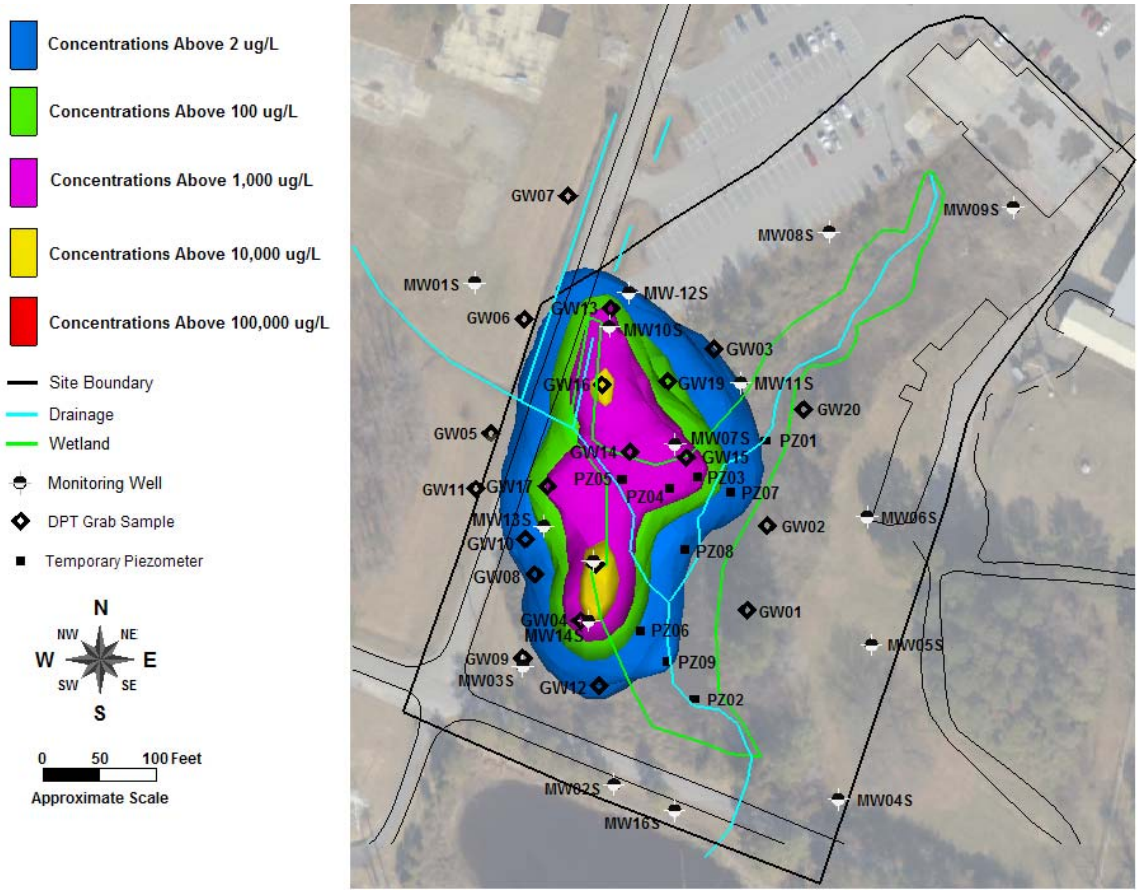
Note: The most recent analytical data from the sample locations shown were used to define the plume extent.

FIGURE 5-16
Horizontal Extent of cis-1,2-DCE in Groundwater
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia



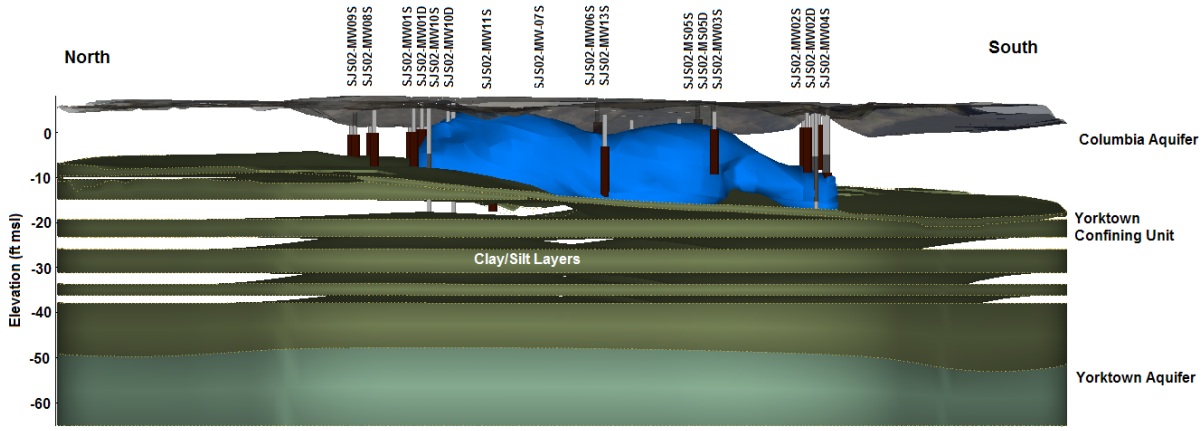
Note: The most recent analytical data from the sample locations shown were used to define the plume extent.

FIGURE 5-17
Horizontal Extent of Vinyl Chloride in Groundwater
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia



Note: The most recent analytical data from the sample locations shown were used to define the plume extent, with the following exceptions, where the reporting limit for the most recent round was above the MCL: Monitoring wells SJS02-MW11S and -MW14S and at DPT grab samples SJS02-GW13 and -GW16. To interpolate the plume extent, the previous 2004 VC concentration at SJS02-MW11S was used. Since there was no historic data for the other locations, the reporting limit was used in the interpolation.

FIGURE 5-18
Vertical Extent of TCE in Groundwater
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia



Note: The most recent analytical data from the sample locations shown were used to define the plume extent. TCE concentrations at monitoring well SJS02-MW11S in June 2007 were reported as 10 U µg/L, above the MCL of 5 µg/L. Since previous TCE concentrations at this well were reported above 10 µg/L, a value of 10 µg/L was used in the plume interpolation.

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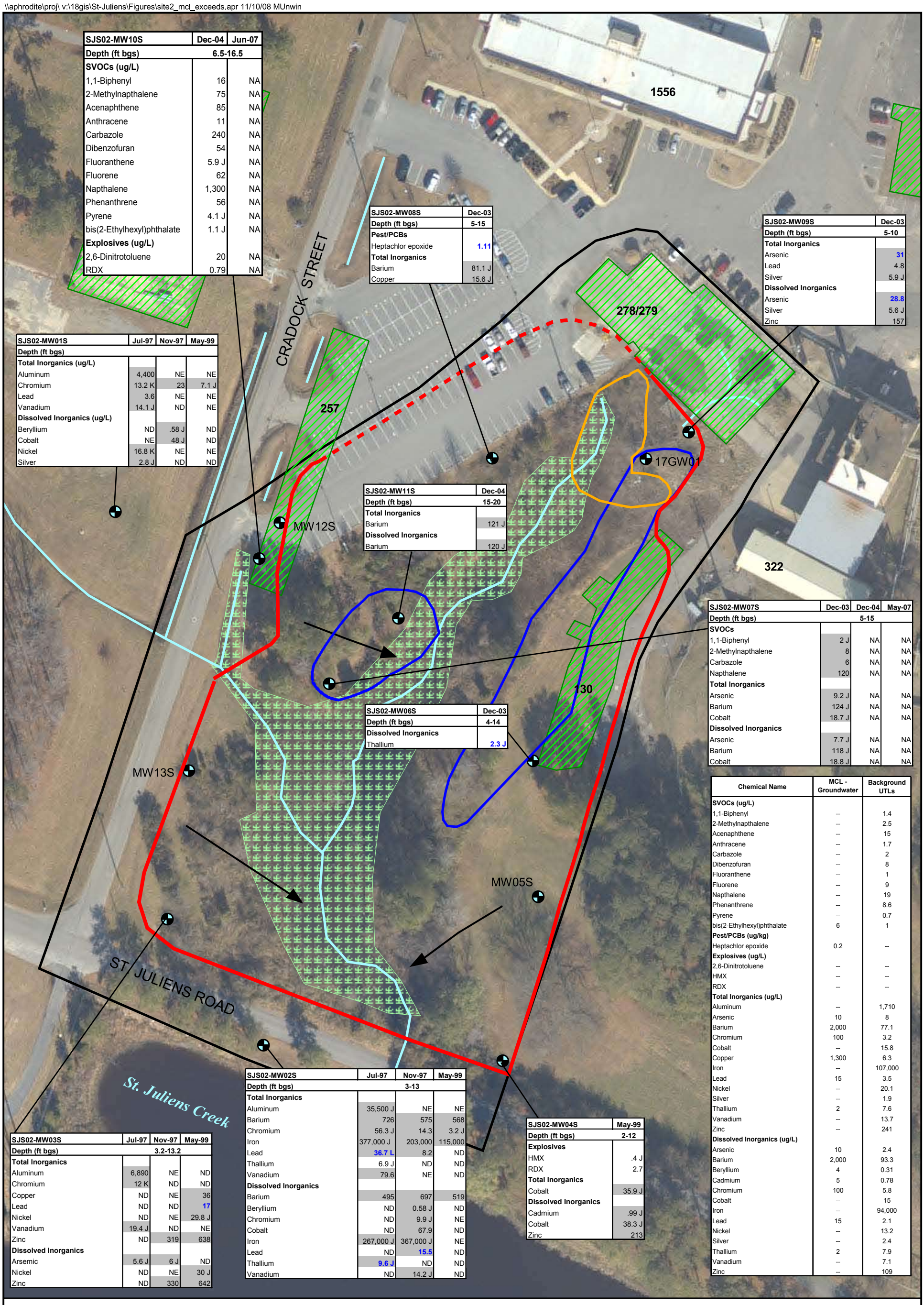

SJS02-MW10S	Dec-04	Jun-07
Depth (ft bgs)	6.5-16.5	
SVOCs (ug/L)		
1,1-Biphenyl	16	NA
2-Methylnapthalene	75	NA
Acenaphthene	85	NA
Anthracene	11	NA
Carbazole	240	NA
Dibenzofuran	54	NA
Fluoranthene	5.9 J	NA
Fluorene	62	NA
Napthalene	1,300	NA
Phenanthrene	56	NA
Pyrene	4.1 J	NA
bis(2-Ethylhexyl)phthalate	1.1 J	NA
Explosives (ug/L)		
2,6-Dinitrotoluene	20	NA
RDX	0.79	NA

SJS02-MW08S	Dec-03
Depth (ft bgs)	5-15
Pest/PCBs	
Heptachlor epoxide	1.11
Total Inorganics	
Barium	81.1 J
Copper	15.6 J

SJS02-MW09S	Dec-03
Depth (ft bgs)	5-10
Total Inorganics	
Arsenic	31
Lead	4.8
Silver	5.9 J
Dissolved Inorganics	
Arsenic	28.8
Silver	5.6 J
Zinc	157

SJS02-MW01S	Jul-97	Nov-97	May-99
Depth (ft bgs)			
Total Inorganics (ug/L)			
Aluminum	4,400	NE	NE
Chromium	13.2 K	23	7.1 J
Lead	3.6	NE	NE
Vanadium	14.1 J	ND	NE
Dissolved Inorganics (ug/L)			
Beryllium	ND	.58 J	ND
Cobalt	NE	48 J	ND
Nickel	16.8 K	NE	NE
Silver	2.8 J	ND	ND

SJS02-MW11S	Dec-04
Depth (ft bgs)	15-20
Total Inorganics	
Barium	121 J
Dissolved Inorganics	
Barium	120 J

SJS02-MW07S	Dec-03	Dec-04	May-07
Depth (ft bgs)		5-15	
SVOCs			
1,1-Biphenyl	2 J	NA	NA
2-Methylnapthalene	8	NA	NA
Carbazole	6	NA	NA
Napthalene	120	NA	NA
Total Inorganics			
Arsenic	9.2 J	NA	NA
Barium	124 J	NA	NA
Cobalt	18.7 J	NA	NA
Dissolved Inorganics			
Arsenic	7.7 J	NA	NA
Barium	118 J	NA	NA
Cobalt	18.8 J	NA	NA

SJS02-MW06S	Dec-03
Depth (ft bgs)	4-14
Dissolved Inorganics	
Thallium	2.3 J

Chemical Name	MCL - Groundwater	Background UTLs
SVOCs (ug/L)		
1,1-Biphenyl	--	1.4
2-Methylnapthalene	--	2.5
Acenaphthene	--	15
Anthracene	--	1.7
Carbazole	--	2
Dibenzofuran	--	8
Fluoranthene	--	1
Fluorene	--	9
Napthalene	--	19
Phenanthrene	--	8.6
Pyrene	--	0.7
bis(2-Ethylhexyl)phthalate	6	1
Pest/PCBs (ug/kg)		
Heptachlor epoxide	0.2	--
Explosives (ug/L)		
2,6-Dinitrotoluene	--	--
HMX	--	--
RDX	--	--
Total Inorganics (ug/L)		
Aluminum	--	1,710
Arsenic	10	8
Barium	2,000	77.1
Chromium	100	3.2
Cobalt	--	15.8
Copper	1,300	6.3
Iron	--	107,000
Lead	15	3.5
Nickel	--	20.1
Silver	--	1.9
Thallium	2	7.6
Vanadium	--	13.7
Zinc	--	241
Dissolved Inorganics (ug/L)		
Arsenic	10	2.4
Barium	2,000	93.3
Beryllium	4	0.31
Cadmium	5	0.78
Chromium	100	5.8
Cobalt	--	15
Iron	--	94,000
Lead	15	2.1
Nickel	--	13.2
Silver	--	2.4
Thallium	2	7.9
Vanadium	--	7.1
Zinc	--	109

SJS02-MW03S	Jul-97	Nov-97	May-99
Depth (ft bgs)		3.2-13.2	
Total Inorganics			
Aluminum	6,890	NE	ND
Chromium	12 K	ND	ND
Copper	ND	NE	36
Lead	ND	ND	17
Nickel	ND	NE	29.8 J
Vanadium	19.4 J	ND	NE
Zinc	ND	319	638
Dissolved Inorganics			
Arsemic	5.6 J	6 J	ND
Nickel	ND	NE	30 J
Zinc	ND	330	642

SJS02-MW02S	Jul-97	Nov-97	May-99
Depth (ft bgs)		3-13	
Total Inorganics			
Aluminum	35,500 J	NE	NE
Barium	726	575	568
Chromium	56.3 J	14.3	3.2 J
Iron	377,000 J	203,000	115,000
Lead	36.7 L	8.2	ND
Thallium	6.9 J	ND	ND
Vanadium	79.6	NE	ND
Dissolved Inorganics			
Barium	495	697	519
Beryllium	ND	0.58 J	ND
Chromium	ND	9.9 J	NE
Cobalt	ND	67.9	ND
Iron	267,000 J	367,000 J	NE
Lead	ND	15.5	ND
Thallium	9.6 J	ND	ND
Vanadium	ND	14.2 J	ND

SJS02-MW04S	May-99
Depth (ft bgs)	2-12
Explosives	
HMX	.4 J
RDX	2.7
Total Inorganics	
Cobalt	35.9 J
Dissolved Inorganics	
Cadmium	.99 J
Cobalt	38.3 J
Zinc	213

LEGEND

- Site Boundary
- Drainage
- Demolished Buildings
- Wetland
- Shallow Monitoring Well Locations
- Estimated Groundwater Flow Direction
- Extent of Blast Grit (ABM)
- Extent of Petroleum Impact
- Extent of Waste (3.9 acres)

Notes:
-- No criteria established
NE - Screening criteria not exceeded
ND - Not detected
J - Reported value is estimated
K - Reported value is biased high
L - Reported value is biased low
Sample locations without text boxes have no exceedances.
Shading indicates background UTL exceedance
Bold blue text indicates MCL exceedance
No explosives screening criteria exist; therefore all detections are shown.
Concentrations reported in µg/L

N

0 45 90 Feet

Figure 5-19
Shallow Groundwater Exceedances
SVOCs, Pest/PCBs, Explosives, and Inorganics
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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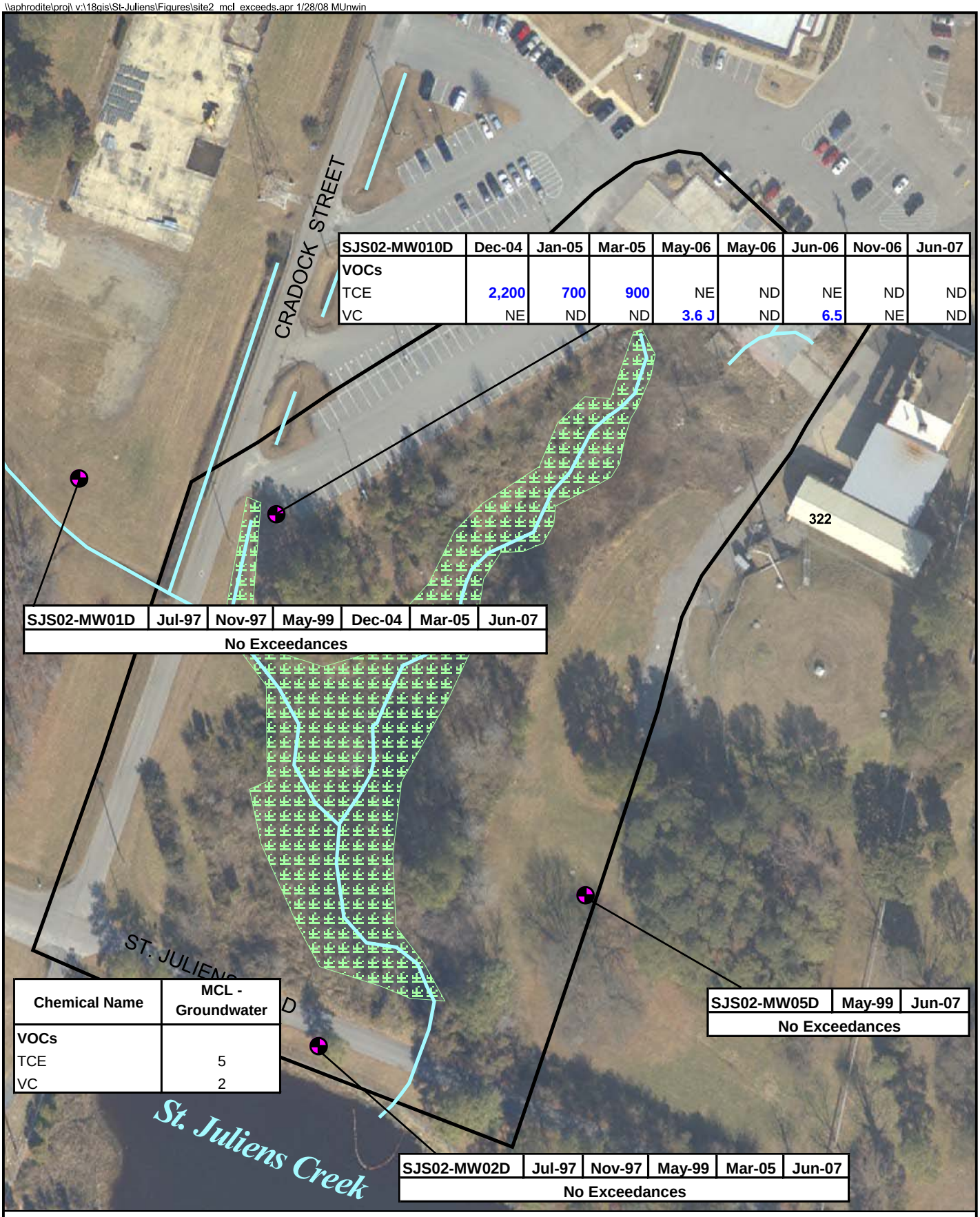

SJS02-MW010D	Dec-04	Jan-05	Mar-05	May-06	May-06	Jun-06	Nov-06	Jun-07
VOCs								
TCE	2,200	700	900	NE	ND	NE	ND	ND
VC	NE	ND	ND	3.6 J	ND	6.5	NE	ND

SJS02-MW01D	Jul-97	Nov-97	May-99	Dec-04	Mar-05	Jun-07
No Exceedances						

SJS02-MW05D	May-99	Jun-07
No Exceedances		

SJS02-MW02D	Jul-97	Nov-97	May-99	Mar-05	Jun-07
No Exceedances					

Chemical Name	MCL - Groundwater
VOCs	
TCE	5
VC	2

LEGEND

- Site Boundary
- Drainage
- Wetland
- Deep Monitoring Well Locations

Concentrations reported in µg/L
NE - Screening criteria not exceeded
ND - Not detected
J - Reported value is estimated
TCE - Trichloroethene
VC - Vinyl chloride

N

0 50 100 Feet

Figure 5-20
Deep Groundwater Exceedances
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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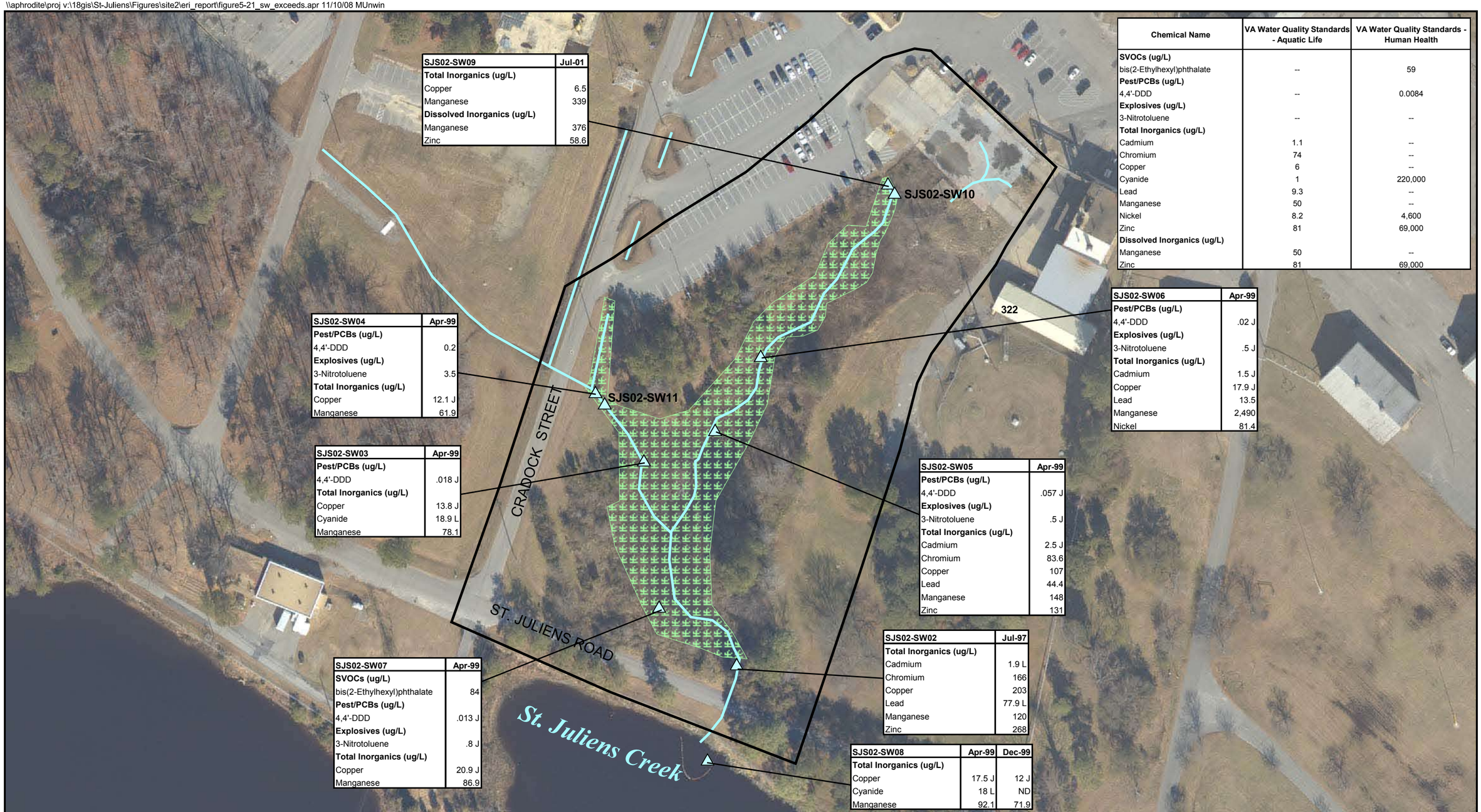

SJS02-SW09	Jul-01
Total Inorganics (ug/L)	
Copper	6.5
Manganese	339
Dissolved Inorganics (ug/L)	
Manganese	376
Zinc	58.6

SJS02-SW04	Apr-99
Pest/PCBs (ug/L)	
4,4'-DDD	0.2
Explosives (ug/L)	
3-Nitrotoluene	3.5
Total Inorganics (ug/L)	
Copper	12.1 J
Manganese	61.9

SJS02-SW03	Apr-99
Pest/PCBs (ug/L)	
4,4'-DDD	.018 J
Total Inorganics (ug/L)	
Copper	13.8 J
Cyanide	18.9 L
Manganese	78.1

SJS02-SW07	Apr-99
SVOCs (ug/L)	
bis(2-Ethylhexyl)phthalate	84
Pest/PCBs (ug/L)	
4,4'-DDD	.013 J
Explosives (ug/L)	
3-Nitrotoluene	.8 J
Total Inorganics (ug/L)	
Copper	20.9 J
Manganese	86.9

SJS02-SW06	Apr-99
Pest/PCBs (ug/L)	
4,4'-DDD	.02 J
Explosives (ug/L)	
3-Nitrotoluene	.5 J
Total Inorganics (ug/L)	
Cadmium	1.5 J
Copper	17.9 J
Lead	13.5
Manganese	2,490
Nickel	81.4

SJS02-SW05	Apr-99
Pest/PCBs (ug/L)	
4,4'-DDD	.057 J
Explosives (ug/L)	
3-Nitrotoluene	.5 J
Total Inorganics (ug/L)	
Cadmium	2.5 J
Chromium	83.6
Copper	107
Lead	44.4
Manganese	148
Zinc	131

SJS02-SW02	Jul-97
Total Inorganics (ug/L)	
Cadmium	1.9 L
Chromium	166
Copper	203
Lead	77.9 L
Manganese	120
Zinc	268

SJS02-SW08	Apr-99	Dec-99
Total Inorganics (ug/L)		
Copper	17.5 J	12 J
Cyanide	18 L	ND
Manganese	92.1	71.9

Chemical Name	VA Water Quality Standards - Aquatic Life	VA Water Quality Standards - Human Health
SVOCs (ug/L)		
bis(2-Ethylhexyl)phthalate	--	59
Pest/PCBs (ug/L)		
4,4'-DDD	--	0.0084
Explosives (ug/L)		
3-Nitrotoluene	--	--
Total Inorganics (ug/L)		
Cadmium	1.1	--
Chromium	74	--
Copper	6	--
Cyanide	1	220,000
Lead	9.3	--
Manganese	50	--
Nickel	8.2	4,600
Zinc	81	69,000
Dissolved Inorganics (ug/L)		
Manganese	50	--
Zinc	81	69,000

LEGEND

- Site Boundary
- Surface Water Sample Locations
- Drainage
- Wetland

Notes:
– No criteria established
J - Reported value is estimated
L - Reported value may be biased low
ND - Not detected
Sample locations without text boxes have no exceedances.
No explosives criteria exist; therefore all detections are shown.
Shading indicates VA Water Quality Standards-Aquatic Life exceedance
Bold blue text indicates VA Water Quality Standards-Human Health exceedance
Concentrations reported in µg/L

N

0 100 200 Feet

Figure 5-21
Surface Water Exceedances
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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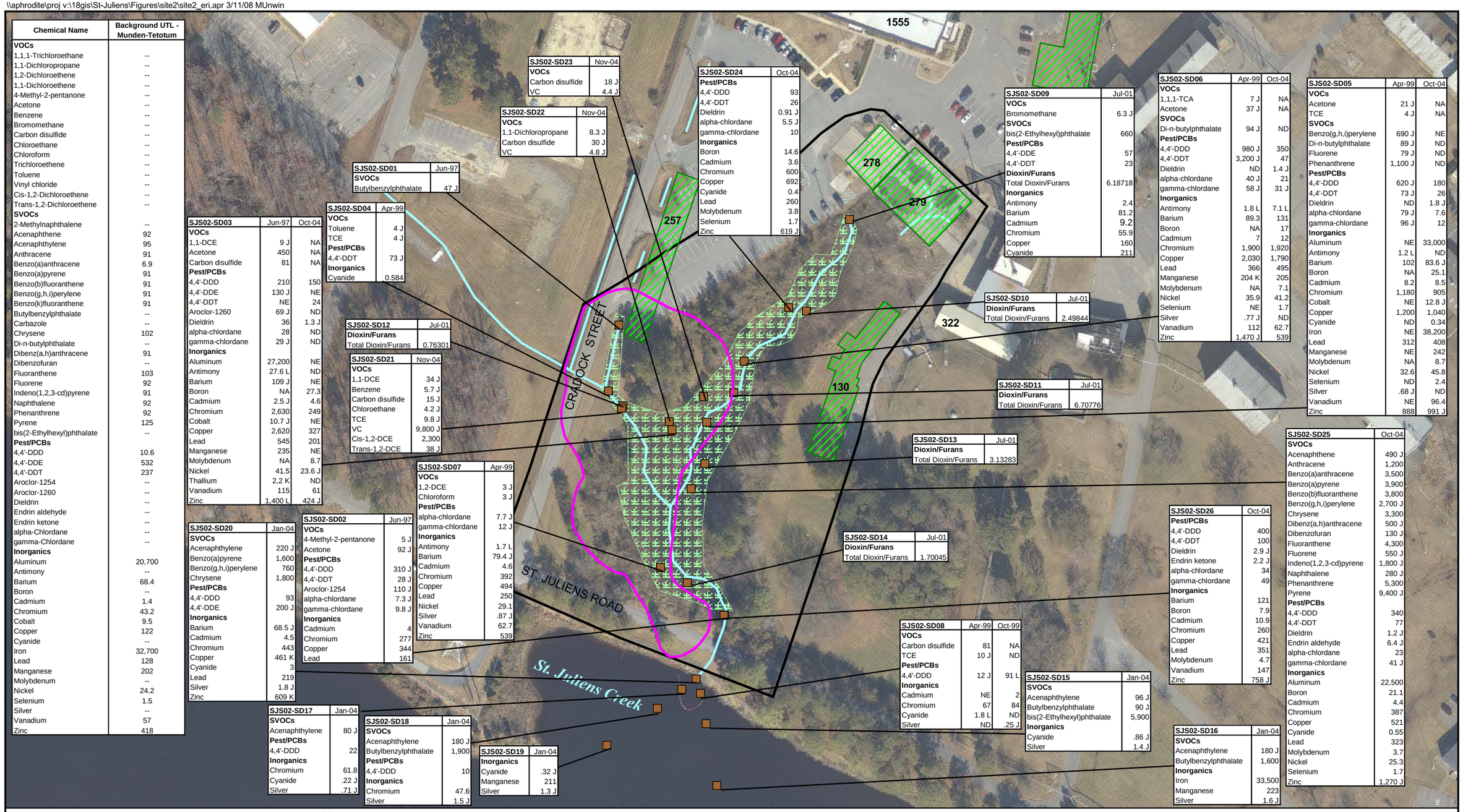

Chemical Name	Background UTL - Munden-Tetotum
VOCs	
1,1,1-Trichloroethane	--
1,1-Dichloropropane	--
1,2-Dichloroethene	--
1,1-Dichloroethene	--
4-Methyl-2-pentanone	--
Acetone	--
Benzene	--
Bromomethane	--
Carbon disulfide	--
Chloroethane	--
Chloroform	--
Trichloroethene	--
Toluene	--
Vinyl chloride	--
Cis-1,2-Dichloroethene	--
Trans-1,2-Dichloroethene	--
SVOCs	
2-Methylnaphthalene	--
Acenaphthene	92
Acenaphthylene	95
Anthracene	91
Benzo(a)anthracene	6.9
Benzo(a)pyrene	91
Benzo(b)fluoranthene	91
Benzo(g,h,i)perylene	91
Benzo(k)fluoranthene	91
Butylbenzylphthalate	--
Carbazole	--
Chrysene	102
Di-n-butylphthalate	--
Dibenz(a,h)anthracene	91
Dibenzofuran	--
Fluoranthene	103
Fluorene	92
Indeno(1,2,3-cd)pyrene	91
Naphthalene	92
Phenanthrene	92
Pyrene	125
bis(2-Ethylhexyl)phthalate	--
Pest/PCBs	
4,4'-DDD	10.6
4,4'-DDE	532
4,4'-DDT	237
Aroclor-1254	--
Aroclor-1260	--
Dieldrin	--
Endrin aldehyde	--
Endrin ketone	--
alpha-Chlordane	--
gamma-Chlordane	--
Inorganics	
Aluminum	20,700
Antimony	--
Barium	68.4
Boron	--
Cadmium	1.4
Chromium	43.2
Cobalt	9.5
Copper	122
Cyanide	--
Iron	32,700
Lead	128
Manganese	202
Molybdenum	--
Nickel	24.2
Selenium	1.5
Silver	--
Vanadium	57
Zinc	418

SJS02-SD23	Nov-04
VOCs	
Carbon disulfide	18 J
VC	4.4 J

SJS02-SD22	Nov-04
VOCs	
1,1-Dichloropropane	8.3 J
Carbon disulfide	30 J
VC	4.8 J

SJS02-SD01	Jun-97
SVOCs	
Butylbenzylphthalate	47 J

SJS02-SD04	Apr-99
VOCs	
Toluene	4 J
TCE	4 J
Pest/PCBs	
4,4'-DDT	73 J
Inorganics	
Cyanide	0.584

SJS02-SD03	Jun-97	Oct-04
VOCs		
1,1-DCE	9 J	NA
Acetone	450	NA
Carbon disulfide	81	NA
Pest/PCBs		
4,4'-DDD	210	150
4,4'-DDE	130 J	NE
4,4'-DDT	NE	24
Aroclor-1260	69 J	ND
Dieldrin	36	1.3 J
alpha-chlordane	28	ND
gamma-chlordane	29 J	ND
Inorganics		
Aluminum	27,200	NE
Antimony	27.6 L	ND
Barium	109 J	NE
Boron	NA	27.3
Cadmium	2.5 J	4.6
Chromium	2,630	249
Cobalt	10.7 J	NE
Copper	2,620	327
Lead	545	201
Manganese	235	NE
Molybdenum	NA	8.7
Nickel	41.5	23.6 J
Thallium	2.2 K	ND
Vanadium	115	61
Zinc	1,400 L	424 J

SJS02-SD12	Jul-01
Dioxin/Furans	
Total Dioxin/Furans	0.76301

SJS02-SD21	Nov-04
VOCs	
1,1-DCE	34 J
Benzene	5.7 J
Carbon disulfide	15 J
Chloroethane	4.2 J
TCE	9.8 J
VC	9,800 J
Cis-1,2-DCE	2,300
Trans-1,2-DCE	38 J

SJS02-SD07	Apr-99
VOCs	
1,2-DCE	3 J
Chloroform	3 J
Pest/PCBs	
alpha-chlordane	7.7 J
gamma-chlordane	12 J
Inorganics	
Antimony	1.7 L
Barium	79.4 J
Cadmium	4.6
Chromium	392
Copper	494
Lead	250
Nickel	29.1
Silver	.87 J
Vanadium	62.7
Zinc	539

SJS02-SD20	Jan-04
SVOCs	
Acenaphthylene	220 J
Benzo(a)pyrene	1,600
Benzo(g,h,i)perylene	760
Chrysene	1,800
Pest/PCBs	
4,4'-DDD	93
4,4'-DDE	200 J
Inorganics	
Barium	68.5 J
Cadmium	4.5
Chromium	443
Copper	461 K
Cyanide	3
Lead	219
Silver	1.8 J
Zinc	609 K

SJS02-SD02	Jun-97
VOCs	
4-Methyl-2-pentanone	5 J
Acetone	92 J
Pest/PCBs	
4,4'-DDD	310 J
4,4'-DDT	28 J
Aroclor-1254	110 J
alpha-chlordane	7.3 J
gamma-chlordane	9.8 J
Inorganics	
Cadmium	4
Chromium	277
Copper	344
Lead	161

SJS02-SD17	Jan-04
SVOCs	
Acenaphthylene	80 J
Pest/PCBs	
4,4'-DDD	22
Inorganics	
Chromium	61.8
Cyanide	.22 J
Silver	.71 J

SJS02-SD18	Jan-04
SVOCs	
Acenaphthylene	180 J
Butylbenzylphthalate	1,900
Pest/PCBs	
4,4'-DDD	10
Inorganics	
Chromium	47.6
Silver	1.5 J

SJS02-SD19	Jan-04
Inorganics	
Cyanide	.32 J
Manganese	211
Silver	1.3 J

SJS02-SD24	Oct-04
Pest/PCBs	
4,4'-DDD	93
4,4'-DDT	26
Dieldrin	0.91 J
alpha-chlordane	5.5 J
gamma-chlordane	10
Inorganics	
Boron	14.6
Cadmium	3.6
Chromium	600
Copper	692
Cyanide	0.4
Lead	260
Molybdenum	3.8
Selenium	1.7
Zinc	619 J

SJS02-SD09	Jul-01
VOCs	
Bromomethane	6.3 J
SVOCs	
bis(2-Ethylhexyl)phthalate	660
Pest/PCBs	
4,4'-DDE	57
4,4'-DDT	23
Dioxin/Furans	
Total Dioxin/Furans	6.18718
Inorganics	
Antimony	2.4
Barium	81.2
Cadmium	9.2
Chromium	55.9
Copper	160
Cyanide	211

SJS02-SD10	Jul-01
Dioxin/Furans	
Total Dioxin/Furans	2.49844

SJS02-SD11	Jul-01
Dioxin/Furans	
Total Dioxin/Furans	6.70776

SJS02-SD13	Jul-01
Dioxin/Furans	
Total Dioxin/Furans	3.13283

SJS02-SD14	Jul-01
Dioxin/Furans	
Total Dioxin/Furans	1.70045

SJS02-SD08	Apr-99	Oct-99
VOCs		
Carbon disulfide	81	NA
TCE	10 J	ND
Pest/PCBs		
4,4'-DDD	12 J	91 L
Inorganics		
Cadmium	NE	2
Chromium	67	84
Cyanide	1.8 L	ND
Silver	ND	.25 J

SJS02-SD15	Jan-04
SVOCs	
Acenaphthylene	96 J
Butylbenzylphthalate	90 J
bis(2-Ethylhexyl)phthalate	5,900
Inorganics	
Cyanide	.86 J
Silver	1.4 J

SJS02-SD06	Apr-99	Oct-04
VOCs		
1,1,1-TCA	7 J	NA
Acetone	37 J	NA
SVOCs		
Di-n-butylphthalate	94 J	ND
Pest/PCBs		
4,4'-DDD	980 J	350
4,4'-DDT	3,200 J	47
Dieldrin	ND	1.4 J
alpha-chlordane	40 J	21
gamma-chlordane	58 J	31 J
Inorganics		
Antimony	1.8 L	7.1 L
Barium	89.3	131
Boron	NA	17
Cadmium	7	12
Chromium	1,900	1,920
Copper	2,030	1,790
Lead	366	495
Manganese	204 K	205
Molybdenum	NA	7.1
Nickel	35.9	41.2
Selenium	NE	1.7
Silver	.77 J	ND
Vanadium	112	62.7
Zinc	1,470 J	539

SJS02-SD26	Oct-04
Pest/PCBs	
4,4'-DDD	400
4,4'-DDT	100
Dieldrin	2.9 J
Endrin ketone	2.2 J
alpha-chlordane	34
gamma-chlordane	49
Inorganics	
Barium	121
Boron	7.9
Cadmium	10.9
Chromium	260
Copper	421
Lead	351
Molybdenum	4.7
Vanadium	147
Zinc	758 J

SJS02-SD16	Jan-04
SVOCs	
Acenaphthylene	180 J
Butylbenzylphthalate	1,600
Inorganics	
Iron	33,500
Manganese	223
Silver	1.6 J

SJS02-SD05	Apr-99	Oct-04
VOCs		
Acetone	21 J	NA
TCE	4 J	NA
SVOCs		
Benzo(g,h,i)perylene	690 J	NE
Di-n-butylphthalate	89 J	ND
Fluorene	79 J	ND
Phenanthrene	1,100 J	ND
Pest/PCBs		
4,4'-DDD	620 J	180
4,4'-DDT	73 J	26
Dieldrin	ND	1.8 J
alpha-chlordane	79 J	7.6
gamma-chlordane	96 J	12
Inorganics		
Aluminum	NE	33,000
Antimony	1.2 L	ND
Barium	102	83.6 J
Boron	NA	25.1
Cadmium	8.2	8.5
Chromium	1,180	905
Cobalt	NE	12.8 J
Copper	1,200	1,040
Cyanide	ND	0.34
Iron	NE	38,200
Lead	312	408
Manganese	NE	242
Molybdenum	NA	8.7
Nickel	32.6	45.8
Selenium	ND	2.4
Silver	.68 J	ND
Vanadium	NE	96.4
Zinc	888	991 J

SJS02-SD25	Oct-04
SVOCs	
Acenaphthene	490 J
Anthracene	1,200
Benzo(a)anthracene	3,500
Benzo(a)pyrene	3,900
Benzo(b)fluoranthene	3,800
Benzo(g,h,i)perylene	2,700 J
Chrysene	3,300
Dibenz(a,h)anthracene	500 J
Dibenzofuran	130 J
Fluoranthene	4,300
Fluorene	550 J
Indeno(1,2,3-cd)pyrene	1,800 J
Naphthalene	280 J
Phenanthrene	5,300
Pyrene	9,400 J
Pest/PCBs	
4,4'-DDD	340
4,4'-DDT	77
Dieldrin	1.2 J
Endrin aldehyde	6.4 J
alpha-chlordane	23
gamma-chlordane	41 J
Inorganics	
Aluminum	22,500
Boron	21.1
Cadmium	4.4
Chromium	387
Copper	521
Cyanide	0.55
Lead	323
Molybdenum	3.7
Nickel	25.3
Selenium	1.7
Zinc	1,270 J

LEGEND

- Site Boundary
- TCE Plume Boundary
- Sediment Sample Locations
- Drainage
- Wetland
- Demolished Buildings

Notes:
J- Reported value is estimated
K- Reported value is biased high
L- Reported value is biased low
NA- Analyte not analyzed
ND- Analyte not decteted
NE- Screening criteria not exceeded
DCE- Dichloroethene
TCE- Trichloroethene
VC- Vinyl Chloride
All concentrations reported in µg/kg, except inorganics (mg/kg).

N

0 120 240 Feet

Figure 5-22
Sediment Exceedances
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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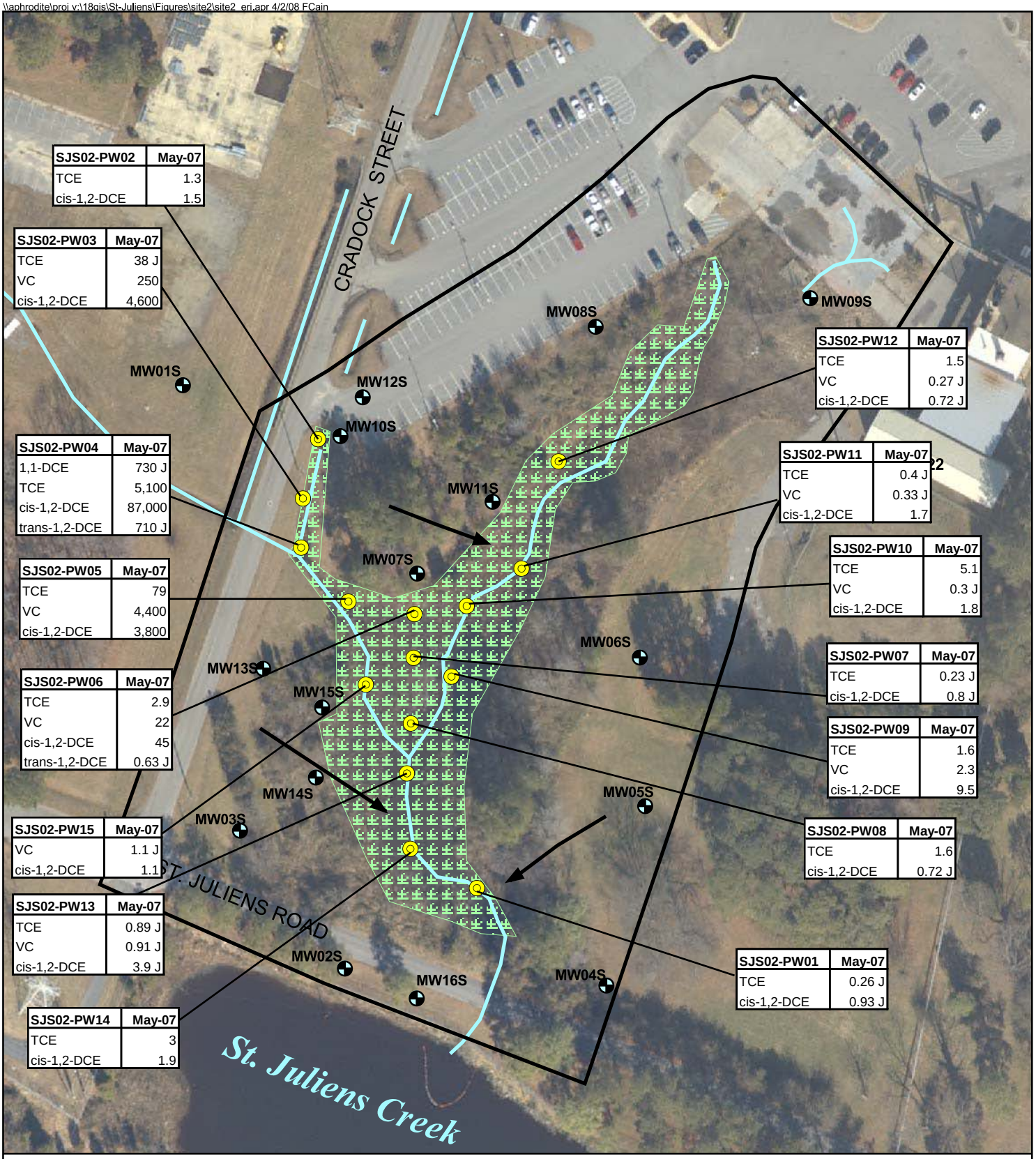

LEGEND

- Site Boundary
- Drainage
- Wetland
- Groundwater Flow Lines
- Shallow Monitoring Well Locations
- Sediment Diffusion Sampler Locations

Notes:
J - Reported value is estimated
DCE - Dichloroethene
TCE - Trichloroethene
VC - Vinyl chloride
Concentrations reported in µg/L

N

0 100 200 Feet

Figure 5-23
Pore Water VOC Detections
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 6

Contaminant Fate and Transport

This section discusses the fate and transport of representative constituents of interest (COIs) identified at Site 2 and their interactions with the soil, groundwater, sediment, and surface water. Fate and transport consists of identification of theoretical contaminant phases and migration and degradation pathways. COIs were selected based on exceedance of screening criteria (Federal MCLs and background UTLs for groundwater, and background UTLs for soil and sediment) and in the absence of exceedance criteria, detections (surface water). COIs represent potentially site-related compounds. The constituents detected in environmental media at Site 2 considered as COIs in this section are presented in **Table 6-1**. COIs are different than COPCs and COCs, which are defined in the risk assessment sections.

Certain chemicals were selected to represent the range of COIs associated with the site. These representative contaminants were selected on the basis of concentrations exceeding screening criteria, frequency of occurrence, occurrence in several media, variable migration potential, and potential to be a risk driver to human health and the environment. The representative contaminants discussed in this section are listed in **Table 6-2** and their specific fate and transport properties are described in the following section. These fate and transport properties provide a range of the characteristic properties of each chemical group. Quantification of a COIs contribution to human health and ecological risk is evaluated in Sections 7 and 8, respectively.

The fate and transport, in addition to data presented in the previous sections, are used to develop a CSM (**Figure 6-1**). The CSM is used to support potential risk management decisions and aid in defining the effectiveness of potential remedial alternatives in the Feasibility Study.

6.1 Contaminant Fate Processes

The primary mechanisms responsible for the fate of contaminants include sorption of contamination to soil surfaces, volatilization from groundwater into the gas phase, natural degradation, metal transformation, and bioaccumulation. **Table 6-2** summarizes several physical and chemical properties for the representative contaminants. **Figure 6-1** presents a conceptual depiction of the primary fate and transport processes at Site 2.

6.1.1 Sorption

Sorption occurs when a compound adheres to and becomes associated with solid particles in the formation (sorbed phase). The subsurface materials likely to sorb chemicals are clays and organic matter, both of which exist in abundance in the Columbia aquifer and Yorktown confining unit at Site 2. In addition, some inorganic compounds, such as arsenic species, can sorb to iron and oxyhydroxide or oxide coatings on soil and sediment grains.

The conventional measure of sorption is the distribution coefficient (K_d). The K_d for organic chemicals is the product of the soil organic carbon partition coefficient (K_{oc}) of the chemical

and the fraction of organic carbon (f_{oc}) in the soil (**Table 6-2**). In general, chemicals with a K_{oc} greater than 10,000 milliters per gram (ml/g) have high degrees of adsorption and consequentially low mobility, whereas chemicals with a K_{oc} lower than 1,000 ml/g) have lower degrees of adsorption and consequentially higher mobility. The VOCs of interest have relatively low K_{oc} values (less than 1,000 ml/g) while the majority of SVOCs, pesticides, and PCBs have relatively high K_{oc} values (greater than 10,000 ml/g). The K_d for inorganic chemicals is a complex function of pH, organic content, oxide coatings, and other factors; therefore, K_d is not easily estimated by methods other than site-specific testing. Due to the number of factors which impact the K_d values for inorganics, these values range from less than 1 ml/g to greater than 100,000 ml/g (**Table 6-2**).

The migration rates of different dissolved contaminants vary depending on the K_d and the rate of groundwater flow. Adsorption of constituents in groundwater to soil can retard the movement of groundwater constituents. For each contaminant detected at the site, it is theoretically possible to calculate a retardation coefficient, which is an estimate of the degree to which the contaminant is slowed by adsorption in relation to the groundwater flow velocity. The retardation coefficient is calculated according to the following equation:

$$R = 1 + p_b \times K_d / n_e$$

Where :

R = Retardation coefficient (dimensionless)
p_b = Bulk density (grams per cubic centimeter [gm/ml])
K_d = Distribution coefficient (ml/g)
n_e = effective porosity (dimensionless)

Assuming a bulk density of 1.5 gm/ml (based on site-specific data) and an effective porosity of 0.20 (typical of silty sand), the resulting retardation coefficients are listed in **Table 6-2**. The retardation coefficients for the representative VOCs range from 1.4 to 41. The retardation coefficients for the representative SVOCs, pesticides, and PCBs are generally above 1,000. Several PAHs and aroclor-1260 had calculated retardation coefficients of greater than 100,000 due to the high chemical partition coefficients and high level of organic carbon in site soil, indicating a very high tendency for sorption and retardation. The retardation of inorganics is variable depending on the form of the chemical in the subsurface and may range from 2 to greater than 1,000,000.

The effect of retardation is estimated by dividing the groundwater flow velocity by R, which provides a value of migration that is either equal to (in the case of no retardation) or less than (in the presence of retardation) the groundwater flow velocity (**Table 6-2**). Based on the information presented in Section 4.3.2, the average groundwater flow velocity is estimated at 55 ft/yr in the Columbia aquifer. As a result of these calculations, VOCs are expected to have the greatest mobility in the subsurface. Inorganics may also have high mobility depending on subsurface conditions, such as pH and ORP, discussed previously. Estimates of the rates of contaminant migration are approximate.

6.1.2 Volatilization

Volatilization occurs when a compound transfers from the aqueous phase to the gas phase. Measures of a chemical's tendency to volatilize from water and soil include its vapor pressure and Henry's Law Constant (K_h). Compounds with K_h values higher than 10^{-3} atmosphere-cubic meter per mole (atm-m^3/M) are expected to volatilize readily from water to air, whereas those with K_h values lower than 10^{-5} atm-m^3/M are relatively non-volatile. Compounds with K_h values in between these values are expected to be moderately volatile. At a given temperature, the higher the vapor pressure of a compound, the higher the volatility of that compound.

Values of vapor pressure and K_h for the representative contaminants are provided in **Table 6-2**. The relatively high vapor pressure and K_h values for the representative VOCs, particularly carbon disulfide and VC, suggest that volatilization could be an important fate mechanism for VOCs in groundwater. However, volatilization only occurs at the air/water interface between the saturated and unsaturated zones, and movement of aqueous-phase contaminants from the bulk groundwater to the interface is largely diffusion-limited. Furthermore, the lower the water solubility and soil distribution coefficient, the lower the amount of chemical available for volatilization across that interface will be. SVOCs, on the contrary, have generally lower K_h values (below 10^{-4} atm-m^3). 2-Methylnaphthalene, acenaphthene, acenaphthylene, and naphthalene are moderately volatile. The K_h values for pesticides and PCBs also suggest moderate volatility. However, the vapor pressure for the SVOCs, pesticides, and PCBs are all generally low. Due to the complexity of inorganics and their variable forms in the environment, no K_h values can be provided. However, these compounds are typically not volatile under normal temperature and pressure conditions.

6.1.3 Degradation/Transformation

Degradation is the deterioration or destruction of a chemical via processes such as hydrolysis, photolysis, and biodegradation. The rate of degradation can be expressed as a half life and is dependent on the existing chemical, biological, and physical conditions of the media in which the contaminant is located. Hydrolysis is the reaction of a chemical with water and photolysis is the result of exposing the chemical to light. Biodegradation of chemicals by microbial organisms occurs through metabolic or enzymatic processes. The biodegradation of CVOCs is discussed in detail in the following section.

Transformation occurs when inorganics are increased (oxidation) or reduced (reduction) in valence state. Transformation may have a significant effect on the mobility of a metal, either increasing or decreasing it. Transformation can be caused by E_h (oxidation potential) and pH changes and by microbial or nonmicrobial (abiotic) processes.

Evaluation of CVOC Attenuation

Based on the nature and extent of contamination presented in Section 5, CVOCs appear to be the most pervasive and extensive contaminants, particularly in groundwater, at Site 2. Therefore, the effectiveness of natural attenuation (NA) processes at remediating CVOCs in groundwater was evaluated. NA is a set of physical (diffusion, dispersion, volatilization, and adsorption), biological (aerobic and anaerobic biodegradation), and chemical processes (abiotic transformation) that naturally act to reduce the toxicity, mobility, and volume, mass, or concentration of contaminants.

Dissolved phase CVOCs can undergo biodegradation through use as an electron acceptor (reductive dechlorination), use as an electron donor (oxidation), or co-metabolism. PCE and TCE typically biodegrade via reductive dechlorination. This is an anaerobic process, in which the contaminant is used as an electron acceptor and a chlorine atom is replaced by a hydrogen atom. Reductive dechlorination occurs in a series of reactions in which the parent compound is reduced to daughter compounds; each reaction forms a daughter compound with sequentially fewer chlorine atoms. The reductive degradation pathway for PCE and TCE is as follows:

$$\text{PCE} \rightarrow \text{TCE} \rightarrow \text{cis-1,2-DCE} \rightarrow \text{VC} \rightarrow \text{ethene}$$

This reaction is often limited by the amount of an available carbon source (electron donor) in the groundwater system. Additionally, the rate of reductive dechlorination appears to decrease as the degree of chlorination decreases. The reduced daughter products of TCE (especially VC) can also be biodegraded via aerobic degradation pathways.

Reductive dechlorination can proceed simultaneously with other oxidation-reduction (redox) reactions (such as aerobic oxidation, denitrification, manganese, iron, and sulfate reduction, and methanogenesis). As each electron acceptor is used and depleted, the ORP of the groundwater system is driven downward. Reductive dechlorination is more thermodynamically favorable under highly reduced conditions. The optimal energy range for reductive dechlorination of CVOCs is within the same range favorable for sulfate reducing and methanogenic conditions (USEPA, 1998). The redox conditions of the subsurface and dominant redox mechanisms can be inferred by the ORP (or E_H; as discussed in Section 5.1.6) and electron acceptor concentration, reduction product concentration, and hydrogen concentration.

CVOCs may also be degraded under abiotic mechanisms. These are chemical reactions (such as hydrolysis or dehydrohalogenation) without the aid of microorganisms. Some abiotic reactions are trigged by the byproducts of biological reactions.

A weight-of-evidence approach was used in this evaluation. Direct field measurements of contaminant transformation or degradation are still being established. Documentation of reactions or mechanisms at multiple levels is therefore used to evaluate the activity and effectiveness of NA. The biodegradation activity of CVOCs can be qualitatively assessed through observation of "reaction footprints," which include:

- Reduction of higher chlorinated compounds
- Consumption of the electron donors (TOC)
- Footprints of other normal redox reactions
  - Consumption of DO (aerobic oxidation)
  - Consumption of nitrate (denitrification)
  - Production of ferrous iron (iron reduction)
  - Consumption of sulfate and/or production of sulfide (sulfate reduction)
  - Production of methane (methanogenesis)
- Generation of ethene and chloride ion
- Increase in alkalinity or hydrogen consumption
- Increase in dissolved inorganic carbon (such as carbon dioxide)

Degradation Products

The primary line of evidence that NA is occurring at a site is the reduction in parent compound concentrations and the increase in degradation products. During the June 2007 sampling event, both cis-1,2-DCE (first generation daughter product) and VC (second generation daughter product) were detected in shallow groundwater. Ethene was detected in the five samples collected from hot spot area and downgradient monitoring wells (SJS02-MW07S, -MW10S, -MW14S, -MW15S, and –MW16S), which provides strong evidence that CVOCs are fully degrading (**Table 5-4**). Ethane was also detected in these wells, with the exception of downgradient well SJS02-MW16S. Carbon dioxide was elevated in the three downgradient monitoring wells (SJS02-MW14S, -15S, and -16S), which may be a possible byproduct of DCE or VC mineralization (**Table 5-4)**.

A contaminant trend plot was developed for shallow monitoring well SJS02-MW07S, as this is the only location with three or more data points. As shown on **Figure 6-2**, CVOC concentrations have remained relatively stable in SJS02-MW07S. The presence of cis-1,2-DCE and VC in this well indicate that reductive dechlorination has occurred in this shallow aquifer. However, since TCE is not decreasing and the reductive degradation products are not increasing, it may suggest that CVOCs are attenuating at the same slow rate that CVOCs are migrating into this area. In the deep groundwater well (SJS02-MW10D), some CVOCs were removed by the aquifer pump test. However, the trend plot (**Figure 6-3**) shows that as TCE concentrations decreased, there was a subsequent increase and then decrease in cis-1,2-DCE and VC concentrations, providing evidence that reductive dechlorination was proceeding in deep groundwater. If the pump test was the only factor, all the CVOCs would be expected to follow the same decreasing trend.

Spatial Distribution of Geochemical Parameters. Geochemical concentrations located upgradient of the hot spot, within the hot spot, and downgradient of the hot spot provided direct qualitative evidence of biodegradation, as described below (**Figure 5-8**). **Table 5-4** summarizes the geochemical results for shallow groundwater during the June 2007 sampling event. **Figure 5-13** shows the distribution of selected geochemical parameters in the shallow groundwater. In monitoring wells with CVOC contamination, DO concentrations ranged from 0.2 to 2.5 mg/L and ORP values were all below zero (or E_H values were below 200 mV), indicating conditions are present in which reductive dechlorination will proceed although conditions do not appear to be in the optimal range for reductive dechlorination. ORP values in shallow upgradient wells suggested groundwater flowing into Site 2 from the east (between 2 and 128 mV) is under less reduced conditions while groundwater flowing in from the west is more reduced (-81 mV). Deep groundwater in the Yorktown aquifer is under naturally reduced conditions and DO concentrations were typically measured at 1 mg/L.

Neither nitrate nor nitrite was detected in any of the shallow groundwater samples. Nitrite, the reductive product of nitrate, is not frequently detected in groundwater because it is highly reactive. Denitrification is not considered a significant contaminant fate process in Site 2 groundwater.

In the shallow hot spot area, there was evidence of iron reduction, sulfate reduction, and methanogenesis at SJS02-MW10S, based on the presence of elevated ferrous iron and methane concentrations and low sulfate concentrations (**Figure 5-13**). Sulfate concentrations at SJS02-MW10 were 5.1 mg/L in June 2007 compared to monitoring well SJS02-MW13S

(130 mg/L in December 2004), which did not have any CVOC detections. Sulfide was not detected in groundwater from any monitoring wells; however, sulfide frequently is not detected in groundwater because it quickly reacts with dissolved inorganics to form insoluble minerals. In the hot spot area near monitoring well SJS02-MW07S, iron reduction appeared to be the dominant process, indicating groundwater is less reduced here. Furthermore, sulfate was present at high concentrations which may be competitive with CVOCs as an electron acceptor. In groundwater in the three downgradient wells (SJS02-MW14S, -MW15S, and -MW16S), there was strong evidence of iron reduction (ferrous iron concentrations above 9 mg/L) and methanogenesis (methane concentrations above 1 mg/L). Sulfate reduction was also suggested in the vicinity of SJS02-MW16, where sulfate concentrations were more depleted than in the rest of the groundwater samples.

As mentioned previously, the optimal energy range for reductive dechlorination of CVOCs is within the same range in which sulfate reduction and methanogenesis are the dominant reactions, which can be inferred by hydrogen concentrations in groundwater. The corresponding hydrogen concentrations for sulfate reducing and methanogenic conditions are 2 and 11 nanomoles per liter (nM/L) (Yang and McCarty, 1998). In groundwater from the hot spot area near monitoring wells SJS02-MW07S and –MW10S and downgradient well SJS02-MW16S, hydrogen concentrations were between 1 and 7 nM/L, which indicate groundwater conditions in these areas of the site are favorable for reductive dechlorination. In groundwater from downgradient monitoring wells, SJS02-MW14S and –MW15S, hydrogen concentrations were very high (greater than 200 nM/L), suggesting that abiotic transformations of iron or steel buried in the tidal inlet may be producing hydrogen under the anaerobic conditions (Chapelle et al., 1997).

Alkalinity was highest in groundwater from the two downgradient wells SJS02-MW15S and –MW16S, indicating that the most biological activity is occurring in these areas. Carbon dioxide concentrations increase with distance downgradient, also suggesting a significant amount of respiration is occurring in the subsurface.

Reductive dechlorination requires a supply of biologically oxidizable organic matter to maintain reducing conditions in the aquifer and to serve as an electron donor. In June 2007, groundwater TOC concentrations ranged from 3 to 6 mg/L, below the recommended level of 20 mg/L for reductive dechlorination (USEPA, 1998). This is relatively low given the depositional environment and may impact the reductive dechlorination decay rates.

6.1.4 Bioaccumulation

Bioaccumulation is the extent to which a chemical will partition from water into the lipophilic parts (e.g., fat) of an organism. Bioaccumulation commonly is estimated by the octanol-water partition coefficient (K_{ow}). Chemicals with high values of K_{ow} tend to avoid the aqueous phase and remain in soil longer or bioaccumulate in the lipid tissue of exposed organisms. Accumulation of a chemical in the tissue of the organism can be quantified by a bioconcentration factor (BCF), which is the ratio of the concentration of the chemical in the tissue to the concentration in the water. BCFs are both contaminant-specific and species-specific. **Table 6-2** lists bioaccumulation values for COPCs.

The VOCs have relatively low values of K_{ow} and BCF so they do not bioaccumulate extensively. The SVOCs, pesticides, and PCBs in general have moderate to high values of K_{ow} and BCF so they will tend to bioaccumulate more, particularly PAHs, pesticides, and aroclor-1260.

6.2 Contaminant Transport

The primary contaminant release mechanism is attributed to the waste material placed over a 3.9-acre portion of the site. Since the disposal area was unlined and extends approximately 4 ft below the water table, CVOCs from solvents and other disposal materials were in direct contact with natural soil and groundwater if any leaching occurred or waste packaging was breached. Additional releases may have occurred as spills onto the ground surface during operational activities at the site. Pesticides have been used base-wide historically. Grassed drainage ditches (approximately 2 to 3 ft deep) originate north of Site 2 along Cradock Street and discharge storm water runoff to the inlet (**Figure 2-3**). An underground storm drainage system originates approximately 1,000 ft northeast of the Site 2 area, within IR Site 21, and also outlets to the northernmost culvert to the inlet.

Although the exact flow pathways of contaminants can not be determined definitively, the following sections present a generalized description of theoretical contaminant flow pathways at Site 2 that may have resulted in the distribution of contaminants. Contaminants are transported in the subsurface through a variety of ways depending on the phase of the contaminant. There are four main phases that can exist in the subsurface: aqueous, sorbed, NAPL, and gas (vadose zone only), as described below.

Aqueous Phase

Contaminants existing in the aqueous phase will have dissolved into the groundwater and are moved primarily through advection and dispersion. Advection is the transport of dissolved contaminants by the bulk motion of flowing groundwater. It is the primary transport mechanism for dissolved contamination along the hydraulic gradient. Advective contaminant transport is a function of the groundwater flow as it has been modified by the retardation factor of the specific contaminant. Dispersion is the spreading of dissolved contaminants from the path they would be expected to follow during advection. It results from the spatial variation in aquifer permeability, fluid mixing, and molecular diffusion.

Sorbed Phase

For contaminants to be present in the sorbed phase they must first have the affinity to bind to a solid surface. This ability differs between contaminants as discussed in Section 6.1. Sorbed contaminants in the subsurface tend to be stationary, staying with the soil, organic matter, or iron/manganese/aluminum oxides and not being transported. However, if surface water or precipitation infiltrates into the subsurface, contaminants in soil may de-sorb or leach into the water. Contaminants in soil may also dissolve into groundwater which flows into the area. If the sorbed soil contamination is in the vadose zone, it may partition into soil gas and even the atmosphere if shallow enough.

Gas Phase

A contaminant can only exist in the gas phase in the vadose zone, which is the unsaturated layer of soil between the surface and the water table. Contaminants enter the gas phase through volatilization of sorbed soil contaminants or aqueous phase contaminants located at the water table surface. They tend to remain trapped in the pore space between grains of soil but can migrate out of the soil to the atmosphere.

Non-Aqueous Phase Liquids

Non-aqueous phase liquids (NAPLs), also known as free product, are liquids which are relatively insoluble in water and as a result do not mix with water. DNAPLs are denser than water and include CVOCs, while light non-aqueous phase liquids (LNAPLs) are less dense than water and include petroleum hydrocarbons. Once in the subsurface, LNAPLs will form a pool on top of the water table and groundwater plumes formed from LNAPL tend to be shallow. DNAPLs, on the contrary, will migrate downward through the aquifer and will slowly partition (dissolve) into the surrounding groundwater at a rate dependent on the solubility of the constituent compounds, composition of the DNAPL, temperature, chemical characteristics of the groundwater, and other factors, thereby continuing to act as a source of contamination. Therefore, determination of its presence and approximate quantity can be very important for evaluating process requirements and effectiveness of remedial alternatives.

DNAPL is often difficult to detect, especially if it occurs as dispersed droplets (residual DNAPL) as opposed to a continuous pool (mobile DNAPL); therefore, indirect evidence and "rules of thumb" are used. As a general rule-of-thumb, dissolved concentrations of CVOCs in groundwater in excess of approximately 1 percent of a compound's solubility suggest that DNAPL may be present. For TCE, with a water solubility of 1,100 mg/L, a concentration of 11,000 µg/L is typically used as an indicator for potential DNAPL. Concentrations of CVOCs in soil in excess of approximately 1 percent the soil mass (10,000,000 µg/kg) or concentrations of DNAPL-related compounds above their soil saturation concentration suggest that DNAPL may be present.

The primary transport mechanisms are shown on **Figure 6-1** and discussed in the following subsections.

Runoff, Surface Water, and Sediment Transport

One of the primary pathways for transport of Site 2 contaminants is the surface runoff or wind erosion from contaminated surface soil or waste materials to surface water or sediment in the tidal inlet. Surface runoff may be limited by grass surface cover. The tidal inlet also receives runoff from the industrial area to the north. A separate shallow groundwater CVOC plume (Site 21) located upgradient of Site 2 is infiltrating the storm water system and discharging to the Site 2 inlet; however, the contribution is considered insignificant compared to the high CVOC concentrations contributing from Site 2 groundwater. The rate at which VOCs in surface water evaporate to the atmosphere is dependent on the chemical's Henry's Law constant, vapor pressure, and solubility. 1,1-DCE, carbon disulfide, and VC, in particular have very high Henry's Law constants and vapor pressures with only moderate solubilities and therefore are expected to volatilize readily. TCE may sorb to particles in water and settle to the bottom of the inlet as sediment (ASTDR, 1997); however, previous sediment sample analytical results suggest that this pathway is not contributing to an unacceptable level of risk.

PAHs and pesticides are more likely to sorb to particulates in the runoff or surface water and deposit as sediment. Pesticides will also evaporate and photooxidize near the surface. Some inorganics, such as lead, may react with hydrous iron and manganese oxide and precipitate out of solution. During high tide, contaminants in surface water may discharge into groundwater beneath the inlet.

Contaminants in sediment, particularly VOCs and SVOCs with lower K_d values, may dissolve into surface water. Contaminants which are more strongly bound to the sediment (such as, pesticides, PCBs, and dioxins) may be suspended with small particles and transported downgradient via surface water or runoff. PCBs in sediment may re-enter solution over time. The degree to which inorganics will sorb to sediment depends on the pH and oxidation-reduction conditions.

Tidal flux has the potential for transporting surface water and suspended sediment into and out of the Site 2 inlet. Results from sediment samples collected in the outfall to St. Juliens Creek indicated that Site 2 is potentially contributing, or has historically contributed, chemicals to St. Juliens Creek via tidal influx through the low-flow culvert. However, significant site-related effects are only indicated in a localized area directly at the outfall location (SJS02-SD08 and SD20). Organic contaminants in inlet surface water may be diluted by the tidal wash from St. Juliens Creek. On the contrary, the brackish water body may be the source of higher concentrations of some inorganics at the inlet culvert.

Unsaturated Zone Migration

Contaminants released to surface soil (via direct waste placement or solvent spills) may have migrated vertically through the unsaturated zone through gravitational force or leaching from infiltration. This pathway is viable as most of the site is covered with grass and vegetation versus impermeable surfaces. Waste materials were also placed directly in subsurface soil. Contaminants in groundwater may volatilize into unsaturated zone soil gas. Once in the unsaturated zone, contaminants may have sorbed to soil or organic matter, become trapped in residual pore space, or continued to leach to the saturated zone. VOCs do not have high sorption coefficients and therefore may leach into groundwater. However, due to the depositional environment of the inlet, lenses of fine-grained and organic materials have been deposited which VOCs will preferentially sorb to. Residual free phase product may also get trapped in the small pore spaces. Volatilization of VOCs into soil gas or even the atmosphere in surface soil can occur in the unsaturated zone. However, based on the relatively low levels of VOCs detected in vadose zone soil at Site 2, this is considered a minor transport pathway compared to the migration of other contaminants identified as potential risk drivers. PAHs, PCBs, and pesticides are expected to adsorb to soil and not appreciably leach to groundwater. In surface soil, pesticides may evaporate and undergo photodegradation. Dioxins in subsurface soil are not expected to readily leach to groundwater.

The presence and mobility of inorganics in the unsaturated zone is highly dependent on the subsurface conditions. Arsenic may sorb onto soil, especially clay particles, iron oxyhydroxides and oxides, aluminum hydroxides, manganese compounds, and organic matter. Under typical soil conditions of pH and redox potential, iron is present in the form of an insoluble hydroxide or oxide that has little potential to leach. Under oxidizing conditions, the ferric form of iron is predominant, where it forms insoluble iron sulfides. Conversely, the more mobile ferrous iron predominates under reducing conditions. Lead forms complexes with organic matter and clay minerals that limit its mobility. Only a small fraction of lead in soil will be in a water-soluble form. Mercury is moderately mobile in soil and may become more soluble in areas with high salinity.

Saturated Zone Migration

Contaminants in the Columbia aquifer have advected from the source release area located near monitoring well SJS02-MW10S and MIP borings SJS02-MIP202, -216, and -235 downgradient to the south-southeast, strongly influenced by fine-grained and organic lithologic materials along the edge of the wetland. Assuming an hydraulic conductivity range between 1.2 and 9.0 ft/day (**Table 4-4**), a horizontal hydraulic gradient of 0.01 ft/ft, and an effective porosity of 0.2 (silty sand), the average linear velocity is estimated between 22 and 155 ft/year with an average value of 155 ft/year. However, due to the high organic carbon content at Site 2, the actual contaminant velocity is much lower due to retardation (**Table 6-2**). Assuming the average groundwater velocity of 55 ft/year, retardation, and the potential release timeframe based on site history (between 1921 and 1947), the TCE plume is estimated to have traveled between 245 and 351 ft from the source release points. This is slightly shorter than the existing TCE plume length, which extends approximately 420 ft from SJS02-MW10S. Therefore, the actual contaminant velocity is assumed to be slightly higher than the estimated value. Shallow groundwater discharges temporally (during lower tides and seasonally) through the sediment to the surface water of the tidal inlet and creek.

As the groundwater plume migrates laterally downgradient, it is vertically directed between a shallow, organic clay/silt layer in the Columbia aquifer and the top of the Yorktown confining unit. This is more evident in the southern portion of the site, where the shallow clay layer in the Columbia aquifer is thicker and slopes to the south. Some dispersion, degradation, and retardation of contaminants are expected, particularly in the organic-rich silt layers with up to 73,500 mg/kg of TOC (near SJS02-MW15S at 16.5-17.5 ft bgs). VOCs in groundwater may volatilize into soil gas overlying the water table. SVOCs and pesticides, which are less volatile and less soluble than CVOCs, are more likely to sorb to soil or organic matter and not migrate as extensively. VOCs, SVOCs, and pesticides may degrade in groundwater depending on geochemical conditions and the biological community. Transport and partitioning of inorganics in water is dependent on the oxidation state of the inorganic and on interactions with other materials present. For example, organic matter, divalent inorganics, and dissolved sulfide enhance the reduction of the arsenic valence state to a more mobile form. The behavior of iron in aquatic environments is strongly dependent on the system's pH and reduction/oxidation (redox) status.

CVOCs are the most extensive contaminants in groundwater. The plume currently extends to downgradient monitoring well, SJS02-MW16S, located adjacent to St. Juliens Creek, and is likely discharging into the surface water body. However, any contaminants entering the surface water body are assumed to dilute and volatilize significantly. The surface water samples collected from the creek in 1999 had very low levels of CVOCs estimated below 1 µg/L. The width of the contaminant plume adjacent to St. Juliens Creek is an uncertainty and may need to be defined if a downgradient treatment remedy is required.

The maximum concentrations of TCE detected in shallow groundwater at Site 2 are 330,000 µg/L at SJS02-MW10S, 270,000 µg/L at SJS02-MW07S, and 240,000 µg/L at SJS02-MW15S, indicating the likely presence of DNAPL. Monitoring wells from which groundwater samples were collected are screened across the entire Columbia aquifer, potentially resulting in dilution of higher-concentration groundwater from areas containing DNAPL during sampling. Even though there are petroleum hydrocarbons in the subsurface, there is no evidence that LNAPL is present.

The predominant direction of DNAPL flow was most likely downward, directed by gravity. As contaminants migrated downward, some of the DNAPL most likely remained in the pore spaces of the aquifer material as residual contamination. DNAPL was also likely caught up in variable density lithology. Vertical migration through silts and clays where there are fractures and preferential pathways or gaps in the confining layer can occur quickly. Some DNAPL likely dissolved in the groundwater and sorbed to the soil, contributing to aqueous-phase and sorbed-phase contamination. Dissolution over time can remove the vertical DNAPL fingers that may have been there originally. Consequently, there can be multiple laminae with high concentrations surrounded by lower concentration zones and are not necessarily connected to each other. If the volume of any of the releases at Site 2 was sufficient to provide enough mass of DNAPL to reach the Yorktown confining unit, as is suspected due to the MIP results showing the high concentrations along the top of the Yorktown confining unit, the DNAPL most likely collected on the Yorktown clay and possibly continued to move under the force of gravity down the slope of the aquitard. Some CVOCs that collected on the Yorktown clay may also have migrated into the clay of the confining unit as residual phase contamination and can serve as a source of groundwater contamination via back diffusion. However, the competence and low permeability of the confining unit indicate that vertical transport into the confining unit is not likely a significant migration pathway.

6.3 Remediation Timeframe Modeling Assessment

A simple fate and transport modeling assessment was performed to provide quantitative estimates of the remediation timeframes under NA processes only, steady-state plume extents, and times to reach steady-state under NA conditions for CVOCs in groundwater. For this evaluation, the remediation timeframe was the time required for groundwater concentrations in the CVOC hot spot area, or the area of very high CVOC concentrations defined by the MIP investigation, to reach a desired target concentration, such as the MCLs. The CVOC hot spot area includes the area of suspected source release. Hot spot area reduction scenarios between 50 and 95 percent were evaluated to provide an estimate of the impact of hot spot treatment or removal on the time of remediation (TOR). These reduction scenarios were also evaluated to provide direction on the degree of reduction that might be required to meet a remedial action objective.

The software applications selected for this assessment were Natural Attenuation Software (NAS), Version 2.1.1, developed at the Virginia Polytechnic Institute and State University (Widdowson et al., 2005) BIOBALANCE Toolkit (BIOBALANCE) (Version 1.03), distributed by GSI Environmental (Kamath et al., 2006). These models incorporate source area characteristics, advection, dispersion, sorption, and first-order degradation into the calculations. These models do not incorporate migration of CVOCs in groundwater vapors to the vadose zone since it is considered a minor transport pathway in comparison to the others. Data results from the Triad investigation (May through July 2007) were used as model input. The model development and results are described in detail in a Technical Memorandum, provided in **Appendix L**.

The NAS model included TCE; cis-1,2-DCE; and VC in the evaluation while BIOBALANCE only has the capability to evaluate the parent compound (TCE). Under average

hydrogeologic conditions and NA processes only, NAS estimated it would take 65, 54, and 68 years, respectively for TCE, cis-1,2-DCE, and VC concentrations in the hot spot to decrease to MCLs. BIOBALANCE estimates were higher with it taking over 200 years for TCE concentrations in the CVOC hot spot to reduce to MCLs. Considering the contamination has likely been in place for approximately 60 years or more and CVOCs are still present at very high concentrations, the higher TOR may be more appropriate as a remedial benchmark until additional time-concentration data is obtained. Hot spot mass reduction had little impact on the TORs calculated by the NAS model, which decreased by less than 1 year under 95 percent hot spot mass removal. The BIOBALANCE model showed a greater decrease in TOR with hot spot mass reduction. The model predicted the TOR would decrease on average by 7 years with 50 percent reduction and 74 years with 95 percent reduction. These differences in TOR estimates are likely attributed to the different methods used by each model to calculate the TOR. NAS calculates TOR using a one-dimensional numerical model, which may limit the amount of contaminant mass that can flux from the source area, and thus increase the TOR even with source reduction. BIOBALANCE estimates TOR using mass balance methods and a first order or compound model.

Steady-state CVOC plume lengths and time for plume stabilization were also estimated using both models. The NAS model used model-generated natural attenuation capacity (NAC) rates to estimate the plume lengths. For the BIOLBALANCE model, minimum, average, and maximum biological decay rates (calculated during the NAS modeling) were used for this evaluation. Steady-state TCE plume length estimates calculated from both models are consistent with existing June 2007 site conditions. Under NA processes only, the both models predicted that the TCE plume will be the most extensive and may migrate beyond monitoring well SJS02-MW16S; however, the plume is not estimated to extend more than 60 ft from this well. The estimated times for the plumes to reach steady state are between 14 and 50 years on average, with BIOBALANCE estimating the longer timeframe.

Differences between TOR estimates and actual conditions at Site 2 create uncertainties in the model results. These differences can be attributed to hydrologic, biological, and geochemical complexities of the site and the limitations of the data used and non-applicable assumptions made in the NAS and BIOBALANCE models. As stated previously, these models do not include the “loss” of contaminant mass from the source area due to the migration of groundwater vapors to the subsurface. Model results are considered to be more conservative than if this pathway was included since the contaminant mass would not decrease as quickly and the contaminant plume is more likely to migrate further. Therefore, the TOR estimates can be regarded only as relative predictors of future plume behavior.

6.4 Summary of Current Migration Pathways

As depicted in the CSM (**Figure 6-1**), the current primary migration pathways of representative contaminants in the site media at Site 2 are:

- Dissolved contaminant migration downgradient with groundwater flow (advection), additionally resulting in migration to residual pore space

- Back diffusion or dissolution of DNAPL sorbed or trapped in the residual pore space at the top of the Yorktown confining unit into shallow groundwater
- Surface water runoff erosion of metals, SVOCs, pesticides, and PCBs in surface soil and deposition as sediment
- Leaching of metals from surface soil and sediment into surface water
- Leaching of metals from buried wastes into groundwater; however, some inorganics are naturally elevated based on concentrations reported in the upgradient well
- Groundwater discharge to the leaking storm sewer system that runs through Site 21 and south towards St. Juliens Creek

Secondary, less prominent, fate and transport mechanisms of representative contaminants present at Site 2 are:

- Surface water infiltration containing suspended or dissolved metals from soil and sediment to groundwater
- Migration and transport of metals and VOCs in inlet surface water to St. Juliens Creek and metals, SVOCs, pesticides, PCBs, and dioxins/furans in suspended inlet sediment to St. Juliens Creek via tidal flux through the low flow culvert
- Volatilization of surface soil or surface water contaminants into the atmosphere
- Volatilization of groundwater contaminants into the vadose zone and subsequently into the atmosphere; if a building was constructed on site in the future, groundwater vapors could potentially migrate into indoor air

Table 6-1
Constituents of Potential Concern by Media
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Constituents of Interest (COIs)	Media				
	Surface Soil	Subsurface Soil	Shallow Groundwater	Sediment	Surface Water
Volatile Organic Compounds					
1,1,2-Trichloroethane			X		
1,1,1-Trichloroethane				X	
1,1-Dichloroethene			X	X	X
1,2,4-Trichlorobenzene					X
1,2-Dichloropropane				X	
2-Butanone	X	X			
4-Methyl-2-pentanone				X	
Acetone	X	X	X	X	X
Benzene				X	
Bromodichloromethane					X
Bromoform					X
Bromomethane				X	
Carbon Disulfide		X	X	X	X
Chloroethane				X	
Chloromethane			X		
Chloroform			X	X	X
cis-1,2-Dichloroethene		X	X	X	X
Cyclohexane			X		
Dibromochloromethane					X
Ethylbenzene					X
Isopropylbenzene			X		
Methylcyclohexane			X		
Methylene Chloride	X		X		
Methyl-tert-butyl ether (MTBE)					X
trans-1,2-Dichloroethene		X	X	X	X
Tetrachloroethene			X		
Trichloroethene		X	X	X	X
Toluene	X			X	
Vinyl Chloride		X	X	X	X
Xylene, total					X
Semivolatile Organic Compounds					
1,1-Biphenyl			X		
2,4-Dimethylphenol			X		
2-Methylnaphthalene	X		X	X	
4-Methylphenol			X		
Acenaphthene	X		X	X	
Acenaphthylene	X	X		X	
Acetophenone			X		
Anthracene	X		X	X	
Benzaldehyde					X
Benzo(a)anthracene	X	X		X	
Benzo(a)pyrene	X	X		X	
Benzo(b)fluoranthene	X	X		X	
Benzo(g,h,i)perylene	X	X		X	
Benzo(k)fluoranthene	X	X		X	
bis(2-ethylhexyl)phthalate	X	X		X	X
Butylbenzylphthalate	X			X	
Caprolactam			X		
Carbazole	X		X	X	
Chrysene	X	X		X	
Dibenz(a,h)anthracene	X	X		X	
Dibenzofuran	X		X	X	
Diethylphthalate				X	
Di-n-butylphthalate	X			X	
Di-n-butylphthalate			X		
Fluoranthene	X	X	X	X	
Fluorene	X		X	X	
Indeno(1,2,3-cd)pyrene	X	X		X	
Naphthalene	X		X	X	
Phenanthrene	X	X	X	X	

Table 6-1
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Chesapeake, Virginia

Constituents of Interest (COIs)	Media				
	Surface Soil	Subsurface Soil	Shallow Groundwater	Sediment	Surface Water
Phenol			X		
Pyrene	X	X	X	X	
Pesticides/Polychlorinated Biphenyls					
4,4'-DDD	X	X		X	X
4,4'-DDE	X	X	X	X	
4,4'-DDT	X	X		X	
Alpha chlordane	X			X	
Dieldrin				X	
Endrin	X				
Endrin aldehyde	X			X	
Endrin ketone				X	
Endosulfan II	X				
Endosulfan sulfate			X		
gamma-chlordane	X	X		X	
Heptachlor	X				
Heptachlor Epoxide			X		
Methoxychlor				X	
Aroclor-1254				X	
Aroclor-1260	X	X		X	
Explosives					
2,6-Dinitrotoluene			X		
3-Nitrotoluene					X
HMX			X		
RDX			X		
Dioxins/Furans					
Total		X		X	
Inorganics					
Aluminum	X	X	X	X	X
Antimony	X	X		X	X
Arsenic	X	X	X		X
Barium	X	X		X	X
Beryllium	X	X			X
Boron			X	X	
Cadmium	X	X		X	X
Chromium	X	X		X	X
Cobalt	X	X	X	X	X
Copper	X	X		X	X
Cyanide	X	X		X	X
Iron	X	X	X	X	X
Lead	X	X	X	X	X
Manganese	X	X		X	X
Mercury	X	X			
Molybdenum				X	
Nickel	X	X	X	X	X
Selenium	X			X	
Silver	X	X	X	X	
Sodium			X	X	X
Thallium	X	X	X		
Vanadium	X	X	X	X	X
Zinc	X	X	X	X	X

Table 6-2
Physical, Chemical, and Half-life Data of Representative Contaminants
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Contaminants	Molecular Weight (g/mole)	Density (g/cm^3)	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	K_h (atm-m3/mole)	Log K_{oc} (---)	K_d (mL/g)	R (---)	V_c (ft/yr)	Log K_{ow} (---)	Log BCF (---)
Volatile Organic Compounds											
1,1,2-Trichloroethane	133.4	1.44	4,400	3.03E+01	7.40E-04	1.80	1.26	10.5	5.26	1.98	NA
1,1-Dichloroethene	96.94	1.22	400	2.23E+03	1.50E-02	1.79	1.23	10.2	5.37	1.48	NA
Carbon Disulfide	76.13	1.26	2,300	3.60E+02	2.43E+01	2.38	4.80	37.0	1.49	1.84	NA
Chloroform	119.4	1.48	7,950	1.98E+02	3.39E-04	1.80	1.26	10.5	5.26	1.97	2.84
cis-1,2-Dichloroethene	96.95 (2)	1.28 (2)	3,500 (2)	1.80E+02 (2)	4.10E-03 (2)	1.69	0.98	8.3	6.59	1.86 (2)	NA
trans-1,2-Dichloroethene	96.94	1.26	6,260	2.65E+02	9.09E-03	1.58	0.76	6.7	8.21	2.09	NA
Tetrachloroethene	165.8	1.62	150	2.00E+01	1.53E-02	2.43	5.38	41.4	1.33	2.53	1.69
Trichloroethene	131.4	1.46	1,100	7.40E+01	9.10E-03	1.92	1.66	13.5	4.08	2.53	1.59
Vinyl Chloride	62.50	0.91	1,100	2.53E+03	1.22E+00	0.39	0.05	1.4	40.2	0.60	3.04
Semivolatile Organic Compounds											
2-Methylnaphthalene	142.2	1.01	24.6	5.10E-02	3.18E-04	3.66	91	687	0.0801	3.86	3.79
Acenaphthene	154.2	1.02	3.47	2.30E-03	1.55E-04	4.58	760	5,704	0.0096	3.92	2.58
Acenaphthylene	152.2	0.90	3.93	6.68E+00	1.14E-04	3.75	112	845	0.0651	4.07	2.58
Anthracene	178.2	1.28	0.0730	6.00E-06	6.51E-05	4.41	514	3,857	0.0143	4.45	2.58
Benzo(a)anthracene	228.3	1.27	0.0140	2.10E-07	8.00E-06	5.81	12,913	96,849	0.0006	5.61	4.00
Benzo(a)pyrene	252.3	1.35	0.0038	5.49E-09	3.36E-07	5.95	17,825	133,689	0.0004	6.00	3.69
Benzo(b)fluoranthene	252.3	NA	0.0012	5.00E-07	5.03E-07	6.70	100,237	751,782	0.0001	6.06	4.00
Benzo(g,h,i)perylene	276.3	NA	0.0003	1.01E-10	2.66E-07	6.60	79,621	597,162	0.0001	7.10	4.45
Benzo(k)fluoranthene	252.3	NA	0.0011	9.59E-11	4.24E-07	5.99	19,545	146,587	0.0004	6.85	4.00
Chrysene	228.3	1.27	0.0020	6.30E-09	5.23E-06	6.27	37,242	279,314	0.0002	5.81	3.79
Dibenz(a,h)anthracene	278.4	1.28	0.0025	2.78E-12	1.70E-06	6.22	33,192	248,939	0.0002	6.50	4.00
Diethylphthalate	222.2	1.11	1080	2.10E-03	4.94E-05	1.84	1	11	4.83	2.35	2.07
Fluoranthene	202.3	1.25	0.2650	5.00E-05	1.09E-05	4.71	1,026	7,694	0.0071	5.22	3.24
Fluorene	166.2	1.20	1.685	2.90E-03	6.42E-05	3.95	178	1,338	0.0411	4.12	2.70
Indeno(1,2,3-cd)pyrene	276.3	NA	0.0620	1.01E-10	2.86E-07	6.30	39,905	299,290	0.0002	5.97	3.40
Naphthalene	128.2	1.02	31.7	8.20E-02	4.60E-04	3.11	26	194	0.2832	3.40	2.12
Phenanthrene	178.2	1.18	1.08	4.20E-04	2.86E-05	4.07	235	1,763	0.0312	4.57	2.51
Pyrene	202.3	1.27	0.1350	2.50E-06	1.19E-05	4.88	1,517	11,380	0.0048	5.09	3.43
Pesticides/Polychlorinated Biphenyls											
4,4'-DDD	320.1	1.47	0.0900	8.25E-06	2.16E-05	5.38	4,798	35,983	0.0015	5.80	4.92
4,4'-DDE	319.0	NA	0.0650	1.40E-05	1.22E-03	5.39	4,864	36,484	0.0015	5.83	4.08
4,4'-DDT	354.5	1.56	0.0055	1.00E-07	1.03E-04	5.20	3,170	23,774	0.0023	6.00	4.15
Alpha chlordane	409.8	NA	0.0510	3.60E-05	8.75E-04	5.40	5,024	37,679	0.0015	5.93	3.68
Dieldrin	380.9	1.75	0.1860	3.99E-05	5.80E-05	4.37	469	3,517	0.0156	5.16	2.95
gamma-chlordane	409.8	1.59	0.0090	1.00E-05	4.80E-05	4.88	1,517	11,380	0.0048	6.00	3.74
Aroclor-1254	327.0	1.51	0.0570	3.22E-05	2.30E-03	4.88	1,517	11,380	0.0048	6.47	4.70
Aroclor-1260	324.0	1.57	0.0144	1.31E-05	3.36E-04	6.42	52,605	394,541	0.0001	6.91	5.29

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Metals											
Aluminum	U	U	U	U	U	NA	NA	NA	NA	U	U
Arsenic	U	U	U	U	U	NA	2.0 - 20,000 (3)	16 - 150,000	3.67E-04 - 3.4	U	U
Barium	U	U	U	U	U	NA	5.0 - 2,500 (3)	39 - 18,50	2.93E-03 - 1.4	U	U
Cadmium	U	U	U	U	U	NA	1.3 - 100,000 (3)	11 - 750,000	7.33E-05 - 5.1	U	U
Chromium	U	U	U	U	U	NA	0.20 - 63,000 (3)	3 - 472,500	1.16E-04 - 22	U	U
Copper	U	U	U	U	U	NA	1.6 - 4,000 (3)	13 - 30,000	1.83E-03 - 4.2	U	U
Cyanide	U	U	U	U	U	NA	5.0 - 4,000 (3)	39 - 30,000	1.83E-03 - 1.4	U	U
Iron	U	U	U	U	U	NA	1.4-10,000 (4)	12 - 75,000	7.33E-04 - 4.8	U	U
Lead	U	U	U	U	U	NA	5.0 - 100,000 (3)	39 - 750,000	7.33E-05 - 1.4	U	U
Mercury	U	U	U	U	U	NA	160 - 630,000 (3)	1,200 - 4,700,000	1.16E-05 - 0.05	U	U
Nickel	U	U	U	U	U	NA	10 - 6,300 (3)	76 - 47,250	1.16E-03 - 0.7	U	U
Selenium	U	U	U	U	U	NA	0.5 - 250 (3)	5 - 1,880	2.93E-02 - 12	U	U
Vanadium	U	U	U	U	U	NA	4.0 - 500 (3)	31 - 3,750	1.47E-02 - 1.8	U	U
Zinc	U	U	U	U	U	NA	0.1 - 100,000 (3)	2 - 750,000	7.33E-05 - 31	U	U

BCF = Bioconcentration Factor
foc = fraction organic carbon = 0.02 (average of May 2007 total orgnic carbon soil data)
K_d = Soil-Water partition coefficient = K_{oc} x foc for organics
K_h= Henry's Law Constant
K_{oc} = Organic carbon partition coefficient
K_{ow} = Octanol-water partition coefficient
NA = no information available
n_e = Effective porosity = 0.20
R = Retardation coefficient = 1 + K_d x p_b / n_e
p_b = Soil bulk density = 1.5 grams per cubic centimeter
U = No value is provided because of the uncertainty in the form of these chemicals in the environment.
Vc = Contaminant velocity = seepage velocity (estimated at 55 ft/yr) / R

All information if from Data Source (1) unless otherwise noted.
Data sources:
(1) Montgomery. 2000. *Groundwater Chemicals Desk Reference. Third Edition.*
(2) ATSDR. 1996. *Toxicological Profile for 1,2-Dichloroethene.*
(3) USEPA. 1999. *Partition Coefficients for Metals in Surface Water, Soil, and Waste.*
(4) Dragun, James. 1998. *The Soil Chemistry of Hazardous Materials 2nd Edition*.

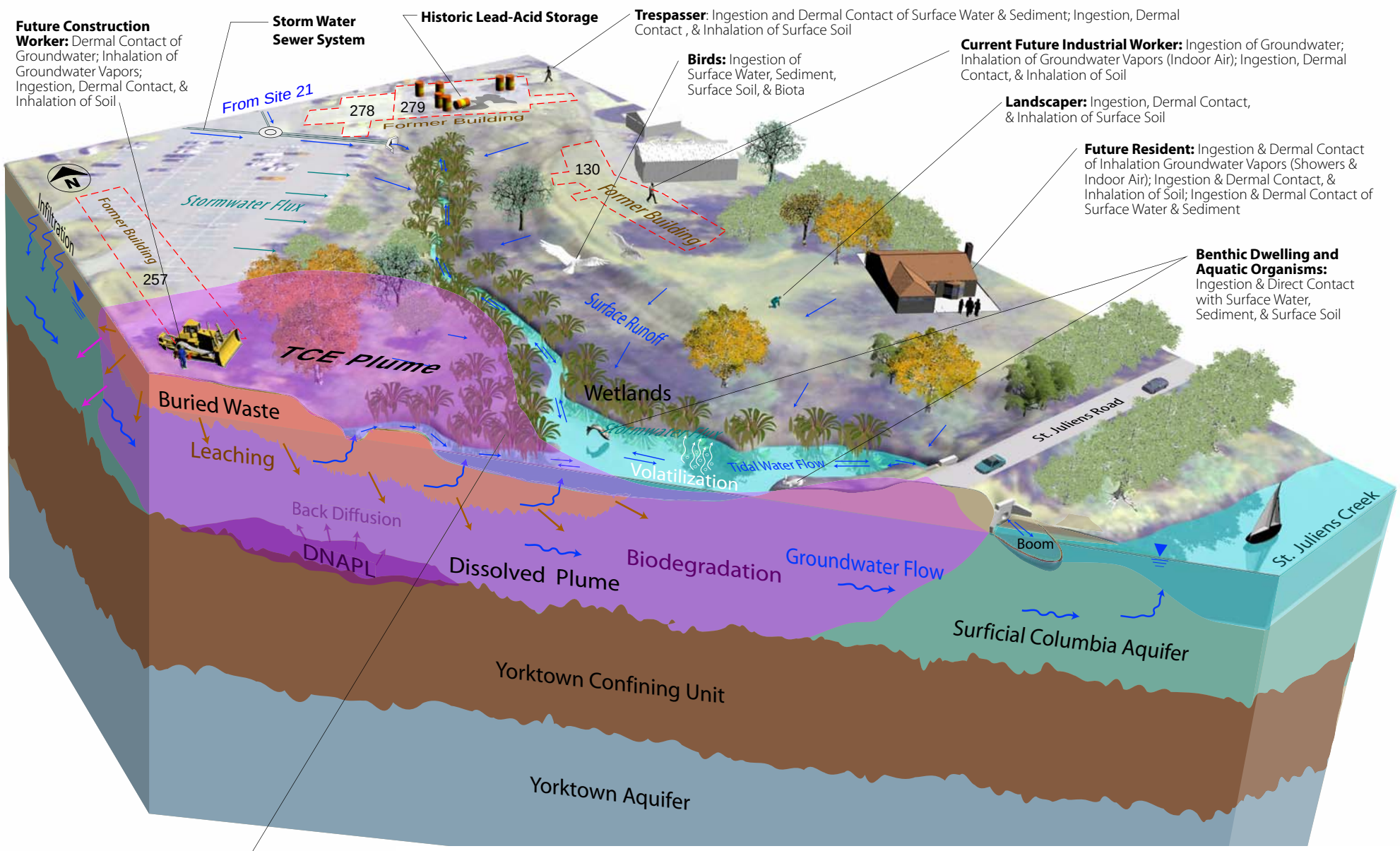


Figure 6-1
Site 2 Conceptual Site Model
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

ES082008014GNV SJCA_St_Juliens_Creek_Annex_Conceptual_Model.ai

FIGURE 6-2
Chlorinated VOC concentration Trends in Shallow Monitoring Well SJS02-MW07S
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

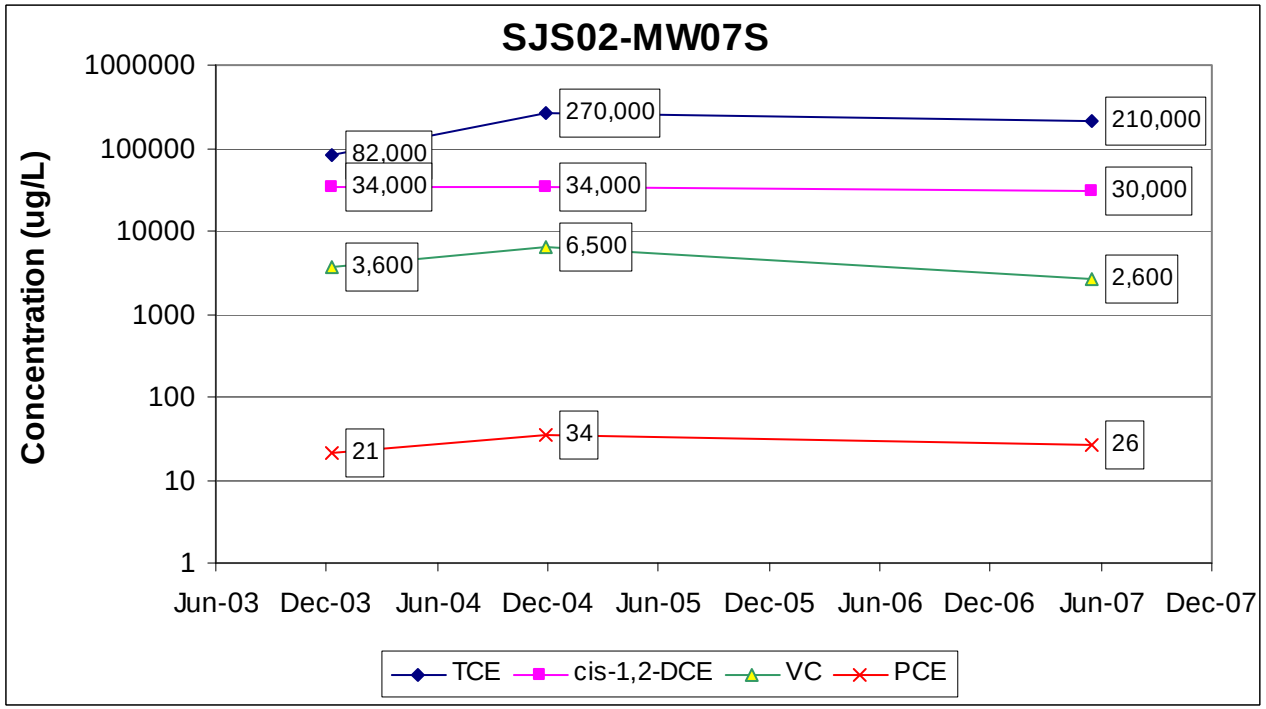
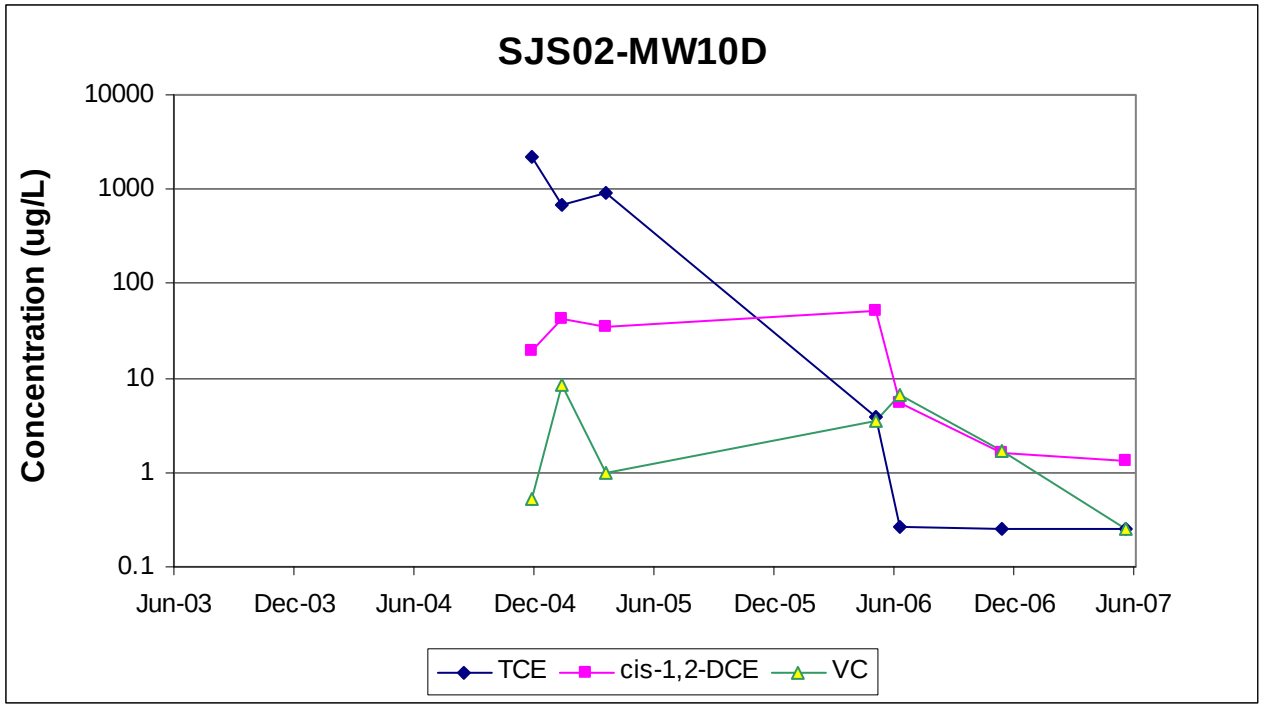


FIGURE 6-3
Chlorinated VOC concentration Trends in Deep Monitoring Well SJS02-MW10D
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex,
Chesapeake, Virginia



SECTION 7

Human Health Risk Assessment Addendum

The data available for evaluation in the HHRA includes surface soil, subsurface soil, surface water, sediment, and shallow and deep aquifer groundwater data collected during the RI and Expanded RI. This HHRA amends/updates the baseline HHRA that was prepared as part of the Site 2 RI (CH2M HILL, 2004a) for soil, groundwater, surface water, and sediment. This baseline risk assessment was conducted to assess the potential human health impacts from the site under current conditions; as well as to determine if any further actions are needed at the site to be sufficiently protective of human health. This risk assessment has been prepared using conservative assumptions, and exposure pathways based on current site conditions and current and potential future site use were evaluated. The risk assessment incorporates the general methodology described in *Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual, Part A* (USEPA, 1989), *Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual, Part D* (USEPA, 2001c), and USEPA Region III Technical Guidance Manuals for Risk Assessment.

The results of the Site 2 baseline HHRA will be used to document the potential for endangerment to human health, and to provide a basis to select action levels, if necessary.

The HHRA is comprised of the following components:

- Identification of COPCs
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Uncertainty assessment

These components are described briefly in the following sections. Spreadsheets prepared in accordance with *RAGS, Volume 1, Human Health Evaluation Manual, Part D* (USEPA, 2001c) were used to screen for COPCs, and to calculate estimated exposures and health risks associated with the COPCs. These spreadsheets (Tables 1 through 10) are presented in **Appendix M**.

7.1 Identification of Chemicals of Potential Concern

The identification of COPCs is performed through data evaluation and screening as described below.

7.1.1 Data Evaluation and Selection

Data from the RI and Expanded RI were evaluated for quantitative use in the risk assessment, as described in the data summary below.

The environmental sampling and analysis conducted at Site 2 was designed to cover the range of potential site contaminants associated with historical site activities. The CSM,

which was continuously updated to incorporate new data as it was collected, was used as a tool to identify data gaps and support the selection of sample locations as discussed in Section 3. Detailed results of the sampling program for Site 2 are presented in Section 5 of this report.

All data used in the risk assessment were validated following USEPA Region III data validation procedures (USEPA, 1993b, 1994a). Available data and the data qualifiers were reviewed and used, as follows, for the quantitative risk assessment.

- Estimated values flagged with a J, K, or L qualifier were treated as unqualified detected concentrations.
- Data qualified with an R (rejected) were not used in the risk assessment.
- Data qualified with a B (blank contamination) were used in the risk assessment as if they were nondetects. One-half of the blank-related concentration was used to calculate exposure point concentrations in the risk assessment for cases where the constituent was detected in other samples from the same medium.
- One-half of the sample quantitation limit was used in the risk assessment to calculate exposure point concentrations for cases where no detectable contaminant concentrations were found in a sample, but the contaminant was detected in other samples collected from the same medium.
- For duplicate samples, the higher of the two concentrations was used as the sample concentration.

Data Summary

Surface soil, subsurface soil, surface water, sediment, and groundwater data collected at Site 2 were evaluated in the HHRA. **Table 7-1** lists the samples used in the risk assessment and the corresponding analyses. **Appendix C** presents the analytical results for the data collected at Site 2.

Background data have been collected for soil, shallow groundwater, and sediment and are presented in the Final Background Investigation Report (CH2M HILL, 2001b), Final Background Investigation Report Addendum for Groundwater (CH2M HILL, 2004b), and Final Technical Memorandum Site 2 Outfall Sediment Investigation Results and Development of Reference Sediment Data in St. Juliens Creek (CH2M HILL, 2005a). The background UTLs are included in the RAGS Part D Tables 2s (**Appendix M**). A comparison of site data to background data was not used to select the COPCs, but is discussed in the uncertainty section, Section 7.5.1.

Soil. All soil data collected at Site 2 between 1997 and 2001 were evaluated in the risk assessment, with the exception of samples (SJS02-SS/SB01), which are located outside of the site boundary and do not represent site-related conditions. Although soil samples collected during the Site 2 RI adequately defined the nature and extent of soil contamination, soil was reassessed to include the surface soil samples collected during the Site 17 SI, based on the decision to incorporate Site 17 with Site 2. Because it is unlikely that a receptor would contact subsurface soil alone, quantitative evaluation for subsurface soil was only performed in combination with surface soil.

The Expanded RI soil samples were collected to confirm the MIP response and vertically delineate VOCs in the aquifer and not to quantitatively assess risk; therefore, they were not validated. However, two of the soil samples were collected at depths that a receptor could be exposed. One of these samples, SB204 collected from 5.5 to 6.5 ft bgs, had elevated concentrations of TCE, cis-1,2-DCE, and VC. As this sample was collected from the saturated zone, it is unlikely any permanent building would be placed at this location (resulting in contact with the soil by construction workers, industrial workers, and or residents) but it is possible that conduit or piping could be placed at this depth at this location. Therefore these samples were qualitatively evaluated in this risk assessment.

Groundwater. Groundwater data were grouped into two exposure units for evaluation in the risk assessment, shallow groundwater and deep groundwater. The shallow groundwater data are from wells screened in the Columbia aquifer. The deep groundwater data are from the well screened in the Yorktown aquifer.

The RI determined that the nature and extent of contamination in the shallow groundwater was not completely defined. Therefore, additional shallow monitoring wells were installed and sampled as part of the ERI. Available groundwater data exists from 1997 through 2007. The shallow groundwater samples collected in 1997 were not quantitatively evaluated as all of the analytical parameters analyzed and wells sampled in 1997 were sampled again in 1999. The 1999 were used in the risk assessment, as many of the analytical parameters have not been analyzed for in more recent samples from these same monitoring wells. All shallow aquifer monitoring well samples collected at Site 2 between 1999 and 2007 were evaluated in the risk assessment; with the exception of the samples from the upgradient well (SJS02-MW01S) which were not included in the Site 2 risk assessment data set because upgradient contaminant levels do not represent site-related conditions.

Risks associated with exposure to deep groundwater were evaluated in the RI using data collected in 1997 and 1999, and demonstrated no unacceptable risks from exposure to deep groundwater. During the Expanded RI, deep monitoring well SJS02-MW10D was installed and sampled in December 2004. TCE and VC exceeded their MCLs at SJS02-MW10D. Because the Yorktown confining unit has been shown to be an effective barrier to vertical contaminant migration, an aquifer test and additional groundwater sampling events were conducted to investigate the presence of VOCs in this deep groundwater well; the results of this investigation are presented in detail in **Appendix D**. Based on the results, it is likely that the source of TCE in SJS02-MW10D was contaminated soil, free product, or a volume of contaminated groundwater carried from the shallow to the deep aquifer during the installation of the monitoring well. Analytical trend data following the pump test shows concentration of TCE and VC decreasing to concentrations below the MCLs (shown on **Figure 6-3**). Results from the deep groundwater samples collected during the Expanded RI, including the results from SJS02-MW10D following the pump test, were compared to the samples used in the 2004 RI and found to be consistent. Therefore, the RI conclusion that no unacceptable risks were posed by exposure to deep groundwater are still appropriate and the pathway was not evaluated in this HHRA.

In accordance with the USEPA Region III *Draft Guidance on the Selection of Analytical Metal Results from Monitoring Well Samples for Use in the Quantitative Assessment of Risk* (USEPA, 1992), unfiltered groundwater samples were used to determine inorganic constituent exposure concentrations for deep and shallow groundwater because a review of the

groundwater data determined that the results from the filtered samples were similar to the results from the unfiltered groundwater samples.

Surface Water. All surface water samples collected at Site 2 between 1999 and 2003 as part of the RI and Expanded RI, except for those collected from St. Juliens Creek (which were collected to see if Site 2 has impacted the creek) were evaluated in the risk assessment. Unfiltered surface water samples were included in the risk assessment because the receptors are expected to come in direct contact with the surface water within the tidal inlet.

Sediment. All sediment samples collected at Site 2 as part of the RI and Expanded RI, except for those collected from St. Juliens Creek (which were collected to see if Site 2 has impacted the creek) were evaluated in the risk assessment.

7.1.2 Selection of Chemicals of Potential Concern

All of the detected constituents were screened following the procedures described below. The selection of COPCs was based on the criteria presented in a USEPA Region III technical guidance manual (USEPA, 1993a) and USEPA's *RAGS Part D* (USEPA, 2001c). The maximum detected concentration of each constituent in each data grouping was compared to the criteria discussed below to select the COPCs. If the maximum concentration exceeded the criteria, the constituent was selected as a COPC. Constituents that were not detected in any of the samples or were detected at concentrations less than the screening criteria were not retained as COPCs. The COPC screening is presented in **Appendix M**, Tables 2.1 through 2.8. **Table 7-2** lists the chemicals that were selected as COPCs based on the screening methodology for all media.

- **Comparison with Health-based Criteria for Soil:** Soil data were compared to the USEPA Regional Screening Levels (RSLs) for residential soil (USEPA, 2008). RSLs that are based on non-carcinogenic effects were divided by 10 to account for exposure to multiple constituents. RSLs based on carcinogenic effects were used as presented in the RSL table.

- **Comparison with Health-based Criteria for Surface Water:** The maximum detected chemical concentrations in surface water were compared with ten times the adjusted (adjusted as discussed for groundwater below) USEPA RSLs (USEPA, 2008). Therefore, for surface water, RSLs that are based on non-carcinogenic effects were used as presented in the RSL table. RSLs based on carcinogenic effects were multiplied by ten.

- **Comparison with Health-based Criteria for Sediment:** The maximum detected chemical concentrations in sediment were compared with ten times the adjusted (adjusted as discussed for soil above) USEPA residential soil RSLs. Therefore, for sediment, RSLs that are based on non-carcinogenic effects were used as presented in the RSL table. RSLs based on carcinogenic effects were multiplied by ten.

- **Comparison with Health-based Criteria for Groundwater:** Groundwater data were compared to the USEPA RSLs for tap water (USEPA, 2008). RSLs that are based on non-carcinogenic effects were divided by 10 to account for exposure to multiple constituents. RSLs based on carcinogenic effects were used as presented in the RSL table. Groundwater data were also compared to the National Primary Drinking Water Regulations MCLs, however, this comparison was not used to select the groundwater COPCs. Tables 2.7 and 2.8, **Appendix M**, present the screening for the shallow aquifer

groundwater direct contact with water, and volatilization to air from groundwater and subsequent inhalation of air, respectively.

- Appropriate constituents were chosen as surrogates for constituents not included in the USEPA RSL table (USEPA, 2008) and their RSLs were used as the screening value. These constituents and their surrogates are identified on Tables 2.1 through 2.8, in **Appendix M**.
- **Lead:** Lead concentrations in soil and sediment were compared to the USEPA residential child soil screening value of 400 mg/kg (USEPA, 1994b). Lead concentrations in groundwater and surface water were compared to the federal action level of 15 µg/L (USEPA, 2002).
- **Essential Human Nutrients:** Constituents that are considered essential nutrients, present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and toxic only at very high doses were eliminated from the quantitative risk analysis. These constituents include calcium, magnesium, potassium, and sodium. Although iron is also considered an essential nutrient and is only toxic at very high doses, iron was included in the HHRA since a provisional toxicity value is available.

7.2 Exposure Assessment

Exposure refers to the potential contact of an individual with a constituent. The exposure assessment identifies pathways and routes by which an individual may be exposed to the COPCs, and estimates the magnitude, frequency, and duration of potential exposure. Constituent intakes and associated health risks are only quantified for complete exposure pathways.

A conceptual exposure model showing potential human exposure scenarios identified for current and potential future site-use conditions is presented in **Figure 7-1**. A site-wide comprehensive CSM is provided as **Figure 6-1**. The following sections discuss the components of exposure assessment:

- Conceptual exposure model for human health (characterization of exposure setting, identification of exposure pathways)
- Exposure point concentrations
- Exposure assumptions for potentially complete exposure pathways
- Calculation of intakes

7.2.1 Characterization of Exposure Setting

Characterizing an exposure setting consists of two parts: (1) identifying the physical characteristics of the site as they relate to exposure, and (2) characterizing human populations on or near the site.

Physical Characteristics

Basic site characteristics such as physical setting, climate, and groundwater hydrology are summarized in Section 4.

Potentially Exposed Populations

Potentially exposed populations are identified based on their locations relative to the site, their activity patterns, and the presence of potential sensitive subpopulations. Table 1 in **Appendix M** details the potentially exposed populations evaluated in this risk assessment. The pathways evaluated in the risk assessment are also shown in **Table 7-3** and on the conceptual exposure model (**Figure 7-1**).

Current Land Use. Site 2 is a former waste disposal area, currently consisting of a storm water drainage inlet, open field of mowed grass, and an asphalt parking lot. Construction and excavation activities at the site are prohibited. Landscapers and trespassers could access the site. Landscapers at the base could contact surface soil during their activities. The trespassers could be exposed to surface soil, and the surface water and sediment in the drainage inlet on the site. The tidal inlet is not used for swimming due to the shallow depth of water, however, there is the potential for trespassers to wade in the water bodies and contact both surface water and sediment.

Groundwater is not currently used at or near the site, and therefore, direct exposure to groundwater is not evaluated under current land use. There are no buildings currently on the site. Therefore, vapor intrusion from shallow groundwater into building indoor air is not a complete pathway and is not evaluated under current land use.

Potential Future Land Use. Future land use at the site is not expected to change, although it is more likely that it would be industrial or commercial than residential. However, future residential development of the site is evaluated as the most conservative future use of the site.

No wells reportedly utilize the Columbia aquifer (shallow groundwater) as a domestic potable water supply at or near SJCA, due to its poor quality and low yield (Fluor Daniel GTI, 1997). However, it is evaluated under the future residential scenario for exposure through potable use (ingestion and bathing with the water). Shallow groundwater is also evaluated for the construction worker since the depth to groundwater at the site generally ranges from 1 to 6 ft bgs, and construction workers could contact this water during excavation activities. Additionally, although there are no buildings currently on the site, it is possible, although unlikely, that buildings could be constructed on the site in the future. Therefore, vapor intrusion from shallow groundwater into the indoor air of a future building (residential or industrial) is a potential scenario.

The potential future exposure scenarios assume that the subsurface soil may be disturbed during construction and excavation activities and may be mixed with surface soil and placed on the surface. Therefore, potential future receptors (residents, construction workers, and industrial workers) may be exposed to the combined surface and subsurface soil. Some of the subsurface soil samples were collected from the saturated zone (the unvalidated samples were not quantitatively evaluated in the risk assessment). It is less likely that a potential future receptor would contact the subsurface soil from the saturated zone as it is

unlikely any permanent building or structure would be placed within the saturated zone. However, it is possible that conduit or piping could be placed within the saturated zone.

As with current site use, surface soil, surface water, and sediment would be accessible to trespassers under future site use. Under a future scenario, future residents may also come in contact with surface water and sediment. Surface water is not used for swimming due to the shallow depth of water; however, there is a potential for future residents and trespassers to wade in the tidal inlet areas at the site.

7.2.2 Identification of Exposure Pathways

An exposure pathway can be described as a mechanism that moves a COPC from its source to an exposed population or individual, referred to as a receptor. An exposure pathway must be complete or exposure cannot occur. A complete exposure pathway has five elements:

- A source (e.g., chemical residues in groundwater)
- A mechanism for release and migration of chemical (e.g., leaching)
- An environmental transport medium (e.g., groundwater)
- A point or site of potential human contact (exposure point, e.g., drinking water)
- A route of intake (e.g., ingestion of groundwater used as a drinking water source)

All five elements must be present for a pathway to be considered complete. If one or more elements are not present, then the pathway is incomplete and there is no possibility of exposure. The following subsections discuss the elements as they pertain to Site 2.

Contaminant Sources

Contaminant sources at Site 2 are associated with the past uses of the site and current conditions near the site. The past site uses and contaminant sources are discussed in Sections 2 and 5. Contaminant sources include 3.9 acres of buried waste; former waste incinerator; former ASTs and a former UST; former lead-acid battery maintenance, commercial degreasing, and drum storage at Building 279; surface runoff from an upgradient industrial area (Site 21) through a storm sewer system; and discharge from the storm sewer system which passes through a VOC groundwater plume at Site 21.

Release and Transport Mechanisms

The fate and transport of chemicals in soil, surface water, sediment, and groundwater are determined by physical characteristics of the site as well as by the chemical and physical properties of the chemicals. A detailed description of the fate and transport of the site contamination is included in Section 6 and summarized here.

Contaminants placed on the surface and in the ground at the site may have migrated from the surface through the surface soil to the subsurface soil. SVOCs, pesticides, and inorganics were detected in both surface and subsurface soil at the site. Contaminants may have also leached through the soil to the groundwater. All of the VOCs detected in the groundwater were not detected in the unsaturated zone soil, however, they may have migrated from the soil to the groundwater when originally placed in the waste disposal area. VOCs were detected in the saturated zone soil samples collected in 2007 for MIP verification and vertical delineation of VOCs in the aquifer. Contaminants may be transported downgradient from the site in the groundwater. Additionally, runoff of contaminants from

the surface and groundwater discharge may have resulted in contamination in the surface water and sediment of the tidal inlet at the site.

Potential Exposure Points and Exposure Routes

Exposure points are locations where humans could come in contact with contamination. On-site exposure points include surface soil, combined surface and subsurface soil, surface water, sediment, shallow groundwater, and deep groundwater. Offsite exposure points include the deep groundwater and surface water and sediment downgradient of the site. Only onsite exposure points are evaluated in this risk assessment since it is assumed dilution and degradation of contamination would occur downgradient of the site, resulting in lower concentrations, and therefore lower risks than those calculated for the site.

Potential exposure routes are evaluated for current site use and potential future site use. The potentially complete pathways of exposure evaluated in this risk assessment are presented in Table 1 in **Appendix M** and in **Table 7-3**.

Current Exposure Routes. Groundwater is not currently used as a source of potable water either at the site or downgradient of the site, and direct exposure to deep or shallow groundwater is not currently a complete exposure pathway. Surface soil is currently accessible to trespassers and landscapers, and sediment and surface water are currently accessible to trespassers.

In summary, the current exposure routes include:

- Trespasser (adult and adolescent): incidental ingestion of and dermal contact with surface soil, inhalation of fugitive dust from surface soil; incidental ingestion and dermal contact with sediment and surface water through wading.
- Landscaper (adult): incidental ingestion of and dermal contact with surface soil, inhalation of fugitive dust from surface soil.

Future Exposure Routes. Potential future site use is unlikely to change from current use, but for a conservative evaluation of potential risks, both residential and industrial uses were evaluated. In the unlikely event the site is used for future residential development, future onsite residential receptors could use the shallow or deep groundwater beneath the site as a potable water supply. Exposure to shallow groundwater by construction workers during excavation activities is a potential exposure scenario under future exposure routes. Vapor intrusion from shallow groundwater into indoor air of a future residential or industrial building is a potential, although unlikely, future scenario. Due to the uncertainties associated with quantifying the risks associated with this potential future pathway, it was qualitatively evaluated in the risk assessment. The potential future exposure scenarios for soil assume that the subsurface soil will be excavated and mixed with surface soil and placed on the ground surface. Construction workers at the site may be exposed to surface and subsurface soil during excavation activities.

Exposure to surface soil, surface water, and sediment by trespassers is evaluated as both a potential current and future exposure scenario. Exposure to sediment and surface water in the tidal inlet by future residents are evaluated as potential future exposure scenarios.

In summary, the potential future exposure routes include:

- Resident (adult): ingestion of and dermal contact with shallow or deep groundwater, and inhalation of volatiles from shallow or deep groundwater while showering; incidental ingestion of and dermal contact with soil (surface and subsurface soil combined), inhalation of fugitive dust from soil; dermal contact with surface water through wading; and incidental ingestion of and dermal contact with sediment through wading; and inhalation of indoor air (vapor intrusion from shallow groundwater into future residential house).
- Resident (child): ingestion of and dermal contact with shallow or deep groundwater while bathing; incidental ingestion of and dermal contact with soil (surface and subsurface soil combined), inhalation of fugitive dust from soil; dermal contact with surface water through wading; and incidental ingestion of and dermal contact with sediment through wading; and inhalation of indoor air (vapor intrusion from shallow groundwater into future residential house).
- Construction Worker: dermal contact with shallow groundwater, and inhalation of volatile emissions from shallow groundwater while performing excavation and construction activities; incidental ingestion of and dermal contact with soil (surface and subsurface soil combined), and inhalation of fugitive dust from soil.
- Industrial Worker: incidental ingestion of and dermal contact with soil (surface and subsurface soil combined), and inhalation of fugitive dust from soil; and inhalation of indoor air (vapor intrusion from shallow groundwater into future industrial building).

7.2.3 Estimation of Exposure Point Concentrations

Exposure point concentrations (EPCs) are estimated constituent concentrations that a receptor may contact and are specific to each exposure medium. Exposure is quantified by estimating the EPCs of COPCs in environmental media and constituent intake by the receptor. EPCs may be directly monitored or estimated using environmental models. Constituent concentrations in shallow groundwater were measured for this assessment. Concentrations of volatile constituents in bathroom air from volatilization from shallow groundwater during showering, and in outside air due to volatilization from shallow groundwater during excavation activities were modeled using the methods described at the end of this subsection.

The reasonable maximum exposure (RME) EPC for each COPC was calculated as a 95 percent upper confidence limit (UCL) of the arithmetic mean of the data set, using ProUCL Version 4.0 (Singh, Singh, and Miachle, 2007). First, the distribution of each data set was determined (normal, lognormal, and/or gamma; or non-parametric if data fit none of these distributions) using the Shapiro-Wilks test to test for a normal or lognormal distribution, and the Anderson-Darling and Kolmogorov-Smirnov Tests to test for a gamma distribution. Based on the distribution and the skewness of the data, ProUCL recommended a 95 percent UCL that was used as the RME EPC for the data set. In cases where there were less than five samples in the data set, or the recommended UCL exceeded the maximum detected concentration, the maximum concentration was used as the EPC.

The arithmetic mean of the dataset was used as the central tendency exposure (CTE) EPC regardless of distribution, except in cases where the data set was lognormally distributed. In this case, the minimum variance unbiased estimate (MVUE) of the mean was used as the CTE EPC.

Appendix M, Tables 3.1 through 3.7 present the EPCs for the COPCs, and the rationale for the selected EPC.

Volatilization While Showering

Volatilization while showering was estimated using the Foster and Chrostowski (1987) shower model. The shallow aquifer groundwater concentrations used in the model are shown in Table 3.7, **Appendix M**. The model parameters and the Foster and Chrostowski shower model calculations are presented in Table 7.4.RME Supplement D in **Appendix M**.

Volatilization from Shallow Groundwater During Construction Activities

Concentrations of VOCs in air resulting from volatilization of constituents in shallow groundwater in an open excavation were calculated using a two-film volatilization model, in conjunction with USEPA's SCREEN 3 model. The groundwater concentrations used in the model are shown in Table 3.7 in **Appendix M**. The two-film volatilization model calculations are shown in Table 7.7.RME Supplement B in **Appendix M**.

7.2.4 Estimation of Chemical Intakes for Individual Pathways

Chemical intake is the amount of the chemical contaminant entering the receptor's body. Chemical intakes are generally expressed as follows:

$$I = \frac{C \; x \; CR \; x \; EF \; x \; ED}{BW \; x \; AT} = (mg/kg/day)$$

Where:

I = intake (mg/kg/day)

C = chemical concentration at exposure point (µg/L)

CR = contact rate, or amount of contaminated medium contacted per unit time or event (l/day, m^3/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight of exposed individual (kg)

AT = averaging time, or period over which exposure is averaged (days)

The intake equation requires specific exposure parameters for each exposure pathway. Exposure parameters are often assumed values, and their magnitude influences the estimates of potential exposure (and risk). The reliability of the values chosen can also contribute substantially to the uncertainty of the resulting risk estimates. Many of the exposure parameters have default values, which were used for this assessment. These assumptions, based on estimates of body weights, media intake levels, and exposure

frequencies and duration, are provided by USEPA guidance. Other assumptions required consideration of location-specific information and were determined using professional judgment. Tables 4.1 through 4.9 in **Appendix M** present the exposure factors used for different receptor scenarios at the site. RME values are presented in Tables 4.1.RME through 4.9.RME and CTE values are included in Tables 4.1.CTE through 4.8.CTE.

For the dermal contact with water scenario, skin permeability rates were obtained from *RAGS Part E* (USEPA, 2004a). Permeability constants used in the risk assessment are presented in the supplemental tables to Tables 7s in **Appendix M**. For the dermal contact with soil and sediment scenarios, dermal absorption factors (DABS) were obtained from *RAGS Part E* (USEPA, 2004a).

7.3 Toxicity Assessment

Toxicity assessment defines the relationship between the magnitude of exposure and possible severity of adverse effects, and weighs the quality of available toxicological evidence. Toxicity assessment generally consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to the chemical along with the type of health effect involved. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the constituent administered or received and the incidence of adverse health effects in the exposed population. Toxicity criteria (e.g., reference doses and slope factors) are derived from the dose-response relationship.

Health effects are divided into two broad groups: non-carcinogenic and carcinogenic effects. This division is based on the different mechanisms of action currently associated with each category. This section discusses non-carcinogenic and carcinogenic effects separately.

USEPA recommends that a tiered approach be used to obtain the toxicity values, the reference doses (RfDs) and cancer slope factors (CSFs), that are used to calculate non-cancer and cancer risks, respectively (USEPA, 2003b). The sources of toxicity values were: (1) Integrated Risk Information System (IRIS), (2) Provisional Peer-Reviewed Toxicity values (PPRTV) and (3) other USEPA and non-USEPA sources including the National Center for Environmental Assessment (NCEA), Agency for Toxic Substances and Disease Registry (ATSDR), Health Effects Assessment Summary Tables (HEAST), California EPA (Cal EPA), and USEPA's Office of Water, and the World Health Organization (WHO). If no toxicity values were available for a detected constituent, surrogate constituents were selected and their RBCs were used for the COPC selection process.

7.3.1 Toxicity Information for Non-carcinogenic Effects

Non-carcinogenic health effects include a variety of toxic effects on body systems, ranging from renal toxicity (toxicity to the kidneys) to central nervous system disorders. Non-carcinogenic health effects are grouped into two basic categories: acute toxicity and chronic toxicity. Acute toxicity can occur after a single exposure (usually at high doses), where the effect is most often seen immediately. Chronic toxicity generally occurs after repeated exposure (usually at low doses) and is seen weeks, months, or years after the initial exposure. The toxicity of a chemical is assessed through a review of toxic effects noted in

short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

USEPA (USEPA, 1989) defines the chronic RfD as a dose which is likely to be without appreciable risk of deleterious effects during a lifetime of exposure. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (7 years to a lifetime), and consider uncertainty in the toxicological database and sensitive receptors.

Chronic RfDs may be overly protective if used to evaluate the potential for adverse health effects resulting from short-term exposure. Subchronic RfDs are developed for short-term exposure (2 weeks to 7 years). Subchronic RfDs have been peer-reviewed by Agency and outside reviewers, but they have not undergone verification by an intra-Agency workgroup, and as a result are considered interim rather than verified toxicity values. Subchronic RfDs were used for the construction worker scenario because the exposure duration is 1 year. Chronic RfDs were used for all other receptors.

In the development of RfDs, all available studies examining the toxicity of a chemical following exposure are considered based on their scientific merit. Several uncertainty factors (UFs) and modifying factors (MFs) may be applied to account for uncertainty. UFs account for uncertainties such as poor data quality, extrapolation of data from animal studies to human exposures, or the use of subchronic studies to develop chronic criteria. These UFs and MFs range between 1 and 10,000, and are based on professional judgment. Therefore, there are varying degrees of uncertainty in the toxicity criteria.

USEPA-derived oral and inhalation chronic RfDs, and associated UF and MF values, for the COPCs at Site 2 are listed in Tables 5.1 and 5.2 in **Appendix M**.

Per USEPA guidance, oral RfDs were adjusted from administered doses to absorbed doses for evaluating dermal toxicity when deemed appropriate. The RfDs were adjusted using oral absorption factors from USEPA (USEPA, 2004a). The adjusted dermal RfDs are summarized in Table 5.1 in **Appendix M**.

7.3.2 Toxicity Information for Carcinogenic Effects

Potential carcinogenic effects are quantified using oral and inhalation CSFs, or unit risk factors that convert estimated exposures directly to incremental lifetime carcinogenic risks. CSFs may be derived from the results of chronic animal bioassays, human epidemiological studies, or both. Animal bioassays are usually conducted at dose levels that are much higher than are likely to be encountered in the environment. This design detects possible adverse effects in the relatively small test populations used in the studies. The actual risks from exposure to a potential carcinogen are not likely to exceed the estimated risks, and are probably much lower or even zero. USEPA-derived oral and inhalation CSFs are listed in Tables 6.1 and 6.2 in **Appendix M**.

As was done for oral RfDs, oral CSFs were adjusted from administered dose (oral) to absorbed dose (dermal) to evaluate dermal toxicity. When appropriate, the CSF were adjusted using oral absorption factors (USEPA, 2004a). The adjusted dermal CSFs are summarized in **Appendix M**, Table 6.1.

In addition to deriving a quantitative estimate of carcinogenic potency, USEPA also presents the weight of evidence of potential carcinogens. Current USEPA guidance (USEPA, 2005) uses a narrative approach to assess weight of evidence with five 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*." Previous USEPA guidance assigned weight-of-evidence classifications to potential carcinogens; constituents were classified as Group A, Group B1, Group B2, Group C, Group D, or Group E carcinogens. Weight-of-evidence classifications are presented in Tables 6.1 and 6.2, **Appendix M**.

7.3.3 Constituents for Which USEPA Toxicity Values Are Not Available

Most of the constituents detected at Site 2 have toxicity factors. However, lead, which was detected in soil, surface water, sediment, and groundwater, does not have available published toxicity factors. Lead is regulated by USEPA based on blood-lead uptake using a physiologically based pharmakokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil and sediment and 15 µg/L in groundwater and surface water, based on residential exposure.

The maximum detected concentration of lead in the soil, surface water, sediment, and groundwater exceeded the applicable screening values. Risks associated with residential exposure to lead are evaluated using USEPA's IEUBK Model. The principal assumption associated with the use of IEUBK is that a child from ages 0 to 7 years old is the receptor for potential exposure to lead in soil and groundwater. The USEPA has also developed a model that can be applied to industrial adults exposed to lead in soil, which relates soil lead intake to blood lead concentrations of women of child-bearing age (USEPA, 2003a). The methodology focuses on estimating fetal blood lead concentrations in women exposed to lead-contaminated soil. The average lead concentration is used as the exposure concentration in both models.

7.4 Risk Characterization

Risk characterization is the process of integrating the previous elements of the risk assessment into quantitative and semi-quantitative expressions of risk. The quantification of risk is then used as an integral component in remedial decision making and selection of potential remedies or actions, as necessary.

7.4.1 Non-carcinogenic and Carcinogenic Risk Estimation Methods

Potential human health risks are discussed independently for carcinogenic and non-carcinogenic contaminants because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. Some chemicals may produce both non-carcinogenic and carcinogenic effects, and were evaluated in both groups. The methodology used to estimate non-carcinogenic hazards and carcinogenic risk are described below. Following the description of the methodology, the non-carcinogenic hazards and carcinogenic risks for Site 2 are discussed.

Non-carcinogenic Hazard Estimation

Non-carcinogenic health risks are estimated by comparing the calculated exposure levels to threshold concentrations (or RfDs). The calculated intake divided by the RfD is equal to the hazard quotient (HQ):

$$HQ = Intake / RfD$$

The intake and RfD are expressed in the same units (mg/kg/day) and represent the same exposure period (i.e., chronic and subchronic). The intake and RfD also represent the same exposure route (i.e., inhalation intakes are divided by the inhalation RfDs, oral intakes are divided by the oral RfDs). An HQ that exceeds 1.0 (i.e., intake exceeds the RfD) indicates that there is a potential for adverse health effects associated with exposure to that chemical.

To assess the potential for non-carcinogenic health effects posed by exposure to multiple chemicals, a "hazard index" approach is used (USEPA, 1989). This approach assumes that non-carcinogenic hazards associated with exposure to more than one chemical are additive. Synergistic or antagonistic interactions between chemicals are not considered. The hazard index (HI) may exceed 1.0 even if all of the individual HQs are less than one. The chemicals may then be separated by similar mechanisms of toxicity and toxicological effects, and separate HIs derived based on mechanism and target organ affected. If the HI for each target organ is not above 1, it can be assumed that there is no non-carcinogenic hazard to the receptor.

Carcinogenic Risk Estimation

The potential for carcinogenic effects due to exposure to site-related constituents is evaluated by estimating the excess lifetime carcinogenic risk (ELCR). ELCR is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer.

Carcinogenic risk is calculated by multiplying the intake by the CSF:

$$ELCR = Intake \times CSF$$

The above equation is the linear low dose cancer risk equation, which is valid only at risk levels below 0.01 (USEPA, 1989). When the risk level is above 0.01, the one-hit model is used to estimate risk. Therefore, when the risk level for a particular constituent for an exposure pathway was above 0.01 (such as for ingestion of vinyl chloride from groundwater for the future lifetime resident) the following equation was used:

$$ELCR = 1 - \exp(-CSF \times Intake)$$

The combined risk from exposure to multiple constituents was evaluated by adding the risks from individual constituents. Risks were also added across the exposure routes if an individual would be exposed through multiple routes.

When a cumulative carcinogenic risk to an individual receptor under the assumed RME exposure conditions at the site exceeds USEPA's acceptable risk range of 10^{-4} (a 1 in 10,000 chance of developing cancer) and 10^{-6} (a 1 in 1,000,000 chance of developing cancer), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) generally requires remedial action to reduce risks at the site (USEPA, 1991). If the

cumulative risk is less than 10^{-4}, action generally is not required, but may be warranted if a risk-based chemical-specific standard (e.g., MCL) is exceeded.

7.4.2 Risk Assessment Results

RME risks were evaluated for all exposure scenarios. RME risks were evaluated using upper-bound estimates of the exposure parameters (**Appendix M**, Tables 4.1.RME through 4.9.RME) and the RME exposure point concentrations (**Appendix M**, Tables 3.1.RME through 3.7.RME). CTE risks were calculated for those scenarios that had an RME HI greater than 1.0 and/or an RME carcinogenic risk greater than $1x10^{-4}$. CTE risks were evaluated using median estimates of the exposure parameters (**Appendix M**, Tables 4.1.CTE through 4.8.CTE) and the CTE exposure point concentrations (**Appendix M**, Tables 3.1.CTE through 3.7.CTE).

The results of the risk characterization are presented below by receptor. The risk calculations are presented in **Appendix M**, Tables 7.1.RME through 7.6.CTE. A summary of the RME risk estimates is presented in **Appendix M**, Tables 9.1.RME through 9.6.CTE, and **Table 7-4**, and a summary of the CTE risk estimates is presented in **Table 7-5**.

Current/Future Adult Trespassers

Appendix M, Table 9.1.RME, summarizes the hazards and risks to a current/future adult trespasser for exposure to surface soil (incidental ingestion, dermal contact, and inhalation of fugitive dust), surface water (ingestion and dermal contact), and sediment (ingestion and dermal contact). The total RME non-carcinogenic hazard to current/future adult trespassers for all media (HI = 1.2) is above USEPA's target HI of 1.0, however, there are no individual constituents or target organ/effects with HIs above 1.0. The carcinogenic risks from exposure to the surface soil, surface water, and sediment based on RME are within USEPA's acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$.

Current/Future Adolescent Trespassers

Appendix M, Table 9.2.RME, summarizes the hazards and risks to a current/future adolescent trespasser for exposure to surface soil (ingestion, dermal contact, and inhalation of fugitive dust), surface water (ingestion and dermal contact), and sediment (ingestion and dermal contact). The total RME non-carcinogenic hazard to current/future adolescent trespassers for all media (HI = 2.3) is above USEPA's target HI of 1.0. The non-carcinogenic hazard from exposure to surface soil (HI = 1.5) based on RME exceeds USEPA's target HI of 1.0. The RME non-carcinogenic hazard is primarily associated with dermal contact (HI = 1.2) with vanadium. The carcinogenic risk from exposure to surface soil, surface water, sediment, and groundwater based on RME are within USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}.

No non-carcinogenic hazard from exposure to the surface soil based on CTE exceeded the USEPA's target HI of 1.0 (**Appendix M**, Table 9.1.CTE).

Current/Future Landscaper

Appendix M, Table 9.3.RME, summarizes the hazards and risks to a current/future landscaper for exposure to surface soil (incidental ingestion, dermal contact, and inhalation of fugitive dust). No non-carcinogenic hazard from exposure to surface soil based on RME

exceeded the USEPA's target HI of 1.0. The carcinogenic risk based on RME is within USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}.

Future Adult Resident

Appendix M, Table 9.4 RME, summarizes the hazards and risks to a future adult resident for exposure to COPCs in combined soil (ingestion and dermal contact), surface water (dermal contact), sediment (ingestion and dermal contact), and groundwater (ingestion, dermal contact, and inhalation). No non-carcinogenic hazard from exposure to surface water based on RME exceeded USEPA's target HI of 1.0. The RME non-carcinogenic hazard from exposure to combined soil (HI = 1.8), sediment (HI = 1.5), and shallow groundwater (HI = 292) based on RME exceed USEPA's target HI of 1.0. There are no individual COPCs that contribute a HI above 1.0 for the soil, or target organ/effects with an HI above 1 for exposure to soil alone. The RME non-carcinogenic hazard from exposure to sediment is associated with dermal contact (HI = 1.4) with chromium. The RME non-carcinogenic hazard from potable use of groundwater is primarily associated with ingestion (HI = 232) of 1,1,2-TCA, VC, cis-1,2-DCE, naphthalene, heptachlor epoxide, iron, and manganese; and dermal contact (HI = 19) with VC, cis-1,2-DCE, naphthalene, and heptachlor epoxide; and inhalation of water vapors while showering (HI = 41) of VC, trans-1,2-DCE, and naphthalaene. The carcinogenic risk from inhalation of shallow groundwater while showering (6.6×10^{-3}) based on RME exceeds USEPA's acceptable risk range of 10^{-6} to 10^{-4}. The RME carcinogenic risk is primarily associated with TCE, VC, and naphthalene.

The CTE non-carcinogenic hazard from potable use of groundwater (HI = 25) is above USEPA's target HI of 1.0. The CTE non-carcinogenic hazard is primarily associated with ingestion (HI = 23) of VC and cis-1,2-DCE; and dermal contact (HI = 1.9) with cis-1,2-DCE; and inhalation of water vapors while showering (HI = 1.1) although there are no individual COPCs with HIs above 1 for inhalation. The carcinogenic risk from inhalation of shallow groundwater vapors while showering (2.0×10^{-4}) based on RME exceeds USEPA's acceptable risk range of 10^{-6} to 10^{-4}. The RME carcinogenic risk is primarily associated with TCE. No non-carcinogenic hazard from exposure to soil or sediment based on CTE exceeded USEPA's target HI of 1.0 (**Appendix M**, Table 9.2.CTE).

Future Child Resident

Appendix M, Table 9.5.RME, summarizes the hazards to a future child resident for exposure to combined soil (ingestion and dermal contact), surface water (dermal contact), sediment (ingestion and dermal contact), and groundwater (ingestion, dermal contact, and inhalation). No non-carcinogenic hazard from exposure to surface water based on RME exceeded USEPA's target HI of 1.0. The non-carcinogenic hazards from exposure to combined soil (HI = 13), sediment (HI = 77), and shallow groundwater (HI = 585) based on RME exceed USEPA's target HI of 1.0. The RME non-carcinogenic hazard from exposure to combined soil is primarily associated with ingestion (HI = 6.3) of antimony, iron, and vanadium; and dermal contact (HI = 7.1) with vanadium. The RME non-carcinogenic hazard from exposure to sediment is primarily associated with dermal contact (HI = 77) with chromium. The RME non-carcinogenic hazard from exposure to shallow groundwater is primarily associated with ingestion (HI = 541) of 1,1,2-TCA, 1,1-DCE, VC, cis-1,2-DCE, trans-1,2-DCE, naphthalene, heptachlor epoxide, 2,6-dinitrotoluene, arsenic, iron, and

manganese; and dermal contact (HI = 44) with VC, cis-1,2-DCE, naphthalene, and heptachlor epoxide.

The non-carcinogenic hazards from exposure to sediment (HI = 3.1) and shallow groundwater (HI = 82) based on CTE exceed the USEPA's target HI of 1.0. The CTE non-carcinogenic hazard from exposure to sediment is primarily associated with dermal contact (HI = 3.0) with chromium. The CTE non-carcinogenic hazard from exposure to groundwater is primarily associated with ingestion (HI = 78) of 1,1,2-TCA, VC, cis-1,2-DCE, trans-1,2-DCE, iron, and manganese; and dermal contact (HI = 3.7) with cis-1,2-DCE. No non-carcinogenic hazard from exposure to soil based on CTE exceeded USEPA's target HI of 1.0 (**Appendix M**, Table 9.3.CTE).

Future Lifetime Resident

Appendix M, Table 9.6.RME, summarizes the carcinogenic risks to a future lifetime resident for exposure to combined soil (ingestion and dermal contact), surface water (dermal contact), sediment (ingestion and dermal contact), and shallow groundwater (ingestion, dermal contact, and inhalation). The RME carcinogenic risks from exposure to combined soil and surface water are within USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}. The carcinogenic risk from exposure to sediment ($1.6x10^{-4}$) and shallow groundwater ($2.2x10^{-1}$) based on RME exceeds USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}. The RME carcinogenic risk from exposure to sediment is primarily associated with dermal contact ($1.6x10^{-4}$) with no individual COPCs contributing to a cancer risk above 10^{-4}. The RME carcinogenic risk from exposure to shallow groundwater is primarily associated with ingestion ($2.0x10^{-1}$) of 1,1,2-TCA, PCE, TCE, VC, heptachlor epoxide, and arsenic; and dermal contact ($1.4x10^{-2}$) with PCE, TCE, and VC.

The carcinogenic risk from exposure to shallow groundwater ($1.7x10^{-2}$) based on CTE exceeds USEPA's acceptable risk range of 10^{-6} to 10^{-4}. The CTE carcinogenic risk from exposure to shallow groundwater is primarily associated with ingestion ($1.6x10^{-2}$) of PCE, TCE, and VC; and dermal contact ($8.5x10^{-4}$) with TCE and VC. The CTE carcinogenic risk from exposure to sediment is within USEPA's target risk range of 10^{-6} to 10^{-4} (**Appendix M**, 9.4.CTE).

Future Construction Worker

Appendix M, Table 9.7.RME, summarizes the hazards and risks to a future construction worker. The risk assessment assumed that a future construction worker could be exposed to soil through incidental ingestion, dermal contact, and inhalation of fugitive dust, and groundwater through dermal contact and inhalation of volatiles while performing construction and excavation activities. The non-carcinogenic hazard from exposure to combined soil (HI = 1.1) and shallow groundwater (HI = 11) based on RME exceeds USEPA's target HI of 1.0. There are no individual COPCs in combined soil contributing to a HI above 1.0. The RME non-carcinogenic hazard from exposure to shallow groundwater is primarily associated with dermal contact (HI = 7.9) with VC; and inhalation of shallow groundwater vapors (HI = 3.1) of naphthalene.

No carcinogenic risk from exposure to combined soil based on RME exceeded the USEPA's acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. The RME carcinogenic risk associated with exposure to shallow groundwater ($2.3x10^{-4}$) is above is the USEPA's acceptable cancer risk

range of $1x10^{-4}$ to $1x10^{-6}$. The risk is primarily associated with dermal contact ($1.6x10^{-4}$) with VC.

No non-carcinogenic hazards or carcinogenic risks from exposure to the combined soil or groundwater based on CTE exceeded the USEPA's target HI of 1.0 or acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$ (**Appendix M**, Table 9.5.CTE).

Future Industrial Worker

Appendix M, Table 9.8 RME, summarizes the hazards and risks to the future industrial worker for exposure to combined soil (incidental ingestion, dermal contact, and inhalation of fugitive dust), and groundwater used as a potable water supply (ingestion). The non-carcinogenic hazard from exposure to combined soil (HI = 1.8) and shallow groundwater (HI = 83) based on RME exceeds the USEPA's target HI of 1.1. The RME non-carcinogenic hazard from exposure to soil (HI = 1.1) is primarily associated with dermal contact with vanadium. The RME non-carcinogenic hazard from exposure to shallow groundwater is primarily associated with ingestion (HI = 83) of VC and cis-1,2-DCE. No carcinogenic risk from exposure to combined soil based on RME exceeded the USEPA's target risk range. The RME carcinogenic risk associated with exposure to groundwater ($2.9x10^{-2}$) exceeds USEPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$. This risk is primarily associated with ingestion of TCE and VC.

No non-carcinogenic hazard from exposure to combined soil based on CTE exceeded USEPA's target HI of 1.0 (**Appendix M**, Table 9.5.CTE). The non-carcinogenic hazard from exposure to shallow groundwater (HI = 16) based on CTE exceeds the USEPA's target HI of 1.0. The CTE non-carcinogenic hazard from exposure to shallow groundwater is primarily associated with ingestion (HI = 16) of VC and cis-1,2-DCE. The CTE carcinogenic risk associated with exposure to groundwater ($2.0x10^{-3}$) exceeds USEPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$ (**Appendix M**, Table 9.6.CTE). This risk is primarily associated with ingestion of TCE and VC.

Lead Exposure for All Media and All Scenarios

Lead is regulated by USEPA based on the concentration of lead in blood. The blood-lead concentration is estimated by using a physiologically-based pharmakokinetic model (the IEUBK model). As a conservative screening value, 400 mg/kg lead in soil was considered appropriate for residential land use scenarios (USEPA, 1994b). This value was also conservatively used as a screening value for lead in sediment. For groundwater, the Safe Drinking Water Act action level of 15 µg/L was used as the screening value. The lead action level was also conservatively used as the screening level for surface water. If maximum detected concentrations of lead in the site media exceeded these screening values, it was evaluated quantitatively in the risk assessment. Risks associated with non-residential adult (industrial worker) exposure to lead in soil were evaluated based on *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil,* (USEPA, 1996d). This approach uses a methodology to relate soil lead intake to blood lead concentrations in women of child-bearing age. The methodology focuses on estimating fetal blood lead concentration in women exposed to lead contaminated soil. This guidance provides a set of default parameter values that can be used in cases where high quality data are not available to support site-specific estimates.

Risks associated with residential exposure to lead in soil and groundwater were evaluated using USEPA's IEUBK Model. The principal assumption associated with the use of IEUBK is that a child from ages 0 to 7 years old is the receptor for potential exposure to lead in soil and groundwater. The average lead concentrations in soil and groundwater are used in these two models.

The maximum detected concentrations of lead in surface soil, combined surface and subsurface soil, surface water, sediment, and shallow groundwater exceeded the applicable lead screening values. The average lead concentrations in sediment and groundwater were below the applicable screening values.

The maximum detected concentration of lead in the surface water of 77.9 µg/L, which exceeds the groundwater/surface water screening level of 15 µg/L. The average lead concentration in surface water of 21 µg/L also exceeded the screening level. The screening level is the Safe Drinking Water Act action level for lead, and is based on ingestion of lead in drinking water, which is a very conservative screening value for surface water. Ingestion rates of lead in groundwater are around 25 times those expected for surface water. Therefore, it is assumed that incidental ingestion of lead in surface water, although exceeding the extremely conservative screening level used for surface water, would not result in an unacceptable risk. Therefore, lead can be eliminated as a COPC for surface water.

The maximum detected concentration of lead in the sediment is 545 mg/kg, which exceeds the screening level of 400 mg/kg used for sediment, which is based on exposure by a child resident to soil. The average lead concentration in sediment of 280 mg/kg is below the conservative screening value. Therefore, based on the conservative use of the soil screening value as a sediment screening value, and because the average concentration is below the screening level, it can be assumed that exposure to lead in sediment would not result in an unacceptable risk, and therefore, lead can be eliminated as a COPC for sediment.

The adult lead model was run for the surface soil, as lead was retained as a COPC for a trespasser and landscaper scenario. The results of the adult lead model for the trespasser exposed to surface soil are presented in **Appendix M**, Table 11.1. The results of the adult lead model for the landscaper exposed to surface soil are presented in **Appendix M**, Table 11.2. As shown in Table 11.1, the 95th percentile blood lead concentration among fetuses of adult trespassers is 1.7 to 1.9 micrograms lead per deciliter blood (µg/dL). The probability that the fetal lead blood concentration would be greater than the target blood lead concentration of 10 µg/dL ranges from 5 percent to 6.6 percent, with the upper end of the range above 5 percent. As shown in Table 11.2, the 95th percentile blood lead concentration among fetuses of adult landscapers is 1.6 to 1.8 µg/dL. The probability that the fetal lead blood concentration would be greater than the target blood lead concentration of 10 µg/dL ranges from 4.8 percent to 6.3 percent, with the upper end of the range above 5 percent. Therefore, the adult lead model indicates that exposure to lead in surface soil by adult trespassers or landscapers could be a health concern for the fetuses of these populations. However, it should be noted that the lead concentration exceeded 400 mg/kg in only five of the 24 surface soil samples (SJS02-SS03-000, SJS02-SS06-000, SJS02-SS20-000, SJS17-SS03-000, and SJS17-SS04-000) which are scattered across the site. Additionally, the average lead concentration (423 mg/kg) in surface soil at Site 2 is only slightly greater than

400 mg/kg, which is the level considered adequately protective of human health under residential land-use conditions.

The adult lead model was run for the combined surface and subsurface soil, as lead was retained as a COPC for a future industrial worker and construction worker scenario. The results of the adult lead model for the adult worker exposed to soil are presented in **Appendix M**, Table 11.3. As shown in Table 11.3, the 95th percentile blood lead concentration among fetuses of adult trespassers is 2.4 to 2.6 µg/dL. The probability that the fetal lead blood concentration would be greater than the target blood lead concentration of 10 µg/dL ranges from 7.4 percent to 9.3 percent, which is above 5 percent. Therefore, the adult lead model indicates that exposure to lead in soil by adult workers could be a health concern for the fetuses of these workers. It should be noted that the lead concentration exceeded 400 mg/kg in only nine of the 36 soil samples.

The results of the IEUBK model using the mean site soil concentration of 643 mg/kg and the mean site groundwater concentration of 2.4 µg/L are shown in **Appendix M**. The IEUBK evaluation resulted in a geometric mean blood concentration of 6.9 µg/dL for children 0 to 84 months old. Approximately 21 percent of this population had a blood lead level above USEPA's recommended level of 10 µg/dL. USEPA considers lead not to be a health concern if less than 5 percent of the population has a blood-lead level greater than 10 µg/dL. Therefore, residential exposure to lead in soil (which drives the risk, the groundwater concentration is below the model default groundwater concentration of 4 µg/L) may be a potential health concern for residential children. As noted above, the lead concentration exceeded 400 mg/kg in only nine of the 35 soil samples.

Vapor Intrusion

There are currently no buildings on site, but there is potential (though unlikely) for buildings to be constructed on the site in the future. Therefore, vapor intrusion from shallow groundwater into the indoor air of a future building (residential or industrial) is a potential scenario. Due to the uncertainties associated with quantifying the risks associated with this potential future pathway; such as uncertainties with future building size, air exchange systems, and foundations; risks associated with this pathway were not quantitatively evaluated in the risk assessment. Based on the elevated concentrations detected in the shallow groundwater, it is expected that vapor intrusion from the shallow groundwater into indoor air could pose unacceptable risks to future receptors.

7.5 Uncertainty Associated with HHRA

The risk measures used in Superfund site risk assessments are not fully probabilistic estimates of risk but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus, it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective.

A site-specific discussion on the uncertainties associated with the individual components of the risk assessment is presented in the following sections.

7.5.1 General Uncertainty in COPC Selection

The sampling conducted at Site 2 focused on areas of known or suspected contamination. Therefore, the uncertainty in sampling and possibility of missing a contaminated location is expected to be minimal. The uncertainty associated with the data analysis is minimal, as the data have been fully validated prior to use in the risk assessment. The general assumptions used in the COPCs selection process were conservative to ensure that the true COPCs were not eliminated from the quantitative risk assessment and that the highest possible risk was estimated.

A comparison of site concentrations to background concentrations was not used to select the COPCs. Additionally, the COPCs were not limited to those constituents that are potentially attributed to historical activities at the site. This may result in including risks calculated for some constituents that are not necessarily site related in the total site risk, which is probably more applicable to soil, surface water, and sediment, than to the groundwater. Risk management of these constituents is provided in Section 6.2.

Dibenzofuran, which was detected in the surface soil, sediment, and groundwater, is the only constituent that was detected in site media that did not have an RSL or an appropriate surrogate constituent RSL. Dibenzofuran was not detected widely throughout media across Site 2. Dibenzofuran was detected in 5 of the 23 surface soil samples (maximum concentration of 0.22 J mg/kg), 1 of the 14 sediment samples (maximum concentration of 0.13 J mg/kg), and 2 of the 12 groundwater samples (maximum concentration off 54 ug/L. Therefore, it is unlikely that if this constituent is a COPC at the site, it would contribute significantly to the risks across the site.

A number of the reporting limits for constituents not detected in samples exceeded the applicable screening level or MCL. For cases where the maximum detected concentration of the constituent exceeded the screening level or MCL, one-half the reporting limit was used as a proxy concentration in calculating the exposure concentration. This may result in an over- or under-estimation of the actual exposure point concentration, as it is possible the constituent is present in the sample at a concentration either above or below one half the reporting limit. Additionally, there were some constituents not detected in any of the samples, with reporting limits above the screening levels. These constituents were not carried through the risk assessment, which might result in an underestimation of risk. For soil and sediment, the majority of the non-detected constituents had reporting limits below the screening values. There were some SVOCs, including carcinogenic PAHs, with reporting limits above the screening values, which could result in underestimation of risk However, further evaluation of this potential underestimation would not be expected to impact the overall outcome due to the extent of soil and sediment posing potential risk from other constituents.

For groundwater, a number of the reporting limits, particularly for VOCs, and for a smaller number of SVOCs, are above the groundwater screening levels or MCLs. As the risk assessment already indicated that there are risks associated with exposure to groundwater, these elevated reporting limits for non-detected constituents would not be expected to change the results of the risk assessment.

For surface water, about one third of the non-detected VOCs had reporting limits above the screening levels and about one tenth of the non-detected SVOCs had reporting limits above

the screening levels. Therefore, there could be some constituents present in the surface water at concentrations below the reporting limit but above the screening value, and the risk associated with exposure to surface water could be higher than actually estimated. However, it is not expected that these constituents and risks would result in elevating the surface water risks to levels above target risk levels.

7.5.2 Uncertainty Associated with Exposure Assessment

Uncertainty in the exposure assessment was generally treated with conservative decision rules and assumptions, and therefore the uncertainty likely overestimates actual exposure to COPCs. Several exposure pathways evaluated by this HHRA, such as residential land use, are hypothetical and are not anticipated to exist in the future. Most of the exposure factors used to quantify exposure are generally conservative and reflect worst-case, or upper-bound, assumptions for the exposure.

The unvalidated saturated subsurface soil samples collected in 2007 at depths a potential future receptor could be exposed to were not quantitatively evaluated in the human health risk assessment. One of these samples, SB04 from 5.5 to 6.5 ft bgs, had elevated concentrations of TCE, cis-1,2-DCE, and VC. cis-1,2-DCE and VC were not detected in any of the validated samples evaluated in the risk assessment. TCE was detected in one of the samples used in the risk assessment, but this detected concentration was four orders of magnitude lower than the concentration detected in SB04, and TCE was not retained as a COPC. As this sample was collected from the saturated zone, it is unlikely any permanent buildings would be placed at this location (resulting in contact with the soil by construction workers, industrial workers, and or residents) but it is possible that conduit or piping could be placed at this depth at this location. This results in an underestimation of potential risks associated with exposure to subsurface soil, particularly for a future construction worker, and potentially for a future industrial worker or resident.

The risks calculated for exposure to sediment are associated with the dermal exposure pathway, the risks associated with incidental ingestion of sediment alone are below or within USEPA target risk levels. Exposures to sediment differ from exposure to soil due to potential differences in chemical and physical properties between the two media and differing conditions under which these types of exposures occur. However, due to limited studies of dermal exposure to sediment, the risk assessment approach for dermal exposure to soil is used for evaluating dermal exposure to sediment. The sediment to skin adherence factors (DABS) used to evaluate dermal exposure to sediment result in a large degree of uncertainty in the risk calculations. Increasing moisture content of the sediment will increase adherence to the skin, but may also affect the relative percent absorbed. However, the dermal absorption factor for soil is used, as there are no values available for sediment. Another large source of uncertainty and overestimation of risk is the difference in dry weight and wet weight of the sediment sample; the sediment adherence factors reflect wet weight, but the does estimations use sediment data recorded in dry weight.

Site-related contamination would be expected to decrease with time. The risk assessment assumed concentrations would remain constant throughout the exposure period (30 years for the residential scenarios, 25 years for the worker, and 1 year for the construction worker). This will result in an over-estimation of risk.

Due to uncertanties associated with potential future buildings that could be constructed at the site, the future vapor intrusion from shallow groundwater into indoor air pathway was not quantified in the risk assessment. This could result in an underestimation of risks to future residents or industrial worker if a residential or industrial building was constructed at the site. However, the risk assessment already indicated risks above acceptable levels to these receptors associated with exposure to groundwater. Therefore, groundwater will be further evaluated during future investigations, both in terms of direct contact and potential vapor intrusion.

7.5.3 Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the non-carcinogenic toxicity factors is included in Tables 5.1 and 5.2 in **Appendix M**. UFs are applied by USEPA to extrapolate from animal studies to humans. Additional modification factors are also applied based on USEPA's professional judgment. Therefore, the non-carcinogenic toxicity factors most likely overestimate the actual toxicity.

The uncertainty associated with CSFs is mostly associated with the low dose extrapolation where carcinogenicity at low doses is assumed to be straight-line responses. This is a conservative assumption, which introduces a high uncertainty into slope factors which are from this extrapolated area of the dose-response curve. Most of the experimental studies indicate existence of a threshold for carcinogenicity, which is not accounted for in the development of the CSF.

CSFs developed by USEPA represent upper-bound estimates. Carcinogenic risks generated in this assessment should be regarded as an upper-bound estimate of the potential carcinogenic risks rather than an accurate representation of carcinogenic risk. The true carcinogenic risk is likely to be less than the predicted value (USEPA, 1989).

Additional uncertainty is in the prediction of relative sensitivities of different species of animals and the applicability of animal data to humans.

There is a large degree of uncertainty associated with the oral to dermal adjustment factors (based on chemical-specific gastrointestinal absorption) used to transform the oral RfDs and CSFs based on administered doses to dermal RfDs and CSFs based on absorbed doses. It is not known if the adjustment factors result in an underestimate or overestimate of the actual toxicity associated with dermal exposure.

The provisional toxicity values used for TCE in this assessment were obtained from the Cal EPA. These values are the values the Department of Defense (DOD) and USEPA have agreed will be used for human health risk assessments performed for the DOD. However, these toxicity values are considered provisional as they are have not been endorsed by USEPA and published in the IRIS database.

Iron is an essential human nutrient, which complicates the derivation of an RfD (USEPA, 1999). The future child resident had an estimated HQ from ingestion of iron in soil of 1.7, which is greater than the USEPA target value of 1. The estimated RME intake of iron via incidental ingestion of soil (1.2 mg/kg-day; **Appendix M** Table 7.5.RME) is only slightly above the recommended daily allowance (RDA) range for children ages 6 months to 10 years (0.36 – 1.11 mg/kg-day) (USEPA, 1999). However, the intake is below the maximum

daily intake that is likely to pose no risk of adverse effects, or the upper limit (UL) for children of 2.7 mg/kg-day (Institute of Medicine, 2005). Therefore, exposure to iron in soil is most likely not a health concern for the future child resident.

The future child and adult residents had estimated HQs for ingestion of iron in the groundwater above USEPA's target value of 1.0. The estimated intake of iron via ingestion of groundwater (4.4 mg/kg-day; **Appendix M** Table 7.5.RME) by the child resident exceeds the RDA range for children ages 6 months to 10 years (0.36 – 1.11 mg/kg-day) (USEPA, 1999). The estimated intake for the child resident is also above the UL for children of 2.7 mg/kg-day (Institute of Medicine, 2005). The estimated intake of iron via ingestion of groundwater for the adult resident (1.9 mg/kg-day; **Appendix M** Table 7.4.RME) is above the RDA for adult men (0.13 mg/kg-day) and the RDA range for females aged 11 to 50 years (0.24-0.33 mg/kg-day) (USEPA, 1999). This intake is also above the UL for adults of 0.64 mg/day (Institute of Medicine, 2005).

Although the oral RfD for manganese is not provisional (that is, the RfD has been approved by a USEPA workgroup), the derivation of toxicity factors for essential nutrients is complicated, and therefore, warrants further discussion. Manganese is an essential human nutrient responsible for activating several enzymes (USEPA, 2007). Disease states have been documented in humans associated with both deficiencies and excess intakes of manganese (USEPA, 2007). The IRIS profile for manganese states, "The reference dose is estimated to be an intake for the general population that is not associated with adverse health effects; this is not meant to imply that intakes above the reference dose are necessarily associated with toxicity. Some individuals may, in fact, consume a diet that contributes more than 10 mg manganese/day without any cause for concern," (USEPA, 2007). Ingestion of manganese in groundwater may result in an HI of 2.9 to a future child resident, based on a daily intake rate of 0.07 mg/kg-day, which corresponds to an intake of 0.07 mg/day (**Appendix M**, Table 7.5.RME). This intake is below the Adequate Intake (AI) for manganese for a child 1 to 3 years of age of 1.2 mg/day). Therefore, ingestion of manganese in the groundwater is not expected to be a health concern for the child resident.

Ingestion of manganese in groundwater may result in an HI of 1.2 to a future adult resident, based on a daily intake rate of 0.03 mg/kg-day (corresponding to an intake of 2.1 mg/day; **Appendix M**, Table 7.4.RME). This intake is below the AI for manganese for an adult male of 2.3 mg/day and above the AI for an adult female of 1.8 mg/day (Institute of Medicine, 2005).

7.5.4 Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals such as additivity, synergism, potentiation, and susceptibility of exposed receptors. The simple assumption of additivity used for this assessment may or may not be accurate and may or may not over- or under-estimate risk; however, a better alternative is not available at this time.

7.6 Summary of the HHRA

The risk assessment was conducted to evaluate the potential human health risks associated with current and hypothetical future receptors and exposure scenarios if no remedial action is implemented for soil, surface water, sediment, and shallow aquifer groundwater. A summary of the RME and CTE risks are provided in **Tables 7-4** and **7-5**, respectively. The following subsections provide the summary of potential human health risks related to each site media:

7.6.1 Surface Soil

There are no non-carcinogenic hazards or carcinogenic risks that exceed USEPA target levels for a current/future adult trespasser or landscaper worker exposed to surface soil. Exposure to surface soil may pose non-carcinogenic hazards above USEPA target levels for current/future adolescent trespassers. The non-carcinogenic hazard to the adolescent trespasser based on RME is associated with dermal contact with vanadium. The carcinogenic risks associated with surface soil are within USEPA's target risk range of 10^{-4} to 10^{-6}. Based on the adult lead model there may be a potential risk associated with exposure to lead in surface soil.

7.6.2 Combined Surface and Subsurface Soil

Although the total non-carcinogenic hazard from exposure to combined surface and subsurface soil to the future adult resident and construction worker based on RME exceeds USEPA's target HI of 1.0, there are no individual constituents or target organ/effects with HIs above 1.0 for each of these receptors. Exposure to combined surface and subsurface soil may pose non-carcinogenic hazards above USEPA target levels for future child residents and industrial workers. The non-carcinogenic hazard to the child resident based on RME is associated with ingestion of antimony, iron, and vanadium. Additionally, based on the IEUBK model there may be a potential risk associated with exposure to lead in soil. The non-carcinogenic hazard to the industrial worker based on RME is associated with dermal contact of vanadium.

Based on the qualitative evaluation of the unvalidated saturated subsurface soil samples there are potential risks from TCE, cis-1,2-DCE and VC for a future construction worker, and potentially, for a future industrial worker or resident, with exposure to subsurface soil.

7.6.3 Surface Water

For current or future land use, there are no non-carcinogenic hazards or carcinogenic risks that exceed USEPA target levels for any evaluated receptor exposed to surface water.

7.6.4 Sediment

There are no non-carcinogenic hazards or carcinogenic risks that exceed USEPA target levels for a future/current trespasser exposed to sediment. However, for future residential land use, exposure to sediment may pose non-carcinogenic hazards and carcinogenic risks above USEPA target levels. The non-carcinogenic hazard to the adult resident based on RME is associated with dermal contact with chromium. There are no non-carcinogenic risks to the adult resident based on CTE. The non-carcinogenic hazards to the child resident based on

RME and CTE is associated with dermal contact with chromium. There are no carcinogenic risks to the hypothetical future lifetime resident from exposure to the sediment.

7.6.5 Shallow Groundwater

Future potable use of shallow aquifer groundwater may pose non-carcinogenic hazards and carcinogenic risks above USEPA target levels for future hypothetical residents or industrial workers. The non-carcinogenic hazard to the adult resident based on RME is associated with ingestion of 1,1,2-TCA, VC, cis-1,2-DCE, naphthalene, heptachlor epoxide, iron, and manganese; and dermal contact with VC, cis-1,2-DCE, naphthalene, and heptachlor epoxide. Based on CTE, the non-carcinogenic hazard to the adult resident is associated with ingestion of VC and cis-1,2-DCE; and dermal contact with cis-1,2-DCE.

The non-carcinogenic hazards to the child resident based on RME are associated with ingestion of 1,1,2-TCA, 1,1-DCE, VC, cis-1,2-DCE, trans-1,2-DCE, naphthalene, heptachlor epoxide, 2,6-Dinitrotolune, arsenic, iron, and manganese; and dermal contact with VC, cis-1,2-DCE, naphthalene, and heptachlor epoxide. Based on CTE, the non-carcinogenic hazard to the child resident is associated with ingestion of 1,1,2-TCA, VC, cis-1,2-DCE, trans-1,2-DCE, iron, and manganese; and dermal contact with cis-1,2-DCE.

The carcinogenic risk to the hypothetical future lifetime resident based on RME is associated with ingestion of 1,1,2-TCA, PCE, TCE, VC, heptachlor epoxide, and arsenic; and dermal contact with PCE, TCE, and VC. The CTE carcinogenic risk to the future lifetime resident is associated with ingestion of PCE, TCE, and VC; and dermal contact with TCE and VC.

The non-carcinogenic hazards to the future industrial worker based on RME are associated with ingestion of cis-1,2-DCE and VC. Based on CTE, the non-carcinogenic hazard to the future industrial worker is associated with ingestion of cis-1,2-DCE and VC. Based on both the RME and CTE, the carcinogenic risk to the future industrial worker is primarily associated with ingestion of TCE and VC.

Exposure to shallow groundwater by a construction worker during excavation activities may pose non-carcinogenic hazards that exceed USEPA target levels. The non-carcinogenic hazard and carcinogenic risk to the construction worker based on RME is associated with dermal contact with VC. Based on CTE, the non-carcinogenic hazard to the construction worker is associated with dermal contact with VC. There are no CTE carcinogenic risks to the construction worker.

There are currently no buildings on site, but there is potential (though unlikely) for buildings to be constructed on the site in the future. Due to the uncertainties associated with quantifying the risks associated with this potential future pathway; such as uncertainties with future building size, air exchange systems, and foundations; risks associated with this pathway were not quantitatively evaluated in the risk assessment. Based on the elevated concentrations detected in the shallow groundwater, it is expected that vapor intrusion from the shallow groundwater into indoor air could pose unacceptable risks to future receptors.

Table 7-1
Summary of Data Used in Baseline Human Health Risk Assessment
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Sample ID	Date of Sampling	Sample Location	Parameters
Soil			
Surface Soil			
SJS02-SS02-000	6/25/1997	SJS02-SS02	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS03-000	6/25/1997	SJS02-SS03	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS04-000	6/25/1997	SJS02-SS04	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS05-000	6/25/1997	SJS02-SS05	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS05P-000[a]	6/25/1997	SJS02-SS05	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS06-000	6/25/1997	SJS02-SS06	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS07-000	6/25/1997	SJS02-SS07	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS08-000	6/25/1997	SJS02-SS08	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS09-000	6/25/1997	SJS02-SS09	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS10-000	6/25/1997	SJS02-SS10	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS11-000	4/21/1999	SJS02-SS11	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS12-000	4/21/1999	SJS02-SS12	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS13-000	4/21/1999	SJS02-SS13	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS14-000	4/21/1999	SJS02-SS14	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS15-000	4/21/1999	SJS02-SS15	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS16-000	4/21/1999	SJS02-SS16	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS16P-000[b]	4/21/1999	SJS02-SS16	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS17-000	4/21/1999	SJS02-SS17	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS18-000	4/21/1999	SJS02-SS18	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS19-000	4/21/1999	SJS02-SS19	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS20-000	4/21/1999	SJS02-SS20	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS01-000	2/14/2001	SJS17-SO01	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS02-000	2/14/2001	SJS17-SO02	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS02-000P[c]	2/14/2001	SJS17-SO02	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS03-000	2/14/2001	SJS17-SS03	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS04-000	2/14/2001	SJS17-SS04	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
Subsurface Soil			
SJS02-SB02-002	6/25/1997	SJS02-SB02	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB03-000	6/25/1997	SJS02-SB03	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB04-004	6/25/1997	SJS02-SB04	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB04-004P[d]	6/25/1997	SJS02-SB04	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB05-002	6/25/1997	SJS02-SB05	Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB06-001	4/21/1999	SJS02-SB06	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB07-001	4/21/1999	SJS02-SB07	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB08-001	4/21/1999	SJS02-SB08	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB09-001	4/21/1999	SJS02-SB09	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB10-001	4/21/1999	SJS02-SB10	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB11-001	4/21/1999	SJS02-SB11	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB11-001P[e]	4/21/1999	SJS02-SB11	Explo, Metals, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SB12-001	6/27/2001	SJS02-SB12	Total Metals, Dioxin
SJS02-SB13-001	6/29/2001	SJS02-SB13	Total Metals
SJS02-SB15-001	6/30/2001	SJS02-SB15	Total Metals, Dioxin
SJS02-SB17-001	7/1/2001	SJS02-SB17	Dioxin
SJS02-SB19-001	7/2/2001	SJS02-SB19	Dioxin
SJS02-SB20-001	7/5/2001	SJS02-SB20	Dioxin

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Groundwater			
Shallow Aquifer			
SJS02-GW2S-003	5/18/1999	SJS02-MW02S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW02S-07B	6/1/2007	SJS02-MW02S	CVOCs
SJS02-GW3S-003	5/19/1999	SJS02-MW03S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW03S-07B	6/1/2007	SJS02-MW03S	CVOCs
SJS02-GW4S-001	5/19/1999	SJS02-MW04S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-GW4S-001P[f]	5/19/1999	SJS02-MW04S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW04S-07B	6/1/2007	SJS02-MW04S	CVOCs
SJS02-GW5S-001	5/18/1999	SJS02-MW05S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW05S-07B	5/31/2007	SJS02-MW05S	CVOCs
SJS02-MW05S-07BP[g]	5/31/2007	SJS02-MW05S	CVOCs
SJS02-MW06S-03D	12/11/2003	SJS02-MW06S	Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW06S-07B	5/29/2007	SJS02-MW06S	CVOCs
SJS02-MW07S-03D	12/11/2003	SJS02-MW07S	Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW07S-04D	12/11/2003	SJS02-MW07S	VOCs
SJS02-MW07S-07B	6/4/2007	SJS02-MW07S	CVOCs
SJS02-MW08S-03D	12/11/2003	SJS02-MW08S	Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW08S-03D-P[h]	12/11/2003	SJS02-MW08S	Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW08S-07B	5/29/2007	SJS02-MW08S	CVOCs
SJS02-MW09S-03D	12/11/2003	SJS02-MW09S	Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW09S-07B	6/1/2007	SJS02-MW09S	CVOCs
SJS02-MW10S-04D	12/11/2003	SJS02-MW10S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW10S-07B	6/6/2007	SJS02-MW10S	CVOCs
SJS02-MW11S-04D	12/11/2003	SJS02-MW11S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW11S-07B	12/02/04	SJS02-MW11S	CVOCs
SJS02-MW12S-04D	12/11/2003	SJS02-MW12S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW12S-07B	5/30/2007	SJS02-MW12S	CVOCs
SJS02-MW13S-04D	12/11/2003	SJS02-MW13S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW13S-04D-P[i]	12/11/2003	SJS02-MW13S	Explo, Filtered Metals, Metals, SVOCs, VOCs, PEST/PCBs
SJS02-MW13S-07B	6/1/2007	SJS02-MW13S	CVOCs
SJS02-MW14S-07B	6/6/2007	SJS02-MW14S	CVOCs
SJS02-MW15S-07B	6/5/2007	SJS02-MW15S	CVOCs
SJS02-MW16S-07B	6/5/2007	SJS02-MW16S	CVOCs
SJS02-MW16S-07C	7/13/2007	SJS02-MW16S	CVOCs
SJS02-MW16S-07CP[j]	7/13/2007	SJS02-MW16S	CVOCs
Surface Water			
SJS02-SW02-000	7/14/1997	SJS02-SW02	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW02-000P[k]	7/14/1997	SJS02-SW02	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW03-001	4/13/1999	SJS02-SW03	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW04-001	4/16/1999	SJS02-SW04	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW05-001	4/16/1999	SJS02-SW05	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW06-001	4/16/1999	SJS02-SW06	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW07-001	4/16/1999	SJS02-SW07	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW09	7/17/2001	SJS02-SW09	Total Metals, Filtered Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SW10-03D	12/9/2003	SJS02-SW10	VOCs
SJS02-SW11-03D	12/9/2003	SJS02-SW11	VOCs

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Sediment			
SJS02-SD01-000	7/14/1997	SJS02-SD01	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD02-000	7/14/1997	SJS02-SD02	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD03-000	6/26/1997	SJS02-SD03	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD03-000P[l]	6/26/1997	SJS02-SD03	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD04-001	4/16/1999	SJS02-SD04	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD05-001	4/16/1999	SJS02-SD05	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD06-001	4/16/1999	SJS02-SD06	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD07-001	4/16/1999	SJS02-SD07	Total Metals, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD09	7/17/2001	SJS02-SD09	Explo, Total Metals, SVOCs, VOCs, PEST/PCBs, Dioxin
SJS02-SD10	7/17/2001	SJS02-SD10	Dioxin
SJS02-SD11	7/17/2001	SJS02-SD11	Dioxin
SJS02-SD12	7/17/2001	SJS02-SD12	Dioxin
SJS02-SD13	7/17/2001	SJS02-SD13	Dioxin
SJS02-SD14	7/17/2001	SJS02-SD14	Dioxin
SJS02-SD03-00-04D	10/6/2004	SJS02-SD03	Total Metals, SVOCs, PEST/PCBs
SJS02-SD05-00-04D	10/6/2004	SJS02-SD05	Total Metals, SVOCs, PEST/PCBs
SJS02-SD06-00-04D	10/6/2004	SJS02-SD06	Total Metals, SVOCs, PEST/PCBs
SJS02-SD21-00-04D	11/18/2004	SJS02-SD21	VOCs
SJS02-SD21-00-04D-P[m]	11/18/2004	SJS02-SD21	VOCs
SJS02-SD22-00-04D	11/18/2004	SJS02-SD22	VOCs
SJS02-SD23-00-04D	11/18/2004	SJS02-SD23	VOCs
SJS02-SD24-00-04D	10/6/2004	SJS02-SD24	Total Metals, SVOCs, PEST/PCBs
SJS02-SD25-00-04D	10/6/2004	SJS02-SD25	Total Metals, SVOCs, PEST/PCBs
SJS02-SD26-00-04D	10/6/2004	SJS02-SD26	Total Metals, SVOCs, PEST/PCBs

VOCs - Volatile Organic Constituents
CVOCs - Chlorinated Volatile Organic Constituents
SVOCs - Semivolatile Organic Constituents
Metals - Inorganic Constituents
Explo - Explosives
Pest/PCBs - Pesticides and Polychlorinated Biphenyls

[a] duplicate of SJS02-GW4S-001
[b] duplicate of SJS02-SS16-000
[c] duplicate of SJS17-SS02-000
[d] duplicate of SJS02-SB04-004
[e] duplicate of SJS02-SB11-001
[f] duplicate of SJS02-GW4S-001
[g] duplicate of SJS02-MW05S-07B
[h] duplicate of SJS02-MW08S-03D
[i] duplicate of SJS02-MW13S-04D
[j] duplicate of SJS02-MW16S-07C
[k] duplicate of SJS02-SW02-000
[l] duplicate of SJS02-SD03-000
[m] duplicate of SJS02-SD21-00-04D

Table 7-2
Summary of Chemicals of Potential Concern for Human Health
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Surface Soil	Groundwater	Surface Water	Sediment	Soil*
	Shallow Groundwater			
Benzo(a)anthracene	1,1,2-Trichloroethane	Chloroform	Vinyl chloride	Benzo(a)anthracene
Benzo(a)pyrene	1,1-Dichloroethene	Trichloroethene	Benzo(a)anthracene	Benzo(a)pyrene
Benzo(b)fluoranthene	1,4-Dichlorobenzene	Vinyl chloride	Benzo(a)pyrene	Benzo(b)fluoranthene
Benzo(k)fluoranthene	Chloroform	bis(2-Ethylhexyl)phthalate	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Dibenz(a,h)anthracene	Dibromochloromethane	Arsenic	Dibenz(a,h)anthracene	Dibenz(a,h)anthracene
Indeno(1,2,3-cd)pyrene	Ethylbenzene	Chromium	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene
4,4'-DDD	Methylene chloride	Lead	Arsenic	4,4'-DDD
4,4'-DDE	Tetrachloroethene	Manganese	Chromium	4,4'-DDE
4,4'-DDT	Trichloroethene		Lead	4,4'-DDT
Aroclor-1260	Vinyl chloride			Aroclor-1260
Aluminum	Xylene, total			Aluminum
Antimony	cis-1,2-Dichloroethene			Antimony
Arsenic	cis-1,3-Dichloropropene			Arsenic
Cadmium	trans-1,2-Dichloroethene			Cadmium
Chromium	2-Methylnaphthalene			Chromium
Copper	Carbazole			Copper
Iron	Naphthalene			Iron
Lead	Heptachlor			Lead
Manganese	Heptachlor epoxide			Manganese
Nickel	2,6-Dinitrotolune			Mercury
Thallium	RDX			Nickel
Vanadium	Arsenic			Thallium
Zinc	Iron			Vanadium
	Lead			Zinc
Emissions from Surface Soil at Site 2	Manganese			*Emissions from Soil* at Site 2*
	Water Vapors at Showerhead			
None				Chromium
	1,1,2-Trichloroethane			
	1,1-Dichloroethene			
	1,4-Dichlorobenzene			
	Chloroform			
	Dibromochloromethane			
	Ethylbenzene			
	Methylene chloride			
	Tetrachloroethene			
	Trichloroethene			
	Vinyl chloride			
	Xylene, total			
	cis-1,2-Dichloroethene			
	cis-1,3-Dichloropropene			
	trans-1,2-Dichloroethene			
	2-Methylnaphthalene			
	Naphthalene			

Table 7-3
Exposure Pathways
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Media	Exposure Route	Current/Future			Future			
		Trespasser		Landscaper	Resident		Industrial Worker	Construction Worker
		Adult	Adolescent	Adult	Adult	Child	Adult	Adult
Surface Soil								
	Ingestion	X	X	X				
	Dermal	X	X	X				
	Inhalation	X	X	X				
Shallow Groundwater	Ingestion				X	X	X	
	Dermal				X	X		X
	Inhalation				X			X
Surface Water								
	Ingestion	X	X		X	X		
	Dermal	X	X		X	X		
	Inhalation							
Sediment								
	Ingestion	X	X		X	X		
	Dermal	X	X		X	X		
	Inhalation							
Soil*								
	Ingestion				X	X	X	X
	Dermal				X	X	X	X
	Inhalation				X	X	X	X

X = Quantitative evaluation.
* Combines surface and subsurface soil.

Table 7-4
Summary of RME Cancer Risks and Hazard Indices
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Current/Future Trespasser - Adult	Surface Soil	Ingestion	1.9E-06				0.092	
		Dermal Contact	6.0E-07				0.24	
		Inhalation	NA				NA	
		Total	**2.5E-06**				**0.34**	
	Surface Water	Ingestion	9.2E-07				0.019	
		Dermal Contact	1.5E-06			bis(2-Ethylhexyl)phthalate	0.075	
		Inhalation	NA				NA	
		Total	**2.4E-06**			bis(2-Ethylhexyl)phthalate	**0.095**	
	Sediment	Ingestion	1.7E-06				0.057	
		Dermal Contact	4.7E-06			Benzo(a)pyrene	0.72	
		Inhalation	NA				NA	
		Total	**6.4E-06**			Vinyl chloride, Benzo(a)pyrene, Arsenic	**0.78**	
	All Media	Total	**1.1E-05**				**1.2**	
Current/Future Trespasser - Adolescent	Surface Soil	Ingestion	9.9E-07				0.13	
		Dermal Contact	1.2E-06				1.3	Vanadium
		Inhalation	NA				NA	
		Total	**2.2E-06**				**1.5**	Vanadium
	Surface Water	Ingestion	4.7E-07				0.027	
		Dermal Contact	5.5E-07				0.074	
		Inhalation	NA				NA	
		Total	**1.0E-06**				**0.10**	
	Sediment	Ingestion	8.5E-07				0.079	
		Dermal Contact	1.7E-06				0.71	
		Inhalation	NA				NA	
		Total	**2.6E-06**				**0.78**	
	All Media	Total	**5.8E-06**				**2.3**	
Current/Future Landscaper - Adult	Surface Soil	Ingestion	1.0E-06				0.048	
		Dermal Contact	5.1E-07				0.21	
		Inhalation	NA				NA	
		Total	**1.5E-06**				**0.26**	
	All Media	Total	**1.5E-06**				**0.26**	
Future Resident Adult	Soil*	Ingestion	NA				0.68	
		Dermal Contact	NA				1.1	
		Inhalation	NA				0.00056	
		Total	NA				**1.8**	Vanadium
	Surface Water	Ingestion	NA				0.019	
		Dermal Contact	NA				0.075	
		Inhalation	NA				NA	
		Total	NA				**0.095**	
	Sediment	Ingestion	NA				0.057	
		Dermal Contact	NA				1.4	Chromium
		Inhalation	NA				NA	
		Total	NA				**1.5**	Chromium

Table 7-4
Summary of RME Cancer Risks and Hazard Indices
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future Resident Adult (continued)	Shallow Groundwater	Ingestion	NA				232	1,1,2-Trichloroethane, Vinyl chloride, cis-1,2-Dichloroethene, Naphthalene, Heptachlor epoxide, Iron, Manganese
		Dermal Contact	NA				19	Vinyl chloride, cis-1,2-Dichloroethene, Naphthalene
		Inhalation	NA				41	Vinyl chloride, trans-1,2-Dichloroethene, Naphthalene
		Total	NA				**292**	1,1,2-Trichloroethane, Vinyl chloride, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Naphthalene, Heptachlor epoxide, Iron, Manganese
	All Media	Total	NA				**295**	
Future Resident Child	Soil*	Ingestion	NA				6.3	Antimony, Iron, Vanadium
		Dermal Contact	NA				7.1	Vanadium
		Inhalation	NA				0.0020	
		Total	NA				**13**	Antimony, Iron, Vanadium
	Surface Water	Ingestion	NA				0.091	
		Dermal Contact	NA				0.11	
		Inhalation	NA				NA	
		Total	NA				**0.21**	
	Sediment	Ingestion	NA				0.54	
		Dermal Contact	NA				77	Chromium
		Inhalation	NA				NA	
		Total	NA				**77**	Chromium
	Shallow Groundwater	Ingestion	NA				541	1,1,2-Trichloroethane, 1,1-Dichloroethene, Vinyl chloride, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Naphthalene, Heptachlor epoxide,2,6-Dinitrotolune, Arsenic, Iron, Manganese
		Dermal Contact	NA				44	Vinyl chloride, cis-1,2-Dichloroethene, Naphthalene, Heptachlor epoxide
		Inhalation	NA				NA	
		Total	NA				**585**	1,1,2-Trichloroethane, 1,1-Dichloroethene, Vinyl chloride, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Naphthalene, Heptachlor epoxide,2,6-Dinitrotolune, Arsenic, Iron, Manganese
	All Media	Total	NA				**676**	

Table 7-4
Summary of RME Cancer Risks and Hazard Indices
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future Resident Adult/Child	Soil*	Ingestion	4.7E-05		Arsenic	Benzo(a)pyrene, Dibenz(a,h)anthracene, 4,4'-DDE, 4,4'-DDT, Aroclor-1260	NA	
		Dermal Contact	1.7E-05			Benzo(a)pyrene, Dibenz(a,h)anthracene, Aroclor-1260, Arsenic	NA	
		Inhalation	4.2E-10				NA	
		Total	**6.4E-05**		Benzo(a)pyrene, Arsenic	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, 4,4'-DDE, 4,4'-DDT, Aroclor-1260	NA	
	Surface Water	Ingestion	8.5E-06			Vinyl chloride, Arsenic	NA	
		Dermal Contact	2.4E-06			bis(2-Ethylhexyl)phthalate	NA	
		Inhalation	NA				NA	
		Total	**1.1E-05**			Vinyl chloride, bis(2-Ethylhexyl)phthalate, Arsenic	NA	
	Sediment	Ingestion	6.3E-06			Vinyl chloride, Benzo(a)pyrene, Arsenic	NA	
		Dermal Contact	1.6E-04		Vinyl chloride, Benzo(a)pyrene, Dibenz(a,h)anthracene, Arsenic	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	NA	
		Inhalation	NA				NA	
		Total	**1.6E-04**		Vinyl chloride, Benzo(a)pyrene, Dibenz(a,h)anthracene, Arsenic	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	NA	
	Shallow Groundwater**	Ingestion	2.0E-01	1,1,2-Trichloroethane, Tetrachloroethene, Trichloroethene, Vinyl chloride, Heptachlor epoxide, Arsenic	Chloroform, Dibromochloromethane, Carbazole	Ethylbenzene, Methylene chloride, cis-1,3-Dichloropropene, Heptachlor, RDX	NA	
		Dermal Contact	1.4E-02	Tetrachloroethene, Trichloroethene, Vinyl chloride	1,1,2-Trichloroethane, Carbazole, Heptachlor epoxide	Chloroform, Dibromochloromethane, Ethylbenzene, Heptachlor, Arsenic	NA	
		Inhalation	6.6E-03	Trichloroethene, Vinyl chloride, Naphthalene	1,1,2-Trichloroethane, Chloroform	Ethylbenzene, Tetrachloroethene	NA	
		Total	**2.2E-01**	1,1,2-Trichloroethane, Tetrachloroethene, Trichloroethene, Vinyl chloride, Heptachlor epoxide, Naphthalene, Arsenic	Chloroform, Dibromochloromethane, Carbazole	Ethylbenzene, Methylene chloride, cis-1,3-Dichloropropene, Heptachlor, RDX	NA	
	All Media	Total	**2.2E-01**				NA	
Future Construction Worker	Soil*	Ingestion	6.9E-07				0.86	
		Dermal Contact	1.4E-07				0.23	
		Inhalation	3.4E-09				0.00020	
		Total	**8.4E-07**				**1.1**	
	Shallow Groundwater	Ingestion	NA				NA	
		Dermal Contact	2.1E-04	Vinyl chloride	Trichloroethene	Tetrachloroethene	7.9	Vinyl chloride
		Inhalation	2.1E-05		Trichloroethene	Vinyl chloride	3.1	Naphthalene
		Total	**2.3E-04**	Vinyl chloride	Trichloroethene	Tetrachloroethene	**11**	Vinyl chloride, Naphthalene
	All Media	Total	**2.3E-04**				**12**	

Table 7-4
Summary of RME Cancer Risks and Hazard Indices
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future Industrial Worker	Soil*	Ingestion	1.0E-05			Benzo(a)pyrene, Dibenz(a,h)anthracene, 4,4'-DDT, Arsenic	0.48	
		Dermal Contact	4.7E-06			Benzo(a)pyrene, Dibenz(a,h)anthracene	1.3	Vanadium
		Inhalation	3.4E-09				0.00020	
		Total	**1.5E-05**			Benzo(a)pyrene, Dibenz(a,h)anthracene, 4,4'-DDT, Aroclor-1260, Arsenic	**1.8**	Vanadium
	Shallow Groundwater	Ingestion	2.9E-02	Trichloroethene, Vinyl chloride	1,1,2-Trichloroethane, Chloroform, Dibromochloromethane, Tetrachloroethene, Carbazole, Heptachlor epoxide, Arsenic	Heptachlor	83	Vinyl chloride, cis-1,2-Dichloroethene
		Dermal Contact	NA				NA	
		Inhalation	NA				NA	
		Total	**2.9E-02**	Trichloroethene, Vinyl chloride	1,1,2-Trichloroethane, Chloroform, Dibromochloromethane, Tetrachloroethene, Carbazole, Heptachlor epoxide, Arsenic	Heptachlor	**83**	Vinyl chloride, cis-1,2-Dichloroethene
	All Media	Total	**2.9E-02**				**85**	

NA - Not applicable, pathway incomplete.
*Surface and subsurface soil combined.
**Inhalation pathway risk based on adult exposure only.

Table 7-5
Summary of CTE Cancer Risks and Hazard Indices
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Current/Future Trespasser - Adolescent	Surface Soil	Ingestion	1.6E-07				0.0087	
		Dermal Contact	1.2E-08				0.0031	
		Inhalation	NA				NA	
		Total	**1.7E-07**				**0.012**	
	All Media	Total	**1.7E-07**				**0.012**	
Future Resident Adult	Soil*	Ingestion	NA				0.067	
		Dermal Contact	NA				0.020	
		Inhalation	NA				NA	
		Total	NA				**0.087**	
	Sediment	Ingestion	NA				0.015	
		Dermal Contact	NA				0.18	
		Inhalation	NA				NA	
		Total	NA				**0.19**	
	Shallow Groundwater	Ingestion	NA				23	Vinyl chloride, cis-1,2-Dichloroethene,
		Dermal Contact	NA				1.9	cis-1,2-Dichloroethene
		Inhalation	NA				1.1	
		Total	NA				**26**	Vinyl chloride, cis-1,2-Dichloroethene
	All Media	Total	NA				**27**	
Future Resident Child	Soil*	Ingestion	NA				0.63	
		Dermal Contact	NA				0.18	
		Inhalation	NA				NA	
		Total	NA				**0.81**	
	Sediment	Ingestion	NA				0.14	
		Dermal Contact	NA				3.0	Chromium
		Inhalation	NA				NA	
		Total	NA				**3.1**	Chromium
	Shallow Groundwater	Ingestion	NA				78	1,1,2-Trichloroethane, Vinyl chloride, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Iron, Manganese
		Dermal Contact	NA				3.7	cis-1,2-Dichloroethene
		Inhalation	NA				NA	
		Total	NA				**82**	1,1,2-Trichloroethane, Vinyl chloride, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Iron, Manganese
	All Media	Total	NA				**86**	

Table 7-5
Summary of CTE Cancer Risks and Hazard Indices
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future Resident	Sediment	Ingestion	1.5E-06				NA	
Adult/Child		Dermal Contact	6.5E-06			Benzo(a)pyrene, Dibenz(a,h)anthracene, Arsenic	NA	
		Inhalation	NA				NA	
		Total	**8.0E-06**			Benzo(a)pyrene, Dibenz(a,h)anthracene, Arsenic	NA	
	Shallow Groundwater	Ingestion	1.6E-02	Tetrachloroethene, Trichloroethene, Vinyl chloride	1,1,2-Trichloroethane, Chloroform, Dibromochloromethane, Arsenic	Methylene chloride, cis-1,3-Dichloropropene, Carbazole, Heptachlor epoxide	NA	
		Dermal Contact	8.5E-04	Trichloroethene, Vinyl chloride	Tetrachloroethene	1,1,2-Trichloroethane, Chloroform, Dibromochloromethane, Carbazole, Heptachlor	NA	
		Inhalation	2.0E-04	Trichloroethene	Vinyl chloride	1,1,2-Trichloroethane, Chloroform, Naphthalene	NA	
		Total	**1.7E-02**	Tetrachloroethene, Trichloroethene, Vinyl chloride	1,1,2-Trichloroethane, Chloroform, Dibromochloromethane, Arsenic	Methylene chloride, cis-1,3-Dichloropropene, Carbazole, Heptachlor epoxide	NA	
	All Media	Total	**1.7E-02**				NA	
Future Construction Worker	Soil*	Ingestion	2.5E-07				0.14	
		Dermal Contact	1.7E-08				0.011	
		Inhalation	NA				NA	
		Total	**2.7E-07**				**0.15**	
	Shallow Groundwater	Ingestion	NA				NA	
		Dermal Contact	2.8E-05		Trichlorothene, Vinyl chloride	Tetrachloroethene	0.67	
		Inhalation	2.3E-06			Trichloroethene	0.12	
		Total	**3.1E-05**		Trichlorothene, Vinyl chloride	Tetrachloroethene	**0.78**	
	All Media	Total	**3.1E-05**				**0.9**	
Future Industrial Worker	Soil*	Ingestion	7.2E-07				0.063	
		Dermal Contact	6.4E-08				0.021	
		Inhalation	NA				NA	
		Total	**7.8E-07**				**0.084**	
	Shallow Groundwater	Ingestion	2.0E-03	Trichloroethene, Vinyl chloride	1,1,2-Trichloroethane, Tetrachloroethene	Chloroform, Dibromochloromethane, Heptachlor epoxide, Arsenic	16	Vinyl chloride, cis-1,2-Dichloroethene
		Dermal Contact	NA				NA	
		Inhalation	NA				NA	
		Total	**2.0E-03**	Trichloroethene, Vinyl chloride	1,1,2-Trichloroethane, Tetrachloroethene	Chloroform, Dibromochloromethane, Heptachlor epoxide, Arsenic	**16**	
	All Media	Total	**2.0E-03**				**16**	

NA - Not applicable, pathway incomplete.
*Surface and subsurface soil combined.

SECTION 8

Ecological Risk Assessment

This ERA amends/updates the Screening ERA (SERA) (Steps 1 and 2 of the 8-step ERA process) and Step 3 of a Baseline ERA (BERA) for surface soil, sediment, and surface water, which were prepared as part of the Site 2 RI (CH2M HILL, 2004a), and completes Step 7 of the 8 Step ERA process for Site 2. This ERA was conducted to assess the potential ecological impacts from the site under current conditions; as well as to determine if any further actions are needed at the site to be sufficiently protective of the environment.

The results from the Steps 1 through 3 of the ERA process that were conducted in the RI indicated potential risks to the following:

- Lower trophic-level receptors (plants and soil invertebrates) from the presence of inorganics, pesticides, and PAHs in soil
- Avian vermivores (worm eaters) and reptiles from the presence of lead, zinc, and 4,4'-DDE in soil
- Aquatic life from the presence of inorganics and carbon disulfide in inlet surface water
- Benthic-dwelling organisms from the presence of inorganics, pesticides, and PAHs in inlet sediment
- Avian piscivores (fish eaters) and reptiles from the presence of mercury in inlet sediment

The following conclusions and recommendations were made following the completion of Steps 1 through 3 of the ERA in the RI:

- No further evaluation of potential risks to terrestrial receptors from the presence of COPCs in soil is necessary based on remediation/presumptive remedies (removal/soil cover) planned
- No further evaluation of potential risks to aquatic life from the presence of COPCs in surface water is necessary based on the transient nature of this media and the expectation that sediment is the primary source of chemicals to surface water
- Further evaluation of potential risks to benthic-dwelling organisms from the presence of COPCs in sediment is necessary and should include further characterization of the area of potential impact within the inlet and evaluation of the toxicity of chemicals to benthic organisms.
- Further evaluation of the potential risks to avian piscivores and reptiles from the presence of mercury in sediment is necessary.

The primary ecologically-oriented activities that were conducted following the completion of Step 3 of the ERA consist of a sediment bioassay conducted with *Leptocheirus plumulosus* (L. plumulosus), and to a lesser extent, sediment pore water chemistry analysis, both of

which were conducted during the Expanded RI. Although further evaluation of risk to ecological receptors from exposure to chemicals in soil and surface water was not recommended at the completion of Step 3 of the ERA, additional surface soil and surface water data have become available following completion of the ERA in the RI. Because Site 17 was incorporated into Site 2 after the RI (see Section 2.3.7), this ERA updates the SERA and Step 3 of the BERA from the RI to include Site 17 surface soil samples. Additionally, two surface water samples were collected during the Expanded RI to determine if VOCs in groundwater from Site 21 are discharging to the Site 2 inlet; therefore, a SERA and Step 3 of the BERA have been performed for the Expanded RI surface water samples.

Data Summary

Table 8-1 lists the samples used in this risk assessment and the corresponding analyses. **Appendix C** presents the analytical results for the data.

Background data have been collected for soil and sediment and are presented in the Final Background Investigation Report (CH2M HILL, 2001b) and Final Technical Memorandum Site 2 Outfall Sediment Investigation Results and Development of Reference Sediment Data in St. Juliens Creek (CH2M HILL, 2005a). A comparison of site data to background data was not used to select the COPCs, but is discussed in the uncertainty section, Section 8.4.

Surface Soil. All surface soil data collected at Site 2 were evaluated in the risk assessment, with the exception of sample SJS02-SS01, which is located outside of the site boundary and does not represent site-related conditions. Although soil samples collected during the Site 2 RI adequately defined the nature and extent of soil contamination, soil was reassessed to include the surface soil samples collected during the Site 17 SI, based on the decision to incorporate Site 17 with Site 2.

Surface Water. All surface water data collected within Site 2 were evaluated in the risk assessment, with the exception of samples SJS02-SW02 and -SW09, which were collected during different years than all of the other surface water samples collected. These samples were excluded from the data summary to eliminate the possibility of temporal influences on chemical concentrations within this transient media. The surface water samples collected during the RI and Expanded RI were evaluated separately because surface water is a transient media and chemical concentrations in this media have the potential to change over time. Additionally, the evaluation was kept separate for the RI and Expanded RI samples because the samples collected during the Expanded RI are from very localized areas (drainage outfalls) which do not represent the inlet as well as the samples collected during the RI.

Sediment. All sediment samples collected within Site 2 as part of the RI and Expanded RI were evaluated in the risk assessment. The sediment samples collected during the Expanded RI to establish reference UTLs and evaluate potential impacts from the Site 2 inlet to St. Juliens Creek were presented in a separate technical memorandum, *Site 2 Outfall Sediment Investigation Results and Development of Reference Sediment Data in St. Juliens Creek* (CH2M HILL, 2005a) provided as **Appendix F** of this report.

8.1 General Approach and Methodology

The following sections present the approach used to complete Steps 1 through 7 of the ERA and provides an overview of each step of the ERA conducted, including a review of the problem formulation (Step 1) and methodology employed for Steps 2 through 3 of the ERA, which were first completed as part of the Site 2 RI (CH2M HILL, 2004a).

The ERA was conducted in accordance with the *Navy Policy for Conducting Ecological Risk Assessments* (CNO, 1999) and the Navy guidance for implementing the Chief of Naval Operations (CNO) policy entitled *Navy Guidance for Conducting Ecological Risk Assessments* (NAVFAC, 2001).

Although the Navy guidance is conceptually similar to the eight-step process outlined in USEPA ERA guidance for CERCLA (USEPA, 1997), the Navy has divided the eight steps into a three-tiered approach. The USEPA's Steps 1 and 2 are equivalent to the Navy's Tier 1, USEPA's Steps 3 through 7 are equivalent to the Navy's Tier 2, and the USEPA's Step 8 is equivalent to the Navy's Tier 3. **Figure 8-1** depicts the eight-step ERA process and the three-tiered process developed by the Navy, demonstrating the relationship between these two processes.

8.1.1 Screening-Level Problem Formulation (SERA Step 1)

The SERA problem formulation establishes the goals, scope, and focus of the ERA. As part of problem formulation, a conceptual model is developed. Assessment endpoints, measurement endpoints, and risk hypotheses are then selected to evaluate receptors for which complete and potentially significant exposure pathways are likely to exist. The fate and transport of the chemicals present at a site are also considered during this process.

Preliminary Conceptual Model

Important components of the preliminary conceptual model include the identification of potential contaminant sources, transport pathways, exposure media, potential exposure routes, and potential receptor groups. A summary of pathways/routes by which ecological receptors could be exposed to chemicals originating from Site 2 is presented in **Figure 8-2** and discussed in the following sections. A site-wide comprehensive CSM is provided as **Figure 6-1**.

Exposure Pathways and Routes

An exposure pathway links a source of contamination with one or more receptors. Exposure, and thus potential risk, can only occur if complete exposure pathways exist. **Figure 8-2** shows the potentially complete exposure pathways for Site 2. A discussion of these pathways and routes is provided in this section.

An exposure route describes the specific mechanism(s) by which a receptor is exposed to a chemical in an environmental medium. Terrestrial and rooted aquatic plants may be exposed through their root surfaces during water and nutrient uptake to chemicals present in surface soil and sediment, respectively. Unrooted, floating aquatic plants, and rooted submerged vascular aquatic plants and algae may be directly exposed to chemicals in water.

Animals may be exposed to chemicals through (1) the inhalation of gaseous chemicals or chemicals adhered to particulate matter; (2) the incidental ingestion of contaminated abiotic media (e.g., soil or sediment) during feeding activities; (3) the ingestion of contaminated water; (4) the ingestion of contaminated plant and/or animal tissues for chemicals that have entered the food chain; and/or (5) dermal contact with contaminated abiotic media. These exposure routes, where applicable, are also depicted in the preliminary conceptual models.

Based on the expected fate properties (e.g., relatively high adsorption to solids) of the chemicals commonly present on these sites (generally inorganics and PAHs) and the protection offered by hair or feathers, dermal and inhalation exposures for upper trophic level receptor species are not considered significant relative to ingestion exposures and are therefore not evaluated in the SERA. Incidental ingestion of soil or sediment during feeding, preening, or grooming activities is, however, considered in the risk estimates. Direct contact is considered for lower trophic level receptors (e.g., invertebrates).

Direct ingestion of drinking water is only considered when the salinity is below 15 parts per thousand (ppt), the approximate toxic threshold for wildlife receptors (Humphreys, 1988). The salinity measured in the site-associated drainage and open water wetland area ranged[2] from 0.002 to 11.3 ppt, which is below the toxic threshold. Because the salinity of surface water in Site 2 is below the toxic threshold, it was concluded these water bodies are probable sources of drinking water, and drinking water exposures were evaluated for Site 2.

Endpoints and Risk Hypotheses

The conclusion of the screening-level problem formulation includes the selection of ecological endpoints, which are based on the conceptual model. Two types of endpoints, assessment endpoints and measurement endpoints, are defined as part of the ERA process as are risk hypotheses or risk questions (USEPA, 1992, 1997, 1998). An assessment endpoint is an explicit expression of the environmental component or value that is to be protected. A measurement endpoint is a measurable ecological characteristic that is related to the component or value chosen as the assessment endpoint. The considerations for selecting assessment and measurement endpoints are summarized in USEPA (1992, 1997) and discussed in detail in Suter (1989, 1990, 1993). Risk hypotheses are testable hypotheses about the relationship among the assessment endpoints and their predicted responses when exposed to contaminants.

Assessment and measurement endpoints may involve ecological components from any level of biological organization, from individual organisms to the ecosystem itself (USEPA, 1992). Effects on individuals are important for some receptors, such as rare and endangered species, while population- and community-level effects are typically more relevant to ecosystems and are most often the focus of evaluations. Population- and community-level effects are usually difficult to evaluate directly without long-term and extensive study. However, measurement endpoint evaluations at the individual level, such as an evaluation of the effects of chemical exposure on reproduction, can be used to predict effects on an assessment endpoint at the population or community level. In addition, use of criteria values designed to protect the vast majority (e.g., 95 percent) of the components of a

[2] A salinity result of 420 ppt was reported for SJS02-SW04, collected in 1999. However, because seawater has a salinity of approximately 33 ppt, it is assumed that this result is incorrect.

community (e.g., Ambient Water Quality Criteria for the protection of aquatic life) can be useful in evaluating potential community- and/or population-level effects. A summary of the assessment and measurement endpoints identified for evaluation in the ERA is summarized in **Table 8-2.**

Selection of Surrogate Receptors

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, specific receptor species (e.g., belted kingfisher) or species groups (e.g., fish) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (e.g., guilds such as piscivorous birds) used to represent the assessment endpoints (e.g., survival and reproduction of piscivorous birds). Selection criteria typically include those species that:

- Are known or likely to occur at the site
- Have a particular ecological, economic, or aesthetic value
- Are representative of taxonomic groups, life history traits, and/or trophic levels in the habitats present at the site
- Can, because of toxicological sensitivity or potential exposure, be expected to represent potentially sensitive populations at the site
- Have sufficient ecotoxicological information available on which to base an evaluation

Lower trophic level receptor species are evaluated in the ERA based on taxonomic groupings for which screening values have been developed. These groupings and screening values are used in most ecological risk assessments. As such, specific species of aquatic biota (e.g., fish and macroinvertebrates) are not at this point chosen as receptors because of the limited information available and because these receptors are dealt with on a community level via a comparison to surface water and sediment screening values. Similarly, terrestrial plants and soil invertebrates (earthworms are the standard surrogate) are evaluated using soil-screening values developed for these communities. These assessment endpoints are refined to focus on one or more specific surrogate species as the ERA progresses and the Site 2 conceptual model is further refined.

The potential for adverse affect to aquatic life in the drainage ditch and Site 2 inlet was evaluated in the ERA. The ditch is dry during most of the year and does not provide viable aquatic habitat, though it could represent a conduit by which chemicals could be transported to downgradient aquatic habitats.

Risk to reptiles was evaluated using birds as surrogates based on limitations in relevant toxicity data. Using this approach, potential risks indicated to birds should be interpreted as also indicating a potential risk to reptiles.

The following upper trophic level receptor species have been chosen for exposure modeling based on the criteria listed above, the general guidelines presented in USEPA (1991), and the relevant assessment endpoints:

- Short-tailed shrew (*Blarina brevicauda*)—terrestrial mammalian insectivore
- American robin (*Turdus migratorius*)—terrestrial avian insectivore/omnivore
- American woodcock (*Scolopax minor*)—wetland/terrestrial avian insectivore
- Deer mouse (*Peromyscus maniculatus*)—terrestrial mammalian omnivore
- Red fox (*Vulpes vulpes*)—terrestrial mammalian carnivore
- Red-tailed hawk (*Buteo jamaicensis*)—terrestrial avian carnivore
- Muskrat (*Ondatra zibethicus*)—aquatic mammalian herbivore
- Raccoon (*Procyon lotor*)—semi-aquatic mammalian omnivore
- Mink (*Mustela vison*)—aquatic mammalian piscivore
- Belted kingfisher (*Megaceryle alcyon*)—wetland/aquatic avian piscivore/omnivore

A summary of the assessment endpoints, measurement endpoints, risk hypotheses, and surrogate receptors (i.e. "receptor species") identified for evaluation in the ERA is summarized in **Table 8-2**.

8.1.2 Screening-Level Effects Evaluation (SERA Step 1)

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. One set of screening values is typically developed for each selected assessment endpoint.

Medium-Specific Screening Values

Medium-specific screening values are established for ecologically relevant media, including soil, sediment, and surface water. The salinity measured in the inlet (0.2 to 11.3 ppt) approximates the range of salinity defined by USEPA (1996) as brackish (1 to 10 ppt). Accordingly, the lower of freshwater and marine toxicity values from the scientific literature were selectively used to screen chemical concentrations detected in site sediment and surface water. Because updated screening values were available for the Expanded RI sample evaluation and the Expanded RI samples were only analyzed for VOCs, the screening performed on the VOC results from the RI surface water samples has been updated in order to maintain consistency with the Expanded RI results.

Region III Biological Technical Assistance Group (BTAG) screening values (USEPA, 1995) were used when available for screening potential risks to in the ERA. Alternate screening values selected from the open scientific literature were used if Region III BTAG screening values were not available for a chemical. **Table 8-3** summarizes these screening values. Where more than one final screening value was available for a chemical within a medium (e.g., one for soil fauna and flora), the lower of the values was selected for use in the ERA.

Ingestion Screening Values

Ingestion screening values for dietary exposures were derived for each avian/mammalian receptor species and bioaccumulating chemical. Toxicological information from the literature for wildlife species most closely related to the receptor species was used, where available, but was supplemented by laboratory studies of nonwildlife species (e.g., laboratory

mice) where necessary. The ingestion screening values are expressed as milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day).

Growth and reproduction were emphasized as assessment endpoints since they are the most relevant, ecologically, to maintaining viable populations and because they are generally the most studied chronic toxicological endpoints for ecological receptors. If several chronic toxicity studies were available from the literature, the most appropriate study was selected for each receptor species based on study design, study methodology, study duration, study endpoint, and test species. No Observed Adverse Effect Levels (NOAELs) based on growth and reproduction were utilized, where available, as the screening values. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic Lowest Observed Adverse Effect Levels (LOAELs) or acute values as follows:

- When values for chronic toxicity were not available, the median lethal dose (LD_{50}) was used. An uncertainty factor of 100 was used to convert the acute LD_{50} to a chronic NOAEL (i.e., the LD_{50} was multiplied by 0.01 to obtain the chronic NOAEL)
- An uncertainty factor of 10 was used to convert a reported LOAEL to a NOAEL

Ingestion screening values (NOAELs and LOAELs) for mammals and birds are summarized in **Tables 8-4** and **8-5**, respectively. The SERA conservatively identified a constituent as a food web COPC if the estimated dose for at least one upper trophic level receptor exceeded the NOAEL. The actual dose that is protective of an individual receptor, however, is expected to occur between the NOAEL and the LOAEL. Therefore, the BERA food web exposure is focused on the Maximum Acceptable Threshold Concentration (MATC), which is the geometric mean of the NOAEL and LOAEL. MATC-based HQs provide realistic risk estimates as the MATC represents a standard estimation of the threshold concentration (i.e., the concentration above which a toxic effect on the test endpoint is produced) lying in a range bounded at the lower end by the highest tested dose having no observed effect (NOAEL) and at the higher end by the lowest tested dose having a significant toxic effect (LOAEL).

8.1.3 Screening-Level Exposure Estimate (SERA Step 2)

The available analytical data were evaluated and selected to represent the relevant environmental media at Site 2. Subsequently, maximum concentrations in surface soil and/or sediment (as appropriate to each receptor) and surface water were used in the SERA to conservatively estimate potential chemical exposures (direct and food web exposures) for the ecological receptors selected to represent the assessment endpoints at each site.

Selection Criteria for Analytical Data

All data used in the risk assessment were validated following USEPA Region III data validation procedures (USEPA, 1993b, 1994a). Available data and the data qualifiers were reviewed and used, as follows, for the quantitative risk assessment.

- Estimated values flagged with a J, K, or L qualifier were treated as unqualified detected concentrations.
- Data qualified with an R (rejected) were not used in the risk assessment.

- Data qualified with a B (blank contamination) were used in the risk assessment as if they were nondetects.
- In cases where one result was a detect and the other a nondetect, the detected value was used in screening.
- For chemicals not detected in any samples of a particular medium, the maximum reporting limit was used to estimate exposure concentration.
- For duplicate samples, the higher of the two concentrations was used as the sample concentration.
- For surface water, total (unfiltered) chemical concentrations were used in the SERA for conservatism.

Direct Exposure

The maximum detected chemical concentrations in surface soil, sediment, and surface water were used in the ERA to conservatively estimate potential direct chemical exposures for the ecological receptors selected for evaluation.

Food Web Exposure

All chemicals identified as potentially bioaccumulative in USEPA (2000) were evaluated in food web exposure models for upper trophic level receptors. In these models, exposure is estimated based on the assumption that chemicals can accumulate in the dietary components of receptors. The chemical concentration in each dietary item (i.e., tissue concentration) was estimated from the maximum detected concentrations of these chemicals in surface soil, sediment, and/or surface water.

Dietary items for which tissue concentrations were modeled included terrestrial plants, soil invertebrates (earthworms), small mammals, aquatic plants, aquatic invertebrates, and fish. The uptake of chemicals from the abiotic media into these dietary items was based (where available) on conservative (e.g., maximum or 90th percentile) bioconcentration factors (BCFs) or bioaccumulation factors (BAFs) from the literature. Default factors of 1.0 were used when data were not available for a chemical in the literature. Incidental ingestion of soil or sediment was also included when calculating total exposure. In the models it was assumed that chemicals were 100 percent bioavailable to the receptor and that each receptor spent 100 percent of its time on the site (i.e., an area use factor of 1.0 was assumed). Exposure via drinking water was included in the food web models at Site 2.

The methodology and models used to derive tissue concentration estimates are described in the following subsections.

Terrestrial Plant Tissue Concentrations. Tissue concentrations in the aboveground vegetative portion of terrestrial plants were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific soil-to-plant BCFs obtained from the scientific literature. The BCF values used were based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight

basis by dividing the wet-weight BCF by the estimated solids content for terrestrial plants (15 percent [0.15]; Sample et al., 1997).

For inorganic chemicals without literature based BCFs, a soil-to-plant BCF of 1.0 was assumed. For organic chemicals without literature based BCFs, soil-to-plant BCFs were estimated using the algorithm provided in Travis and Arms (1988):

$$\log B_v = 1.588 - (0.578)(\log K_{ow})$$

where:

B_v = Soil-to-plant BCF (unitless; dry weight basis)
K_{ow} = Octanol-water partitioning coefficient (unitless)

The log K_{ow} values used in the calculations were obtained mostly from USEPA (1995b; 1996b). The soil-to-plant BCFs used in the SERA are shown in **Table 8-6**.

Earthworm Tissue Concentrations. Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same chemical in the surrounding environmental medium (in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Since earthworms consume soil, BAFs are more appropriate values and are used in the food web models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) were given preference over undepurated analyses when selecting BAF values since direct ingestion of soil is accounted for separately in the food web model.

The BCF/BAF values used were based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms (16 percent [0.16]; USEPA, 1993a). For inorganic chemicals without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed. The soil-to-invertebrate (earthworm) BCFs/BAFs used in the SERA are shown in **Table 8-6.**

Small Mammal Tissue Concentrations. Whole-body tissue concentrations in small mammals (shrews, voles, and/or mice) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BAFs, the small mammal tissue concentration was estimated by multiplying the maximum measured surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BAF obtained from the literature. The BAF values used were based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for small mammals (32 percent [0.32]; USEPA, 1993a).

BAFs reported in Sample et al. (1998b) were used to estimate whole-body tissue concentrations. BAFs for insectivores were used for shrews (or for general small mammals if insectivore values were unavailable), BAFs for voles were used for herbivores, and BAFs for

mice were used for omnivores. General BAFs for small mammals were used when BAFs for specific receptor groups were not available. The small mammal BAFs used in the SERA are shown in **Table 8-7.**

For chemicals without soil-to-small mammal BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for small mammal species is via diet, it was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a diet to whole-body BAF (wet-weight basis) of one was assumed. The diet to whole-body BAF value of one is expected to represent a conservative estimate of tissue concentrations for most chemicals. For example, a maximum BAF (wet weight) value of 1.0 was reported by Simmons and McKee (1992) for PCBs based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for DDT of 0.3 for voles and 0.2 for short-tailed shrews. Reported BAF (wet-weight) values for dioxin were only slightly above one (1.4) for the deer mouse (USEPA, 1990). Resulting tissue concentrations (wet-weight) were then converted to dry weight using an estimated solids content of 32 percent (see above).

Aquatic Plant Tissue Concentrations. Tissue concentrations in the aboveground vegetative portion of aquatic plants were estimated using the same methodologies as described above for terrestrial plants except that maximum sediment (not soil) concentrations were used in the calculation.

Aquatic Invertebrate Tissue Concentrations. Tissue concentrations in aquatic invertebrates were estimated by multiplying the maximum measured sediment concentration for each chemical by chemical-specific sediment-to-invertebrate BAFs obtained from the literature. The BAF values used were based on the ratio between dry-weight sediment and dry-weight invertebrate tissue. BAFs based on depurated analyses (sediment was purged from the gut of the organism prior to analysis) were given preference over undepurated analyses when selecting BAF values since direct ingestion of sediment is accounted for separately in the food web model.

Literature values based on the ratio between dry-weight sediment and wet-weight invertebrate tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for aquatic invertebrates (21 percent [0.21]; USEPA, 1993a). For chemicals without literature based sediment-to-invertebrate BAFs, a BAF of 1.0 was assumed. The sediment-to-invertebrate BAFs used in the SERA are shown in **Table 8-8.**

Fish Tissue Concentrations. Tissue concentrations in whole-body fish were estimated by multiplying the maximum measured sediment concentration for each chemical by chemical-specific sediment-to-fish BAFs obtained from the literature. The BAF values used were based on the ratio between dry-weight sediment and dry-weight fish tissue. Literature values based on the ratio between dry-weight sediment and wet-weight fish tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for fish (25 percent [0.25]; USEPA, 1993a). For chemicals without literature based sediment-to-fish BAFs, a BAF of 1.0 was assumed. The sediment-to-fish BAFs used in the SERA are shown in **Table 8-8**.

Dietary Intakes. Dietary intakes for each receptor species were calculated using the following formula (modified from USEPA, 1993a):

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

where:

DI_x	=	Dietary intake for chemical x (mg chemical/kg body weight/day)
FIR	=	Food ingestion rate (kg/day, dry-weight)
FC_{xi}	=	Concentration of chemical x in food item i (mg/kg, dry weight)
PDF_i	=	Proportion of diet composed of food item i (dry weight basis)
SC_x	=	Concentration of chemical x in soil/sediment (mg/kg, dry weight)
PDS	=	Proportion of diet composed of soil/sediment (dry weight basis)
WIR	=	Water ingestion rate (L/day)
WC_x	=	Concentration of chemical x in water (mg/L)
BW	=	Body weight (kg, wet weight)

A summary of the receptor-specific exposure parameters used for the above equation is provided in **Table 8-9.** Exposures were based on maximum ingestion rates and minimum body weights for each receptor.

Dioxins and furans were analyzed in a subset of the sediment samples collected from Site 2. Because of differences in the toxicity and the large number of different dioxin/furan congeners, dioxin/furan concentrations were expressed as 2,3,7,8-tetrachlorodibenzodioxin (TCDD) equivalents (TEQs). Toxicity equivalence factors (TEFs) were used to calculate the TEQs. A summary of these TEFs is presented in **Table 8-10**.

8.1.4 Screening-Level Risk Calculation (SERA Step 2)

The screening-level risk calculation is the final step in a SERA. In this step, the maximum exposure concentrations (i.e., direct exposure to environmental media) or exposure doses (i.e., ingestion/dietary dosage for upper trophic level receptor species) (see Section 8.1.3) are compared with the corresponding screening values (see Section 8.1.2) to derive screening risk estimates. The outcome of this step is a list of COPCs for each media-pathway-receptor combination evaluated.

The COPCs are selected using the HQ method. The HQs are calculated by dividing the estimated exposure concentration by the corresponding medium-specific screening value (direct exposure) or by dividing the exposure dose by the corresponding ingestion screening value (food web exposure). Chemicals with HQs greater than or equal to 1.0 are considered COPCs in the SERA and are further evaluated in the ERA. When HQs are less than 1.0 the chemicals are not considered COPCs and are eliminated from further consideration in the ERA. Chemicals without screening values were retained as COPCs in the SERA.

HQs equal to or exceeding 1.0 indicate the potential for risk. However, screening values and exposure estimates are derived using intentionally conservative assumptions such that HQs greater than or equal to 1.0 do not necessarily indicate that risks are present or impacts are occurring. Rather, it identifies chemical-pathway-receptor combinations requiring further evaluation. Following the same reasoning, HQs that are less than 1.0 indicate that risks are very unlikely, enabling a conclusion of no unacceptable risk to be reached with high confidence.

Chemicals (detected or not detected) that did not have screening values and chemicals that were not detected but had maximum reporting limits exceeding screening values were identified as COPCs in the SERA. Chemicals that were not detected and did not have screening values, though identified as COPCs in the SERA, were not further evaluated in Step 3A. Uncertainties associated with these compounds were discussed in Section 8.4.

8.1.5 Refinement of Risk Estimates and Conceptual Model (BERA Step 3)

COPCs are identified in the SERA (i.e., Steps 1 and 2) using conservative exposure assumptions. If chemicals are shown to have the potential for posing ecological risk (i.e., HQs greater than or equal to 1.0) then they require further evaluation. According to Navy guidance (CNO, 1999), the baseline ERA is initiated in Step 3. In this step, the conservative exposure assumptions are refined to be more environmentally realistic and the risk estimates are re-calculated using the conceptual models developed in Tier 1. The following sections discuss the refinements to the exposure assumptions and risk calculation conducted as part of Step 3.

Exposure Assumption Refinements

The refined exposure assumptions and methods that were modified for the calculation of media-specific and food chain HQs for Step 3A are listed below:

- Average concentrations are used instead of maximum concentrations to evaluate potential impacts to terrestrial plants and terrestrial and aquatic invertebrates. While immobile invertebrates could be impacted by maximum concentrations, the invertebrate population as a whole would be exposed to a range of chemical concentrations and therefore the average concentration is a more realistic indicator of the overall potential for population- or community-level effect. Based on the similar composition of the terrestrial habitat (from which surface soil samples were collected) and aquatic habitat (from which sediment and surface water samples were collected) throughout the Site 2 area, it is considered reasonable to assume the evaluation of mean concentration is an acceptable estimator of the potential for adverse effects to receptor populations

- Average chemical concentrations are used instead of more conservative maximum concentrations to evaluate potential impacts to individual avian and mammal receptors. The average chemical concentration can provide a more realistic estimate of exposure for mobile receptors if it is assumed they randomly forage over a habitat (exposure) area. The terrestrial habitat (from which surface soil samples were collected) and the aquatic habitat (from which sediment and surface water samples were collected) are each relatively homogenous. Within each habitat type, for example, there are not localized areas of higher quality or specialized habitat that would cause a receptor to bias their foraging activity to that area. Furthermore, many of the prey for these species (e.g., fish) are also mobile, and would be expected to integrate chemicals accumulated from throughout the Site 2 area. Accordingly, it is reasonable to assume in the alternate food web models that most avian and mammalian receptors would forage throughout the Site 2 area without preference to any portion of the site. It is accordingly considered reasonable to consider mean concentration as an estimator of exposure in addition to the previously-considered upper bound estimate provided by the maximum concentration

- Where sufficient data are available, mean BCF or BAFs replace the selected BCF or BAF used in the SERA. The refined soil-to-plant and soil-to-invertebrate BCFs/BAFs, soil-to-small mammal BAFs, and sediment-to-invertebrate and sediment-to-fish BCFs/BAFs are summarized in **Tables 8-11, 8-12, and 8-13**, respectively
- Midpoints of body weight and ingestion rate were used to develop exposure estimates, rather than minimum body weights and maximum ingestion rates because midpoint exposure parameters are more representative of a greater proportion of a population. The Step 3A refined exposure parameters are summarized in **Table 8-14.**

Refined Risk Calculations

Following refinement of the exposure assumptions, risks from direct and food web exposure were recalculated using the same HQ method as described in Section 8.1.4. In the SERA, however, chemicals in the food web models were identified as COPCs if the estimated dose to wildlife exceeded the NOAEL for a chemical. The dose that is protective to wildlife, however, is expected to fall between the NOAEL and the LOAEL. Both the NOAEL and LOAEL were used for comparison in Step 3A. However, chemicals were eliminated as COPCs if estimated wildlife exposure doses did not exceed the LOAEL because this dose is expected to be protective of the overall population, which is the assessment endpoint being evaluated.

Chemicals that were not detected but were retained as COPCs in the SERA because the maximum reporting limit exceeded the respective screening value were further evaluated in Step 3A by comparing the mean reporting limit to the screening value. Chemicals (nondetected) having mean reporting limits that exceeded screening values were discussed in Section 8.4. Finally, chemicals that were detected but did not have screening values were retained as COPCs.

Conceptual Model Refinement

Following the recalculation of risks with the refined model assumptions, the ERA model problem formulation was refined and focused as part of Step 3B to further evaluate the exposure pathways where additional data are needed to more definitively characterize potential site-related risks.

8.1.6 Additional Site Investigation and Analysis (BERA Steps 4 - 6)

Step 4 of the ERA involves developing a study design to collect the additional data that are necessary to reduce any key uncertainties that are associated with the risk estimates. Steps 5 and 6 of the ERA process involve field verification of the sampling design and the site investigation and analysis phases, respectively.

These steps were conducted during the Expanded RI as a result of the recommendation made in the RI to further evaluate potential risk posed by sediment. The primary ecologically-oriented activities that were conducted following the completion of Step 3 of the ERA consist of a sediment bioassay conducted with *L. plumulosus*, and to a lesser extent, sediment pore water sample analysis, both of which were conducted during the Expanded RI.

8.1.7 Risk Characterization (Step 7)

Step 7 incorporates all of the available data in a weight-of-evidence approach to evaluate and draw final conclusions about the potential for adverse effects to ecological receptors. The uncertainties associated with the risk outcomes and their implications on the risk outcomes are summarized and evaluated as part of this step.

8.2 Risk Outcomes

The following section presents the risk outcomes that were calculated with both SERA and BERA model assumptions and the outcomes of the sediment bioassays conducted on the Site 2 sediment samples. As discussed in Section 8.1, the SERA risk estimates provide a highly conservative, worst-case estimate of potential risk, while the BERA risk estimates provide a less conservative, but likely more realistic estimate of potential risk. Several chemicals were identified as COPCs in the following evaluation, either because they were detected but did not have screening values or because their reporting limits exceeded screening values. The screening values are discussed in Section 8.1.2. Analytical data detections are shown in the raw analytical data tables in **Appendix C**.

8.2.1 Terrestrial Plants and Soil Invertebrates

Terrestrial plants and soil invertebrates could be exposed to chemicals in Site 2 soil. The SERA and Step 3 of the BERA indicated a potential for adverse effects to terrestrial plants and soil invertebrates from the presence of several chemicals (primarily inorganics, pesticides, and PAHs) in onsite soil. This conclusion was based on an evaluation of 19 surface soil samples collected throughout Site 2 as part of the RI. This evaluation incorporates an additional four surface soil samples collected during the Expanded RI. This section compares the soil analytical results from the RI and Expanded RI to the soil screening values. Surface soil detections are presented in Table C-1 of **Appendix C**.

The maximum concentrations of 11 inorganics, four pesticides, and 16 SVOCs (primarily PAHs), were above the acceptable HQ of 1.0 (**Table 8-15**). The mean concentrations of six inorganics, three pesticides, one PCB, and 16 SVOCs (primarily PAHs), were above the acceptable HQ of 1.0 (**Table 8-16**).

8.2.2 Aquatic Life

Several pathways have been identified by which aquatic life could be exposed to chemicals in the Site 2 tidal inlet. Benthic-dwelling organisms could be exposed to chemicals directly associated with sediment particles. Based on the historic nature of disposal activities at Site 2, these chemicals consist of mostly recalcitrant compounds (e.g., PAHs, inorganics) that would remain in sediment over extended periods of time. Benthic-dwelling organisms also could be exposed to chemicals in groundwater as it discharges through sediment and into surface water (sediment pore water). CVOCs are the primary COPCs in groundwater at Site 2. Although CVOCs are transient, and will rapidly volatilize and dilute following discharge to surface water, they could have the potential to adversely affect aquatic life if they are present in sediment pore water at high concentrations and regularly discharge to surface water. Water column-dwelling aquatic life could be exposed to chemicals in surface water from surficial runoff from the surrounding area and following the discharge of

groundwater. Earlier evaluations completed in the SERA and Step 3 of the BERA (CH2M HILL, 2004a) suggest that chemical concentrations in surface water have only a very limited potential to adversely affect aquatic life, and concluded that additional investigations focus on the evaluation of risks associated with the presence of chemicals in sediment. However, two additional surface water samples were collected during the Expanded RI to assess the source of VOCs in the inlet surface water. The following sections evaluate the potential for adverse effects to benthic-dwelling organisms and water column-dwelling aquatic organisms.

Benthic-Dwelling Organisms

This section summarizes the sediment bioassay data used to evaluate potential risks to benthic-dwelling organisms from the presence of chemicals in sediment. Bioassays provide one of the most accurate indicators of the potential for adverse effects to benthic-dwelling organisms because the outcomes directly quantify the toxicity of chemicals residing in sediment, and accurately account for bioavailability and the cumulative/antagonistic effects of chemicals in sediment. Bioassays accordingly provide an important line of evidence when evaluating the potential for adverse effects to benthic-dwelling organisms from the presence of chemicals in sediment.

This section also compares the sediment chemical analytical results collected during the RI and Expanded RI to literature-based screening values and evaluates the AVS/SEM ratio to characterize the bioavailability of key inorganic chemicals in sediment. The AVS/SEM analysis is based on the observation that the toxicity of some metals in sediment (cadmium, copper, lead, nickel, and zinc) are influenced by the presence of sulfides in sediment (Suter, 1993; Ankley, 1996). This is the result of complexes formed between these metals and sulfides, which reduces their bioavailability and toxicity in sediment. The bioavailability of these metals is expressed as a ratio of the SEM concentrations to the AVS concentrations measured in sediment (on a molar basis). When simultaneously extracted metals concentrations are less than the sulfide concentration (SEM/AVS ratio less than one), toxicity to benthic-dwelling organisms has not been observed for these metals (Hansen and Berry, 1996; Ankley, 1996).

Sediment Bioassays. The 28-day sediment *(L. plumulosus)* bioassay tests were conducted with sediment collected from both inlet and reference sediment sample locations (**Figure 8-2**). The Site 2 inlet sediment samples (SJS02-SD03-00-04D, SJS02-SD05-00-04D, SJS02-SD06-00-04D, SJS02-SD24-00-04D, SJS02-SD25-00-04D, and SJS02-SD26-00-04D) were collected from potentially site-impacted locations within the inlet. The Site 2 reference sediment samples (SJREF-SD01-00-04D, SJREF-SD04-00-04D, and SJREF-SD05 -00-04D) were collected from locations in the main body of St. Juliens Creek that were not impacted by Site 2 or any other site-related sources. The laboratory control sample was a native marine sample collected from Little Harbor in Wareham, Massachusetts. In accordance with USEPA guidelines, a laboratory control sample must be collected from a site known to be free of contamination, supporting a local population of amphipods, and consist of estuarine sediment with the appropriate content of silt and clay (USEPA, 2001a).

Results of the *L. plumulosus* sediment bioassay are summarized in **Table 8-17** and **Figure 8-2**. The complete laboratory bioassay report is presented in **Appendix L**. Survival, growth, and

reproduction within each site sample was statistically compared to each laboratory control and reference sample.

Survival. The mean percent survival for the laboratory control organisms was 76 percent, while the mean percent survival for organisms from the reference samples ranged from 83 to 90percent. Mean percent survival in inlet samples SJS02-SD06, -SD24, and -SD25 ranged from 0 to 33 percent, and was significantly less than in the reference samples and the laboratory control sample. Mean percent survival in inlet samples SJS02-SD03, SD05, and SD26 ranged from 58 to 87 percent and did not significantly differ from the laboratory control or reference samples.

Growth. The mean dry weight for the laboratory control organisms was 3.18 mg per amphipod, while the mean dry weight for organisms from the reference samples ranged from 6.45 to 9.26 mg per amphipod. Mean dry weight in inlet sample SJS02-SD24 (0.51 mg per amphipod) was significantly less than in the reference samples. Mean dry weight in inlet samples SJS02-SD03, -SD05, and -SD26 (ranging from 5.01 to 12.53 mg per amphipod) did not significantly differ from the reference samples. None of the sample results were significantly different than the laboratory control.

Reproduction. The mean number of offspring per amphipod for the laboratory control organisms was 1.19, while the mean number of offspring per amphipod for organisms from the reference samples ranged from 1.88 to 2.51. The mean number of offspring per amphipod in inlet samples SJS02-SD05 and -SD24 (1.28 and 0.94, respectively) was significantly less than the mean number of offspring per amphipod in the reference samples. The mean offspring per amphipod in inlet samples SJS02-SD03 and -SD26 (2.36 and 2.06, respectively) did not significantly differ from the reference samples. None of the inlet sample results were significantly different than the laboratory control.

Sediment Analytical Data. This section compares the sediment analytical results collected during the RI and Expanded RI to literature-based screening values.

Bioassay Samples Only. Chemical analysis was conducted on a split of each of the nine sediment samples collected during the Expanded RI for bioassays. This section evaluates the chemical concentrations detected in the sediment samples collected from these split samples in order to support the interpretation of bioassay outcomes.

The maximum concentrations of 14 inorganics, three pesticides, two PCBs, 17 SVOCs (primarily PAHs), and three VOCs in the Site 2 inlet samples exceeded ecological screening values (**Table 8-18**). The maximum concentrations of four inorganics in the sediment reference samples exceeded ecological screening values (**Table 8-19**).

The mean concentrations of 13 inorganics, three pesticides, three PCBs, and 16 SVOCs (primarily PAHs), and two VOCs in the Site 2 inlet samples exceeded ecological screening values (**Table 8-20**). The mean concentration of one inorganic (chromium) in the sediment reference samples exceeded its respective ecological screening value (**Table 8-21**).

All Sediment Samples. Analytical detections of the Site 2 inlet sediment samples for the combined RI and Expanded RI analytical data sets are compared to literature-based screening values, using the same screening values as used for the evaluation of chemicals in the sediment bioassay samples.

The maximum concentrations of 14 inorganics, three pesticides, two PCBs, 17 SVOCs (primarily PAHs), and three VOCs exceeded ecological screening values. A summary of the comparison outcomes is presented in **Table 8-22**. The mean concentrations of 11 inorganics, three pesticides, three PCBs, 16 SVOCs (primarily PAHs), and two VOCs exceeded ecological screening values. A summary of the comparison outcomes is presented in **Table 8-23**.

AVS/SEM Outcomes. AVS and SEM concentrations were measured in all nine sediment samples collected during the Expanded RI to support the evaluation of bioassay outcomes. **Table 8-24** summarizes the AVS/SEM ratios for these samples. As discussed above, ratios greater than one indicate increased bioavailability, and the potential for toxicity, although a ratio greater than one does not necessarily confirm that an adverse effect is occurring. The ratios were greater than one (ranging from 1.1 to 4.3) in all but one reference (SJS02-SD04) and one site (SJS02-SD03) sample. These results suggest that metals are bioavailable and have the potential to adversely affect benthic-dwelling organisms in most site samples, if present at high enough concentrations.

Sediment Pore Water Analytical Data. CVOC analysis was conducted on sediment pore water samples collected during the Expanded RI to determine if CVOCs discharging through sediment have the potential to adversely affect aquatic life. Concentrations of CVOCs detected in pore water samples are compared to surface water literature-based screening values in this section. Concentrations of CVOCs detected in pore water samples are presented in **Appendix C**. The maximum and mean concentrations of three CVOCs exceeded ecological screening values (**Tables 8-25** and **8-26**, respectively).

Water Column-Dwelling Organisms

This section presents a comparison of the surface water analytical data collected during the RI and Expanded RI to literature-based screening values to evaluate the potential risk to aquatic life.

During the RI, the maximum concentrations of 10 inorganics, one SVOC (bis[2-ethyhexyl]-phthalate), and three VOCs (carbon disulfide, chloroform, and TCE) exceeded ecological screening values (**Table 8-27)**. The mean concentrations of ten inorganic chemicals and the VOC carbon disulfide exceeded surface water screening levels in Step 3A (**Table 8-28)**.

Based on the surface water data collected during the Expanded RI, the maximum and mean concentrations of chloroform and TCE exceeded ecological screening values (**Tables 8-29** and **8-30**, respectively).

8.2.3 Wildlife

Using data collected as part of the RI for food web modeling, the Step 3A dietary dose estimates calculations indicated the potential for adverse effects to avian vermivores and reptiles from the presence of lead, zinc, and 4,4′-DDE in soil and to avian piscivores and reptiles from the presence of mercury in sediment. This evaluation, which was first reported in the RI, has been updated to include the soil analytical data collected as part of the Site 17 SI to. The sediment analytical data collected during the RI were similarly combined with the sediment analytical data collected during the Expanded RI to update the evaluation reported in the RI.

This subsequent evaluation also considers the potential for Aroclor-1260 in soil to represent a potential risk to avian vermivores and reptiles. Aroclor-1260 was not identified as a potential risk to wildlife in the RI; however, this aroclor was added to the evaluation because it was detected at a clearly higher concentration in the Site 17 soil samples (concentrations up to 2,700 µg/kg in SJS17-SS03) than in the initial soil samples (concentrations up to 110 µg/kg), and it is a bioaccumulative compound.

Wetland/Terrestrial Avian Risk Outcome

Results of the food web exposure models with the highly conservative SERA model assumptions are summarized in **Table 8-31**. HQs were greater than one for lead, zinc, 4,4'-DDE, and Aroclor-1260 based on the comparison to all three screening values when highly conservative exposure assumptions were used in the food web model.

Results of the food web exposure models with the BERA model assumptions are summarized in **Table 8-32**. HQs were greater than one for lead, zinc, and 4,4'-DDE for avian vermivores when compared to the most conservative ecological screening value (NOAEL). HQs were only slightly greater than one for lead and zinc when the estimated doses were compared to the LOAEL (HQ $\leq$ 1.8) and MATC (HQ $\leq$ 5.4), and were less than one for 4,4'-DDE when estimated doses were compared to both the LOAEL and MATC. HQs remained below one for Aroclor-1260 for all comparisons.

Avian Piscivore Risk Outcome

Results of the food web exposure models with the highly conservative SERA model assumptions are summarized in **Table 8-31**. HQs were greater than one for mercury based on the comparison to all three screening values when highly conservative exposure assumptions were used in the food web model.

Results of the food web exposure models with the BERA model assumptions are summarized in **Table 8-32**. HQs were greater than one for mercury based on comparison to all three screening values when BERA model assumptions were used in the food web model.

8.3 Risk Evaluation

The following section considers the available lines of evidence to evaluate the overall potential for adverse effects to potential ecological receptors from the presence of chemicals at Site 2.

8.3.1 Terrestrial Plants and Soil Invertebrates

Comparison of the data to the screening values indicates limited potential for adverse effects to lower trophic-level receptors (plants and soil invertebrates). The primary risk to these receptors from exposure to surface soil is from inorganics, pesticides, one PCB, and PAHs. The highest potential risks occur mostly in isolated "hot spot" areas, specifically inorganics and PAHs in the soil in the northern portion of the site (former Site 17). The four additional surface soil sample concentrations were only marginally higher than those previously evaluated, and does not change the final conclusion made in Step 3 of the BERA.

8.3.2 Aquatic Life

Benthic-Dwelling Organisms

Results of the sediment bioassays at Site 2 indicate the potential for adverse effects to benthic-dwelling organisms within the inlet. When compared to the laboratory control, *L. plumulosus* survival was significantly reduced in three of the six site samples tested (SJS02-SD06, -SD24, and -SD25). Reference samples had consistently higher survival, reproduction, and growth than did the laboratory controls. When compared to reference samples, *L. plumulosus* survival was significantly reduced in the same three samples, as well as SJS02-SD05. Sample SJS02-SD05 also had significantly reduced reproduction, while sample SJS02-SD24 had significantly reduced reproduction and growth when compared to the reference samples. The other two samples (SJS02-SD06 and -SD25) had 0 percent survival and reproduction and growth could not be statistically tested. There was no significant reduction in survival, growth, or reproduction in sample SJS02-SD03, which was collected in the central portion of the Site 2 inlet, or sample SJS02-SD26, which was collected adjacent to the mouth of the Site 2 inlet, where it joins St. Juliens Creek (**Figure 8-2**).

Several lines of evidence indicate that bioassay organism response is related to the presence of chemicals (most notably PAHs and inorganics) in sediment. The samples with the highest chemical concentrations also indicated a significant reduction in survival, growth, and/or reproduction. For example, the highest PAH concentrations were detected in sample SJS02-SD25 and the highest inorganic concentrations were detected in sample SJS02-SD06. These samples both indicated *L. plumulosus* survival of 0 percent. Elevated inorganic concentrations were also detected in sample SJS02-SD05, where there was a significant reduction in both *L. plumulosus* survival and reproduction.

AVS/SEM ratios suggest that the inorganics are bioavailable in sediment and the observed ratios generally correspond with the observed bioassay outcomes. For example, survival, growth, and/or reproduction were significantly reduced (compared to one or more of the site reference samples) in all but two of the site samples (SJS02-SD05 and -SD26) where the AVS/SEM ratios were greater than one (**Table 8-24**). There were no significant reductions in survival, growth, or reproduction in the sediment collected from locations (SJS02-SD03 and -SD04), where the AVS/SEM ratios were less than one. The AVS/SEM ratios not only suggest that the inorganics are bioavailable in sediment, but the correlation between the AVS/SEM ratio and the observed bioassay outcome suggests that the inorganics, at least in part, contributed to the observed bioassay organism impacts.

The analytical results from both the RI and Expanded RI indicate elevated chemical concentrations are present in the inlet sediment with no definitive pattern (**Figure 5-22**). The highest concentrations of PAHs were detected in sample SJS02-SD25, the highest concentrations of pesticides were detected in sample SJS02-SD26, and the highest concentrations of inorganics were detected in samples SJS02-SD05 and -SD06. Although there were some minor differences, the concentrations detected in sediment during the Expanded RI were in most cases similar to the range of concentrations observed when the combined sediment data set was evaluated (**Table 8-26**). It is therefore concluded that the results of the bioassays, which evaluated a subset of the total samples collected from the inlet, are indicative of the risks within the broader inlet. The bioassay outcomes, analytical, and bioavailability (AVS/SEM) data all suggest the potential for adverse effects to benthic-

dwelling organisms from the presence of chemicals (primarily PAHs and metals) in inlet sediment.

In addition to the potential for benthic-dwelling organisms to be exposed to chemicals residing in sediment, there is the potential for benthc-dwelling organisms to be exposed to chemicals (CVOCs) in groundwater as it discharges through sediment. Because of the transient (volatile) nature of CVOCs, the risks associated with this potential pathway could not be evaluated with the lab-based bioassay, but instead quantified by directly measuring CVOC concentrations in sediment pore water in order to accurately quantify the concentrations to which benthic-dwelling organisms would be exposed *in situ*. Furthermore, the evaluation of CVOC concentrations in sediment pore water provides an indication of where CVOCs are discharging through sediment and into the Site 2 inlet.

The sediment pore water analysis indicates there is a very limited area where CVOCs are occurring at high enough concentrations to adversely affect benthic-dwelling organisms. Concentrations of three CVOCs (1,1-DCE, TCE, and VC) exceed ecological screening values when both the maximum and mean concentrations were evaluated (**Table 8-34**). These CVOCs, however, were detected at concentrations exceeding the ecological screening values in a limited number of samples collected primarily within the western drainage ditch of the Site 2 inlet (**Figure 5-23**). Although this drainage ditch has the potential to discharge into the main body of the Site 2 inlet, it is essentially a roadside drainage that contains standing water only periodically, and is unlikely to provide viable habitat for most benthic-dwelling organisms.

Water Column-Dwelling Organisms

Surface water analytical data were collected during the RI and screened during the SERA and Step 3 of the BERA to evaluate the potential for chemicals in surface water to adversely affect aquatic life. Chemicals were detected in surface water (inorganics and carbon disulfide) at concentrations which suggest a very limited potential for adverse effects to aquatic life in the Site 2 inlet.

The surface water samples collected at the drainage outfalls and the sediment pore water samples collected during the Expanded RI indicate that CVOCs are discharging into the Site 2 inlet surface water via the drainage pipe outfalls and from groundwater through the sediment. However, the results of both the sediment pore water and the outfall discharge surface water analyses are consistent with the conclusions in the SERA and Step 3 of the BERA. The earlier investigation found carbon disulfide to be present in surface waster at concentrations slightly exceeding its ecological screening value, and it was concluded there may be a limited potential for adverse effects to aquatic life. The additional evaluation of CVOCs in pore water and the outfall surface water also indicate the presence of CVOCs at concentrations exceeding ecological screening values. However, the pore water samples indicate the highest concentrations of CVOCs are in the western drainage, where few benthic-dwelling organisms would be expected to occur, while the outfall discharge surface water samples indicate only a very limited exceedance at the point of discharge. As in the SERA and Step 3 of the BERA, it is once again concluded there is a minimal potential for adverse effects to aquatic life from the discharge of CVOCs into the Site 2 inlet surface water.

8.3.3 Wildlife

Modeled exposure estimates for the revised BERA risk calculations were compared to the NOAEL, MATC, and LOAEL. The dose that is protective to wildlife is expected to fall between the NOAEL and the LOAEL and, although all three toxicological endpoints were used for evaluation, chemicals were identified as a potential risk only if the estimated wildlife exposure doses exceeded the LOAEL because anything below this dose is expected to be protective of the overall population, which is the assessment endpoint being evaluated.

Based on the outcomes of the food web models, it is concluded there is a potential risk to avian vermivore and reptiles from the presence of lead and zinc in the Site 2 soil and to avian piscivores and reptiles from the presence of mercury in the Site 2 inlet sediment. It should be noted, however, the HQs were only slightly greater than one for lead and zinc when the estimated doses were compared to the LOAEL (HQ $\leq$ 1.8). Furthermore, the concentrations of mercury detected in the Site 2 inlet (up to 0.94 mg/kg) are lower than detected in the sediment reference samples (1.4 mg/kg) collected during the Expanded RI, and they are consistent with the mercury concentrations detected in many urbanized soils and sediments (Eisler, 1987).

8.4 Uncertainties

Detection Limits

Although some chemicals were not detected in site media, they were identified as COPCs because the instrument detection limit for that chemical exceeded applicable screening values (i.e., the maximum detection limit for the SERA, and ½ the mean detection limit for the BERA, Step 3A). The potential for risks associated with these chemicals cannot be fully evaluated and represents an uncertainty in the risk assessment.

One notable group of chemicals associated with this uncertainty in this risk assessment is PAHs. Detection limits for PAHs in soil and sediment were elevated at a number of sample locations. Elevated detection limits not only result in a less accurate estimate of chemical concentration (as a result of censoring), but can also upwardly bias concentration (and risk) estimates when using a summary statistics (e.g., mean) for the calculation of risk.

Nondetected Chemicals Exceeding Screening Values and Chemicals without Screening Values

Nondetected chemicals with maximum detection limits exceeding screening values and nondetected chemicals without screening values were not identified for additional focused evaluation. There is some uncertainty associated with these chemicals because it cannot be determined definitively that they do not occur onsite. However, based on the large number of samples collected from soil, sediment, and surface water and the bias of samples to potential source areas, it is considered unlikely that chemicals potentially posing a risk to ecological receptors would not have been detected in site media.

Soil Sampling Depth

Chemical concentrations were evaluated in soil samples collected from a depth of 0 to 6 inches bgs because this best represents the depth at which most ecological receptors would

be exposed to chemicals in soil. However, some potential receptors could be exposed to chemicals at greater depth if they burrow to subsurface soil. There is some potential for risks to have been underestimated to burrowing organisms if chemical concentrations are greater in subsurface soil.

Dioxins/furans were analyzed for and detected in subsurface soil (depth of 6 to greater than 60 inches bgs) samples collected from Site 2 (see Section 5). Dioxins were not analyzed for in surface soil. There is, accordingly, uncertainty associated with the presence of dioxins in these media. This uncertainty has the potential to underestimate risks primarily to upper trophic level species based on the potential for dioxins/furans to bioaccumulate in the food web.

Sediment Screening Values

The surface water bodies associated with Site 2 represent a transition from freshwater in the upper reaches to brackish water in the St. Juliens Creek inlet. The lower of marine and freshwater sediment and surface water screening values were used in the ERA to evaluate the potential for adverse effects to aquatic life. Accordingly, there is the potential for risks to have been overestimated in freshwater habitats in the upper ditches if the marine screening value is lower than the freshwater screening value and is used in the assessment.

Ingestion Screening Values

Toxicity data for many of the COPCs and surrogate receptor species were minimal, requiring the extrapolation of data from similar wildlife species or from laboratory studies with non-wildlife species (e.g., rats, mice, chicken, dog). The extrapolation of toxic effects in one species to those in another is characterized by an uncertainty factor that is often the product of several others. Thus a benchmark value may be less than the concentration used in the actual literature studies. The uncertainties associated with toxicity extrapolation were minimized through the selection of the most appropriate test species for which suitable toxicity data were available. The factors considered in selecting a test species to represent a receptor species included taxonomic similarities, trophic level, foraging method, and similarity of diet.

Secondly, there are situations in which LOAEL or LD_{50} values are the only toxicity endpoints available from the literature. In these situations, uncertainty factors are applied for extrapolating/converting these values into NOAEL value. Extrapolating in such a manner may either over estimate or under estimate toxicity.

Another form of uncertainty relates to the derivation of ingestion screening values applied to inorganic chemicals. Most of the toxicological studies on which the ingestion screening values for inorganic chemicals were based used soluble forms (such as salts), which exhibit higher bioavailability to receptors. Since the analytical samples on which site-specific exposure estimates were based measured total concentration, regardless of form, and these highly bioavailable forms are expected to compose only a fraction of the total concentration, this is likely to result in an overestimation of potential risks for these chemicals.

Chemical Mixtures

Information on the ecotoxicological effects of chemical interactions is minimal, which required (as is standard for ecological risk assessments) that the chemicals be evaluated on a

compound-by-compound basis during the comparison to screening value. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).

Surrogate Receptor Selection and Use

Specific receptor species (e.g., red-tailed hawk) or species groups (e.g., fish) were selected using criteria thought to best represent the ecological communities at these sites and to evaluate potential risks to larger ecological components (i.e., feeding guilds, such as piscivorous birds). Even though as many site-specific factors as possible are incorporated, not all existing species or habitat conditions can be considered. This represents an uncertainty in the risk assessment.

Several species of amphibians and reptiles have been observed or are expected to exist on SJCA land. However, based on salinities known to occur in the adjacent St. Juliens Creek (greater than 10 ppt), it is considered unlikely that amphibians are present throughout most of the Site 2 aquatic habitat, which is periodically inundated by surface water from St. Juliens Creek. Reptiles do occur at Site 2. However, toxicity data are not very well developed for this group. Accordingly, other vertebrate receptors with similar diets and habitat requirements were used to represent reptiles.

Food Web Exposure Modeling

Chemical concentrations in terrestrial and aquatic food items (plants, earthworms, small mammals, aquatic invertebrates, and fish) were modeled from measured media concentrations and were not directly measured. Use of the literature-derived exposure models and bioaccumulation factors introduces some uncertainty into the resulting tissue concentration estimates. For example, it was conservatively assumed chemicals were bioavailable in the environment. Factors affecting the bioavailability of contaminants for uptake by plants and invertebrates were not evaluated in the SERA or BERA. Therefore calculated exposure doses may be overestimated. The values selected and methodology employed were intended to provide a conservative (SERA) or reasonable (Step 3A) estimate of potential food web exposure concentrations.

Another source of uncertainty is the use of default assumptions for exposure parameters such as BCFs and BAFs). Although BCFs or BAFs for many bioaccumulative chemicals were readily available from the literature and were used in the ERA, the use of a default factor of 1.0 to estimate the concentration of some chemicals in prey items is a source of uncertainty and, in most cases, has the potential to overestimate risk.

Wildlife Site Exposure Assumptions

Another source of uncertainty relates to exposure assumptions made when estimating potential risk to upper trophic-level wildlife such as red-tailed hawk. In the ERA it was assumed upper trophic-level wildlife obtain 100 percent of their diet from the area impacted by Site 2. This assumption, although appropriate for the SERA, is expected to greatly overestimate potential exposure for several reasons. Most importantly, better quality foraging habitat is present at many locations outside the influence of the site. The assumption that 100 percent of an upper trophic-level wildlife species' diet comes from Site 2 is accordingly expected to overestimate risk.

Sediment Bioassays. Sediment bioassays greatly reduce the uncertainties associated with evaluating the potential for adverse effects to benthic-dwelling organisms, particularly when the interpretation of the bioassay outcome is coupled with the analysis of paired chemical analytical and physical data. Bioassays directly measure toxicity in sediment and account for variables such as additive, synergistic, and/or antagonistic effects of chemicals. Bioassays also effectively account for the bioavailability of chemicals in sediment. There are, however, some limitations associated with the use of the laboratory-based sediment bioassays. The most notable is likely to be associated with the effect of sampling on sediment toxicity. Samples are homogenized when collected from the environment. Although this homogenization process facilitates interpretation of the bioassay outcome by evenly distributing a chemical throughout the sample and allowing chemical analysis to more accurately characterize exposure concentrations in sediment, it also disturbs the sediment sample. This disturbance has the potential to change the bioavailability and toxicity of chemicals in sediment. In stratified sediment, sample homogenization also has the potential to increase (e.g., by re-exposing previously buried chemicals) or decrease (e.g., via dilution) exposure concentrations to the test organism.

Testing a single organism as an indicator of sediment toxicity also has the potential to over- or under-estimate the overall potential for adverse effects to the benthic community. This potential uncertainty was minimized, however, by selecting *L. plumulosus*, which is an organism that is indigenous to the brackish waters of the mid-Atlantic region.

8.5 Summary

The ERA was conducted using a tiered approach, and the data collected for this site were evaluated during multiple rounds of investigation. This document has primarily focused on the evaluation of data collected during the final tier of investigation, in order to complete Step 7 of the ERA. The constituents that pose potential unacceptable risk to ecological receptors for site media, those identified as constituents of concern (COCs), are shown on **Table 8-33**. The following subsections provide the summary of potential ecological risks related to each receptor group.

8.5.1 Terrestrial Plants and Soil Invertebrates

There are potential risks to terrestrial plants and soil invertebrates from the presence of inorganics, pesticides, one PCB, and PAHs in soil. However, the greatest potential risk is associated with isolated hotspots areas, located primarily in the soil in the northern portion of the site (former Site 17).

8.5.2 Aquatic Life

Benthic-Dwelling Organisms

There are potential risks to benthic-dwelling organisms from the presence of pesticides, PCBs, PAHs and inorganics in inlet sediment. Many of the organics in the drainage sediment are likely to be complexed with organic carbon and not bioavailable (or toxic) to benthic-dwelling organisms. The analytical results indicate that elevated concentrations are present in the inlet sediment with no definitive pattern of distribution.

The sediment pore water analysis indicated a very limited potential for CVOCs to adversely affect benthic-dwelling organisms. CVOCs were detected along the western branch of Site 2 inlet at concentrations that could adversely affect aquatic life. However, the highest concentrations were detected in the portion of the branch that serves as a drainage ditch and only contains water periodically. This area is unlikely to provide habitat for most benthic-dwelling organisms.

Water Column-Dwelling Aquatic Life

There are limited potential risks to water column-dwelling aquatic life from the presence of inorganics and VOCs in Site 2 surface water. The sediment pore water samples indicate the highest concentrations of CVOCs are in the western drainage, where few benthic-dwelling organisms would be expected to occur, while the outfall discharge surface water samples indicate only a very limited exceedance at the point of discharge.

In addition, the SERA and Step 3 of the BERA identified the potential for chemicals originating from Site 2 to discharge into St. Juliens Creek. Sediment samples were collected from St. Juliens Creek at the mouth of the Site 2 inlet during the Expanded RI to evaluate the potential impact of Site 2 on St. Juliens Creek (CH2M HILL, 2005a). The results of this investigation indicated that, although Site 2 may have contributed chemicals to St. Juliens Creek, significant site-related effects would only occur in a very localized area directly adjacent to the Site 2 inlet. It was therefore concluded that the overall potential for chemicals originating from the inlet to impact ecological receptors in St. Juliens Creek was low and did not warrant further evaluation in the ERA.

8.5.3 Wildlife

There are potential risks to avian piscivores from the presence of mercury in sediment and very low potential for risk to avian vermivore and reptiles from the presence of lead and zinc in the soil. However, the elevated concentrations in soil are localized, with the highest concentrations of inorganics triggering the potential risk detected in the central portion of Site 2, in the area identified as containing ABM.

Table 8-1
Summary of Data Used in Further Evaluation
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Sample ID	Date of Sampling	Sample Location	Parameters
Soil			
Surface Soil			
SJS02-SS02-000	6/25/1997	SJS02-SS02	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS03-000	6/25/1997	SJS02-SS03	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS04-000	6/25/1997	SJS02-SS04	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS05-000	6/25/1997	SJS02-SS05	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS05P-000[a]	6/25/1997	SJS02-SS05	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS06-000	6/25/1997	SJS02-SS06	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS07-000	6/25/1997	SJS02-SS07	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS08-000	6/25/1997	SJS02-SS08	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS09-000	6/25/1997	SJS02-SS09	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS10-000	6/25/1997	SJS02-SS10	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS11-000	4/21/1999	SJS02-SS11	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS12-000	4/21/1999	SJS02-SS12	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS13-000	4/21/1999	SJS02-SS13	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS14-000	4/21/1999	SJS02-SS14	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS15-000	4/21/1999	SJS02-SS15	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS16-000	4/21/1999	SJS02-SS16	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS16P-000[b]	4/21/1999	SJS02-SS16	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS17-000	4/21/1999	SJS02-SS17	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS18-000	4/21/1999	SJS02-SS18	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS19-000	4/21/1999	SJS02-SS19	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SS20-000	4/21/1999	SJS02-SS20	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS01-000	2/14/2001	SJS17-SO01	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS02-000	2/14/2001	SJS17-SO02	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS02-000P[c]	2/14/2001	SJS17-SO02	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS03-000	2/14/2001	SJS17-SS03	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS17-SS04-000	2/14/2001	SJS17-SS04	Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
Surface Water			
SJS02-SW03-001	4/16/1999	SJS02-SW03	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW04-001	4/16/1999	SJS02-SW04	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW05-001	4/16/1999	SJS02-SW05	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW06-001	4/16/1999	SJS02-SW06	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW07-001	4/16/1999	SJS02-SW07	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW08-001	4/14/1999	SJS02-SW08	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW08-001P[d]	4/14/1999	SJS02-SW08	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW08-002	10/27/1999	SJS02-SW08	Explo, Inorganics, Cyanide, SVOCs, VOCs, PEST/PCBs
SJS02-SW10-03D	12/9/2003	SJS02-SW10	VOCs
SJS02-SW11-03D	12/9/2003	SJS02-SW11	VOCs
Sediment			
SJS02-SD01-000	7/14/1997	SJS02-SD01	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD02-000	7/14/1997	SJS02-SD02	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD03-000	6/26/1997	SJS02-SD03	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD03-000P[e]	6/26/1997	SJS02-SD03	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD04-001	4/16/1999	SJS02-SD04	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD05-001	4/16/1999	SJS02-SD05	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD06-001	4/16/1999	SJS02-SD06	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD07-001	4/16/1999	SJS02-SD07	Inorganics, Cyanide, Explo, SVOCs, VOCs, PEST/PCBs
SJS02-SD09	7/17/2001	SJS02-SD09	Inorganics, Explo, SVOCs, VOCs, PEST/PCBs, Dioxin
SJS02-SD10	7/17/2001	SJS02-SD10	Dioxin
SJS02-SD11	7/17/2001	SJS02-SD11	Dioxin
SJS02-SD12	7/17/2001	SJS02-SD12	Dioxin
SJS02-SD13	7/17/2001	SJS02-SD13	Dioxin
SJS02-SD14	7/17/2001	SJS02-SD14	Dioxin
SJS02-SD03-00-04D	10/6/2004	SJS02-SD03	Inorganics, SVOCs, PEST/PCBs
SJS02-SD05-00-04D	10/6/2004	SJS02-SD05	Inorganics, SVOCs, PEST/PCBs
SJS02-SD06-00-04D	10/6/2004	SJS02-SD06	Inorganics, SVOCs, PEST/PCBs
SJS02-SD21-00-04D	11/18/2004	SJS02-SD21	VOCs
SJS02-SD21-00-04D-P[f]	11/18/2004	SJS02-SD21	VOCs
SJS02-SD22-00-04D	11/18/2004	SJS02-SD22	VOCs
SJS02-SD23-00-04D	11/18/2004	SJS02-SD23	VOCs
SJS02-SD24-00-04D	10/6/2004	SJS02-SD24	Inorganics, SVOCs, PEST/PCBs
SJS02-SD25-00-04D	10/6/2004	SJS02-SD25	Inorganics, SVOCs, PEST/PCBs
SJS02-SD26-00-04D	10/6/2004	SJS02-SD26	Inorganics, SVOCs, PEST/PCBs

VOCs - Volatile Organic Constituents
SVOCs - Semivolatile Organic Constituents
Explo. - Explosives
Pest/PCBs - Pesticides and Polychlorinated Biphenyls
[a] duplicate of SJS02-SS05-000
[b] duplicate of SJS02-SS16-000
[c] duplicate of SJS17-SS02-000
[d] duplicate of SJS02-SW08-000
[e] duplicate of SJS02-SD03-000
[f] duplicate of SJS02-SD21-00-04D

Table 8-2
Preliminary Assessment Endpoints, Risk Hypotheses, Measurement Endpoints, and Receptors
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Assessment Endpoints	Risk Hypothesis	Measurement Endpoint	Receptor Species
Protection of terrestrial plant communities from the toxic effects (on survival and growth) of site-related chemicals present in surface soil	Are levels of site-related chemicals present in surface soils sufficient to cause adverse effects on the survival and growth of terrestrial plants at the site?	Comparison of exposure HQs to a reference HQ of 1.0. Exposure HQs are calculated for individual chemicals by dividing the soil concentrations by an invertebrate-based soil screening values. A reference HQ of 1.0 represents a condition where the soil concentration is equal to the screening values.	Terrestrial Plants
Protection of soil invertebrate communities from the toxic effects (on survival and growth) of site-related chemicals present in surface soil	Are levels of site-related chemicals present in surface soils sufficient to cause adverse effects on the survival and growth of soil invertebrates at the site?	Comparison of exposure HQs to a reference HQ of 1.0. Exposure HQs are calculated for individual chemicals by dividing the soil concentrations by an invertebrate-based soil screening values. A reference HQ of 1.0 represents a condition where the soil concentration is equal to the screening values.	Soil Invertebrates
Protection of aquatic receptors (invertebrates and fish) communities from the toxic effects (on survival and growth) of site-related chemicals present in the sediment and surface water.	Are levels of site-related chemicals present in the sediment and surface water sufficient to cause adverse effects on the survival and growth of aquatic receptors at the site?	Comparison of exposure HQs to a reference HQ of 1.0. Exposure HQs are calculated for individual chemicals by dividing the sediment and surface water concentrations by an invertebrate-based sediment and surface water screening values. A reference HQ of 1.0 represents a condition where the sediment and surface water concentration is equal to the screening values.	Aquatic Receptors (invertebrates and fish)
Protection of semiaquatic herbivorous, sometimes omnivorous, mammals to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Are levels of site contaminants in soils sufficient to cause adverse effects on the growth, survival, and reproductive success of herbivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Muskrat
Protection of insectivorous mammals to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Are levels of site contaminants in soils sufficient to cause adverse effects on the growth, survival, and reproductive success of insectivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Short-tailed Shrew
Protection of omnivorous birds to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction	Are levels of site contaminants in soils sufficient to cause adverse effects on the growth, survival, and reproductive success of omnivorous birds using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	American Robin
Protection of piscivorous, sometimes omnivorous, birds to ensure that ingestion of contaminants in sediment and prey does not have a negative impact on growth, survival, and reproduction	Are levels of site contaminants in sediments sufficient to cause adverse effects on the growth, survival, and reproductive success of piscivorous birds using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Belted Kingfisher
Protection of carnivorous birds to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Are levels of site contaminants in soils sufficient to cause adverse effects on the growth, survival, and reproductive success of carnivorous birds using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Red-tailed Hawk
Protection of insectivorous birds to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Are levels of site contaminants in soils sufficient to cause adverse effects on the growth, survival, and reproductive success of insectivorous bird using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	American Woodcock
Protection of omnivorous mammals to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction	Are levels of site contaminants in soil sufficient to cause adverse effects on the growth, survival, and reproductive success of omnivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Raccoon

Table 8-2
Preliminary Assessment Endpoints, Risk Hypotheses, Measurement Endpoints, and Receptors
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St. Juliens Creek Annex
Chesapeake, Virginia

Assessment Endpoints	Risk Hypothesis	Measurement Endpoint	Receptor Species
Protection of piscivorous mammals to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction	Protection of piscivorous mammals to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Mink
Protection of carnivorous mammals to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Are levels of site contaminants in soils sufficient to cause adverse effects on the growth, survival, and reproductive success of carnivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Red Fox
Protection of omnivorous mammals to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction	Are levels of site contaminants in soils sufficient to cause adverse effects on the growth, survival, and reproductive success of omnivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Deer Mouse

Table 8-3
Medium-Specific Screening Values
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Screening Value	Units	Source	Reference
Sediment				
1,1,1-Trichloroethane	31	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
1,1,2-Trichloroethane	31	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
1,2,4-Trichlorobenzene	40	ug/kg		USEPA 1995
1,2-Dichlorobenzene	35	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
1,4-Dichlorobenzene	110	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
2,4-Dimethylphenol	29	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
2-Methylnaphthalene	70	ug/kg	Long et al. 1995	USEPA 1995
2-Methylphenol	63	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
4-Methylphenol	670	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Acenaphthene	16	ug/kg	Long et al. 1995	USEPA 1995
Acenaphthylene	44	ug/kg	Long et al. 1995	USEPA 1995
Aldrin	2	ug/kg		Ontario Ministry of the Environment 1993
alpha-BHC	6	ug/kg		Ontario Ministry of the Environment 1993
alpha-Chlordane	0.5	ug/kg		Long and Morgan 1990
Aluminum	18,000	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Anthracene	85.3	ug/kg	Long et al. 1995	USEPA 1995
Antimony	150	mg/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Aroclor-1016	22.7	ug/kg	Long et al. 1995	USEPA 1995
Aroclor-1221	22.7	ug/kg	Long et al. 1995	USEPA 1995
Aroclor-1232	22.7	ug/kg	Long et al. 1995	USEPA 1995
Aroclor-1242	22.7	ug/kg	Long et al. 1995	USEPA 1995
Aroclor-1248	22.7	ug/kg	Long et al. 1995	USEPA 1995
Aroclor-1254	22.7	ug/kg	Long et al. 1995	USEPA 1995
Aroclor-1260	22.7	ug/kg	Long et al. 1995	USEPA 1995
Arsenic	8.2	mg/kg	Long et al. 1995	USEPA 1995
Barium	48	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Benzo(a)anthracene	261	ug/kg	Long et al. 1995	USEPA 1995
Benzo(a)pyrene	430	ug/kg	Long et al. 1995	USEPA 1995
Benzo(b)fluoranthene	3,200	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Benzo(g,h,i)perylene	670	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Benzo(k)fluoranthene	240	ug/kg		Ontario Ministry of the Environment 1993
beta-BHC	5	ug/kg		Ontario Ministry of the Environment 1993
bis(2-Ethylhexyl)phthalate	1,300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Butylbenzylphthalate	63	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Cadmium	1.2	mg/kg	Long et al. 1995	USEPA 1995
Chromium	5	mg/kg		USEPA 1995
Chrysene	384	ug/kg	Long et al. 1995	USEPA 1995
Cobalt	10	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
2,4,5-Trichlorophenol	3	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
2,4,6-Trichlorophenol	6	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
2,4-Dichlorophenol	5	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Copper	34	mg/kg	Long et al. 1995	USEPA 1995
Cyanide	0.1	mg/kg		Ontario Ministry of the Environment 1993
Dibenz(a,h)anthracene	63.4	ug/kg	Long et al. 1995	USEPA 1995
Dibenzofuran	540	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Dieldrin	0.715	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Diethylphthalate	200	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Dimethyl phthalate	71	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Di-n-butylphthalate	1,400	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Di-n-octyl phthalate	6,200	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Endrin	0.02	ug/kg		Long and Morgan 1990
Ethylbenzene	10	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Fluoranthene	600	ug/kg	Long et al. 1995	USEPA 1995
Fluorene	19	ug/kg	Long et al. 1995	USEPA 1995
gamma-BHC (Lindane)	0.32	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
gamma-Chlordane	0.5	ug/kg		Long and Morgan 1990
Heptachlor	0.3	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Heptachlor epoxide	5	ug/kg		Ontario Ministry of the Environment 1993
Hexachlorobenzene	22	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Hexachlorobutadiene	11	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Indeno(1,2,3-cd)pyrene	600	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Iron	188,400	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Lead	46.7	mg/kg	Long et al. 1995	USEPA 1995
Manganese	260	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Mercury	0.15	mg/kg	Long et al. 1995	USEPA 1995
Naphthalene	160	ug/kg	Long et al. 1995	USEPA 1995
Nickel	20.9	mg/kg	Long et al. 1995	USEPA 1995
n-Nitrosodiphenylamine	28	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995

Table 8-3
Medium-Specific Screening Values
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Screening Value	Units	Source	Reference
Pentachlorophenol	360	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Phenanthrene	240	ug/kg	Long et al. 1995	USEPA 1995
Phenol	420	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Pyrene	665	ug/kg	Long et al. 1995	USEPA 1995
Selenium	1	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Silver	1	mg/kg	Long et al. 1995	USEPA 1995
Tetrachloroethene	57	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Trichloroethene	41	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Vanadium	57	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999
Xylene, total	40	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995
Zinc	150	mg/kg	Long et al. 1995	USEPA 1995
Surface Water				
1,1,1-Trichloroethane	11	ug/L		Suter and Tsao 1996
1,1,2,2-Tetrachloroethane	90.2	ug/L		USEPA 1999
1,1,2-Trichloroethane	550	ug/L		USEPA 1999
1,1-Dichloroethene	47	ug/L		Suter and Tsao 1996
1,1-Dichloroethene	25	ug/L		Suter and Tsao 1996
1,2,4-Trichlorobenzene	5.4	ug/L		CCME 2008
1,2-Dibromoethane	18,000	ug/L		USEPA 1995
1,2-Dichlorobenzene	0.70	ug/L		CCME 2008
1,2-Dichloroethane	100	ug/L		USEPA 1999
1,2-Dichloropropane	2,400	ug/L		USEPA 1999
1,3-Dichlorobenzene	28.5	ug/L		USEPA 1999
1,4-Dichlorobenzene	19.9	ug/L		USEPA 1999
2,4,5-Trichlorophenol	11.0	ug/L		USEPA 1995
2,4,6-Trichlorophenol	970	ug/L		USEPA 1995
2,4-Dichlorophenol	365	ug/L		USEPA 1995
2,4-Dimethylphenol	2,120	ug/L		USEPA 1995
2,4-Dinitrophenol	150	ug/L		USEPA 1995
2,4-Dinitrotoluene	230	ug/L		USEPA 1995
2-Butanone	14,000	ug/L		Suter and Tsao 1996
2-Chloronaphthalene	7.50	ug/L		USEPA 1995
2-Chlorophenol	970.0	ug/L		USEPA 1995
2-Hexanone	99	ug/L		Suter and Tsao 1996
2-Methylnaphthalene	300.0	ug/L		USEPA 1995
2-Methylphenol	13.0	ug/L		USEPA 1995
2-Nitrophenol	150	ug/L		USEPA 1995
4,4'-DDD	0.6	ug/L		USEPA 1995
4,4'-DDE	14	ug/L		USEPA 1995
4,4'-DDT	0.001	ug/L		USEPA 1995
4,6-Dinitro-2-methylphenol	2.30	ug/L		USEPA 1995
4-Bromophenyl-phenylether	1.50	ug/L		USEPA 1995
4-Chloro-3-methylphenol	0.30	ug/L		USEPA 1995
4-Chloroaniline	29700	ug/L		USEPA 1995
4-Methyl-2-pentanone	170	ug/L		Suter and Tsao 1996
4-Nitrophenol	150	ug/L		USEPA 1995
Acenaphthene	520	ug/L		USEPA 1995
Acenaphthylene	300	ug/L		USEPA 1995
Acetone	1,500	ug/L		Suter and Tsao 1996
Aldrin	1.3	ug/L		USEPA 1995
alpha-BHC	0.34	ug/L		USEPA 1995
alpha-Chlordane	0.004	ug/L		USEPA 1995
Aluminum	25	ug/L		USEPA 1995
Anthracene	0.1	ug/L		USEPA 1995
Antimony	30.0	ug/L		USEPA 1995
Aroclor-1016	0.014	ug/L		USEPA 1995
Aroclor-1221	0.030	ug/L		USEPA 1995
Aroclor-1232	0.030	ug/L		USEPA 1995
Aroclor-1242	0.030	ug/L		USEPA 1995
Aroclor-1248	0.030	ug/L		USEPA 1995
Aroclor-1254	0.030	ug/L		USEPA 1995
Aroclor-1260	0.030	ug/L		USEPA 1995
Arsenic	10	ug/L		USEPA 1995
Barium	10,000	ug/L		USEPA 1995
Benzene	110	ug/L		Suter and Tsao 1996
Benzo(a)anthracene	6.30	ug/L		USEPA 1995
Benzo(a)pyrene	0.21	ug/L		USEPA 1995
Benzo(b)fluoranthene	300	ug/L		USEPA 1995
Benzo(g,h,i)perylene	300	ug/L		USEPA 1995

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Chemical	Screening Value	Units	Source	Reference
Benzo(k)fluoranthene	300	ug/L		USEPA 1995
Beryllium	5.30	ug/L		USEPA 1995
beta-BHC	0.34	ug/L		USEPA 1995
bis(2-Chloroethoxy)methane	11,000	ug/L		USEPA 1995
bis(2-Chloroethyl)ether	2,380	ug/L		USEPA 1999
bis(2-Ethylhexyl)phthalate	30.0	ug/L		USEPA 1995
Bromochloromethane	1,100	ug/L		USEPA 1995
Bromodichloromethane	2,700	ug/L		USEPA 1999
Bromoform	320	ug/L		USEPA 1995
Bromomethane	120	ug/L		Suter and Tsao 1996
Butylbenzylphthalate	3	ug/L		USEPA 1995
Cadmium	0.53	ug/L		USEPA 1995
Carbon disulfide	0.92	ug/L		Suter and Tsao 1996
Carbon tetrachloride	13.3	ug/L		CCME 2008
Chlorobenzene	1.3	ug/L		CCME 2008
Chloroform	1.8	ug/L		CCME 2008
Chloromethane	2,700	ug/L		USEPA 1995
Chromium	1240	ug/L		USEPA 1995
Chrysene	300	ug/L		USEPA 1995
cis-1,2-Dichloroethene	970	ug/L		USEPA 1999
Cobalt	35000	ug/L		USEPA 1995
Copper	2.85	ug/L		USEPA 1995
Cyanide	1.00	ug/L		USEPA 1995
delta-BHC	0.340	ug/L		USEPA 1995
Dibenz(a,h)anthracene	300	ug/L		USEPA 1995
Dibenzofuran	20.0	ug/L		USEPA 1996
Dieldrin	0.0019	ug/L		USEPA 1995
Diethylphthalate	3	ug/L		USEPA 1995
Dimethyl phthalate	3	ug/L		USEPA 1995
Di-n-butylphthalate	3.4	ug/L		USEPA 1995
Di-n-octylphthalate	0.3	ug/L		USEPA 1995
Endosulfan I	0.0087	ug/L		USEPA 1995
Endosulfan II	0.0087	ug/L		USEPA 1995
Endosulfan sulfate	0.0087	ug/L		USEPA 1995
Endrin	0.0023	ug/L		USEPA 1995
Endrin aldehyde	0.0023	ug/L		USEPA 1995
Endrin ketone	0.0023	ug/L		USEPA 1995
Ethylbenzene	25	ug/L		CCME 2008
Fluoranthene	16	ug/L		USEPA 1995
Fluorene	300	ug/L		USEPA 1995
gamma-BHC (Lindane)	0.08	ug/L		USEPA 1995
gamma-Chlordane	0.004	ug/L		USEPA 1995
Heptachlor	0.0036	ug/L		USEPA 1995
Heptachlor epoxide	0.0036	ug/L		USEPA 1995
Hexachlorobenzene	3.68	ug/L		USEPA 1995
Hexachlorobutadiene	9.30	ug/L		USEPA 1995
Hexachlorocyclopentadiene	5.20	ug/L		USEPA 1995
Hexachloroethane	540	ug/L		USEPA 1995
Indeno(1,2,3-cd)pyrene	300	ug/L		USEPA 1995
Iron	320	ug/L		USEPA 1995
Isophorone	12,900	ug/L		USEPA 1995
Lead	3.20	ug/L		USEPA 1995
Manganese	10.0	ug/L		USEPA 1995
Mercury	0.01	ug/L		USEPA 1995
Methoxychlor	0.03	ug/L		USEPA 1995
Methylene chloride	98.1	ug/L		CCME 2008
Naphthalene	100	ug/L		USEPA 1995
Nickel	8.30	ug/L		USEPA 1995
Nitrobenzene	6,680	ug/L		USEPA 1995
n-Nitrosodiphenylamine	5,850	ug/L		USEPA 1995
Pentachlorophenol	7.90	ug/L		USEPA 1995
Phenanthrene	4.60	ug/L		USEPA 1995
Phenol	79	ug/L		USEPA 1995
Pyrene	300	ug/L		USEPA 1995
Selenium	5.00	ug/L		USEPA 1995
Silver	0.0001	ug/L		USEPA 1995
Tetrachloroethene	45	ug/L		USEPA 1999
Thallium	40	ug/L		USEPA 1995
Toluene	2.0	ug/L		CCME 2008

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Chemical	Screening Value	Units	Source	Reference
Toxaphene	0.0002	ug/L		USEPA 1995
trans-1,2-Dichloroethene	970	ug/L		USEPA 1999
Trichloroethene	21	ug/L		CCME 2008
Vanadium	10,000	ug/L		USEPA 1995
Vinyl chloride	930	ug/L		USEPA 1999
Xylene, total	13	ug/L		Suter and Tsao 1996
Zinc	19.0	ug/L		USEPA 1995
Surface Soil				
1,1,1-Trichloroethane	300	ug/kg		USEPA 1995
1,1,2,2-Tetrachloroethane	300	ug/kg		USEPA 1995
1,1,2-Trichloroethane	300	ug/kg		USEPA 1995
1,1-Dichloroethane	300	ug/kg		USEPA 1995
1,2,4-Trichlorobenzene	100	ug/kg		USEPA 1995
1,2-Dichlorobenzene	100	ug/kg		USEPA 1995
1,2-Dichloroethane	870,000	ug/kg		USEPA 1995
1,2-Dichloroethene (total)	300	ug/kg		USEPA 1995
1,2-Dichloropropane	300	ug/kg		USEPA 1995
1,4-Dichlorobenzene	100	ug/kg		USEPA 1995
2,4,5-Trichlorophenol	100	ug/kg		USEPA 1995
2,4,6-Trichlorophenol	100	ug/kg		USEPA 1995
2,4-Dichlorophenol	100	ug/kg		USEPA 1995
2,4-Dimethylphenol	100	ug/kg		USEPA 1995
2,4-Dinitrophenol	100	ug/kg		USEPA 1995
2-Chloronaphthalene	1,033	ug/kg		USEPA 1995
2-Chlorophenol	100	ug/kg		USEPA 1995
2-Methylphenol	100	ug/kg		USEPA 1995
4,4'-DDD	100	ug/kg		USEPA 1995
4,4'-DDE	100	ug/kg		USEPA 1995
4,4'-DDT	100	ug/kg		USEPA 1995
4-Methyl-2-pentanone	100,000	ug/kg		USEPA 1995
4-Methylphenol	100	ug/kg		USEPA 1995
4-Nitrophenol	100	ug/kg		USEPA 1995
Acenaphthene	100	ug/kg		USEPA 1995
Acenaphthylene	100	ug/kg		USEPA 1995
Aldrin	100	ug/kg		USEPA 1995
alpha-BHC	100,000	ug/kg		USEPA 1995
alpha-Chlordane	100	ug/kg		USEPA 1995
Aluminum	1.0	mg/kg		USEPA 1995
Anthracene	100	ug/kg		USEPA 1995
Antimony	78	mg/kg		USEPA 1995
Aroclor-1016	100	ug/kg		USEPA 1995
Aroclor-1221	100	ug/kg		USEPA 1995
Aroclor-1232	100	ug/kg		USEPA 1995
Aroclor-1242	100	ug/kg		USEPA 1995
Aroclor-1248	100	ug/kg		USEPA 1995
Aroclor-1254	100	ug/kg		USEPA 1995
Aroclor-1260	100	ug/kg		USEPA 1995
Arsenic	18	mg/kg		USEPA 1995
Barium	330	mg/kg		USEPA 1995
Benzene	105	ug/kg		USEPA 1995
Benzo(a)anthracene	100	ug/kg		USEPA 1995
Benzo(a)pyrene	100	ug/kg		USEPA 1995
Benzo(b)fluoranthene	100	ug/kg		USEPA 1995
Benzo(g,h,i)perylene	100	ug/kg		USEPA 1995
Benzo(k)fluoranthene	100	ug/kg		USEPA 1995
Beryllium	40	mg/kg		USEPA 1995
beta-BHC	100,000	ug/kg		USEPA 1995
Bromodichloromethane	450,000	ug/kg		USEPA 1995
Bromoform	114,700	ug/kg		USEPA 1995
Cadmium	32	mg/kg		USEPA 1995
Carbon tetrachloride	300	ug/kg		USEPA 1995
Chlorobenzene	100	ug/kg		USEPA 1995
Chloroform	300	ug/kg		USEPA 1995
Chrysene	100	ug/kg		USEPA 1995
cis-1,3-Dichloropropene	300	ug/kg		USEPA 1995
Cobalt	13	mg/kg		USEPA 1995
Copper	70	mg/kg		USEPA 1995
delta-BHC	100,000	ug/kg		USEPA 1995
Dibenz(a,h)anthracene	100	ug/kg		USEPA 1995

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Chemical	Screening Value	Units	Source	Reference
Dieldrin	100	ug/kg		USEPA 1995
Diethylphthalate	13,400	ug/kg		USEPA 1995
Dimethyl phthalate	10,640	ug/kg		USEPA 1995
Di-n-butylphthalate	200,000	ug/kg		USEPA 1995
Endrin	100	ug/kg		USEPA 1995
Endrin aldehyde	100	ug/kg		USEPA 1995
Endrin ketone	100	ug/kg		USEPA 1995
Ethylbenzene	100	ug/kg		USEPA 1995
Fluoranthene	100	ug/kg		USEPA 1995
Fluorene	100	ug/kg		USEPA 1995
gamma-BHC (Lindane)	100	ug/kg		USEPA 1995
gamma-Chlordane	100	ug/kg		USEPA 1995
Heptachlor epoxide	100	ug/kg		USEPA 1995
Hexachlorocyclopentadiene	1,000	ug/kg		USEPA 1995
Indeno(1,2,3-cd)pyrene	100	ug/kg		USEPA 1995
Iron	12	mg/kg		USEPA 1995
Lead	120	mg/kg		USEPA 1995
Manganese	220	mg/kg		USEPA 1995
Methoxychlor	100	ug/kg		USEPA 1995
Methylene chloride	300	ug/kg		USEPA 1995
Naphthalene	100	ug/kg		USEPA 1995
Nickel	38	mg/kg		USEPA 1995
Nitrobenzene	2,260	ug/kg		USEPA 1995
n-Nitrosodiphenylamine	1,090	ug/kg		USEPA 1995
Pentachlorophenol	100	ug/kg		USEPA 1995
Phenanthrene	100	ug/kg		USEPA 1995
Phenol	100	ug/kg		USEPA 1995
Pyrene	100	ug/kg		USEPA 1995
Selenium	1.80	mg/kg		USEPA 1995
Silver	560	mg/kg		USEPA 1995
Styrene	100	ug/kg		USEPA 1995
Tetrachloroethene	300	ug/kg		USEPA 1995
Toluene	100	ug/kg		USEPA 1995
trans-1,3-Dichloropropene	300	ug/kg		USEPA 1995
Trichloroethene	300	ug/kg		USEPA 1995
Vanadium	0.50	mg/kg		USEPA 1995
Vinyl chloride	300	ug/kg		USEPA 1995
Xylene, total	100	ug/kg		USEPA 1995
Zinc	10.0	mg/kg		USEPA 1995

Table 8-4
Ingestion Screening Values for Mammals
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Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Aluminum	mouse	0.03	390 days	oral in water	reproduction	193	19.3	ATSDR 1990
Aluminum	dog	10	6 months	oral	reproduction	600	60	ATSDR 1990
Antimony	mouse	0.03	lifetime	oral in water	lifespan/longevity	1.25	0.125	Sample et al. 1996
Arsenic	mouse	0.03	3 generations	oral in water	reproduction	1.26	0.126	Sample et al. 1996
Barium	rat	0.435	16 months	oral in water	growth/hypertension	19.8	5.1	Sample et al. 1996
Beryllium	rat	0.35	lifetime	oral in water	longevity/weight loss	6.6	0.66	Sample et al. 1996
Cadmium	rat	0.303	6 weeks	oral (gavage)	reproduction	10	1	Sample et al. 1996
Cadmium	dog	10	3 months	oral	reproduction	7.5	0.75	ATSDR 1993
Chromium	rat	0.35	3 months	oral in water	mortality	131.4	13.14	Sample et al. 1996
Cobalt	rat	0.35	69 days	oral in diet	reproduction	50	5	ATSDR 1992
Copper	mink	1	357 days	oral in diet	reproduction	15.14	11.7	Sample et al. 1996
Cyanide*	rat	0.273	gestation/lactation	oral in diet	reproduction	687	68.7	Sample et al. 1996
Iron	rabbit	3.8	?	oral in diet	tolerance level	500	50	NAS 1980
Lead	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Manganese	rat	0.35	224 days	oral in diet	reproduction	284	88	Sample et al. 1996
Mercury	rat	0.35	3 generations	oral in diet	reproduction	0.16	0.032	Sample et al. 1996
Mercury	mink	1	93 days	oral in diet	mortality/weight loss	0.25	0.15	Sample et al. 1996
Nickel	rat	0.35	3 generations	oral in diet	reproduction	80	40	Sample et al. 1996
Selenium	rat	0.35	1 year	oral in water	reproduction	0.33	0.2	Sample et al. 1996
Silver	rat	0.35	2 weeks	oral in water	mortality	181	18.1	ATSDR 1990
Thallium	rat	0.365	60 days	oral in water	reproduction	0.74	0.074	Sample et al. 1996
Vanadium	rat	0.26	60 days +	oral intubation	reproduction	2.1	0.21	Sample et al. 1996
Zinc	rat	0.35	GD 1-16	oral in diet	reproduction	320	160	Sample et al. 1996
Zinc	mink	1	25 weeks	oral	reproduction	208	20.8	ATSDR 1992
Pesticides/PCBs								
4,4'-DDD	rat	0.35	2 years	oral in diet	reproduction	4	0.8	Sample et al. 1996
4,4'-DDD	dog	10	2 generations	oral	reproduction	5	1	ATSDR 1994
4,4'-DDE	rat	0.35	2 years	oral in diet	reproduction	4	0.8	Sample et al. 1996
4,4'-DDE	dog	10	2 generations	oral	reproduction	5	1	ATSDR 1994
4,4'-DDT	rat	0.35	2 years	oral in diet	reproduction	4	0.8	Sample et al. 1996
4,4'-DDT	dog	10	2 generations	oral	reproduction	5	1	ATSDR 1994
Aldrin	rat	0.35	3 generations	oral in diet	reproduction	1	0.2	Sample et al. 1996
alpha-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.2	1.6	Sample et al. 1996
alpha-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Aroclor-1016	mink	1	18 months	oral in diet	reproduction	3.43	1.37	Sample et al. 1996
Aroclor-1221	mink	1	7 months	oral in diet	reproduction	0.69	0.069	Sample et al. 1996
Aroclor-1232	mink	1	7 months	oral in diet	reproduction	0.69	0.069	Sample et al. 1996
Aroclor-1242	mink	1	7 months	oral in diet	reproduction	0.69	0.069	Sample et al. 1996
Aroclor-1248	mouse	0.03	5 weeks	oral in diet	immunological	13	1.3	ATSDR 1995
Aroclor-1248	rhesus monkey	5	14 months	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Aroclor-1254	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.068	Sample et al. 1996
Aroclor-1254	mink	1	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1260	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.068	Sample et al. 1996
Aroclor-1260	mink	1	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
PCBs (total)	--	--	--	--	--	NA	NA	--
beta-BHC	rat	0.35	13 weeks	oral in diet	growth/systemic	20	4	Sample et al. 1996
delta-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.2	1.6	Sample et al. 1996
Dieldrin	rat	0.35	3 generations	oral in diet	reproduction	0.2	0.02	Sample et al. 1996
Endosulfan I	rat	0.35	30 days	oral (intubation)	reproduction	15	1.5	Sample et al. 1996
Endosulfan II	rat	0.35	30 days	oral (intubation)	reproduction	15	1.5	Sample et al. 1996
Endosulfan Sulfate	rat	0.35	30 days	oral (intubation)	reproduction	15	1.5	Sample et al. 1996
Endrin	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.092	Sample et al. 1996
Endrin Aldehyde	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.092	Sample et al. 1996
Endrin Ketone	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.092	Sample et al. 1996
Gamma-BHC (Lindane)	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Gamma-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Heptachlor	mink	1	181 days	oral in diet	reproduction	1	0.1	Sample et al. 1996
Heptachlor Epoxide	mink	1	181 days	oral in diet	reproduction	1	0.1	Sample et al. 1996
Methoxychlor	rat	0.35	11 months	oral in diet	reproduction	8	4	Sample et al. 1996
Toxaphene	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	rat	0.35	3 generations	oral in water	reproduction	106	53	Coulston and Kolbye 1994
1,2-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,3-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,4-Dichlorobenzene	rat	0.35	GD 6-15	oral (gavage)	reproduction	500	250	Coulston and Kolbye 1994
2,2'-Oxybis(1-Chloropropane)*	--	--	--	--	--	NA	NA	--
2,4,5-Trichlorophenol	rat	0.35	98 days	oral in diet	hepatic/renal	800	80	McCollister et al. 1961
2,4,6-Trichlorophenol	rat	0.35	98 days	oral in diet	hepatic/renal	800	80	McCollister et al. 1961
2,4-Dichlorophenol	rat	0.35	103 weeks	oral in diet	reproduction	4400	440	NTP 1989
2,4-Dimethylphenol*	--	--	--	--	--	NA	NA	--
2,4-Dinitrophenol*	--	--	--	--	--	NA	NA	--
2,4-Dinitrotoluene*	--	--	--	--	--	NA	NA	--
2,6-Dinitrotoluene*	--	--	--	--	--	NA	NA	--
2-Chloronaphthalene	--	--	--	--	--	NA	NA	--
2-Chlorophenol*	--	--	--	--	--	NA	NA	--
2-Methylnaphthalene	mouse	0.03	81 weeks	oral in diet	systemic	1437	143.7	ATSDR 1995

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
2-Methylphenol*	--	--	--	--	--	NA	NA	--
2-Nitroaniline*	--	--	--	--	--	NA	NA	--
2-Nitrophenol*	--	--	--	--	--	NA	NA	--
3,3'-Dichlorobenzidine	--	--	--	--	--	NA	NA	--
3-Nitroaniline*	--	--	--	--	--	NA	NA	--
4,6-Dinitro-2-Methylphenol*	--	--	--	--	--	NA	NA	--
4-Bromophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Chloro-3-Methylphenol	--	--	--	--	--	NA	NA	--
4-Chloroaniline*	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Methylphenol*	--	--	--	--	--	NA	NA	--
4-Nitroaniline*	--	--	--	--	--	NA	NA	--
4-Nitrophenol*	--	--	--	--	--	NA	NA	--
Acenaphthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	3,500	350	ATSDR 1995
Acenaphthylene	mouse	0.03	13 weeks	oral (gavage)	reproduction	3,500	350	ATSDR 1995
Anthracene	mouse	0.03	13 weeks	oral (gavage)	reproduction	10,000	1,000	ATSDR 1995
Benzo(a)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(a)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(b)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(g,h,i)perylene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1,330	133	ATSDR 1995
Benzo(k)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Bis(2-Chloroethoxy)methane*	--	--	--	--	--	NA	NA	--
Bis(2-Chloroethyl)ether*	--	--	--	--	--	NA	NA	--
Bis(2-Ethylhexyl)phthalate	mouse	0.03	105 days	oral in diet	reproduction	183.3	18.3	Sample et al. 1996
Butylbenzylphthalate	rat	0.35	2 years	oral in diet	hepatic	2400	240	NTP 1997
Carbazole	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Chrysene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Dibenz(a,h)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Dibenzofuran	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Diethylphthalate	mouse	0.03	105 days	oral in diet	reproduction	45830	4583	Sample et al. 1996
Dimethylphthalate*	--	--	--	--	--	NA	NA	--
Di-n-butylphthalate	mouse	0.03	105 days	oral in diet	reproduction	1833	550	Sample et al. 1996
Di-n-octylphthalate	mouse	0.03	105 days	oral in diet	reproduction	550	55	Sample et al. 1996
Fluoranthene	mouse	0.03	13 weeks	oral (gavage)	hepatic	1,250	125	ATSDR 1995
Fluorene	mouse	0.03	13 weeks	oral (gavage)	hematological	1,250	125	ATSDR 1995
Hexachlorobutadiene	rat	0.35	90 days +	oral	reproduction	20	2	IPCS 1994
Hexachlorobenzene	rat	0.35	2 years	oral	reproduction	16	1.6	ATSDR 1989
Hexachlorocyclopentadiene	rat	0.35	GD 6-15	oral	reproduction	30	10	USEPA 1984
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Isophorone*	--	--	--	--	--	NA	NA	--
Naphthalene	mouse	0.03	13 weeks	oral (gavage)	reproduction	1400	140	ATSDR 1995
Nitrobenzene*	--	--	--	--	--	NA	NA	--
N-Nitroso-di-n-propylamine*	--	--	--	--	--	NA	NA	--
N-Nitrosodiphenylamine	rat	0.35	8 to 11 weeks	oral in diet	systemic	1500	150	ATSDR 1993
Pentachlorophenol	rat	0.35	up to 24 months	oral in diet	reproduction	30	3	Coulston and Kolbye 1994
Phenanthrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1,330	133	ATSDR 1995
Phenol*	--	--	--	--	--	NA	NA	--
Pyrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1,330	133	ATSDR 1995
Volatile Organic Compounds								
1,1,1-Trichloroethane*	--	--	--	--	--	NA	NA	--
1,1,2,2-Tetrachloroethane*	--	--	--	--	--	NA	NA	--
1,1,2-Trichloroethane*	--	--	--	--	--	NA	NA	--
1,1-Dichloroethane*	--	--	--	--	--	NA	NA	--
1,1-Dichloroethene*	--	--	--	--	--	NA	NA	--
1,2-Dibromo-3-Chloropropane*	--	--	--	--	--	NA	NA	--
1,2-Dibromoethane*	--	--	--	--	--	NA	NA	--
1,2-Dichloroethane*	--	--	--	--	--	NA	NA	--
1,2-Dichloropropane*	--	--	--	--	--	NA	NA	--
1,2-Dichloroethene (total)*	--	--	--	--	--	NA	NA	--
1,3-Dichloropropene (total)*	--	--	--	--	--	NA	NA	--
2-Butanone*	--	--	--	--	--	NA	NA	--
2-Hexanone*	--	--	--	--	--	NA	NA	--
4-Methyl-2-Pentanone*	--	--	--	--	--	NA	NA	--
Acetone*	--	--	--	--	--	NA	NA	--
Benzene*	--	--	--	--	--	NA	NA	--
Bromochloromethane*	--	--	--	--	--	NA	NA	--
Bromodichloromethane*	--	--	--	--	--	NA	NA	--
Bromoform*	--	--	--	--	--	NA	NA	--
Bromomethane*	--	--	--	--	--	NA	NA	--
Carbon Disulfide*	--	--	--	--	--	NA	NA	--
Carbon Tetrachloride	rat	0.35	2 years	oral in diet	reproduction	160	16	Sample et al. 1996
Chlorobenzene	dog	12.7	chronic	?	liver	273	27.3	IRIS 1998
Chloroethane*	--	--	--	--	--	NA	NA	--
Chloroform	rat	0.35	13 weeks	oral (intubation)	systemic	410	150	Sample et al. 1996
Chloromethane*	--	--	--	--	--	NA	NA	--
Cis-1,2-Dichloroethene*	--	--	--	--	--	NA	NA	--
Cis-1,3-Dichloropropene*	--	--	--	--	--	NA	NA	--
Dibromochloromethane*	--	--	--	--	--	NA	NA	--
Ethylbenzene	rat	0.35	chronic	?	liver/kidney	971	97.1	Wolf et al. 1956
Methylene Chloride*	--	--	--	--	--	NA	NA	--
Styrene	rat	0.35	90 days	oral	reproduction	350	35	Beliles et al. 1985

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Styrene	dog	12.7	560 days	oral (gavage)	blood/liver	400	200	IRIS 1998
Tetrachloroethene	mouse	0.03	6 weeks	oral (gavage)	hepatotoxicity	70	14	Sample et al. 1996
Toluene	mouse	0.03	GD 6-12	oral (gavage)	reproduction	260	26	Sample et al. 1996
Trans-1,2-Dichloroethene*	--	--	--	--	--	NA	NA	--
Trans-1,3-Dichloropropene*	--	--	--	--	--	NA	NA	--
Trichloroethene	rat	0.35	?	oral	reproduction	10000	1000	Coulston and Kolbye 1994
Trichloroethene	mouse	0.03	6 weeks	oral (gavage)	hepatotoxicity	7	0.7	Sample et al. 1996
Vinyl Chloride*	--	--	--	--	--	NA	NA	--
Xylenes (total)	mouse	0.03	GD 6-15	oral (gavage)	reproduction	2.6	2.1	Sample et al. 1996
Dioxin/Furans								
2,3,7,8-TCDD	rat	0.35	3 generations	oral in diet	reproduction	0.00001	0.000001	Sample et al. 1996
1,2,3,7,8-PCDD	--	--	--	--	--	NA	NA	--
1,2,3,4,7,8-HxCDD	--	--	--	--	--	NA	NA	--
1,2,3,6,7,8-HxCDD	--	--	--	--	--	NA	NA	--
1,2,3,7,8,9-HxCDD	--	--	--	--	--	NA	NA	--
1,2,3,4,6,7,8-HpCDD	--	--	--	--	--	NA	NA	--
OCDD	--	--	--	--	--	NA	NA	--
2,3,7,8-TCDF	--	--	--	--	--	NA	NA	--
1,2,3,7,8-PCDF	--	--	--	--	--	NA	NA	--
2,3,4,7,8-PCDF	--	--	--	--	--	NA	NA	--
1,2,3,4,7,8-HxCDF	--	--	--	--	--	NA	NA	--
1,2,3,6,7,8-HxCDF	--	--	--	--	--	NA	NA	--
2,3,4,6,7,8-HxCDF	--	--	--	--	--	NA	NA	--
1,2,3,7,8,9-HxCDF	--	--	--	--	--	NA	NA	--
1,2,3,4,6,7,8-HpCDF	--	--	--	--	--	NA	NA	--
1,2,3,4,7,8,9-HpCDF	--	--	--	--	--	NA	NA	--
OCDF	--	--	--	--	--	NA	NA	--
Total dioxin/furan (TEQ)	rat	0.35	3 generations	oral in diet	reproduction	0.00001	0.000001	Sample et al. 1996

Table 8-5
Ingestion Screening Values for Birds
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Aluminum	ringed dove	0.155	4 months	oral in diet	reproduction	1097	109.7	Sample et al. 1996
Antimony	northern bobwhite	0.19	6 weeks	oral	?	47400	4740	Opresko et al. 1993
Arsenic	brown-headed cowbird	0.049	7 months	oral in diet	mortality	7.38	2.46	Sample et al. 1996
Arsenic	mallard	1	128 days	oral in diet	mortality	12.84	5.14	Sample et al. 1996
Barium	chicks	0.121	4 weeks	oral in diet	mortality	417	208	Sample et al. 1996
Beryllium	--	--	--	--	--	NA	NA	--
Cadmium	mallard	1.15	90 days	oral in diet	reproduction	20	1.45	Sample et al. 1996
Chromium	American black duck	1.25	10 months	oral in diet	reproduction	5	1	Sample et al. 1996
Cobalt	chicken	1.8	14 days	oral in diet	growth	14.7	1.47	Diaz et al. 1994
Copper	chicks	0.53	10 weeks	oral in diet	growth/mortality	61.7	47	Sample et al. 1996
Cyanide*	--	--	--	--	--	NA	NA	--
Iron	chicken	1.6	?	oral	maximum tolerance level	1000	100	NAS 1980
Lead	Japanese quail	0.15	12 weeks	oral in diet	reproduction	11.3	1.13	Sample et al. 1996
Lead	American kestrel	0.13	7 months	oral in diet	reproduction	38.5	3.85	Sample et al. 1996
Manganese	Japanese quail	0.072	75 days	oral in diet	growth/behavior	9770	977	Sample et al. 1996
Mercury	Japanese quail	0.15	1 year	oral in diet	reproduction	0.9	0.45	Sample et al. 1996
Mercury	mallard	1	3 generations	oral in diet	reproduction	0.064	0.0064	Sample et al. 1996
Nickel	mallard	0.78	90 days	oral in diet	growth/mortality	107	77.4	Sample et al. 1996
Selenium	mallard	1	100 days	oral in diet	reproduction	0.8	0.4	Sample et al. 1996
Selenium	screech owl	0.2	13.7 weeks	oral in diet	reproduction	1.5	0.44	Sample et al. 1996
Silver	mallard	?	14 days	oral	?	1780	178	USEPA 1999
Thallium	European starling	?	acute	oral	?	3.5	0.35	USEPA 1999
Vanadium	mallard	1.17	12 weeks	oral in diet	growth/mortality	114	11.4	Sample et al. 1996
Zinc	chicken	1.94	44 weeks	oral in diet	reproduction	131	14.5	Sample et al. 1996
Pesticides/PCBs								
4,4'-DDD	mallard	1.13	chronic	oral	reproduction	5.2	0.52	Stickel 1973
4,4'-DDD	American kestrel	0.12	2 years	oral	reproduction	0.5	0.05	McLane and Hall 1972
4,4'-DDE	brown pelican	3.5	chronic	oral	reproduction	1.31	0.131	Beyer et al. 1996
4,4'-DDE	American kestrel	0.12	2 years	oral	reproduction	0.5	0.05	McLane and Hall 1972
4,4'-DDT	mallard	1.13	chronic	oral	reproduction	1.04	0.104	Davison and Sell 1974
4,4'-DDT	American kestrel	0.12	2 years	oral	reproduction	0.5	0.05	McLane and Hall 1972
Aldrin	mallard	1.13	chronic	oral	mortality	5	0.5	Tucker and Crabtree 1970
alpha-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
alpha-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	mortality	10.7	2.14	Sample et al. 1996
Aroclor-1016	screech owl	0.18	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1221	screech owl	0.18	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1232	screech owl	0.18	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1242	screech owl	0.18	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1248	ring-necked pheasant	1	17 weeks	oral	reproduction	1.8	0.18	Sample et al. 1996
Aroclor-1254	ring-necked pheasant	1	17 weeks	oral	reproduction	1.8	0.18	Sample et al. 1996
Aroclor-1260	ring-necked pheasant	1	17 weeks	oral	reproduction	1.8	0.18	Sample et al. 1996
PCBs (total)	--	--	--	--	--	NA	NA	--
beta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
delta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
Dieldrin	barn owl	0.47	2 years	oral in diet	reproduction	0.77	0.077	Sample et al. 1996
Endosulfan I	gray partridge	0.4	4 weeks	oral in diet	reproduction	100	10	Sample et al. 1996
Endosulfan II	gray partridge	0.4	4 weeks	oral in diet	reproduction	100	10	Sample et al. 1996
Endosulfan Sulfate	gray partridge	0.4	4 weeks	oral in diet	reproduction	100	10	Sample et al. 1996
Endrin	mallard	1.15	>200 days	oral in diet	reproduction	3	0.3	Sample et al. 1996
Endrin	screech owl	0.18	>83 days	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Endrin Aldehyde	mallard	1.15	>200 days	oral in diet	reproduction	3	0.3	Sample et al. 1996
Endrin Aldehyde	screech owl	0.181	>83 days	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Endrin Ketone	mallard	1.15	>200 days	oral in diet	reproduction	3	0.3	Sample et al. 1996
Endrin Ketone	screech owl	0.181	>83 days	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Gamma-BHC (Lindane)	mallard	1	8 weeks	oral (intubation)	reproduction	20	2	Sample et al. 1996
Gamma-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	mortality	10.7	2.14	Sample et al. 1996
Heptachlor	quail	0.19	5 days	oral in diet	mortality	4.05	0.405	Hill et al. 1975
Heptachlor Epoxide	quail	0.19	5 days	oral in diet	mortality	4.05	0.405	Hill et al. 1975
Methoxychlor	quail	0.19	5 days	oral in diet	mortality	4050	405	Hill and Camardese 1986
Toxaphene	mallard	1.04	5 days	oral in diet	mortality	3.07	0.307	Hill and Camardese 1986
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	--	--	--	--	--	NA	NA	--
1,2-Dichlorobenzene	northern bobwhite	0.16	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
1,3-Dichlorobenzene	northern bobwhite	0.16	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
1,4-Dichlorobenzene	northern bobwhite	0.16	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
2,2'-Oxybis(1-Chloropropane)*	--	--	--	--	--	NA	NA	--
2,4,5-Trichlorophenol	--	--	--	--	--	NA	NA	--
2,4,6-Trichlorophenol	--	--	--	--	--	NA	NA	--
2,4-Dichlorophenol	--	--	--	--	--	NA	NA	--
2,4-Dimethylphenol*	--	--	--	--	--	NA	NA	--
2,4-Dinitrophenol*	--	--	--	--	--	NA	NA	--
2,4-Dinitrotoluene*	--	--	--	--	--	NA	NA	--
2,6-Dinitrotoluene*	--	--	--	--	--	NA	NA	--
2-Chloronaphthalene	--	--	--	--	--	NA	NA	--
2-Chlorophenol*	--	--	--	--	--	NA	NA	--

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
2-Methylnaphthalene	--	--	--	--	--	NA	NA	--
2-Methylphenol*	--	--	--	--	--	NA	NA	--
2-Nitroaniline*	--	--	--	--	--	NA	NA	--
2-Nitrophenol*	--	--	--	--	--	NA	NA	--
3,3'-Dichlorobenzidine	--	--	--	--	--	NA	NA	--
3-Nitroaniline*	--	--	--	--	--	NA	NA	--
4,6-Dinitro-2-Methylphenol*	--	--	--	--	--	NA	NA	--
4-Bromophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Chloro-3-Methylphenol	--	--	--	--	--	NA	NA	--
4-Chloroaniline*	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Methylphenol*	--	--	--	--	--	NA	NA	--
4-Nitroaniline*	--	--	--	--	--	NA	NA	--
4-Nitrophenol*	--	--	--	--	--	NA	NA	--
Acenaphthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Acenaphthylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Anthracene	mallard	1.04	7 months	oral in diet	hepatic	228	22.8	Patton and Dieter 1980
Benzo(a)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(a)pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(b)fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(g,h,i)perylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(k)fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Bis(2-Chloroethoxy)methane*	--	--	--	--	--	NA	NA	--
Bis(2-Chloroethyl)ether*	--	--	--	--	--	NA	NA	--
Bis(2-Ethylhexyl)phthalate	ringed dove	0.155	4 weeks	oral in diet	reproduction	11	1.1	Sample et al. 1996
Butylbenzylphthalate	--	--	--	--	--	NA	NA	--
Carbazole	--	--	--	--	--	NA	NA	--
Chrysene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Dibenz(a,h)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Dibenzofuran	--	--	--	--	--	NA	NA	--
Diethylphthalate	--	--	--	--	--	NA	NA	--
Dimethylphthalate*	--	--	--	--	--	NA	NA	--
Di-n-butylphthalate	ringed dove	0.155	4 weeks	oral in diet	reproduction	1.1	0.11	Sample et al. 1996
Di-n-octylphthalate	ring-necked pheasant	1	?	?	mortality	500	50	TERRETOX 1998
Fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Fluorene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Hexachlorobutadiene	Japanese quail	0.19	90 days	oral	reproduction	8	2.5	Coulston and Kolbye 1994; IPCS 1994
Hexachlorobenzene	Japanese quail	0.19	?	oral	reproduction	0.8	0.08	Coulston and Kolbye 1994
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Isophorone*	--	--	--	--	--	NA	NA	--
Naphthalene	mallard	1.04	7 months	oral in diet	hepatic	228	22.8	Patton and Dieter 1980
Nitrobenzene*	--	--	--	--	--	NA	NA	--
N-Nitroso-di-n-propylamine*	--	--	--	--	--	NA	NA	--
N-Nitrosodiphenylamine	--	--	--	--	--	NA	NA	--
Pentachlorophenol	chicken	1.5	8 weeks	oral	growth	200	100	Eisler 1989
Phenanthrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Phenol*	--	--	--	--	--	NA	NA	--
Pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Volatile Organic Compounds								
1,1,1-Trichloroethane*	--	--	--	--	--	NA	NA	--
1,1,2,2-Tetrachloroethane*	--	--	--	--	--	NA	NA	--
1,1,2-Trichloroethane*	--	--	--	--	--	NA	NA	--
1,1-Dichloroethane*	--	--	--	--	--	NA	NA	--
1,1-Dichloroethene*	--	--	--	--	--	NA	NA	--
1,2-Dibromo-3-Chloropropane*	--	--	--	--	--	NA	NA	--
1,2-Dibromoethane*	--	--	--	--	--	NA	NA	--
1,2-Dichloroethane*	--	--	--	--	--	NA	NA	--
1,2-Dichloropropane*	--	--	--	--	--	NA	NA	--
1,2-Dichloroethene (total)*	--	--	--	--	--	NA	NA	--
1,3-Dichloropropene (total)*	--	--	--	--	--	NA	NA	--
2-Butanone*	--	--	--	--	--	NA	NA	--
2-Hexanone*	--	--	--	--	--	NA	NA	--
4-Methyl-2-Pentanone*	--	--	--	--	--	NA	NA	--
Acetone*	--	--	--	--	--	NA	NA	--
Benzene*	--	--	--	--	--	NA	NA	--
Bromochloromethane*	--	--	--	--	--	NA	NA	--
Bromodichloromethane*	--	--	--	--	--	NA	NA	--
Bromoform*	--	--	--	--	--	NA	NA	--
Bromomethane*	--	--	--	--	--	NA	NA	--
Carbon Disulfide*	--	--	--	--	--	NA	NA	--
Carbon Tetrachloride	--	--	--	--	--	NA	NA	--
Chlorobenzene	--	--	--	--	--	NA	NA	--
Chloroethane*	--	--	--	--	--	NA	NA	--
Chloroform	--	--	--	--	--	NA	NA	--
Chloromethane*	--	--	--	--	--	NA	NA	--
Cis-1,2-Dichloroethene*	--	--	--	--	--	NA	NA	--
Cis-1,3-Dichloropropene*	--	--	--	--	--	NA	NA	--
Dibromochloromethane*	--	--	--	--	--	NA	NA	--

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Ethylbenzene	--	--	--	--	--	NA	NA	--
Methylene Chloride*	--	--	--	--	--	NA	NA	--
Styrene	--	--	--	--	--	NA	NA	--
Tetrachloroethene	--	--	--	--	--	NA	NA	--
Toluene	--	--	--	--	--	NA	NA	--
Trans-1,2-Dichloroethene*	--	--	--	--	--	NA	NA	--
Trans-1,3-Dichloropropene*	--	--	--	--	--	NA	NA	--
Trichloroethene	--	--	--	--	--	NA	NA	--
Vinyl Chloride*	--	--	--	--	--	NA	NA	--
Xylenes (total)	quail	0.191	subacute	?	"toxicity"	405	40.5	Hill and Camardese 1986
Dioxin/Furans								
2,3,7,8-TCDD	ring-necked pheasant	1	10 weeks	injection	reproduction	0.00014	0.000014	Sample et al. 1996
1,2,3,7,8-PCDD	--	--	--	--	--	NA	NA	--
1,2,3,4,7,8-HxCDD	--	--	--	--	--	NA	NA	--
1,2,3,6,7,8-HxCDD	--	--	--	--	--	NA	NA	--
1,2,3,7,8,9-HxCDD	--	--	--	--	--	NA	NA	--
1,2,3,4,6,7,8-HpCDD	--	--	--	--	--	NA	NA	--
OCDD	--	--	--	--	--	NA	NA	--
2,3,7,8-TCDF	--	--	--	--	--	NA	NA	--
1,2,3,7,8-PCDF	--	--	--	--	--	NA	NA	--
2,3,4,7,8-PCDF	--	--	--	--	--	NA	NA	--
1,2,3,4,7,8-HxCDF	--	--	--	--	--	NA	NA	--
1,2,3,6,7,8-HxCDF	--	--	--	--	--	NA	NA	--
2,3,4,6,7,8-HxCDF	--	--	--	--	--	NA	NA	--
1,2,3,7,8,9-HxCDF	--	--	--	--	--	NA	NA	--
1,2,3,4,6,7,8-HpCDF	--	--	--	--	--	NA	NA	--
1,2,3,4,7,8,9-HpCDF	--	--	--	--	--	NA	NA	--
OCDF	--	--	--	--	--	NA	NA	--
Total dioxin/furan (TEQ)	ring-necked pheasant	1	10 weeks	injection	reproduction	0.00014	0.000014	Sample et al. 1996

Table 8-6
Screening Level (Step 2) Soil Bioconcentration Factors Used for Plants and Soil Invertebrates
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Aluminum	0.004	Baes et al. 1984	0.2	Sample et al. 1998a
Antimony	0.2	Baes et al. 1984	1	--
Arsenic	1.10	Bechtel Jacobs 1998a	0.52	Sample et al. 1998a
Barium	0.15	Baes et al. 1984	0.36	Beyer and Stafford 1993
Beryllium	0.01	Baes et al. 1984	1.00	--
Cadmium	3.25	Bechtel Jacobs 1998a	40.69	Sample et al. 1998a
Chromium	0.0075	Baes et al. 1984	3.16	Sample et al. 1998a
Cobalt	0.02	Baes et al. 1984	1.00	--
Copper	0.63	Bechtel Jacobs 1998a	1.53	Sample et al. 1998a
Cyanide*	1.00	--	1.00	--
Iron	0.00	Baes et al. 1984	0.10	Sample et al. 1998a
Lead	0.47	Bechtel Jacobs 1998a	1.52	Sample et al. 1998a
Manganese	0.25	Baes et al. 1984	0.124	Sample et al. 1998a
Mercury	5.00	Bechtel Jacobs 1998a	20.63	Sample et al. 1998a
Nickel	1.41	Bechtel Jacobs 1998a	4.73	Sample et al. 1998a
Selenium	3.01	Bechtel Jacobs 1998a	1.34	Sample et al. 1998a
Silver	0.4	Baes et al. 1984	1	--
Thallium	0.004	Baes et al. 1984	1	--
Vanadium	0.0055	Baes et al. 1984	0.088	Sample et al. 1998a
Zinc	1.82	Bechtel Jacobs 1998a	12.89	Sample et al. 1998a
Pesticides/PCBs				
4,4'-DDD	0.01	Travis and Arms 1988	2	Menzie et al. 1992
4,4'-DDE	0.005	Travis and Arms 1988	10.6	Menzie et al. 1992
4,4'-DDT	0.01	Travis and Arms 1988	0.7	Menzie et al. 1992
Aldrin	0.01	Travis and Arms 1988	1	--
alpha-BHC	0.25	Travis and Arms 1988	1	--
alpha-Chlordane	0.01	Travis and Arms 1988	3	Menzie et al. 1992
Aroclor-1016	0.02	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1221	0.07	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1232	0.04	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1242	0.02	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1248	0.01	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1254	0.01	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1260	0.00	Travis and Arms 1988	15.91	Sample et al. 1998a
PCBs (total)	0.01	Travis and Arms 1988	15.91	Sample et al. 1998a
beta-BHC	0.24	Travis and Arms 1988	1	--
delta-BHC	0.17	Travis and Arms 1988	1	--
Dieldrin	0.03	Travis and Arms 1988	8	Beyer and Gish 1980
Endosulfan I	0.24	Travis and Arms 1988	1	--
Endosulfan II	0.09	Travis and Arms 1988	1	--
Endosulfan Sulfate	0.28	Travis and Arms 1988	1	--
Endrin	0.05	Travis and Arms 1988	1	--
Endrin Aldehyde	0.1888	Travis and Arms 1988	1	--
Endrin Ketone	0.1888	Travis and Arms 1988	1	--
Gamma-BHC (Lindane)	0.27	Travis and Arms 1988	1	--
Gamma-Chlordane	0.01	Travis and Arms 1988	3	Menzie et al. 1992
Heptachlor	0.01	Travis and Arms 1988	10	Roberts and Dorough 1985
Heptachlor Epoxide	0.05	Travis and Arms 1988	10	Roberts and Dorough 1985
Methoxychlor	0.04	Travis and Arms 1988	1	--
Toxaphene	0.03	Travis and Arms 1988	1	--
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	0.19	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.40	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.37	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.41	Travis and Arms 1988	1	--
2,2'-Oxybis(1-Chloropropane)*	1.39	Travis and Arms 1988	1	--
2,4,5-Trichlorophenol	0.22	Travis and Arms 1988	8.4	van Gestel and Ma 1988
2,4,6-Trichlorophenol	0.28	Travis and Arms 1988	1	--
2,4-Dichlorophenol	0.64	Travis and Arms 1988	1	--
2,4-Dimethylphenol*	1.67	Travis and Arms 1988	1	--
2,4-Dinitrophenol*	4.92	Travis and Arms 1988	1	--
2,4-Dinitrotoluene*	2.67	Travis and Arms 1988	1	--
2,6-Dinitrotoluene*	3.21	Travis and Arms 1988	1	--

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
2-Chloronaphthalene	0.17	Travis and Arms 1988	1	--
2-Chlorophenol*	2.21	Travis and Arms 1988	1	--
2-Methylnaphthalene	0.22	Travis and Arms 1988	0.2	Beyer and Stafford 1993
2-Methylphenol*	2.74	Travis and Arms 1988	1	--
2-Nitroaniline*	3.09	Travis and Arms 1988	1	--
2-Nitrophenol*	3.53	Travis and Arms 1988	1	--
3,3'-Dichlorobenzidine	0.36	Travis and Arms 1988	1	--
3-Nitroaniline*	6.01	Travis and Arms 1988	1	--
4,6-Dinitro-2-Methylphenol*	2.37	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.05	Travis and Arms 1988	1	--
4-Chloro-3-Methylphenol	0.63	Travis and Arms 1988	1	--
4-Chloroaniline*	3.30	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.05	Travis and Arms 1988	1	--
4-Methylphenol*	2.89	Travis and Arms 1988	1	--
4-Nitroaniline*	6.009	Travis and Arms 1988	1	--
4-Nitrophenol*	3.0889	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	0.3	Beyer and Stafford 1993
Acenaphthylene	0.17	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.09	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.02	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.01	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.01	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.01	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.01	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Bis(2-Chloroethoxy)methane*	14.27	Travis and Arms 1988	1	--
Bis(2-Chloroethyl)ether*	7.74	Travis and Arms 1988	1	--
Bis(2-Ethylhexyl)phthalate	0.00	Travis and Arms 1988	1	--
Butylbenzylphthalate	0.06	Travis and Arms 1988	1	--
Carbazole	0.33	Travis and Arms 1988	1	--
Chrysene	0.02	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.01	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Dibenzofuran	0.14	Travis and Arms 1988	1	--
Diethylphthalate	1.39	Travis and Arms 1988	1	--
Dimethylphthalate*	4.79	Travis and Arms 1988	1	--
Di-n-butylphthalate	0.08	Travis and Arms 1988	1	--
Di-n-octylphthalate	0.00	Travis and Arms 1988	1	--
Fluoranthene	0.04	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.14	Travis and Arms 1988	0.2	Beyer and Stafford 1993
Hexachlorobutadiene	0.06	Travis and Arms 1988	1	--
Hexachlorobenzene	0.02	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorocyclopentadiene	0.03	Travis and Arms 1988	1	--
Hexachloroethane	0.19	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.01	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Isophorone*	4.03	Travis and Arms 1988	1	--
Naphthalene	0.44	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Nitrobenzene*	3.35	Travis and Arms 1988	1	--
N-Nitroso-di-n-propylamine*	6.01	Travis and Arms 1988	1	--
N-Nitrosodiphenylamine	0.58	Travis and Arms 1988	1	--
Pentachlorophenol	0.04	Travis and Arms 1988	8	van Gestel and Ma 1988
Phenanthrene	0.09	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Phenol*	5.40	Travis and Arms 1988	1	--
Pyrene	0.04	Travis and Arms 1988	0.39	Beyer and Stafford 1993

Table 8-7
Screening Level (Step 2) Soil Bioaccumulation Factors Used for Small Mammals
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Aluminum	--	see text	--	see text	--	see text
Antimony	--	see text	--	see text	--	see text
Arsenic	0.01	Sample et al. 1998b	0.02	Sample et al. 1998b	0.01	Sample et al. 1998b
Barium	0.07	Sample et al. 1998b	0.25	Sample et al. 1998b	0.1121	Sample et al. 1998b
Beryllium	0.41	SWDIV 1996	0.41	SWDIV 1996	0.41	SWDIV 1996
Cadmium	0.46	Sample et al. 1998b	0.45	Sample et al. 1998b	7.02	Sample et al. 1998b
Chromium	0.35	Sample et al. 1998b	0.31	Sample et al. 1998b	0.33	Sample et al. 1998b
Cobalt	0.03	Sample et al. 1998b	0.14	Sample et al. 1998b	0.1	Sample et al. 1998b
Copper	0.55	Sample et al. 1998b	1.29	Sample et al. 1998b	1.12	Sample et al. 1998b
Cyanide*	--	see text	--	see text	--	see text
Iron	0.02	Sample et al. 1998b	0.024	Sample et al. 1998b	0.0171	Sample et al. 1998b
Lead	0.29	Sample et al. 1998b	0.19	Sample et al. 1998b	0.34	Sample et al. 1998b
Manganese	--	see text	--	see text	--	see text
Mercury	0.13	Sample et al. 1998b	0.192	Sample et al. 1998b	0.192	Sample et al. 1998b
Nickel	0.59	Sample et al. 1998b	0.90	Sample et al. 1998b	0.58	Sample et al. 1998b
Selenium	1.26	Sample et al. 1998b	0.16	Sample et al. 1998b	1.19	Sample et al. 1998b
Silver	1	--	1	--	1	--
Thallium	0.1227	Sample et al. 1998b	0.1227	Sample et al. 1998b	0.1227	Sample et al. 1998b
Vanadium	--	see text	--	see text	--	see text
Zinc	2.78	Sample et al. 1998b	2.32	Sample et al. 1998b	2.90	Sample et al. 1998b
Pesticides/PCBs						
4,4'-DDD	1	--	1	--	1	--
4,4'-DDE	1	--	1	--	1	--
4,4'-DDT	1	--	1	--	1	--
Aldrin	1	--	1	--	1	--
alpha-BHC	1	--	1	--	1	--
alpha-Chlordane	1	--	1	--	1	--
Aroclor-1016	1	--	1	--	1	--
Aroclor-1221	1	--	1	--	1	--
Aroclor-1232	1	--	1	--	1	--
Aroclor-1242	1	--	1	--	1	--
Aroclor-1248	1	--	1	--	1	--
Aroclor-1254	1	--	1	--	1	--
Aroclor-1260	1	--	1	--	1	--
PCBs (total)	1	--	1	--	1	--
beta-BHC	1	--	1	--	1	--
delta-BHC	1	--	1	--	1	--
Dieldrin	1	--	1	--	1	--
Endosulfan I	1	--	1	--	1	--
Endosulfan II	1	--	1	--	1	--
Endosulfan Sulfate	1	--	1	--	1	--
Endrin	1	--	1	--	1	--
Endrin Aldehyde	1	--	1	--	1	--
Endrin Ketone	1	--	1	--	1	--
Gamma-BHC (Lindane)	1	--	1	--	1	--
Gamma-Chlordane	1	--	1	--	1	--
Heptachlor	1	--	1	--	1	--
Heptachlor Epoxide	1	--	1	--	1	--
Methoxychlor	1	--	1	--	1	--
Toxaphene	1	--	1	--	1	--
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	1	--	1	--	1	--
1,2-Dichlorobenzene	1	--	1	--	1	--
1,3-Dichlorobenzene	1	--	1	--	1	--
1,4-Dichlorobenzene	1	--	1	--	1	--
2,2'-Oxybis(1-Chloropropane)*	1	--	1	--	1	--
2,4,5-Trichlorophenol	1	--	1	--	1	--
2,4,6-Trichlorophenol	1	--	1	--	1	--
2,4-Dichlorophenol	1	--	1	--	1	--
2,4-Dimethylphenol*	1	--	1	--	1	--
2,4-Dinitrophenol*	1	--	1	--	1	--

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
2,4-Dinitrotoluene*	1	--	1	--	1	--
2,6-Dinitrotoluene*	1	--	1	--	1	--
2-Chloronaphthalene	1	--	1	--	1	--
2-Chlorophenol*	1	--	1	--	1	--
2-Methylnaphthalene	1	--	1	--	1	--
2-Methylphenol*	1	--	1	--	1	--
2-Nitroaniline*	1	--	1	--	1	--
2-Nitrophenol*	1	--	1	--	1	--
3,3'-Dichlorobenzidine	1	--	1	--	1	--
3-Nitroaniline*	1	--	1	--	1	--
4,6-Dinitro-2-Methylphenol*	1	--	1	--	1	--
4-Bromophenyl-Phenylether	1	--	1	--	1	--
4-Chloro-3-Methylphenol	1	--	1	--	1	--
4-Chloroaniline*	1	--	1	--	1	--
4-Chlorophenyl-Phenylether	1	--	1	--	1	--
4-Methylphenol*	1	--	1	--	1	--
4-Nitroaniline*	1	--	1	--	1	--
4-Nitrophenol*	1	--	1	--	1	--
Acenaphthene	1	--	1	--	1	--
Acenaphthylene	1	--	1	--	1	--
Anthracene	1	--	1	--	1	--
Benzo(a)anthracene	1	--	1	--	1	--
Benzo(a)pyrene	1	--	1	--	1	--
Benzo(b)fluoranthene	1	--	1	--	1	--
Benzo(g,h,i)perylene	1	--	1	--	1	--
Benzo(k)fluoranthene	1	--	1	--	1	--
Bis(2-Chloroethoxy)methane*	1	--	1	--	1	--
Bis(2-Chloroethyl)ether*	1	--	1	--	1	--
Bis(2-Ethylhexyl)phthalate	1	--	1	--	1	--
Butylbenzylphthalate	1	--	1	--	1	--
Carbazole	1	--	1	--	1	--
Chrysene	1	--	1	--	1	--
Dibenz(a,h)anthracene	1	--	1	--	1	--
Dibenzofuran	1	--	1	--	1	--
Diethylphthalate	1	--	1	--	1	--
Dimethylphthalate*	1	--	1	--	1	--
Di-n-butylphthalate	1	--	1	--	1	--
Di-n-octylphthalate	1	--	1	--	1	--
Fluoranthene	1	--	1	--	1	--
Fluorene	1	--	1	--	1	--
Hexachlorobutadiene	1	--	1	--	1	--
Hexachlorobenzene	1	--	1	--	1	--
Hexachlorocyclopentadiene	1	--	1	--	1	--
Hexachloroethane	1	--	1	--	1	--
Indeno(1,2,3-cd)pyrene	1	--	1	--	1	--
Isophorone*	1	--	1	--	1	--
Naphthalene	1	--	1	--	1	--
Nitrobenzene*	1	--	1	--	1	--
N-Nitroso-di-n-propylamine*	1	--	1	--	1	--
N-Nitrosodiphenylamine	1	--	1	--	1	--
Pentachlorophenol	1	--	1	--	1	--
Phenanthrene	1	--	1	--	1	--
Phenol*	1	--	1	--	1	--
Pyrene	1	--	1	--	1	--

Table 8-8
Screening Level (Step 2) Sediment Bioaccumulation Factors Used for Aquatic Invertebrates and Fish
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Aluminum	0.069	Brumbaugh et al. 1994; Ingersoll et al. 1994	1	--
Antimony	1	--	1	--
Arsenic	0.68	Bechtel Jacobs 1998b	0.13	Pascoe et al. 1996
Barium	1	--	1.00	--
Beryllium	1	--	1.00	--
Cadmium	3.07	Bechtel Jacobs 1998b	0.16	Pascoe et al. 1996
Chromium	0.19	Bechtel Jacobs 1998b	0.04	Krantzberg and Boyd 1992
Cobalt	1	--	1	--
Copper	7.96	Bechtel Jacobs 1998b	0.10	Krantzberg and Boyd 1992
Cyanide*	1	--	1	--
Iron	1	--	1	--
Lead	0.33	Bechtel Jacobs 1998b	0.07	Krantzberg and Boyd 1992
Manganese	1	--	1	--
Mercury	1.735	Bechtel Jacobs 1998b	4.58	Cope et al. 1990
Nickel	0.21	Bechtel Jacobs 1998b	1	--
Selenium	1	--	1	--
Silver	0.18	Hirsch 1998	1	--
Thallium	1	--	1	--
Vanadium	1	--	1	--
Zinc	4.76	Bechtel Jacobs 1998b	0.15	Pascoe et al. 1996
Pesticides/PCBs				
4,4'-DDD	0.50	Oliver 1987	2.61	Oliver and Niimi 1988
4,4'-DDE	4.30	Oliver 1987	20.4	Oliver and Niimi 1988
4,4'-DDT	0.50	Oliver 1987	9.11	Oliver and Niimi 1988
Aldrin	1	--	1	--
alpha-BHC	1	--	1	--
alpha-Chlordane	1	--	1	--
Aroclor-1016	21.9	Bechtel Jacobs 1998b	11.2	Oliver and Niimi 1988
Aroclor-1221	21.9	Bechtel Jacobs 1998b	11.2	Oliver and Niimi 1988
Aroclor-1232	21.9	Bechtel Jacobs 1998b	11.2	Oliver and Niimi 1988
Aroclor-1242	21.9	Bechtel Jacobs 1998b	11.2	Oliver and Niimi 1988
Aroclor-1248	21.9	Bechtel Jacobs 1998b	11.2	Oliver and Niimi 1988
Aroclor-1254	21.9	Bechtel Jacobs 1998b	11.2	Oliver and Niimi 1988
Aroclor-1260	21.9	Bechtel Jacobs 1998b	11.2	Oliver and Niimi 1988
PCBs (total)	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988
beta-BHC	1	--	1	--
delta-BHC	1	--	1	--
Dieldrin	1	--	1	--
Endosulfan I	1	--	1	--
Endosulfan II	1	--	1	--
Endosulfan Sulfate	1	--	1	--
Endrin	1	--	1	--
Endrin Aldehyde	1	--	1	--
Endrin Ketone	1	--	1	--
Gamma-BHC (Lindane)	1	--	1	--
Gamma-Chlordane	1	--	1	--
Heptachlor	1	--	1	--
Heptachlor Epoxide	1	--	1	--
Methoxychlor	1	--	1	--
Toxaphene	1	--	1	--
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	1	--	1	--
1,2-Dichlorobenzene	1	--	1	--
1,3-Dichlorobenzene	1	--	1	--
1,4-Dichlorobenzene	1	--	1	--
2,2'-Oxybis(1-Chloropropane)*	1	--	1	--
2,4,5-Trichlorophenol	1	--	1	--
2,4,6-Trichlorophenol	1	--	1	--
2,4-Dichlorophenol	1	--	1	--
2,4-Dimethylphenol*	1	--	1	--
2,4-Dinitrophenol*	1	--	1	--

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
2,4-Dinitrotoluene*	1	--	1	--
2,6-Dinitrotoluene*	1	--	1	--
2-Chloronaphthalene	1	--	1	--
2-Chlorophenol*	1	--	1	--
2-Methylnaphthalene	1	--	1	--
2-Methylphenol*	1	--	1	--
2-Nitroaniline*	1	--	1	--
2-Nitrophenol*	1	--	1	--
3,3'-Dichlorobenzidine	1	--	1	--
3-Nitroaniline*	1	--	1	--
4,6-Dinitro-2-Methylphenol*	1	--	1	--
4-Bromophenyl-Phenylether	1	--	1	--
4-Chloro-3-Methylphenol	1	--	1	--
4-Chloroaniline*	1	--	1	--
4-Chlorophenyl-Phenylether	1	--	1	--
4-Methylphenol*	1	--	1	--
4-Nitroaniline*	1	--	1	--
4-Nitrophenol*	1	--	1	--
Acenaphthene	2.04	Maruya et al. 1997	1	--
Acenaphthylene	1	--	1	--
Anthracene	0.27	Maruya et al. 1997	1	--
Benzo(a)anthracene	1.40	Maruya et al. 1997	1	--
Benzo(a)pyrene	0.19	Maruya et al. 1997	1	--
Benzo(b)fluoranthene	0.16	Maruya et al. 1997	1	--
Benzo(g,h,i)perylene	0.30	Maruya et al. 1997	1	--
Benzo(k)fluoranthene	0.42	Maruya et al. 1997	1	--
Bis(2-Chloroethoxy)methane*	1	--	1	--
Bis(2-Chloroethyl)ether*	1	--	1	--
Bis(2-Ethylhexyl)phthalate	1	--	1	--
Butylbenzylphthalate	1	--	1	--
Carbazole	1	--	1	--
Chrysene	0.34	Maruya et al. 1997	1	--
Dibenz(a,h)anthracene	1	--	1	--
Dibenzofuran	1	--	1	--
Diethylphthalate	1	--	1	--
Dimethylphthalate*	1	--	1	--
Di-n-butylphthalate	1	--	1	--
Di-n-octylphthalate	1	--	1	--
Fluoranthene	0.31	Maruya et al. 1997	1	--
Fluorene	1.13	Maruya et al. 1997	1	--
Hexachlorobutadiene	1	--	1	--
Hexachlorobenzene	1	--	1	--
Hexachlorocyclopentadiene	1	--	1	--
Hexachloroethane	1	--	1	--
Indeno(1,2,3-cd)pyrene	0.36	Maruya et al. 1997	1	--
Isophorone*	1	--	1	--
Naphthalene	1	--	1	--
Nitrobenzene*	1	--	1	--
N-Nitroso-di-n-propylamine*	1	--	1	--
N-Nitrosodiphenylamine	1	--	1	--
Pentachlorophenol	1	--	1	--
Phenanthrene	0.65	Maruya et al. 1997	1	--
Phenol*	1	--	1	--
Pyrene	0.80	Maruya et al. 1997	1	--
Volatile Organic Compounds				
1,1,1-Trichloroethane*	1	--	1	--
1,1,2,2-Tetrachloroethane*	1	--	1	--
1,1,2-Trichloroethane*	1	--	1	--
1,1-Dichloroethane*	1	--	1	--
1,1-Dichloroethene*	1	--	1	--
1,2-Dibromo-3-Chloropropane*	1	--	1	--
1,2-Dibromoethane*	1	--	1	--
1,2-Dichloroethane*	1	--	1	--
1,2-Dichloropropane*	1	--	1	--
1,2-Dichloroethene (total)*	1	--	1	--
1,3-Dichloropropene (total)*	1	--	1	--
2-Butanone*	1	--	1	--
2-Hexanone*	1	--	1	--

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
4-Methyl-2-Pentanone*	1	--	1	--
Acetone*	1	--	1	--
Benzene*	1	--	1	--
Bromochloromethane*	1	--	1	--
Bromodichloromethane*	1	--	1	--
Bromoform*	1	--	1	--
Bromomethane*	1	--	1	--
Carbon Disulfide*	1	--	1	--
Carbon Tetrachloride	1	--	1	--
Chlorobenzene	1	--	1	--
Chloroethane*	1	--	1	--
Chloroform	1	--	1	--
Chloromethane*	1	--	1	--
Cis-1,2-Dichloroethene*	1	--	1	--
Cis-1,3-Dichloropropene*	1	--	1	--
Dibromochloromethane*	1	--	1	--
Ethylbenzene	1	--	1	--
Methylene Chloride*	1	--	1	--
Styrene	1	--	1	--
Tetrachloroethene	1	--	1	--
Toluene	1	--	1	--
Trans-1,2-Dichloroethene*	1	--	1	--
Trans-1,3-Dichloropropene*	1	--	1	--
Trichloroethene	1	--	1	--
Vinyl Chloride*	1	--	1	--
Xylenes (total)	1	--	1	--
Dioxin/Furans				
2,3,7,8-TCDD	0.3868	USEPA 1990	0.3868	USEPA 1990
1,2,3,7,8-PCDD	0	0	0	0
1,2,3,4,7,8-HxCDD	0	0	0	0
1,2,3,6,7,8-HxCDD	0	0	0	0
1,2,3,7,8,9-HxCDD	0	0	0	0
1,2,3,4,6,7,8-HpCDD	0	0	0	0
OCDD	0	0	0	0
2,3,7,8-TCDF	0	0	0	0
1,2,3,7,8-PCDF	0	0	0	0
2,3,4,7,8-PCDF	0	0	0	0
1,2,3,4,7,8-HxCDF	0	0	0	0
1,2,3,6,7,8-HxCDF	0	0	0	0
2,3,4,6,7,8-HxCDF	0	0	0	0
1,2,3,7,8,9-HxCDF	0	0	0	0
1,2,3,4,6,7,8-HpCDF	0	0	0	0
1,2,3,4,7,8,9-HpCDF	0	0	0	0
OCDF	0	0	0	0
Total dioxin/furan (TEQ)	0.39	USEPA 1990	0.39	USEPA 1990

Table 8-9
Screening Level (Step 2) Exposure Parameters for Upper Trophic Level Ecological Receptors
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
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	Dietary Composition (%)							Soil/ Sediment Ingestion	
Receptor	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American robin	51.6	43.6	0	0	0	0	Martin et al. 1951	4.8	Sample and Suter 1994
American woodcock	0	89.6	0	0	0	0	USEPA 1993	10.4	Beyer et al. 1994
Belted kingfisher	0	0	0	84	0	16	USEPA 1993	0	Sample and Suter 1994
Red-tailed hawk	0	0	100	0	52	0	USEPA 1993; Sample and Suter 1994	0	Sample and Suter 1994
Mammals									
Deer mouse	53	45	0	0	0	0	Martin et al. 1951	2	Beyer et al. 1994
Mink	0	0	0	94	1	5	USEPA 1993	0	Sample and Suter 1994
Muskrat	0	0	0	0	90.6	0	USEPA 1993	9.4	Beyer et al. 1994 (raccoon)
Raccoon	0	0	0	7	40	43.6	USEPA 1993	9.4	Beyer et al. 1994
Red fox	7	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994

Table 8-10
Toxicity Equivalency Factors for Dioxin and Furan Congeners
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St. Juliens Creek Annex
Chesapeake, Virginia

Congener	Mammal TEF	Bird TEF
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01	0.001
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	0.01
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1	0.05
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1	0.01
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1	0.1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.0	1.0
1,2,3,7,8-Pentachlorodibenzofuran	0.05	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1	0.1
2,3,4,7,8-Pentachlorodibenzofuran	0.5	1.0
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1.0	1.0
2,3,7,8-Tetrachlorodibenzofuran	0.1	1.0
Total octachlorodibenzo-p-dioxin	0.0001	0.0001
Total octachlorodibenzofuran	0.0001	0.0001

Table 8-11
Baseline (Step 3) Soil Bioconcentration Factors Used for Plants and Soil Invertebrates
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Aluminum	0.004	Baes et al. 1984	0.053	Sample et al. 1998a
Antimony	0.2	Baes et al. 1984	0.063	Helmke et al. 1979
Arsenic	0.04	Bechtel Jacobs 1998a	0.26	Sample et al. 1998a
Barium	0.15	Baes et al. 1984	0.36	Beyer and Stafford 1993
Beryllium	0.01	Baes et al. 1984	1.00	--
Cadmium	0.51	Bechtel Jacobs 1998a	7.66	Sample et al. 1998a
Chromium	0.01	Baes et al. 1984	0.32	Sample et al. 1998a
Cobalt	0.02	Baes et al. 1984	0.38	Helmke et al. 1979
Copper	0.12	Bechtel Jacobs 1998a	0.47	Sample et al. 1998a
Cyanide*	1.00	--	1.00	--
Iron	0.00	Baes et al. 1984	0.04	Sample et al. 1998a
Lead	0.04	Bechtel Jacobs 1998a	0.31	Sample et al. 1998a
Manganese	0.25	Baes et al. 1984	0.05	Sample et al. 1998a
Nickel	0.03	Bechtel Jacobs 1998a	1.66	Sample et al. 1998a
Selenium	0.57	Bechtel Jacobs 1998a	0.98	Sample et al. 1998a
Silver	0.40	Baes et al. 1984	1	--
Thallium	0.00	Baes et al. 1984	1.00	--
Vanadium	0.01	Baes et al. 1984	0.04	Sample et al. 1998a
Zinc	0.36	Bechtel Jacobs 1998a	2.48	Sample et al. 1998a
Pesticides/PCBs				
4,4'-DDD	0.01	Travis and Arms 1988	2.0	Menzie et al. 1992
4,4'-DDE	0.005	Travis and Arms 1988	10.6	Menzie et al. 1992
4,4'-DDT	0.01	Travis and Arms 1988	0.70	Menzie et al. 1992
Aldrin	0.01	Travis and Arms 1988	1	--
alpha-BHC	0.25	Travis and Arms 1988	1	--
alpha-Chlordane	0.01	Travis and Arms 1988	3	Menzie et al. 1992
Aroclor-1016	0.02	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1221	0.07	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1232	0.04	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1242	0.02	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1248	0.01	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1254	0.01	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1260	0.005	Travis and Arms 1988	4.30	Sample et al. 1998a
PCBs (total)	0.01	Travis and Arms 1988	4.297	Sample et al. 1998a
beta-BHC	0.24	Travis and Arms 1988	1	--
delta-BHC	0.17	Travis and Arms 1988	1	--
Dieldrin	0.03	Travis and Arms 1988	8	Beyer and Gish 1980
Endosulfan I	0.24	Travis and Arms 1988	1	--
Endosulfan II	0.09	Travis and Arms 1988	1	--
Endosulfan Sulfate	0.28	Travis and Arms 1988	1	--
Endrin	0.05	Travis and Arms 1988	1	--
Endrin Aldehyde	0.19	Travis and Arms 1988	1	--
Endrin Ketone	0.19	Travis and Arms 1988	1	--
Gamma-BHC (Lindane)	0.27	Travis and Arms 1988	1	--
Gamma-Chlordane	0.01	Travis and Arms 1988	3	Menzie et al. 1992
Heptachlor	0.01	Travis and Arms 1988	10	Roberts and Dorough 1985
Heptachlor Epoxide	0.05	Travis and Arms 1988	10	Roberts and Dorough 1985
Methoxychlor	0.04	Travis and Arms 1988	1	--
Toxaphene	0.03	Travis and Arms 1988	1	--
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	0.19	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.40	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.37	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.41	Travis and Arms 1988	1	--

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
2,2'-Oxybis(1-Chloropropane)*	1.39	Travis and Arms 1988	1	--
2,4,5-Trichlorophenol	0.22	Travis and Arms 1988	3.2	van Gestel and Ma 1988
2,4,6-Trichlorophenol	0.28	Travis and Arms 1988	1	--
2,4-Dichlorophenol	0.64	Travis and Arms 1988	1	--
2,4-Dimethylphenol*	1.67	Travis and Arms 1988	1	--
2,4-Dinitrophenol*	4.92	Travis and Arms 1988	1	--
2,4-Dinitrotoluene*	2.67	Travis and Arms 1988	1	--
2,6-Dinitrotoluene*	3.21	Travis and Arms 1988	1	--
2-Chloronaphthalene	0.17	Travis and Arms 1988	1	--
2-Chlorophenol*	2.21	Travis and Arms 1988	1	--
2-Methylnaphthalene	0.22	Travis and Arms 1988	0.2	Beyer and Stafford 1993
2-Methylphenol*	2.74	Travis and Arms 1988	1	--
2-Nitroaniline*	3.09	Travis and Arms 1988	1	--
2-Nitrophenol*	3.53	Travis and Arms 1988	1	--
3,3'-Dichlorobenzidine	0.36	Travis and Arms 1988	1	--
3-Nitroaniline*	6.01	Travis and Arms 1988	1	--
4,6-Dinitro-2-Methylphenol*	2.37	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.05	Travis and Arms 1988	1	--
4-Chloro-3-Methylphenol	0.63	Travis and Arms 1988	1	--
4-Chloroaniline*	3.30	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.05	Travis and Arms 1988	1	--
4-Methylphenol*	2.89	Travis and Arms 1988	1	--
4-Nitroaniline*	6.01	Travis and Arms 1988	1	--
4-Nitrophenol*	3.09	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	0.30	Beyer and Stafford 1993
Acenaphthylene	0.17	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.09	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.02	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.01	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.01	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.01	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.01	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Bis(2-Chloroethoxy)methane*	14.27	Travis and Arms 1988	1	--
Bis(2-Chloroethyl)ether*	7.74	Travis and Arms 1988	1	--
Bis(2-Ethylhexyl)phthalate	0.00	Travis and Arms 1988	1	--
Butylbenzylphthalate	0.06	Travis and Arms 1988	1	--
Carbazole	0.33	Travis and Arms 1988	1	--
Chrysene	0.02	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.01	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Dibenzofuran	0.14	Travis and Arms 1988	1	--
Diethylphthalate	1.39	Travis and Arms 1988	1	--
Dimethylphthalate*	4.79	Travis and Arms 1988	1	--
Di-n-butylphthalate	0.08	Travis and Arms 1988	1	--
Di-n-octylphthalate	0.00	Travis and Arms 1988	1	--
Fluoranthene	0.04	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.14	Travis and Arms 1988	0.20	Beyer and Stafford 1993
Hexachlorobutadiene	0.06	Travis and Arms 1988	1	--
Hexachlorobenzene	0.02	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorocyclopentadiene	0.03	Travis and Arms 1988	1	--
Hexachloroethane	0.19	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.01	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Isophorone*	4.03	Travis and Arms 1988	1	--
Naphthalene	0.44	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Nitrobenzene*	3.35	Travis and Arms 1988	1	--
N-Nitroso-di-n-propylamine*	6.01	Travis and Arms 1988	1	--
N-Nitrosodiphenylamine	0.58	Travis and Arms 1988	1	--
Pentachlorophenol	0.04	Travis and Arms 1988	5.18	van Gestel and Ma 1988
Phenanthrene	0.09	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Phenol*	5.40	Travis and Arms 1988	1	--
Pyrene	0.04	Travis and Arms 1988	0.39	Beyer and Stafford 1993

Table 8-12
Baseline (Step 3) Soil Bioaccumulation Factors Used for Small Mammals
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Chesapeake, Virginia

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Aluminum	--	see text	--	see text	--	see text
Antimony	--	see text	--	see text	--	see text
Arsenic	0.003	Sample et al. 1998b	0.01	Sample et al. 1998b	0.004	Sample et al. 1998b
Barium	0.05	Sample et al. 1998b	0.0689	Sample et al. 1998b	0.05	Sample et al. 1998b
Beryllium	0.41	SWDIV 1996	0.41	SWDIV 1996	0.41	SWDIV 1996
Cadmium	0.14	Sample et al. 1998b	0.13	Sample et al. 1998b	2.21	Sample et al. 1998b
Chromium	0.09	Sample et al. 1998b	0.12	Sample et al. 1998b	0.09	Sample et al. 1998b
Cobalt	0.02	Sample et al. 1998b	0.0315	Sample et al. 1998b	0.03	Sample et al. 1998b
Copper	0.11	Sample et al. 1998b	0.11	Sample et al. 1998b	0.50	Sample et al. 1998b
Cyanide*	--	see text	--	see text	--	see text
Iron	0.01	Sample et al. 1998b	0.0137	Sample et al. 1998b	0.01	Sample et al. 1998b
Lead	0.05	Sample et al. 1998b	0.04	Sample et al. 1998b	0.15	Sample et al. 1998b
Manganese	--	see text	--	see text	--	see text
Mercury	0.07	Sample et al. 1998b	0.0672	Sample et al. 1998b	0.07	Sample et al. 1998b
Nickel	0.26	Sample et al. 1998b	0.26	Sample et al. 1998b	0.35	Sample et al. 1998b
Selenium	0.26	Sample et al. 1998b	0.02	Sample et al. 1998b	0.27	Sample et al. 1998b
Silver	1	--	1	--	1	--
Thallium	0.1124	Sample et al. 1998b	0.1124	Sample et al. 1998b	0.11	Sample et al. 1998b
Vanadium	--	see text	--	see text	--	see text
Zinc	0.51	Sample et al. 1998b	0.29	Sample et al. 1998b	0.86	Sample et al. 1998b
Pesticides/PCBs						
4,4'-DDD	1	--	1	--	1	--
4,4'-DDE	1	--	1	--	1	--
4,4'-DDT	1	--	1	--	1	--
Aldrin	1	--	1	--	1	--
alpha-BHC	1	--	1	--	1	--
alpha-Chlordane	1	--	1	--	1	--
Aroclor-1016	1	--	1	--	1	--
Aroclor-1221	1	--	1	--	1	--
Aroclor-1232	1	--	1	--	1	--
Aroclor-1242	1	--	1	--	1	--
Aroclor-1248	1	--	1	--	1	--
Aroclor-1254	1	--	1	--	1	--
Aroclor-1260	1	--	1	--	1	--
PCBs (total)	1	--	1	--	1	--
beta-BHC	1	--	1	--	1	--
delta-BHC	1	--	1	--	1	--
Dieldrin	1	--	1	--	1	--
Endosulfan I	1	--	1	--	1	--
Endosulfan II	1	--	1	--	1	--
Endosulfan Sulfate	1	--	1	--	1	--
Endrin	1	--	1	--	1	--
Endrin Aldehyde	1	--	1	--	1	--
Endrin Ketone	1	--	1	--	1	--
Gamma-BHC (Lindane)	1	--	1	--	1	--
Gamma-Chlordane	1	--	1	--	1	--
Heptachlor	1	--	1	--	1	--
Heptachlor Epoxide	1	--	1	--	1	--
Methoxychlor	1	--	1	--	1	--
Toxaphene	1	--	1	--	1	--
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	1	--	1	--	1	--
1,2-Dichlorobenzene	1	--	1	--	1	--
1,3-Dichlorobenzene	1	--	1	--	1	--
1,4-Dichlorobenzene	1	--	1	--	1	--
2,2'-Oxybis(1-Chloropropane)*	1	--	1	--	1	--
2,4,5-Trichlorophenol	1	--	1	--	1	--
2,4,6-Trichlorophenol	1	--	1	--	1	--
2,4-Dichlorophenol	1	--	1	--	1	--
2,4-Dimethylphenol*	1	--	1	--	1	--
2,4-Dinitrophenol*	1	--	1	--	1	--
2,4-Dinitrotoluene*	1	--	1	--	1	--
2,6-Dinitrotoluene*	1	--	1	--	1	--

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
2-Chloronaphthalene	1	--	1	--	1	--
2-Chlorophenol*	1	--	1	--	1	--
2-Methylnaphthalene	1	--	1	--	1	--
2-Methylphenol*	1	--	1	--	1	--
2-Nitroaniline*	1	--	1	--	1	--
2-Nitrophenol*	1	--	1	--	1	--
3,3'-Dichlorobenzidine	1	--	1	--	1	--
3-Nitroaniline*	1	--	1	--	1	--
4,6-Dinitro-2-Methylphenol*	1	--	1	--	1	--
4-Bromophenyl-Phenylether	1	--	1	--	1	--
4-Chloro-3-Methylphenol	1	--	1	--	1	--
4-Chloroaniline*	1	--	1	--	1	--
4-Chlorophenyl-Phenylether	1	--	1	--	1	--
4-Methylphenol*	1	--	1	--	1	--
4-Nitroaniline*	1	--	1	--	1	--
4-Nitrophenol*	1	--	1	--	1	--
Acenaphthene	1	--	1	--	1	--
Acenaphthylene	1	--	1	--	1	--
Anthracene	1	--	1	--	1	--
Benzo(a)anthracene	1	--	1	--	1	--
Benzo(a)pyrene	1	--	1	--	1	--
Benzo(b)fluoranthene	1	--	1	--	1	--
Benzo(g,h,i)perylene	1	--	1	--	1	--
Benzo(k)fluoranthene	1	--	1	--	1	--
Bis(2-Chloroethoxy)methane*	1	--	1	--	1	--
Bis(2-Chloroethyl)ether*	1	--	1	--	1	--
Bis(2-Ethylhexyl)phthalate	1	--	1	--	1	--
Butylbenzylphthalate	1	--	1	--	1	--
Carbazole	1	--	1	--	1	--
Chrysene	1	--	1	--	1	--
Dibenz(a,h)anthracene	1	--	1	--	1	--
Dibenzofuran	1	--	1	--	1	--
Diethylphthalate	1	--	1	--	1	--
Dimethylphthalate*	1	--	1	--	1	--
Di-n-butylphthalate	1	--	1	--	1	--
Di-n-octylphthalate	1	--	1	--	1	--
Fluoranthene	1	--	1	--	1	--
Fluorene	1	--	1	--	1	--
Hexachlorobutadiene	1	--	1	--	1	--
Hexachlorobenzene	1	--	1	--	1	--
Hexachlorocyclopentadiene	1	--	1	--	1	--
Hexachloroethane	1	--	1	--	1	--
Indeno(1,2,3-cd)pyrene	1	--	1	--	1	--
Isophorone*	1	--	1	--	1	--
Naphthalene	1	--	1	--	1	--
Nitrobenzene*	1	--	1	--	1	--
N-Nitroso-di-n-propylamine*	1	--	1	--	1	--
N-Nitrosodiphenylamine	1	--	1	--	1	--
Pentachlorophenol	1	--	1	--	1	--
Phenanthrene	1	--	1	--	1	--
Phenol*	1	--	1	--	1	--
Pyrene	1	--	1	--	1	--

Table 8-13
Baseline (Step 3) Sediment Bioaccumulation Factors Used for Aquatic Invertebrates and Fish
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Aluminum	0.027	Brumbaugh et al. 1994; Ingersoll et al. 1994	1	--
Antimony	1	--	1	--
Arsenic	0.44	Bechtel Jacobs 1998b	0.13	Pascoe et al. 1996
Barium	1.00	--	1.00	--
Beryllium	1.00	--	1.00	--
Cadmium	0.68	Bechtel Jacobs 1998b	0.16	Pascoe et al. 1996
Chromium	0.09	Bechtel Jacobs 1998b	0.04	Krantzberg and Boyd 1992
Cobalt	1.00	--	1	--
Copper	0.92	Bechtel Jacobs 1998b	0.10	Krantzberg and Boyd 1992
Cyanide*	1.00	--	1	--
Iron	1.00	--	1	--
Lead	0.34	Bechtel Jacobs 1998b	0.07	Krantzberg and Boyd 1992
Manganese	1.00	--	1	--
Mercury	1.02	Bechtel Jacobs 1998b	3.25	Cope et al. 1990
Nickel	0.13	Bechtel Jacobs 1998b	1	--
Selenium	1	--	1	--
Silver	0.18	Hirsch 1998	1	--
Thallium	1	--	1	--
Vanadium	1	--	1	--
Zinc	0.95	Bechtel Jacobs 1998b	0.15	Pascoe et al. 1996
Pesticides/PCBs				
4,4'-DDD	0.50	Oliver 1987	1.66	Oliver and Niimi 1988
4,4'-DDE	4.30	Oliver 1987	15.9	Oliver and Niimi 1988
4,4'-DDT	0.50	Oliver 1987	6.56	Oliver and Niimi 1988
Aldrin	1	--	1	--
alpha-BHC	1	--	1	--
alpha-Chlordane	1	--	1	--
Aroclor-1016	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
Aroclor-1221	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
Aroclor-1232	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
Aroclor-1242	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
Aroclor-1248	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
Aroclor-1254	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
Aroclor-1260	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
PCBs (total)	1.92	Bechtel Jacobs 1998b	8.64	Oliver and Niimi 1988
beta-BHC	1	--	1	--
delta-BHC	1	--	1	--
Dieldrin	1	--	1	--
Endosulfan I	1	--	1	--
Endosulfan II	1	--	1	--
Endosulfan Sulfate	1	--	1	--
Endrin	1	--	1	--
Endrin Aldehyde	1	--	1	--
Endrin Ketone	1	--	1	--
Gamma-BHC (Lindane)	1	--	1	--
Gamma-Chlordane	1	--	1	--
Heptachlor	1	--	1	--
Heptachlor Epoxide	1	--	1	--
Methoxychlor	1	--	1	--
Toxaphene	1	--	1	--
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	1	--	1	--
1,2-Dichlorobenzene	1	--	1	--
1,3-Dichlorobenzene	1	--	1	--
1,4-Dichlorobenzene	1	--	1	--
2,2'-Oxybis(1-Chloropropane)*	1	--	1	--
2,4,5-Trichlorophenol	1	--	1	--
2,4,6-Trichlorophenol	1	--	1	--
2,4-Dichlorophenol	1	--	1	--

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
2,4-Dimethylphenol*	1	--	1	--
2,4-Dinitrophenol*	1	--	1	--
2,4-Dinitrotoluene*	1	--	1	--
2,6-Dinitrotoluene*	1	--	1	--
2-Chloronaphthalene	1	--	1	--
2-Chlorophenol*	1	--	1	--
2-Methylnaphthalene	1	--	1	--
2-Methylphenol*	1	--	1	--
2-Nitroaniline*	1	--	1	--
2-Nitrophenol*	1	--	1	--
3,3'-Dichlorobenzidine	1	--	1	--
3-Nitroaniline*	1	--	1	--
4,6-Dinitro-2-Methylphenol*	1	--	1	--
4-Bromophenyl-Phenylether	1	--	1	--
4-Chloro-3-Methylphenol	1	--	1	--
4-Chloroaniline*	1	--	1	--
4-Chlorophenyl-Phenylether	1	--	1	--
4-Methylphenol*	1	--	1	--
4-Nitroaniline*	1	--	1	--
4-Nitrophenol*	1	--	1	--
Acenaphthene	2.04	Maruya et al. 1997	1	--
Acenaphthylene	1	--	1	--
Anthracene	0.19	Maruya et al. 1997	1	--
Benzo(a)anthracene	0.36	Maruya et al. 1997	1	--
Benzo(a)pyrene	0.13	Maruya et al. 1997	1	--
Benzo(b)fluoranthene	0.15	Maruya et al. 1997	1	--
Benzo(g,h,i)perylene	0.22	Maruya et al. 1997	1	--
Benzo(k)fluoranthene	0.23	Maruya et al. 1997	1	--
Bis(2-Chloroethoxy)methane*	1.00	--	1	--
Bis(2-Chloroethyl)ether*	1.00	--	1	--
Bis(2-Ethylhexyl)phthalate	1.00	--	1	--
Butylbenzylphthalate	1.00	--	1	--
Carbazole	1.00	--	1	--
Chrysene	0.20	Maruya et al. 1997	1	--
Dibenz(a,h)anthracene	1	--	1	--
Dibenzofuran	1	--	1	--
Diethylphthalate	1	--	1	--
Dimethylphthalate*	1	--	1	--
Di-n-butylphthalate	1	--	1	--
Di-n-octylphthalate	1	--	1	--
Fluoranthene	0.21	Maruya et al. 1997	1	--
Fluorene	0.48	Maruya et al. 1997	1	--
Hexachlorobutadiene	1	--	1	--
Hexachlorobenzene	1	--	1	--
Hexachlorocyclopentadiene	1	--	1	--
Hexachloroethane	1	--	1	--
Indeno(1,2,3-cd)pyrene	0.17	Maruya et al. 1997	1	--
Isophorone*	1	--	1	--
Naphthalene	1	--	1	--
Nitrobenzene*	1	--	1	--
N-Nitroso-di-n-propylamine*	1	--	1	--
N-Nitrosodiphenylamine	1	--	1	--
Pentachlorophenol	1	--	1	--
Phenanthrene	0.29	Maruya et al. 1997	1	--
Phenol*	1.00	--	1	--
Pyrene	0.44	Maruya et al. 1997	1	--
Volatile Organic Compounds				
1,1,1-Trichloroethane*	1	--	1	--
1,1,2,2-Tetrachloroethane*	1	--	1	--
1,1,2-Trichloroethane*	1	--	1	--
1,1-Dichloroethane*	1	--	1	--
1,1-Dichloroethene*	1	--	1	--
1,2-Dibromo-3-Chloropropane*	1	--	1	--
1,2-Dibromoethane*	1	--	1	--
1,2-Dichloroethane*	1	--	1	--
1,2-Dichloropropane*	1	--	1	--

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
1,2-Dichloroethene (total)*	1	--	1	--
1,3-Dichloropropene (total)*	1	--	1	--
2-Butanone*	1	--	1	--
2-Hexanone*	1	--	1	--
4-Methyl-2-Pentanone*	1	--	1	--
Acetone*	1	--	1	--
Benzene*	1	--	1	--
Bromochloromethane*	1	--	1	--
Bromodichloromethane*	1	--	1	--
Bromoform*	1	--	1	--
Bromomethane*	1	--	1	--
Carbon Disulfide*	1	--	1	--
Carbon Tetrachloride	1	--	1	--
Chlorobenzene	1	--	1	--
Chloroethane*	1	--	1	--
Chloroform	1	--	1	--
Chloromethane*	1	--	1	--
Cis-1,2-Dichloroethene*	1	--	1	--
Cis-1,3-Dichloropropene*	1	--	1	--
Dibromochloromethane*	1	--	1	--
Ethylbenzene	1	--	1	--
Methylene Chloride*	1	--	1	--
Styrene	1	--	1	--
Tetrachloroethene	1	--	1	--
Toluene	1	--	1	--
Trans-1,2-Dichloroethene*	1	--	1	--
Trans-1,3-Dichloropropene*	1	--	1	--
Trichloroethene	1	--	1	--
Vinyl Chloride*	1	--	1	--
Xylenes (total)	1	--	1	--
Dioxin/Furans				
2,3,7,8-TCDD	0.3868	USEPA 1990	0.3868	USEPA 1990
1,2,3,7,8-PCDD	0	0	0	0
1,2,3,4,7,8-HxCDD	0	0	0	0
1,2,3,6,7,8-HxCDD	0	0	0	0
1,2,3,7,8,9-HxCDD	0	0	0	0
1,2,3,4,6,7,8-HpCDD	0	0	0	0
OCDD	0	0	0	0
2,3,7,8-TCDF	0	0	0	0
1,2,3,7,8-PCDF	0	0	0	0
2,3,4,7,8-PCDF	0	0	0	0
1,2,3,4,7,8-HxCDF	0	0	0	0
1,2,3,6,7,8-HxCDF	0	0	0	0
2,3,4,6,7,8-HxCDF	0	0	0	0
1,2,3,7,8,9-HxCDF	0	0	0	0
1,2,3,4,6,7,8-HpCDF	0	0	0	0
1,2,3,4,7,8,9-HpCDF	0	0	0	0
OCDF	0	0	0	0
Total dioxin/furan (TEQ)	0.39	USEPA 1990	0.39	USEPA 1990

Table 8-14
Baseline (Step 3) Exposure Parameters for Upper Trophic Level Ecological Receptors
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St. Juliens Creek Annex,
Chesapeake, Virginia

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American robin	0.08	USEPA 1993	0.01	allometric equation	0.01	Levey and Karasov 1989
American woodcock	0.20	Dunning 1993	0.02	allometric equation	0.02	USEPA 1993
Belted kingfisher	0.15	Dunning 1993	0.02	allometric equation	0.02	USEPA 1993
Red-tailed hawk	1.13	Sample and Suter 1994	0.06	allometric equation	0.04	Sample and Suter 1994
Mammals						
Deer mouse	0.02	Silva and Downing 1995	0.003	USEPA 1993	0.001	USEPA 1993
Mink	0.78	Silva and Downing 1995	0.02	USEPA 1993	0.03	USEPA 1993
Muskrat	1.17	Silva and Downing 1995	0.11	allometric equation	0.06	USEPA 1993
Raccoon	5.94	Silva and Downing 1995	0.49	allometric equation	0.10	Conover 1989
Red fox	4.06	Silva and Downing 1995	0.35	allometric equation	0.12	Sample and Suter 1994
Short-tailed shrew	0.02	USEPA 1993	0.004	USEPA 1993	0.001	USEPA 1993

Table 8-15
Screening Statistics - Surface Soil - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Inorganics (mg/kg)								
Aluminum	-- - --	23 / 23	18,600	SJS02-SS06-000	1.00	23 / 23	18,600	YES
Antimony	0.35 - 4.10	9 / 21	7.00	SJS02-SS03-000	78.0	0 / 21	0.090	NO
Arsenic	0.52 - 0.52	22 / 23	18.0	SJS02-SS13-000	18.0	1 / 23	1.00	YES
Barium	-- - --	23 / 23	469	SJS02-SS20-000	330	2 / 23	1.42	YES
Beryllium	0.040 - 0.32	15 / 23	13.4	SJS02-SS06-000	40.0	0 / 23	0.34	NO
Cadmium	0.090 - 3.70	18 / 23	9.30	SJS17-SS03-000	32.0	0 / 23	0.29	NO
Calcium[1]	-- - --	23 / 23	15,900	SJS02-SS14-000	NSV	-- / --	NSV	NO
Chromium	-- - --	23 / 23	246	SJS02-SS06-000	NSV	-- / --	NSV	YES
Cobalt	1.35 - 2.80	18 / 23	62.6	SJS02-SS06-000	13.0	2 / 23	4.82	YES
Copper	-- - --	23 / 23	5,030	SJS17-SS04-000	70.0	10 / 23	71.9	YES
Cyanide	0.18 - 0.77	3 / 23	0.85	SJS02-SS03-000	NSV	-- / --	NSV	YES
Iron	-- - --	23 / 23	106,000	SJS02-SS03-000	12.0	23 / 23	8,833	YES
Lead	-- - --	23 / 23	3,130	SJS17-SS04-000	120	11 / 23	26.1	YES
Magnesium[1]	-- - --	23 / 23	2,570	SJS02-SS06-000	NSV	-- / --	NSV	NO
Manganese	-- - --	23 / 23	688	SJS02-SS03-000	220	6 / 23	3.13	YES
Mercury	0.0100 - 0.0100	22 / 23	1.80	SJS17-SS03-000	NSV	-- / --	NSV	YES
Nickel	-- - --	23 / 23	246	SJS02-SS06-000	38.0	4 / 23	6.47	YES
Potassium[1]	-- - --	23 / 23	1,900	SJS02-SS06-000	NSV	-- / --	NSV	NO
Selenium	0.51 - 0.71	9 / 23	1.70	SJS17-SS04-000	1.80	0 / 23	0.94	NO
Silver	0.15 - 2.90	3 / 23	3.50	SJS02-SS16-000	560	0 / 23	0.0063	NO
Sodium [1]	3.30 - 166	10 / 23	533	SJS02-SS06-000	NSV	-- / --	NSV	NO
Thallium	0.34 - 1.80	4 / 23	6.20	SJS02-SS03-000	NSV	-- / --	NSV	YES
Vanadium	-- - --	23 / 23	1,410	SJS17-SS04-000	0.50	23 / 23	2,820	YES
Zinc	-- - --	23 / 23	7,560	SJS02-SS06-000	10.0	23 / 23	756	YES
Pesticide/Polychlorinated Biphenyls (µg/kg)								
4,4'-DDD	3.80 - 4.10	19 / 23	4,200	SJS02-SS09-000	100	5 / 23	42.0	YES
4,4'-DDE	3.30 - 3.30	22 / 23	7,200	SJS02-SS20-000	100	16 / 23	72.0	YES
4,4'-DDT	-- - --	22 / 22	12,000	SJS02-SS20-000	100	12 / 22	120	YES
Aldrin	1.70 - 18.0	0 / 23	--	--	100	-- / --	0.18	NO
Aroclor-1016	33.0 - 350	0 / 23	--	--	100	-- / --	3.50	YES
Aroclor-1221	66.0 - 720	0 / 23	--	--	100	-- / --	7.20	YES
Aroclor-1232	33.0 - 350	0 / 23	--	--	100	-- / --	3.50	YES
Aroclor-1242	33.0 - 350	0 / 23	--	--	100	-- / --	3.50	YES
Aroclor-1248	33.0 - 350	0 / 23	--	--	100	-- / --	3.50	YES
Aroclor-1254	33.0 - 350	0 / 23	--	--	100	-- / --	3.50	YES
Aroclor-1260	33.0 - 350	8 / 23	2,700	SJS17-SS03-000	100	5 / 23	27.0	YES
Dieldrin	3.30 - 35.0	3 / 23	3.80	SJS02-SS02-000	100	0 / 23	0.038	NO
Endosulfan I	1.70 - 18.0	0 / 23	--	--	NSV	-- / --	NSV	NO
Endosulfan II	3.30 - 35.0	3 / 23	53.0	SJS17-SS03-000	NSV	-- / --	NSV	YES
Endosulfan sulfate	3.30 - 35.0	0 / 23	--	--	NSV	-- / --	NSV	NO
Endrin	3.30 - 35.0	1 / 23	24.0	SJS17-SS03-000	100	0 / 23	0.24	NO
Endrin aldehyde	3.30 - 35.0	3 / 23	73.0	SJS17-SS03-000	100	0 / 23	0.73	NO
Endrin ketone	3.30 - 35.0	0 / 23	--	--	100	-- / --	0.35	NO
Heptachlor	1.70 - 18.0	1 / 23	2.20	SJS02-SS12-000	100	0 / 23	0.022	NO
Heptachlor epoxide	1.70 - 18.0	0 / 23	--	--	100	-- / --	0.18	NO
Methoxychlor	17.0 - 180	0 / 23	--	--	100	-- / --	1.80	YES
Toxaphene	170 - 1,800	0 / 23	--	--	NSV	-- / --	NSV	NO
alpha-BHC	1.70 - 18.0	0 / 23	--	--	100,000	-- / --	1.80E-04	NO
alpha-Chlordane	1.70 - 18.0	8 / 23	50.0	SJS02-SS12-000	100	0 / 23	0.50	NO
beta-BHC	1.70 - 18.0	0 / 23	--	--	100,000	-- / --	1.80E-04	NO
delta-BHC	1.70 - 18.0	0 / 23	--	--	100,000	-- / --	1.80E-04	NO
gamma-BHC (Lindane)	1.70 - 18.0	0 / 23	--	--	100	-- / --	0.18	NO
gamma-Chlordane	1.70 - 18.0	6 / 23	29.0	SJS02-SS12-000	100	0 / 23	0.29	NO

Table 8-15
Screening Statistics - Surface Soil - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Semivolatile Organic Compounds (µg/kg)								
1,2,4-Trichlorobenzene	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
1,2-Dichlorobenzene	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
1,3-Dichlorobenzene	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
2,2'-Oxybis(1-chloropropane)	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	400 - 4,400	0 / 23	--	--	100	-- / --	44.0	YES
2,4,6-Trichlorophenol	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
2,4-Dichlorophenol	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
2,4-Dimethylphenol	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
2,4-Dinitrophenol	830 - 4,400	0 / 23	--	--	100	-- / --	44.0	YES
2,4-Dinitrotoluene	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
2-Chloronaphthalene	330 - 1,700	0 / 23	--	--	1,033	-- / --	1.65	YES
2-Chlorophenol	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
2-Methylnaphthalene	330 - 1,700	4 / 23	310	SJS02-SS03-000	NSV	-- / --	NSV	YES
2-Methylphenol	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
2-Nitroaniline	830 - 4,400	0 / 23	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	330 - 2,500	0 / 23	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	830 - 4,400	0 / 23	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	830 - 4,400	0 / 23	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
4-Nitroaniline	830 - 4,400	0 / 23	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	830 - 4,400	0 / 23	--	--	100	-- / --	44.0	YES
Acenaphthene	330 - 1,700	6 / 23	370	SJS17-SS04-000	100	3 / 23	3.70	YES
Acenaphthylene	350 - 1,700	12 / 23	820	SJS02-SS03-000	100	7 / 23	8.20	YES
Anthracene	330 - 1,700	10 / 23	790	SJS17-SS04-000	100	6 / 23	7.90	YES
Benzo(a)anthracene	350 - 1,700	18 / 23	2,300	SJS02-SS03-000	100	18 / 23	23.0	YES
Benzo(a)pyrene	350 - 1,700	18 / 23	2,100	SJS17-SS04-000	100	18 / 23	21.0	YES
Benzo(b)fluoranthene	350 - 1,700	19 / 23	2,000	SJS17-SS03-000	100	18 / 23	20.0	YES
Benzo(g,h,i)perylene	350 - 1,700	17 / 23	1,600	SJS17-SS03-000	100	15 / 23	16.0	YES
Benzo(k)fluoranthene	350 - 1,700	18 / 23	1,600	SJS17-SS03-000	100	15 / 23	16.0	YES
Butylbenzylphthalate	330 - 1,700	5 / 23	430	SJS17-SS03-000	NSV	-- / --	NSV	YES
Carbazole	330 - 1,700	6 / 23	350	SJS17-SS04-000	NSV	-- / --	NSV	YES
Chrysene	350 - 1,700	18 / 23	2,700	SJS02-SS03-000	100	18 / 23	27.0	YES
Di-n-butylphthalate	330 - 1,700	7 / 23	510	SJS02-SS20-000	200,000	0 / 23	0.0026	NO
Di-n-octylphthalate	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
Dibenz(a,h)anthracene	330 - 1,700	5 / 23	440	SJS17-SS04-000	100	4 / 23	4.40	YES
Dibenzofuran	330 - 1,700	5 / 23	220	SJS17-SS04-000	NSV	-- / --	NSV	YES
Diethylphthalate	330 - 1,700	0 / 23	--	--	13,400	-- / --	0.13	NO
Dimethyl phthalate	330 - 1,700	0 / 23	--	--	10,640	-- / --	0.16	NO
Fluoranthene	350 - 1,700	19 / 23	5,000	SJS02-SS03-000	100	18 / 23	50.0	YES
Fluorene	330 - 1,700	6 / 23	380	SJS02-SS03-000	100	3 / 23	3.80	YES
Hexachlorobenzene	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
Hexachlorobutadiene	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
Hexachlorocyclopentadiene	330 - 2,500	0 / 23	--	--	1,000	-- / --	2.50	YES
Hexachloroethane	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	350 - 1,700	18 / 23	1,500	SJS17-SS03-000	100	15 / 23	15.0	YES
Isophorone	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
Naphthalene	330 - 1,700	5 / 23	250	SJS17-SS04-000	100	1 / 23	2.50	YES
Nitrobenzene	330 - 1,700	0 / 23	--	--	2,260	-- / --	0.75	NO
Pentachlorophenol	830 - 4,400	0 / 23	--	--	100	-- / --	44.0	YES
Phenanthrene	350 - 1,700	17 / 23	4,400	SJS02-SS03-000	100	11 / 23	44.0	YES
Phenol	330 - 1,700	0 / 23	--	--	100	-- / --	17.0	YES
Pyrene	350 - 1,600	19 / 23	7,200	SJS02-SS03-000	100	18 / 23	72.0	YES
bis(2-Chloroethoxy)methane	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	140 - 1,700	8 / 23	1,700	SJS17-SS03-000	NSV	-- / --	NSV	YES
n-Nitroso-di-n-propylamine	330 - 1,700	0 / 23	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	330 - 1,700	0 / 23	--	--	1,090	-- / --	1.56	YES

Table 8-15
Screening Statistics - Surface Soil - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	238 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	238 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	238 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	238 - 250	0 / 10	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	238 - 250	0 / 10	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	238 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
2-Nitrotoluene	477 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	477 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	238 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	477 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
HMX	477 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	238 - 250	0 / 10	--	--	2,260	-- / --	0.11	NO
RDX	477 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
Tetryl	477 - 500	0 / 11	--	--	NSV	-- / --	NSV	NO
Volatile Organic Compounds (µg/kg)								
1,1,1-Trichloroethane	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
1,1,2,2-Tetrachloroethane	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
1,1-Dichloroethane	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
1,1-Dichloroethene	10.0 - 15.0	0 / 23	--	--	NSV	-- / --	NSV	NO
1,2,4-Trichlorobenzene	12.0 - 15.0	0 / 4	--	--	100	-- / --	0.15	NO
1,2-Dibromo-3-chloropropane	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
1,2-Dichlorobenzene	12.0 - 15.0	0 / 4	--	--	100	-- / --	0.15	NO
1,2-Dichloroethane	10.0 - 15.0	0 / 23	--	--	870,000	-- / --	1.72E-05	NO
1,2-Dichloroethene (total)	10.0 - 12.0	0 / 19	--	--	NSV	-- / --	NSV	NO
1,2-Dichloropropane	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
1,3-Dichlorobenzene	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	12.0 - 15.0	0 / 4	--	--	100	-- / --	0.15	NO
2-Butanone	10.0 - 15.0	1 / 23	200	SJS02-SS11-000	NSV	-- / --	NSV	YES
2-Hexanone	10.0 - 15.0	0 / 23	--	--	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	10.0 - 15.0	0 / 23	--	--	100,000	-- / --	1.50E-04	NO
Acetone	3.00 - 12.0	3 / 23	35.0	SJS02-SS10-000	NSV	-- / --	NSV	YES
Benzene	10.0 - 15.0	0 / 23	--	--	105	-- / --	0.14	NO
Bromodichloromethane	10.0 - 15.0	0 / 23	--	--	450,000	-- / --	3.33E-05	NO
Bromoform	10.0 - 15.0	0 / 23	--	--	114,700	-- / --	1.31E-04	NO
Bromomethane	10.0 - 15.0	0 / 23	--	--	NSV	-- / --	NSV	NO
Carbon disulfide	10.0 - 15.0	0 / 23	--	--	NSV	-- / --	NSV	NO
Carbon tetrachloride	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
Chlorobenzene	10.0 - 15.0	0 / 23	--	--	100	-- / --	0.15	NO
Chloroethane	10.0 - 15.0	0 / 23	--	--	NSV	-- / --	NSV	NO
Chloroform	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
Chloromethane	10.0 - 15.0	0 / 23	--	--	NSV	-- / --	NSV	NO
Cyclohexane	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Dibromochloromethane	10.0 - 15.0	0 / 23	--	--	NSV	-- / --	NSV	NO
Dichlorodifluoromethane (Freon-12)	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	10.0 - 15.0	0 / 23	--	--	100	-- / --	0.15	NO
Isopropylbenzene	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methyl acetate	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methyl-tert-butyl ether (MTBE)	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methylcyclohexane	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methylene chloride	2.00 - 65.0	2 / 23	2.80	SJS17-SS02-000	300	0 / 23	0.0093	NO
Styrene	10.0 - 15.0	0 / 23	--	--	100	-- / --	0.15	NO
Tetrachloroethene	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
Toluene	10.0 - 15.0	2 / 23	2.00	SJS02-SS08-000	100	0 / 23	0.020	NO
Trichloroethene	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
Trichlorofluoromethane(Freon-11)	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
Xylene, total	10.0 - 15.0	0 / 23	--	--	100	-- / --	0.15	NO
cis-1,2-Dichloroethene	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
cis-1,3-Dichloropropene	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO
trans-1,2-Dichloroethene	12.0 - 15.0	0 / 4	--	--	NSV	-- / --	NSV	NO
trans-1,3-Dichloropropene	10.0 - 15.0	0 / 23	--	--	300	-- / --	0.050	NO

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits
[1]Macronutrient - Not considered to be a COPC

Table 8-16
Screening Statistics - Surface Soil - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (mg/kg)									
Aluminum	-- - --	23 / 23	18,600	SJS02-SS06-000	5,578	1.00	23 / 23	5,578	YES
Arsenic	0.52 - 0.52	22 / 23	18.0	SJS02-SS13-000	5.98	18.0	1 / 23	0.33	NO
Barium	-- - --	23 / 23	469	SJS02-SS20-000	112	330	2 / 23	0.34	NO
Chromium	-- - --	23 / 23	246	SJS02-SS06-000	45.1	NSV	-- / --	NSV	YES
Cobalt	1.35 - 2.80	18 / 23	62.6	SJS02-SS06-000	6.35	13.0	2 / 23	0.49	NO
Copper	-- - --	23 / 23	5,030	SJS17-SS04-000	493	70.0	10 / 23	7.04	YES
Cyanide	0.18 - 0.77	3 / 23	0.85	SJS02-SS03-000	0.25	NSV	-- / --	NSV	YES
Iron	-- - --	23 / 23	106,000	SJS02-SS03-000	18,136	12.0	23 / 23	1,511	YES
Lead	-- - --	23 / 23	3,130	SJS17-SS04-000	442	120	11 / 23	3.68	YES
Manganese	-- - --	23 / 23	688	SJS02-SS03-000	164	220	6 / 23	0.75	NO
Mercury	0.0100 - 0.0100	22 / 23	1.80	SJS17-SS03-000	0.35	NSV	-- / --	NSV	YES
Nickel	-- - --	23 / 23	246	SJS02-SS06-000	37.2	38.0	4 / 23	0.98	NO
Thallium	0.34 - 1.80	4 / 23	6.20	SJS02-SS03-000	0.91	NSV	-- / --	NSV	YES
Vanadium	-- - --	23 / 23	1,410	SJS17-SS04-000	94.1	0.50	23 / 23	188	YES
Zinc	-- - --	23 / 23	7,560	SJS02-SS06-000	780	10.0	23 / 23	78.0	YES
Pesticide/Polychlorinated Biphenyls (µg/kg)									
4,4'-DDD	3.80 - 4.10	19 / 23	4,200	SJS02-SS09-000	248	100	5 / 23	2.48	YES
4,4'-DDE	3.30 - 3.30	22 / 23	7,200	SJS02-SS20-000	659	100	16 / 23	6.59	YES
4,4'-DDT	-- - --	22 / 22	12,000	SJS02-SS20-000	961	100	12 / 22	9.61	YES
Aroclor-1016	33.0 - 350	0 / 23	--	--	44.3	100	-- / --	0.44	NO
Aroclor-1221	66.0 - 720	0 / 23	--	--	90.4	100	-- / --	0.90	NO
Aroclor-1232	33.0 - 350	0 / 23	--	--	44.3	100	-- / --	0.44	NO
Aroclor-1242	33.0 - 350	0 / 23	--	--	44.3	100	-- / --	0.44	NO
Aroclor-1248	33.0 - 350	0 / 23	--	--	44.3	100	-- / --	0.44	NO
Aroclor-1254	33.0 - 350	0 / 23	--	--	44.3	100	-- / --	0.44	NO
Aroclor-1260	33.0 - 350	8 / 23	2,700	SJS17-SS03-000	167	100	5 / 23	1.67	YES
Endosulfan II	3.30 - 35.0	3 / 23	53.0	SJS17-SS03-000	6.45	NSV	-- / --	NSV	YES
Methoxychlor	17.0 - 180	0 / 23	--	--	22.8	100	-- / --	0.23	NO
Semivolatile Organic Compounds (µg/kg)									
1,2,4-Trichlorobenzene	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
1,2-Dichlorobenzene	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
1,4-Dichlorobenzene	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
2,4,5-Trichlorophenol	400 - 4,400	0 / 23	--	--	862	100	-- / --	8.62	(YES)
2,4,6-Trichlorophenol	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
2,4-Dichlorophenol	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
2,4-Dimethylphenol	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
2,4-Dinitrophenol	830 - 4,400	0 / 23	--	--	1,012	100	-- / --	10.1	(YES)
2-Chloronaphthalene	330 - 1,700	0 / 23	--	--	364	1,033	-- / --	0.35	NO
2-Chlorophenol	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
2-Methylnaphthalene	330 - 1,700	4 / 23	310	SJS02-SS03-000	322	NSV	-- / --	NSV	YES
2-Methylphenol	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
4-Methylphenol	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
4-Nitrophenol	830 - 4,400	0 / 23	--	--	1,012	100	-- / --	10.1	(YES)
Acenaphthene	330 - 1,700	6 / 23	370	SJS17-SS04-000	317	100	3 / 23	3.17	YES
Acenaphthylene	350 - 1,700	12 / 23	820	SJS02-SS03-000	334	100	7 / 23	3.34	YES
Anthracene	330 - 1,700	10 / 23	790	SJS17-SS04-000	352	100	6 / 23	3.52	YES
Benzo(a)anthracene	350 - 1,700	18 / 23	2,300	SJS02-SS03-000	568	100	18 / 23	5.68	YES
Benzo(a)pyrene	350 - 1,700	18 / 23	2,100	SJS17-SS04-000	541	100	18 / 23	5.41	YES
Benzo(b)fluoranthene	350 - 1,700	19 / 23	2,000	SJS17-SS03-000	611	100	18 / 23	6.11	YES
Benzo(g,h,i)perylene	350 - 1,700	17 / 23	1,600	SJS17-SS03-000	476	100	15 / 23	4.76	YES
Benzo(k)fluoranthene	350 - 1,700	18 / 23	1,600	SJS17-SS03-000	415	100	15 / 23	4.15	YES
Butylbenzylphthalate	330 - 1,700	5 / 23	430	SJS17-SS03-000	329	NSV	-- / --	NSV	YES
Carbazole	330 - 1,700	6 / 23	350	SJS17-SS04-000	325	NSV	-- / --	NSV	YES
Chrysene	350 - 1,700	18 / 23	2,700	SJS02-SS03-000	629	100	18 / 23	6.29	YES
Dibenz(a,h)anthracene	330 - 1,700	5 / 23	440	SJS17-SS04-000	372	100	4 / 23	3.72	YES
Dibenzofuran	330 - 1,700	5 / 23	220	SJS17-SS04-000	334	NSV	-- / --	NSV	YES
Fluoranthene	350 - 1,700	19 / 23	5,000	SJS02-SS03-000	987	100	18 / 23	9.87	YES
Fluorene	330 - 1,700	6 / 23	380	SJS02-SS03-000	326	100	3 / 23	3.26	YES
Hexachlorocyclopentadiene	330 - 2,500	0 / 23	--	--	514	1,000	-- / --	0.51	NO
Indeno(1,2,3-cd)pyrene	350 - 1,700	18 / 23	1,500	SJS17-SS03-000	407	100	15 / 23	4.07	YES
Naphthalene	330 - 1,700	5 / 23	250	SJS17-SS04-000	335	100	1 / 23	2.50	YES
Pentachlorophenol	830 - 4,400	0 / 23	--	--	1,012	100	-- / --	10.1	(YES)
Phenanthrene	350 - 1,700	17 / 23	4,400	SJS02-SS03-000	714	100	11 / 23	7.14	YES
Phenol	330 - 1,700	0 / 23	--	--	364	100	-- / --	3.64	(YES)
Pyrene	350 - 1,600	19 / 23	7,200	SJS02-SS03-000	1,067	100	18 / 23	10.7	YES
bis(2-Ethylhexyl)phthalate	140 - 1,700	8 / 23	1,700	SJS17-SS03-000	358	NSV	-- / --	NSV	YES
n-Nitrosodiphenylamine	330 - 1,700	0 / 23	--	--	364	1,090	-- / --	0.33	NO
Volatile Organic Compounds (µg/kg)									
2-Butanone	10.0 - 15.0	1 / 23	200	SJS02-SS11-000	14.2	NSV	-- / --	NSV	YES
Acetone	3.00 - 12.0	3 / 23	35.0	SJS02-SS10-000	7.08	NSV	-- / --	NSV	YES

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits

Table 8-17
28 Day L.plumulosus Sediment Bioassay Outcomes
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Sample Identification		Mean Percent Survival (SD)	Mean Growth Dry Weight (mg/amphipod) (SD)	Mean Reproduction Offspring/Female (SD)
Reference Controls	Laboratory Control	76 (15)	3.18 (0.95)[2]	1.19 (0.47)[2,3,4]
	SJREF-SD01-00-04D	83 (16)	9.26 (4.48)	1.88 (0.36)[3]
	SJREF-SD04-00-04D	90 (8)	7.25 (2.65)	2.51 (0.23)
	SJREF-SD05-00-04D	87 (14)	6.45 (3.05)	2.27 (0.38)
Site Samples	SJS02-SD03-00-04D	87 (10)	12.53 (2.25)	2.36 (0.30)
	SJS02-SD05-00-04D	58 (12)[2,3,4]	5.01 (0.98)	1.28 (0.22)[2,3,4]
	SJS02-SD06-00-04D	0 (0)[1,2,3,4]	NA	NA
	SJS02-SD24-00-04D	33 (26)[1,2,3,4]	0.51 (0.51)[2,3,4]	0.94 (0.24)[2,3,4]
	SJS02-SD25-00-04D	0 (0)[1,2,3,4]	NA	NA
	SJS02-SD26-00-04D	77 (19)	8.38 (3.78)	2.06 (0.28)

SD Standard deviation
NA Not applicable

1 Statistically different than control data.
2 Statistically different than SJREF-SD01-00-040.
3 Statistically different than SJREF-SD04-00-040.
4 Statistically different than SJREF-SD05-00-040.

Table 8-18
Screening Statistics - Inlet Sediment - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Inorganics (mg/kg)								
Aluminum	49.4 - 122	6 / 6	33,000	SJS02-SD05-00-04D	18,000	3 / 6	1.83	YES
Antimony	14.8 - 36.5	1 / 6	7.10	SJS02-SD06-00-04D	150	0 / 6	0.047	NO
Arsenic	2.50 - 6.10	6 / 6	16.9	SJS02-SD05-00-04D	8.20	5 / 6	2.06	YES
Barium	49.4 - 122	6 / 6	131	SJS02-SD06-00-04D	48.0	6 / 6	2.73	YES
Beryllium	1.20 - 3.00	6 / 6	1.50	SJS02-SD05-00-04D	NSV	-- / --	NSV	YES
Boron	3.70 - 9.10	6 / 6	27.3	SJS02-SD03-00-04D	NSV	-- / --	NSV	YES
Cadmium	1.20 - 3.00	6 / 6	12.3	SJS02-SD06-00-04D	1.20	6 / 6	10.3	YES
Calcium[1]	1,240 - 3,040	6 / 6	4,880	SJS02-SD06-00-04D	NSV	-- / --	NSV	NO
Chromium	2.50 - 6.10	6 / 6	1,920	SJS02-SD06-00-04D	5.00	6 / 6	384	YES
Cobalt	12.4 - 30.4	6 / 6	12.8	SJS02-SD05-00-04D	10.0	1 / 6	1.28	YES
Copper	6.20 - 15.2	6 / 6	1,790	SJS02-SD06-00-04D	34.0	6 / 6	52.6	YES
Cyanide	0.13 - 0.15	3 / 6	0.55	SJS02-SD25-00-04D	0.10	3 / 6	5.50	YES
Iron	24.7 - 60.8	6 / 6	38,200	SJS02-SD05-00-04D	188,400	0 / 6	0.20	NO
Lead	0.74 - 1.80	6 / 6	495	SJS02-SD06-00-04D	46.7	6 / 6	10.6	YES
Magnesium[1]	1,240 - 3,040	6 / 6	6,680	SJS02-SD05-00-04D	NSV	-- / --	NSV	NO
Manganese	3.70 - 9.10	6 / 6	242	SJS02-SD05-00-04D	260	0 / 6	0.93	NO
Mercury	0.043 - 0.11	6 / 6	0.94	SJS02-SD25-00-04D	0.15	6 / 6	6.27	YES
Molybdenum	1.20 - 3.00	6 / 6	8.70	SJS02-SD03-00-04D	NSV	-- / --	NSV	YES
Nickel	9.90 - 24.3	6 / 6	45.8	SJS02-SD05-00-04D	20.9	6 / 6	2.19	YES
Potassium[1]	1,240 - 3,040	6 / 6	4,050	SJS02-SD05-00-04D	NSV	-- / --	NSV	NO
Selenium	1.20 - 3.00	4 / 6	2.40	SJS02-SD05-00-04D	1.00	4 / 6	2.40	YES
Silver	2.50 - 6.10	0 / 6	--	--	1.00	-- / --	6.10	YES
Sodium[1]	1,240 - 3,040	6 / 6	14,200	SJS02-SD03-00-04D	NSV	-- / --	NSV	NO
Thallium	2.50 - 6.10	0 / 6	--	--	NSV	-- / --	NSV	NO
Vanadium	12.4 - 30.4	6 / 6	147	SJS02-SD26-00-04D	57.0	4 / 6	2.58	YES
Zinc	4.90 - 12.2	6 / 6	1,470	SJS02-SD06-00-04D	150	6 / 6	9.80	YES
Pesticide/Polychlorinated Biphenyls (µg/kg)								
4,4'-DDD	7.00 - 53.0	6 / 6	400	SJS02-SD26-00-04D	NSV	-- / --	NSV	YES
4,4'-DDE	7.00 - 17.0	6 / 6	71.0	SJS02-SD03-00-04D	NSV	-- / --	NSV	YES
4,4'-DDT	7.00 - 17.0	6 / 6	100	SJS02-SD26-00-04D	NSV	-- / --	NSV	YES
Aldrin	3.50 - 8.60	0 / 6	--	--	2.00	-- / --	4.30	YES
Aroclor-1016	70.0 - 170	0 / 6	--	--	22.7	-- / --	7.49	YES
Aroclor-1221	140 - 350	0 / 6	--	--	22.7	-- / --	15.4	YES
Aroclor-1232	70.0 - 170	0 / 6	--	--	22.7	-- / --	7.49	YES
Aroclor-1242	70.0 - 170	0 / 6	--	--	22.7	-- / --	7.49	YES
Aroclor-1248	70.0 - 170	0 / 6	--	--	22.7	-- / --	7.49	YES
Aroclor-1254	70.0 - 170	0 / 6	--	--	22.7	-- / --	7.49	YES
Aroclor-1260	70.0 - 170	0 / 6	--	--	22.7	-- / --	7.49	YES
Dieldrin	7.00 - 17.0	6 / 6	2.90	SJS02-SD26-00-04D	0.72	6 / 6	4.06	YES
Endosulfan I	3.50 - 8.60	0 / 6	--	--	NSV	-- / --	NSV	NO
Endosulfan II	7.00 - 17.0	0 / 6	--	--	NSV	-- / --	NSV	NO
Endosulfan sulfate	7.00 - 17.0	0 / 6	--	--	NSV	-- / --	NSV	NO
Endrin	7.00 - 17.0	0 / 6	--	--	0.020	-- / --	850	YES
Endrin aldehyde	7.00 - 17.0	1 / 6	6.40	SJS02-SD25-00-04D	NSV	-- / --	NSV	YES
Endrin ketone	7.00 - 17.0	1 / 6	2.20	SJS02-SD26-00-04D	NSV	-- / --	NSV	YES
Heptachlor	3.50 - 8.60	0 / 6	--	--	0.30	-- / --	28.7	YES
Heptachlor epoxide	3.50 - 8.60	0 / 6	--	--	5.00	-- / --	1.72	YES
Methoxychlor	35.0 - 86.0	0 / 6	--	--	NSV	-- / --	NSV	NO
Toxaphene	350 - 860	0 / 6	--	--	NSV	-- / --	NSV	NO
alpha-BHC	3.50 - 8.60	0 / 6	--	--	6.00	-- / --	1.43	YES
alpha-Chlordane	3.50 - 8.60	5 / 6	34.0	SJS02-SD26-00-04D	0.50	5 / 6	68.0	YES
beta-BHC	3.50 - 8.60	0 / 6	--	--	5.00	-- / --	1.72	YES
delta-BHC	3.50 - 8.60	0 / 6	--	--	NSV	-- / --	NSV	NO
gamma-BHC (Lindane)	3.50 - 8.60	0 / 6	--	--	0.32	-- / --	26.9	YES
gamma-Chlordane	3.50 - 8.60	5 / 6	49.0	SJS02-SD26-00-04D	0.50	5 / 6	98.0	YES

Table 8-18
Screening Statistics - Inlet Sediment - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Semivolatile Organic Compounds (µg/kg)								
1,1-Biphenyl	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	1,700 - 4,300	0 / 6	--	--	3.00	-- / --	1,433	YES
2,4,6-Trichlorophenol	700 - 1,700	0 / 6	--	--	6.00	-- / --	283	YES
2,4-Dichlorophenol	700 - 1,700	0 / 6	--	--	5.00	-- / --	340	YES
2,4-Dimethylphenol	700 - 1,700	0 / 6	--	--	29.0	-- / --	58.6	YES
2,4-Dinitrophenol	1,700 - 4,300	0 / 6	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
2-Chloronaphthalene	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
2-Chlorophenol	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
2-Methylnaphthalene	700 - 1,700	1 / 6	250	SJS02-SD25-00-04D	70.0	1 / 6	3.57	YES
2-Methylphenol	700 - 1,700	0 / 6	--	--	63.0	-- / --	27.0	YES
2-Nitroaniline	1,700 - 4,300	0 / 6	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	1,700 - 4,300	0 / 6	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	1,700 - 4,300	0 / 6	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	700 - 1,700	0 / 6	--	--	670	-- / --	2.54	YES
4-Nitroaniline	1,700 - 4,300	0 / 6	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	1,700 - 4,300	0 / 6	--	--	NSV	-- / --	NSV	NO
Acenaphthene	700 - 1,700	1 / 6	490	SJS02-SD25-00-04D	16.0	1 / 6	30.6	YES
Acenaphthylene	700 - 1,700	0 / 6	--	--	44.0	-- / --	38.6	YES
Acetophenone	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Anthracene	700 - 1,700	1 / 6	1,200	SJS02-SD25-00-04D	85.3	1 / 6	14.1	YES
Atrazine	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	700 - 1,700	5 / 6	3,500	SJS02-SD25-00-04D	261	3 / 6	13.4	YES
Benzo(a)pyrene	700 - 1,700	5 / 6	3,900	SJS02-SD25-00-04D	430	1 / 6	9.07	YES
Benzo(b)fluoranthene	700 - 1,700	6 / 6	3,800	SJS02-SD25-00-04D	3,200	1 / 6	1.19	YES
Benzo(g,h,i)perylene	700 - 1,700	5 / 6	2,700	SJS02-SD25-00-04D	670	1 / 6	4.03	YES
Benzo(k)fluoranthene	700 - 1,700	4 / 6	1,000	SJS02-SD25-00-04D	240	1 / 6	4.17	YES
Butylbenzylphthalate	700 - 1,700	0 / 6	--	--	63.0	-- / --	27.0	YES
Caprolactam	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Carbazole	700 - 1,700	1 / 6	120	SJS02-SD25-00-04D	NSV	-- / --	NSV	YES
Chrysene	700 - 1,700	5 / 6	3,300	SJS02-SD25-00-04D	384	3 / 6	8.59	YES
Di-n-butylphthalate	700 - 1,700	0 / 6	--	--	1,400	-- / --	1.21	YES
Di-n-octylphthalate	700 - 1,700	0 / 6	--	--	6,200	-- / --	0.27	NO
Dibenz(a,h)anthracene	700 - 1,700	1 / 6	500	SJS02-SD25-00-04D	63.4	1 / 6	7.89	YES
Dibenzofuran	700 - 1,700	1 / 6	130	SJS02-SD25-00-04D	540	0 / 6	0.24	NO
Diethylphthalate	700 - 1,700	0 / 6	--	--	200	-- / --	8.50	YES
Dimethyl phthalate	700 - 1,700	0 / 6	--	--	71.0	-- / --	23.9	YES
Fluoranthene	700 - 1,700	6 / 6	4,300	SJS02-SD25-00-04D	600	1 / 6	7.17	YES
Fluorene	700 - 1,700	1 / 6	550	SJS02-SD25-00-04D	19.0	1 / 6	28.9	YES
Hexachlorobenzene	700 - 1,700	0 / 6	--	--	22.0	-- / --	77.3	YES
Hexachlorobutadiene	700 - 1,700	0 / 6	--	--	11.0	-- / --	155	YES
Hexachlorocyclopentadiene	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Hexachloroethane	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	700 - 1,700	5 / 6	1,800	SJS02-SD25-00-04D	600	1 / 6	3.00	YES
Isophorone	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Naphthalene	700 - 1,700	1 / 6	280	SJS02-SD25-00-04D	160	1 / 6	1.75	YES
Nitrobenzene	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
Pentachlorophenol	1,700 - 4,300	0 / 6	--	--	360	-- / --	11.9	YES
Phenanthrene	700 - 1,700	3 / 6	5,300	SJS02-SD25-00-04D	240	2 / 6	22.1	YES
Phenol	700 - 1,700	0 / 6	--	--	420	-- / --	4.05	YES
Pyrene	700 - 1,700	6 / 6	9,400	SJS02-SD25-00-04D	665	2 / 6	14.1	YES
bis(2-Chloro-1-methylethyl) ether	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethoxy)methane	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	700 - 1,700	0 / 6	--	--	1,300	-- / --	1.31	YES
n-Nitroso-di-n-propylamine	700 - 1,700	0 / 6	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	700 - 1,700	0 / 6	--	--	28.0	-- / --	60.7	YES

Table 8-18
Screening Statistics - Inlet Sediment - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Volatile Organic Compounds (µg/kg)								
1,1,1-Trichloroethane	31.0 - 39.0	0 / 3	--	--	30.2	-- / --	1.29	YES
1,1,2,2-Tetrachloroethane	31.0 - 39.0	0 / 3	--	--	202	-- / --	0.19	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	31.0 - 39.0	0 / 3	--	--	570	-- / --	0.068	NO
1,1-Dichloroethane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,1-Dichloroethene	31.0 - 36.0	1 / 3	34.0	SJS02-SD21-00-04D	2,780	0 / 3	0.012	NO
1,2,4-Trichlorobenzene	31.0 - 39.0	0 / 3	--	--	473	-- / --	0.082	NO
1,2-Dibromo-3-chloropropane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,2-Dichlorobenzene	31.0 - 39.0	0 / 3	--	--	16.5	-- / --	2.36	YES
1,2-Dichloroethane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,2-Dichloropropane	31.0 - 39.0	1 / 3	8.30	SJS02-SD22-00-04D	NSV	-- / --	NSV	YES
1,3-Dichlorobenzene	31.0 - 39.0	0 / 3	--	--	842	-- / --	0.046	NO
1,4-Dichlorobenzene	31.0 - 39.0	0 / 3	--	--	460	-- / --	0.085	NO
2-Butanone	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Hexanone	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Acetone	25.0 - 35.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Benzene	31.0 - 36.0	1 / 3	5.70	SJS02-SD21-00-04D	137	0 / 3	0.042	NO
Bromodichloromethane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Bromoform	31.0 - 39.0	0 / 3	--	--	654	-- / --	0.060	NO
Bromomethane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Carbon disulfide	-- - --	3 / 3	30.0	SJS02-SD22-00-04D	0.85	3 / 3	35.3	YES
Carbon tetrachloride	31.0 - 39.0	0 / 3	--	--	64.2	-- / --	0.61	NO
Chlorobenzene	31.0 - 39.0	0 / 3	--	--	8.42	-- / --	4.63	YES
Chloroethane	31.0 - 36.0	1 / 3	4.20	SJS02-SD21-00-04D	NSV	-- / --	NSV	YES
Chloroform	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Chloromethane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Cyclohexane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Dibromochloromethane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Dichlorodifluoromethane (Freon-12)	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	31.0 - 39.0	0 / 3	--	--	305	-- / --	0.13	NO
Isopropylbenzene	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methyl acetate	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methyl-tert-butyl ether (MTBE)	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methylcyclohexane	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methylene chloride	3.30 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Styrene	31.0 - 39.0	0 / 3	--	--	559	-- / --	0.070	NO
Tetrachloroethene	31.0 - 39.0	0 / 3	--	--	190	-- / --	0.21	NO
Toluene	31.0 - 39.0	0 / 3	--	--	1,090	-- / --	0.036	NO
Trichloroethene	31.0 - 36.0	1 / 3	9.80	SJS02-SD21-00-04D	96.9	0 / 3	0.10	NO
Trichlorofluoromethane(Freon-11)	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	-- - --	3 / 3	9,800	SJS02-SD21-00-04D	31.0	1 / 3	316	YES
Xylene, total	31.0 - 39.0	0 / 3	--	--	25.2	-- / --	1.55	YES
cis-1,2-Dichloroethene	31.0 - 36.0	1 / 3	2,300	SJS02-SD21-00-04D	1,050	1 / 3	2.19	YES
cis-1,3-Dichloropropene	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	31.0 - 36.0	1 / 3	38.0	SJS02-SD21-00-04D	1,050	0 / 3	0.036	NO
trans-1,3-Dichloropropene	31.0 - 39.0	0 / 3	--	--	NSV	-- / --	NSV	NO

Notes:

NSV - No screening criteria

Shaded cells represent hazard quotient based on reporting limits

[1]Macronutrient - Not considered to be a COPC

Table 8-19
Screening Statistics - Reference Sediment - Step 2
Site 2 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Inorganics (mg/kg)								
Aluminum	35.4 - 41.1	3 / 3	7,000	SJREF-SD01-00-04D	18,000	0 / 3	0.39	NO
Antimony	10.6 - 12.3	0 / 3	--	--	150	-- / --	0.082	NO
Arsenic	1.80 - 2.10	3 / 3	6.40	SJREF-SD01-00-04D	8.20	0 / 3	0.78	NO
Barium	35.4 - 41.1	3 / 3	17.8	SJREF-SD01-00-04D	48.0	0 / 3	0.37	NO
Beryllium	0.89 - 1.00	3 / 3	0.55	SJREF-SD01-00-04D	NSV	-- / --	NSV	YES
Boron	2.70 - 3.10	3 / 3	7.00	SJREF-SD01-00-04D	NSV	-- / --	NSV	YES
Cadmium	0.89 - 1.00	1 / 3	0.73	SJREF-SD01-00-04D	1.20	0 / 3	0.61	NO
Calcium[1]	886 - 1,030	3 / 3	8,210	SJREF-SD05-00-04D	NSV	-- / --	NSV	NO
Chromium	1.80 - 2.10	3 / 3	17.4	SJREF-SD01-00-04D	5.00	3 / 3	3.48	YES
Cobalt	8.90 - 10.3	3 / 3	4.80	SJREF-SD01-00-04D	10.0	0 / 3	0.48	NO
Copper	4.40 - 5.10	3 / 3	33.1	SJREF-SD01-00-04D	34.0	0 / 3	0.97	NO
Cyanide	0.13 - 0.15	0 / 3	--	--	0.10	-- / --	1.50	YES
Iron	17.7 - 20.6	3 / 3	12,700	SJREF-SD01-00-04D	188,400	0 / 3	0.067	NO
Lead	0.53 - 0.62	3 / 3	32.4	SJREF-SD01-00-04D	46.7	0 / 3	0.69	NO
Magnesium[1]	886 - 1,030	3 / 3	1,560	SJREF-SD01-00-04D	NSV	-- / --	NSV	NO
Manganese	2.70 - 3.10	3 / 3	59.7	SJREF-SD01-00-04D	260	0 / 3	0.23	NO
Mercury	0.032 - 0.042	3 / 3	0.16	SJREF-SD01-00-04D	0.15	1 / 3	1.07	YES
Molybdenum	0.89 - 1.00	3 / 3	1.40	SJREF-SD01-00-04D	NSV	-- / --	NSV	YES
Nickel	7.10 - 8.20	3 / 3	8.80	SJREF-SD01-00-04D	20.9	0 / 3	0.42	NO
Potassium[1]	886 - 1,030	3 / 3	823	SJREF-SD01-00-04D	NSV	-- / --	NSV	NO
Selenium	0.89 - 1.00	3 / 3	1.20	SJREF-SD01-00-04D	1.00	1 / 3	1.20	YES
Silver	1.80 - 2.10	0 / 3	--	--	1.00	-- / --	2.10	YES
Sodium[1]	886 - 1,030	3 / 3	2,090	SJREF-SD01-00-04D	NSV	-- / --	NSV	NO
Thallium	1.80 - 2.10	0 / 3	--	--	NSV	-- / --	NSV	NO
Vanadium	8.90 - 10.3	3 / 3	16.9	SJREF-SD01-00-04D	57.0	0 / 3	0.30	NO
Zinc	3.50 - 4.10	3 / 3	169	SJREF-SD01-00-04D	150	1 / 3	1.13	YES
Pesticide/Polychlorinated Biphenyls (µg/kg)								
4,4'-DDD	4.70 - 5.60	3 / 3	2.50	SJREF-SD01-00-04D	NSV	-- / --	NSV	YES
4,4'-DDE	4.70 - 5.60	3 / 3	2.80	SJREF-SD01-00-04D	NSV	-- / --	NSV	YES
4,4'-DDT	4.70 - 5.60	1 / 3	0.59	SJREF-SD01-00-04D	NSV	-- / --	NSV	YES
Aldrin	2.30 - 2.80	0 / 3	--	--	2.00	-- / --	1.40	YES
Aroclor-1016	47.0 - 56.0	0 / 3	--	--	22.7	-- / --	2.47	YES
Aroclor-1221	93.0 - 110	0 / 3	--	--	22.7	-- / --	4.85	YES
Aroclor-1232	47.0 - 56.0	0 / 3	--	--	22.7	-- / --	2.47	YES
Aroclor-1242	47.0 - 56.0	0 / 3	--	--	22.7	-- / --	2.47	YES
Aroclor-1248	47.0 - 56.0	0 / 3	--	--	22.7	-- / --	2.47	YES
Aroclor-1254	47.0 - 56.0	0 / 3	--	--	22.7	-- / --	2.47	YES
Aroclor-1260	47.0 - 56.0	0 / 3	--	--	22.7	-- / --	2.47	YES
Dieldrin	4.70 - 5.60	1 / 3	0.40	SJREF-SD01-00-04D	0.72	0 / 3	0.56	NO
Endosulfan I	2.30 - 2.80	0 / 3	--	--	NSV	-- / --	NSV	NO
Endosulfan II	4.70 - 5.60	0 / 3	--	--	NSV	-- / --	NSV	NO
Endosulfan sulfate	4.70 - 5.60	0 / 3	--	--	NSV	-- / --	NSV	NO
Endrin	4.70 - 5.60	0 / 3	--	--	0.020	-- / --	280	YES
Endrin aldehyde	4.70 - 5.60	0 / 3	--	--	NSV	-- / --	NSV	NO
Endrin ketone	4.70 - 5.60	0 / 3	--	--	NSV	-- / --	NSV	NO
Heptachlor	2.30 - 2.80	0 / 3	--	--	0.30	-- / --	9.33	YES
Heptachlor epoxide	2.30 - 2.80	0 / 3	--	--	5.00	-- / --	0.56	NO
Methoxychlor	23.0 - 28.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Toxaphene	230 - 280	0 / 3	--	--	NSV	-- / --	NSV	NO
alpha-BHC	2.30 - 2.80	0 / 3	--	--	6.00	-- / --	0.47	NO
alpha-Chlordane	2.30 - 2.80	0 / 3	--	--	0.50	-- / --	5.60	YES
beta-BHC	2.30 - 2.80	0 / 3	--	--	5.00	-- / --	0.56	NO
delta-BHC	2.30 - 2.80	0 / 3	--	--	NSV	-- / --	NSV	NO
gamma-BHC (Lindane)	2.30 - 2.80	0 / 3	--	--	0.32	-- / --	8.75	YES
gamma-Chlordane	2.30 - 2.80	0 / 3	--	--	0.50	-- / --	5.60	YES

Table 8-19
Screening Statistics - Reference Sediment - Step 2
Site 2 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Semivolatile Organic Compounds(µg/kg)								
1,1-Biphenyl	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	1,200 - 1,400	0 / 3	--	--	3.00	-- / --	467	YES
2,4,6-Trichlorophenol	470 - 560	0 / 3	--	--	6.00	-- / --	93.3	YES
2,4-Dichlorophenol	470 - 560	0 / 3	--	--	5.00	-- / --	112	YES
2,4-Dimethylphenol	470 - 560	0 / 3	--	--	29.0	-- / --	19.3	YES
2,4-Dinitrophenol	1,200 - 1,400	0 / 3	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Chloronaphthalene	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Chlorophenol	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Methylnaphthalene	470 - 560	0 / 3	--	--	70.0	-- / --	8.00	YES
2-Methylphenol	470 - 560	0 / 3	--	--	63.0	-- / --	8.89	YES
2-Nitroaniline	1,200 - 1,400	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	1,200 - 1,400	0 / 3	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	1,200 - 1,400	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	470 - 560	0 / 3	--	--	670	-- / --	0.84	NO
4-Nitroaniline	1,200 - 1,400	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	1,200 - 1,400	0 / 3	--	--	NSV	-- / --	NSV	NO
Acenaphthene	470 - 560	0 / 3	--	--	16.0	-- / --	35.0	YES
Acenaphthylene	470 - 560	0 / 3	--	--	44.0	-- / --	12.7	YES
Acetophenone	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Anthracene	470 - 560	0 / 3	--	--	85.3	-- / --	6.57	YES
Atrazine	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	470 - 560	2 / 3	94.0	SJREF-SD01-00-04D	261	0 / 3	0.36	NO
Benzo(a)pyrene	470 - 560	2 / 3	170	SJREF-SD01-00-04D	430	0 / 3	0.40	NO
Benzo(b)fluoranthene	470 - 560	3 / 3	300	SJREF-SD01-00-04D	3,200	0 / 3	0.094	NO
Benzo(g,h,i)perylene	470 - 560	2 / 3	130	SJREF-SD01-00-04D	670	0 / 3	0.19	NO
Benzo(k)fluoranthene	470 - 560	2 / 3	78.0	SJREF-SD01-00-04D	240	0 / 3	0.33	NO
Butylbenzylphthalate	470 - 560	0 / 3	--	--	63.0	-- / --	8.89	YES
Caprolactam	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Carbazole	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Chrysene	470 - 560	2 / 3	150	SJREF-SD01-00-04D	384	0 / 3	0.39	NO
Di-n-butylphthalate	470 - 560	0 / 3	--	--	1,400	-- / --	0.40	NO
Di-n-octylphthalate	470 - 560	0 / 3	--	--	6,200	-- / --	0.090	NO
Dibenz(a,h)anthracene	470 - 560	0 / 3	--	--	63.4	-- / --	8.83	YES
Dibenzofuran	470 - 560	0 / 3	--	--	540	-- / --	1.04	YES
Diethylphthalate	470 - 560	0 / 3	--	--	200	-- / --	2.80	YES
Dimethyl phthalate	470 - 560	0 / 3	--	--	71.0	-- / --	7.89	YES
Fluoranthene	470 - 560	2 / 3	170	SJREF-SD01-00-04D	600	0 / 3	0.28	NO
Fluorene	470 - 560	0 / 3	--	--	19.0	-- / --	29.5	YES
Hexachlorobenzene	470 - 560	0 / 3	--	--	22.0	-- / --	25.5	YES
Hexachlorobutadiene	470 - 560	0 / 3	--	--	11.0	-- / --	50.9	YES
Hexachlorocyclopentadiene	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Hexachloroethane	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	470 - 560	2 / 3	110	SJREF-SD01-00-04D	600	0 / 3	0.18	NO
Isophorone	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Naphthalene	470 - 560	0 / 3	--	--	160	-- / --	3.50	YES
Nitrobenzene	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
Pentachlorophenol	1,200 - 1,400	0 / 3	--	--	360	-- / --	3.89	YES
Phenanthrene	470 - 560	0 / 3	--	--	240	-- / --	2.33	YES
Phenol	470 - 560	0 / 3	--	--	420	-- / --	1.33	YES
Pyrene	470 - 560	2 / 3	170	SJREF-SD01-00-04D	665	0 / 3	0.26	NO
bis(2-Chloro-1-methylethyl) ether	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethoxy)methane	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	470 - 560	2 / 3	120	SJREF-SD01-00-04D	1,300	0 / 3	0.092	NO
n-Nitroso-di-n-propylamine	470 - 560	0 / 3	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	470 - 560	0 / 3	--	--	28.0	-- / --	20.0	YES

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits
[1]Macronutrient - Not considered to be a COPC

Table 8-20
Screening Statistice - Inlet Sediment - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (mg/kg)									
Aluminum	49.4 - 122	6 / 6	33,000	SJS02-SD05-00-04D	18,783	18,000	3 / 6	1.04	YES
Arsenic	2.50 - 6.10	6 / 6	16.9	SJS02-SD05-00-04D	14.4	8.20	5 / 6	1.76	YES
Barium	49.4 - 122	6 / 6	131	SJS02-SD06-00-04D	86.6	48.0	6 / 6	1.80	YES
Beryllium	1.20 - 3.00	6 / 6	1.50	SJS02-SD05-00-04D	0.95	NSV	-- / --	NSV	YES
Boron	3.70 - 9.10	6 / 6	27.3	SJS02-SD03-00-04D	18.9	NSV	-- / --	NSV	YES
Cadmium	1.20 - 3.00	6 / 6	12.3	SJS02-SD06-00-04D	7.38	1.20	6 / 6	6.15	YES
Chromium	2.50 - 6.10	6 / 6	1,920	SJS02-SD06-00-04D	720	5.00	6 / 6	144	YES
Cobalt	12.4 - 30.4	6 / 6	12.8	SJS02-SD05-00-04D	8.22	10.0	1 / 6	0.82	NO
Copper	6.20 - 15.2	6 / 6	1,790	SJS02-SD06-00-04D	799	34.0	6 / 6	23.5	YES
Cyanide	0.13 - 0.15	3 / 6	0.55	SJS02-SD25-00-04D	0.25	0.10	3 / 6	2.49	YES
Lead	0.74 - 1.80	6 / 6	495	SJS02-SD06-00-04D	340	46.7	6 / 6	7.27	YES
Mercury	0.043 - 0.11	6 / 6	0.94	SJS02-SD25-00-04D	0.73	0.15	6 / 6	4.87	YES
Molybdenum	1.20 - 3.00	6 / 6	8.70	SJS02-SD03-00-04D	6.12	NSV	-- / --	NSV	YES
Nickel	9.90 - 24.3	6 / 6	45.8	SJS02-SD05-00-04D	30.1	20.9	6 / 6	1.44	YES
Selenium	1.20 - 3.00	4 / 6	2.40	SJS02-SD05-00-04D	1.54	1.00	4 / 6	1.54	YES
Silver	2.50 - 6.10	0 / 6	--	--	0.32	1.00	-- / --	0.32	NO
Vanadium	12.4 - 30.4	6 / 6	147	SJS02-SD26-00-04D	85.2	57.0	4 / 6	1.49	YES
Zinc	4.90 - 12.2	6 / 6	1,470	SJS02-SD06-00-04D	922	150	6 / 6	6.15	YES
Pesticide/Polychlorinated Biphenyls (µg/kg)									
4,4'-DDD	7.00 - 53.0	6 / 6	400	SJS02-SD26-00-04D	252	NSV	-- / --	NSV	YES
4,4'-DDE	7.00 - 17.0	6 / 6	71.0	SJS02-SD03-00-04D	50.8	NSV	-- / --	NSV	YES
4,4'-DDT	7.00 - 17.0	6 / 6	100	SJS02-SD26-00-04D	50.0	NSV	-- / --	NSV	YES
Aldrin	3.50 - 8.60	0 / 6	--	--	2.74	2.00	-- / --	1.37	(YES)
Aroclor-1016	70.0 - 170	0 / 6	--	--	54.5	22.7	-- / --	2.40	(YES)
Aroclor-1221	140 - 350	0 / 6	--	--	110	22.7	-- / --	4.85	(YES)
Aroclor-1232	70.0 - 170	0 / 6	--	--	54.5	22.7	-- / --	2.40	(YES)
Aroclor-1242	70.0 - 170	0 / 6	--	--	54.5	22.7	-- / --	2.40	(YES)
Aroclor-1248	70.0 - 170	0 / 6	--	--	54.5	22.7	-- / --	2.40	(YES)
Aroclor-1254	70.0 - 170	0 / 6	--	--	54.5	22.7	-- / --	2.40	(YES)
Aroclor-1260	70.0 - 170	0 / 6	--	--	54.5	22.7	-- / --	2.40	(YES)
Dieldrin	7.00 - 17.0	6 / 6	2.90	SJS02-SD26-00-04D	1.59	0.72	6 / 6	2.22	YES
Endrin	7.00 - 17.0	0 / 6	--	--	5.45	0.020	-- / --	273	(YES)
Endrin aldehyde	7.00 - 17.0	1 / 6	6.40	SJS02-SD25-00-04D	5.82	NSV	-- / --	NSV	YES
Endrin ketone	7.00 - 17.0	1 / 6	2.20	SJS02-SD26-00-04D	4.90	NSV	-- / --	NSV	YES
Heptachlor	3.50 - 8.60	0 / 6	--	--	2.74	0.30	-- / --	9.14	(YES)
Heptachlor epoxide	3.50 - 8.60	0 / 6	--	--	2.74	5.00	-- / --	0.55	NO
alpha-BHC	3.50 - 8.60	0 / 6	--	--	2.74	6.00	-- / --	0.46	NO
alpha-Chlordane	3.50 - 8.60	5 / 6	34.0	SJS02-SD26-00-04D	15.9	0.50	5 / 6	31.8	YES
beta-BHC	3.50 - 8.60	0 / 6	--	--	2.74	5.00	-- / --	0.55	NO
gamma-BHC (Lindane)	3.50 - 8.60	0 / 6	--	--	2.74	0.32	-- / --	8.57	(YES)
gamma-Chlordane	3.50 - 8.60	5 / 6	49.0	SJS02-SD26-00-04D	24.6	0.50	5 / 6	49.1	YES
Semivolatile Organic Compounds (µg/kg)									
2,4,5-Trichlorophenol	1,700 - 4,300	0 / 6	--	--	1,358	3.00	-- / --	453	(YES)
2,4,6-Trichlorophenol	700 - 1,700	0 / 6	--	--	545	6.00	-- / --	90.8	(YES)
2,4-Dichlorophenol	700 - 1,700	0 / 6	--	--	545	5.00	-- / --	109	(YES)
2,4-Dimethylphenol	700 - 1,700	0 / 6	--	--	545	29.0	-- / --	18.8	(YES)
2-Methylnaphthalene	700 - 1,700	1 / 6	250	SJS02-SD25-00-04D	517	70.0	1 / 6	3.57	YES
2-Methylphenol	700 - 1,700	0 / 6	--	--	545	63.0	-- / --	8.65	(YES)
4-Methylphenol	700 - 1,700	0 / 6	--	--	545	670	-- / --	0.81	NO
Acenaphthene	700 - 1,700	1 / 6	490	SJS02-SD25-00-04D	557	16.0	1 / 6	30.6	YES
Acenaphthylene	700 - 1,700	0 / 6	--	--	545	44.0	-- / --	12.4	(YES)
Anthracene	700 - 1,700	1 / 6	1,200	SJS02-SD25-00-04D	675	85.3	1 / 6	7.91	YES
Benzo(a)anthracene	700 - 1,700	5 / 6	3,500	SJS02-SD25-00-04D	858	261	3 / 6	3.29	YES
Benzo(a)pyrene	700 - 1,700	5 / 6	3,900	SJS02-SD25-00-04D	958	430	1 / 6	2.23	YES
Benzo(b)fluoranthene	700 - 1,700	6 / 6	3,800	SJS02-SD25-00-04D	938	3,200	1 / 6	0.29	NO
Benzo(g,h,i)perylene	700 - 1,700	5 / 6	2,700	SJS02-SD25-00-04D	758	670	1 / 6	1.13	YES
Benzo(k)fluoranthene	700 - 1,700	4 / 6	1,000	SJS02-SD25-00-04D	481	240	1 / 6	2.01	YES
Butylbenzylphthalate	700 - 1,700	0 / 6	--	--	545	63.0	-- / --	8.65	(YES)
Carbazole	700 - 1,700	1 / 6	120	SJS02-SD25-00-04D	495	NSV	-- / --	NSV	YES
Chrysene	700 - 1,700	5 / 6	3,300	SJS02-SD25-00-04D	873	384	3 / 6	2.27	YES
Di-n-butylphthalate	700 - 1,700	0 / 6	--	--	473	1,400	-- / --	0.34	NO
Dibenz(a,h)anthracene	700 - 1,700	1 / 6	500	SJS02-SD25-00-04D	558	63.4	1 / 6	7.89	YES
Diethylphthalate	700 - 1,700	0 / 6	--	--	545	200	-- / --	2.73	(YES)
Dimethyl phthalate	700 - 1,700	0 / 6	--	--	545	71.0	-- / --	7.68	(YES)
Fluoranthene	700 - 1,700	6 / 6	4,300	SJS02-SD25-00-04D	983	600	1 / 6	1.64	YES
Fluorene	700 - 1,700	1 / 6	550	SJS02-SD25-00-04D	567	19.0	1 / 6	28.9	YES
Hexachlorobenzene	700 - 1,700	0 / 6	--	--	545	22.0	-- / --	24.8	(YES)
Hexachlorobutadiene	700 - 1,700	0 / 6	--	--	545	11.0	-- / --	49.5	(YES)
Indeno(1,2,3-cd)pyrene	700 - 1,700	5 / 6	1,800	SJS02-SD25-00-04D	572	600	1 / 6	0.95	NO
Naphthalene	700 - 1,700	1 / 6	280	SJS02-SD25-00-04D	522	160	1 / 6	1.75	YES
Pentachlorophenol	1,700 - 4,300	0 / 6	--	--	1,358	360	-- / --	3.77	(YES)
Phenanthrene	700 - 1,700	3 / 6	5,300	SJS02-SD25-00-04D	1,258	240	2 / 6	5.24	YES
Phenol	700 - 1,700	0 / 6	--	--	545	420	-- / --	1.30	(YES)
Pyrene	700 - 1,700	6 / 6	9,400	SJS02-SD25-00-04D	1,900	665	2 / 6	2.86	YES
bis(2-Ethylhexyl)phthalate	700 - 1,700	0 / 6	--	--	228	1,300	-- / --	0.18	NO
n-Nitrosodiphenylamine	700 - 1,700	0 / 6	--	--	545	28.0	-- / --	19.5	(YES)

Table 8-20
Screening Statistice - Inlet Sediment - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Volatile Organic Compounds (µg/kg)									
1,1,1-Trichloroethane	31.0 - 39.0	0 / 3	--	--	17.7	30.2	-- / --	0.58	NO
1,2-Dichlorobenzene	31.0 - 39.0	0 / 3	--	--	17.7	16.5	-- / --	1.07	(YES)
1,2-Dichloropropane	31.0 - 39.0	1 / 3	8.30	SJS02-SD22-00-04D	14.4	NSV	-- / --	NSV	YES
Carbon disulfide	-- - --	3 / 3	30.0	SJS02-SD22-00-04D	21.0	0.85	3 / 3	24.7	YES
Chlorobenzene	31.0 - 39.0	0 / 3	--	--	17.7	8.42	-- / --	2.10	(YES)
Chloroethane	31.0 - 36.0	1 / 3	4.20	SJS02-SD21-00-04D	12.6	NSV	-- / --	NSV	YES
Vinyl chloride	-- - --	3 / 3	9,800	SJS02-SD21-00-04D	3,270	31.0	1 / 3	105	YES
Xylene, total	31.0 - 39.0	0 / 3	--	--	17.7	25.2	-- / --	0.70	NO
cis-1,2-Dichloroethene	31.0 - 36.0	1 / 3	2,300	SJS02-SD21-00-04D	778	1,050	1 / 3	0.74	NO

Notes:

NSV - No screening criteria

Shaded cells represent hazard quotient based on reporting limits

Table 8-21
Screening Statistics - Reference Sediment - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (mg/kg)									
Beryllium	0.89 - 1.00	3 / 3	0.55	SJREF-SD01-00-04D	0.33	NSV	-- / --	NSV	YES
Boron	2.70 - 3.10	3 / 3	7.00	SJREF-SD01-00-04D	5.90	NSV	-- / --	NSV	YES
Chromium	1.80 - 2.10	3 / 3	17.4	SJREF-SD01-00-04D	11.3	5.00	3 / 3	2.26	YES
Cyanide	0.13 - 0.15	0 / 3	--	--	0.070	0.10	-- / --	0.70	NO
Mercury	0.032 - 0.042	3 / 3	0.16	SJREF-SD01-00-04D	0.12	0.15	1 / 3	0.78	NO
Molybdenum	0.89 - 1.00	3 / 3	1.40	SJREF-SD01-00-04D	1.16	NSV	-- / --	NSV	YES
Selenium	0.89 - 1.00	3 / 3	1.20	SJREF-SD01-00-04D	0.90	1.00	1 / 3	0.90	NO
Silver	1.80 - 2.10	0 / 3	--	--	0.12	1.00	-- / --	0.12	NO
Zinc	3.50 - 4.10	3 / 3	169	SJREF-SD01-00-04D	107	150	1 / 3	0.71	NO
Pesticide/Polychlorinated Biphenyls (µg/kg)									
4,4'-DDD	4.70 - 5.60	3 / 3	2.50	SJREF-SD01-00-04D	1.34	NSV	-- / --	NSV	YES
4,4'-DDE	4.70 - 5.60	3 / 3	2.80	SJREF-SD01-00-04D	1.69	NSV	-- / --	NSV	YES
4,4'-DDT	4.70 - 5.60	1 / 3	0.59	SJREF-SD01-00-04D	1.78	NSV	-- / --	NSV	YES
Aldrin	2.30 - 2.80	0 / 3	--	--	1.25	2.00	-- / --	0.63	NO
Aroclor-1016	47.0 - 56.0	0 / 3	--	--	25.2	22.7	-- / --	1.11	(YES)
Aroclor-1221	93.0 - 110	0 / 3	--	--	49.8	22.7	-- / --	2.20	(YES)
Aroclor-1232	47.0 - 56.0	0 / 3	--	--	25.2	22.7	-- / --	1.11	(YES)
Aroclor-1242	47.0 - 56.0	0 / 3	--	--	25.2	22.7	-- / --	1.11	(YES)
Aroclor-1248	47.0 - 56.0	0 / 3	--	--	25.2	22.7	-- / --	1.11	(YES)
Aroclor-1254	47.0 - 56.0	0 / 3	--	--	25.2	22.7	-- / --	1.11	(YES)
Aroclor-1260	47.0 - 56.0	0 / 3	--	--	25.2	22.7	-- / --	1.11	(YES)
Endrin	4.70 - 5.60	0 / 3	--	--	2.52	0.020	-- / --	126	(YES)
Heptachlor	2.30 - 2.80	0 / 3	--	--	1.25	0.30	-- / --	4.17	(YES)
alpha-Chlordane	2.30 - 2.80	0 / 3	--	--	1.25	0.50	-- / --	2.50	(YES)
gamma-BHC (Lindane)	2.30 - 2.80	0 / 3	--	--	1.25	0.32	-- / --	3.91	(YES)
gamma-Chlordane	2.30 - 2.80	0 / 3	--	--	1.25	0.50	-- / --	2.50	(YES)
Semivolatile Organic Compounds (µg/kg)									
2,4,5-Trichlorophenol	1,200 - 1,400	0 / 3	--	--	633	3.00	-- / --	211	(YES)
2,4,6-Trichlorophenol	470 - 560	0 / 3	--	--	252	6.00	-- / --	41.9	(YES)
2,4-Dichlorophenol	470 - 560	0 / 3	--	--	252	5.00	-- / --	50.3	(YES)
2,4-Dimethylphenol	470 - 560	0 / 3	--	--	252	29.0	-- / --	8.68	(YES)
2-Methylnaphthalene	470 - 560	0 / 3	--	--	252	70.0	-- / --	3.60	(YES)
2-Methylphenol	470 - 560	0 / 3	--	--	252	63.0	-- / --	3.99	(YES)
Acenaphthene	470 - 560	0 / 3	--	--	252	16.0	-- / --	15.7	(YES)
Acenaphthylene	470 - 560	0 / 3	--	--	252	44.0	-- / --	5.72	(YES)
Anthracene	470 - 560	0 / 3	--	--	252	85.3	-- / --	2.95	(YES)
Butylbenzylphthalate	470 - 560	0 / 3	--	--	252	63.0	-- / --	3.99	(YES)
Dibenz(a,h)anthracene	470 - 560	0 / 3	--	--	252	63.4	-- / --	3.97	(YES)
Dibenzofuran	470 - 560	0 / 3	--	--	252	540	-- / --	0.47	NO
Diethylphthalate	470 - 560	0 / 3	--	--	252	200	-- / --	1.26	(YES)
Dimethyl phthalate	470 - 560	0 / 3	--	--	252	71.0	-- / --	3.54	(YES)
Fluorene	470 - 560	0 / 3	--	--	252	19.0	-- / --	13.2	(YES)
Hexachlorobenzene	470 - 560	0 / 3	--	--	252	22.0	-- / --	11.4	(YES)
Hexachlorobutadiene	470 - 560	0 / 3	--	--	252	11.0	-- / --	22.9	(YES)
Naphthalene	470 - 560	0 / 3	--	--	252	160	-- / --	1.57	(YES)
Pentachlorophenol	1,200 - 1,400	0 / 3	--	--	633	360	-- / --	1.76	(YES)
Phenanthrene	470 - 560	0 / 3	--	--	252	240	-- / --	1.05	(YES)
Phenol	470 - 560	0 / 3	--	--	252	420	-- / --	0.60	NO
n-Nitrosodiphenylamine	470 - 560	0 / 3	--	--	252	28.0	-- / --	8.99	(YES)

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits

Table 8-22
Screening Statistics - Site 2-Sediment - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Inorganics (mg/kg)								
Aluminum	-- - --	16 / 16	33,000	SJS02-SD05-00-04D	18,000	5 / 16	1.83	YES
Antimony	0.40 - 3.70	6 / 16	27.6	SJS02-SD03-000	150	0 / 16	0.18	NO
Arsenic	-- - --	16 / 16	19.4	SJS02-SD03-000	8.20	8 / 16	2.37	YES
Barium	-- - --	16 / 16	131	SJS02-SD06-00-04D	48.0	12 / 16	2.73	YES
Beryllium	0.21 - 1.10	14 / 16	1.50	SJS02-SD05-00-04D	NSV	0 / 16	NSV	YES
Boron	-- - --	6 / 6	27.3	SJS02-SD03-00-04D	NSV	-- / --	NSV	YES
Cadmium	-- - --	16 / 16	12.3	SJS02-SD06-00-04D	1.20	13 / 16	10.3	YES
Calcium[1]	-- - --	16 / 16	24,300	SJS02-SD03-000	NSV	-- / --	NSV	NO
Chromium	-- - --	16 / 16	2,630	SJS02-SD03-000	5.00	16 / 16	526	YES
Cobalt	1.67 - 4.06	14 / 16	12.8	SJS02-SD05-00-04D	10.0	2 / 16	1.28	YES
Copper	-- - --	16 / 16	2,620	SJS02-SD03-000	34.0	14 / 16	77.1	YES
Cyanide	0.13 - 2.10	5 / 15	1.80	SJS02-SD08-001	0.10	5 / 15	18.0	YES
Iron	-- - --	16 / 16	38,200	SJS02-SD05-00-04D	188,400	0 / 16	0.20	NO
Lead	-- - --	16 / 16	545	SJS02-SD03-000	46.7	14 / 16	11.7	YES
Magnesium[1]	-- - --	16 / 16	6,890	SJS02-SD03-000	NSV	-- / --	NSV	NO
Manganese	-- - --	16 / 16	242	SJS02-SD05-00-04D	260	0 / 16	0.93	NO
Mercury	0.050 - 0.050	15 / 16	0.94	SJS02-SD25-00-04D	0.15	14 / 16	6.27	YES
Molybdenum	-- - --	6 / 6	8.70	SJS02-SD03-00-04D	NSV	0 / 6	NSV	YES
Nickel	1.80 - 1.80	15 / 16	45.8	SJS02-SD05-00-04D	20.9	10 / 16	2.19	YES
Potassium[1]	-- - --	16 / 16	4,050	SJS02-SD05-00-04D	NSV	-- / --	NSV	NO
Selenium	0.39 - 2.27	6 / 16	2.40	SJS02-SD05-00-04D	1.00	5 / 16	2.40	YES
Silver	0.13 - 1.80	4 / 16	0.87	SJS02-SD07-001	1.00	0 / 16	0.87	NO
Sodium[1]	33.7 - 33.7	15 / 16	17,800	SJS02-SD03-000	NSV	-- / --	NSV	NO
Thallium	0.42 - 3.40	1 / 16	2.20	SJS02-SD03-000	NSV	0 / 16	NSV	YES
Vanadium	-- - --	16 / 16	147	SJS02-SD26-00-04D	57.0	7 / 16	2.58	YES
Zinc	-- - --	16 / 16	1,470	SJS02-SD06-00-04D	150	14 / 16	9.80	YES
Pesticide/Polychlorinated Biphenyls (µg/kg)								
4,4'-DDD	-- - --	14 / 14	980	SJS02-SD06-001	NSV	0 / 14	NSV	YES
4,4'-DDE	-- - --	15 / 15	130	SJS02-SD03-000	NSV	0 / 15	NSV	YES
4,4'-DDT	-- - --	15 / 15	3,200	SJS02-SD06-001	NSV	0 / 15	NSV	YES
Aldrin	1.70 - 8.60	0 / 15	--	--	2.00	-- / --	4.30	YES
Aroclor-1016	33.0 - 170	0 / 15	--	--	22.7	-- / --	7.49	YES
Aroclor-1221	67.0 - 350	0 / 15	--	--	22.7	-- / --	15.4	YES
Aroclor-1232	33.0 - 170	0 / 15	--	--	22.7	-- / --	7.49	YES
Aroclor-1242	33.0 - 170	0 / 15	--	--	22.7	-- / --	7.49	YES
Aroclor-1248	33.0 - 170	0 / 15	--	--	22.7	-- / --	7.49	YES
Aroclor-1254	33.0 - 170	1 / 15	110	SJS02-SD02-000	22.7	1 / 15	4.85	YES
Aroclor-1260	33.0 - 170	1 / 15	69.0	SJS02-SD03-000	22.7	1 / 15	3.04	YES
Dieldrin	3.30 - 11.0	7 / 15	36.0	SJS02-SD03-000	0.72	7 / 15	50.3	YES
Endosulfan I	1.70 - 8.60	0 / 15	--	--	NSV	-- / --	NSV	NO
Endosulfan II	3.30 - 17.0	0 / 15	--	--	NSV	-- / --	NSV	NO
Endosulfan sulfate	3.30 - 17.0	0 / 15	--	--	NSV	-- / --	NSV	NO
Endrin	3.30 - 17.0	0 / 15	--	--	0.020	-- / --	850	YES
Endrin aldehyde	3.30 - 17.0	1 / 15	6.40	SJS02-SD25-00-04D	NSV	0 / 15	NSV	YES
Endrin ketone	3.30 - 17.0	1 / 15	2.20	SJS02-SD26-00-04D	NSV	0 / 15	NSV	YES
Heptachlor	1.70 - 8.60	0 / 15	--	--	0.30	-- / --	28.7	YES
Heptachlor epoxide	1.70 - 8.60	0 / 15	--	--	5.00	-- / --	1.72	YES
Methoxychlor	17.0 - 86.0	0 / 15	--	--	NSV	-- / --	NSV	NO
Toxaphene	170 - 860	0 / 15	--	--	NSV	-- / --	NSV	NO
alpha-BHC	1.70 - 8.60	0 / 15	--	--	6.00	-- / --	1.43	YES
alpha-Chlordane	1.70 - 8.60	11 / 15	79.0	SJS02-SD05-001	0.50	11 / 15	158	YES
beta-BHC	1.70 - 8.60	0 / 15	--	--	5.00	-- / --	1.72	YES
delta-BHC	1.70 - 8.60	0 / 15	--	--	NSV	-- / --	NSV	NO
gamma-BHC (Lindane)	1.70 - 8.60	0 / 15	--	--	0.32	-- / --	26.9	YES
gamma-Chlordane	1.70 - 8.60	11 / 15	96.0	SJS02-SD05-001	0.50	11 / 15	192	YES

Table 8-22
Screening Statistics - Site 2-Sediment - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Semivolatile Organic Compounds (µg/kg)								
1,1-Biphenyl	440 - 1,700	0 / 7	--	--	NSV	-- / --	NSV	NO
1,2,4-Trichlorobenzene	330 - 9,100	0 / 8	--	--	473	-- / --	19.2	YES
1,2-Dichlorobenzene	330 - 9,100	0 / 8	--	--	16.5	-- / --	552	YES
1,3-Dichlorobenzene	330 - 9,100	0 / 8	--	--	842	-- / --	10.8	YES
1,4-Dichlorobenzene	330 - 9,100	0 / 8	--	--	460	-- / --	19.8	YES
2,2'-Oxybis(1-chloropropane)	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	840 - 23,000	0 / 15	--	--	3.00	-- / --	7,667	YES
2,4,6-Trichlorophenol	330 - 9,100	0 / 15	--	--	6.00	-- / --	1,517	YES
2,4-Dichlorophenol	330 - 9,100	0 / 15	--	--	5.00	-- / --	1,820	YES
2,4-Dimethylphenol	330 - 9,100	0 / 15	--	--	29.0	-- / --	314	YES
2,4-Dinitrophenol	840 - 23,000	0 / 15	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
2-Chloronaphthalene	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
2-Chlorophenol	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
2-Methylnaphthalene	330 - 9,100	1 / 15	250	SJS02-SD25-00-04D	70.0	1 / 15	3.57	YES
2-Methylphenol	330 - 9,100	0 / 15	--	--	63.0	-- / --	144	YES
2-Nitroaniline	840 - 23,000	0 / 15	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
3- and 4-Methylphenol	440 - 440	0 / 1	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	840 - 23,000	0 / 15	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	840 - 23,000	0 / 15	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	330 - 9,100	0 / 14	--	--	670	-- / --	13.6	YES
4-Nitroaniline	840 - 23,000	0 / 15	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	840 - 23,000	0 / 15	--	--	NSV	-- / --	NSV	NO
Acenaphthene	330 - 9,100	1 / 15	490	SJS02-SD25-00-04D	16.0	1 / 15	30.6	YES
Acenaphthylene	330 - 9,100	0 / 15	--	--	44.0	-- / --	207	YES
Acetophenone	440 - 1,700	0 / 7	--	--	NSV	-- / --	NSV	NO
Anthracene	330 - 9,100	4 / 15	1,200	SJS02-SD25-00-04D	85.3	4 / 15	14.1	YES
Atrazine	440 - 1,700	0 / 7	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	440 - 1,700	0 / 7	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	480 - 9,100	12 / 16	3,500	SJS02-SD25-00-04D	261	6 / 16	13.4	YES
Benzo(a)pyrene	480 - 9,100	12 / 16	3,900	SJS02-SD25-00-04D	430	3 / 16	9.07	YES
Benzo(b)fluoranthene	480 - 930	14 / 16	3,800	SJS02-SD25-00-04D	3,200	1 / 16	1.19	YES
Benzo(g,h,i)perylene	440 - 9,100	11 / 16	2,700	SJS02-SD25-00-04D	670	2 / 16	4.03	YES
Benzo(k)fluoranthene	480 - 9,100	11 / 16	1,000	SJS02-SD25-00-04D	240	3 / 16	4.17	YES
Butylbenzylphthalate	440 - 9,100	1 / 15	47.0	SJS02-SD01-000	63.0	0 / 15	0.75	NO
Caprolactam	440 - 1,700	0 / 7	--	--	NSV	-- / --	NSV	NO
Carbazole	330 - 9,100	1 / 15	120	SJS02-SD25-00-04D	NSV	0 / 15	NSV	YES
Chrysene	480 - 9,100	12 / 16	3,300	SJS02-SD25-00-04D	384	6 / 16	8.59	YES
Di-n-butylphthalate	41.0 - 9,100	2 / 15	94.0	SJS02-SD06-001	1,400	0 / 15	0.067	NO
Di-n-octylphthalate	330 - 9,100	0 / 15	--	--	6,200	-- / --	1.47	YES
Dibenz(a,h)anthracene	330 - 9,100	1 / 15	500	SJS02-SD25-00-04D	63.4	1 / 15	7.89	YES
Dibenzofuran	330 - 9,100	1 / 15	130	SJS02-SD25-00-04D	540	0 / 15	0.24	NO
Diethylphthalate	330 - 9,100	2 / 16	250	SJS02-SD03-000	200	1 / 16	1.25	YES
Dimethyl phthalate	330 - 9,100	0 / 15	--	--	71.0	-- / --	128	YES
Fluoranthene	330 - 930	13 / 16	4,300	SJS02-SD25-00-04D	600	5 / 16	7.17	YES
Fluorene	330 - 9,100	2 / 15	550	SJS02-SD25-00-04D	19.0	2 / 15	28.9	YES
Hexachlorobenzene	330 - 9,100	0 / 15	--	--	22.0	-- / --	414	YES
Hexachlorobutadiene	330 - 9,100	0 / 15	--	--	11.0	-- / --	827	YES
Hexachlorocyclopentadiene	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
Hexachloroethane	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	440 - 9,100	11 / 16	1,800	SJS02-SD25-00-04D	600	1 / 16	3.00	YES
Isophorone	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
Naphthalene	330 - 9,100	1 / 15	280	SJS02-SD25-00-04D	160	1 / 15	1.75	YES
Nitrobenzene	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
Pentachlorophenol	840 - 23,000	0 / 15	--	--	360	-- / --	63.9	YES
Phenanthrene	480 - 9,100	9 / 16	5,300	SJS02-SD25-00-04D	240	4 / 16	22.1	YES
Phenol	330 - 9,100	0 / 15	--	--	420	-- / --	21.7	YES
Pyrene	930 - 930	15 / 16	9,400	SJS02-SD25-00-04D	665	6 / 16	14.1	YES
bis(2-Chloroethoxy)methane	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	49.0 - 9,100	4 / 16	660	SJS02-SD09	1,300	0 / 16	0.51	NO
n-Nitroso-di-n-propylamine	330 - 9,100	0 / 15	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	330 - 9,100	0 / 15	--	--	28.0	-- / --	325	YES

Table 8-22
Screening Statistics - Site 2-Sediment - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Explosives (µg/kg)								
1,3,5-Trinitrobenzene	238 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	238 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	238 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	238 - 630	0 / 7	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	238 - 630	0 / 7	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	238 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
2-Nitrotoluene	476 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	476 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	238 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	476 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
HMX	476 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	238 - 630	0 / 7	--	--	NSV	-- / --	NSV	NO
RDX	476 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
Tetryl	476 - 2,200	0 / 9	--	--	NSV	-- / --	NSV	NO
Volatile Organic Compounds (µg/kg)								
1,1,1-Trichloroethane	3.60 - 39.0	1 / 13	7.00	SJS02-SD06-001	30.2	0 / 13	0.23	NO
1,1,2,2-Tetrachloroethane	11.0 - 39.0	0 / 13	--	--	202	-- / --	0.19	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	11.0 - 39.0	0 / 13	--	--	570	-- / --	0.068	NO
1,1-Dichloroethane	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
1,1-Dichloroethene	11.0 - 37.0	1 / 13	34.0	SJS02-SD21-00-04D	2,780	0 / 13	0.012	NO
1,2,4-Trichlorobenzene	13.0 - 39.0	0 / 4	--	--	473	-- / --	0.082	NO
1,2-Dibromo-3-chloropropane	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
1,2-Dichlorobenzene	13.0 - 39.0	0 / 4	--	--	16.5	-- / --	2.36	YES
1,2-Dichloroethane	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
1,2-Dichloroethene (total)	11.0 - 31.0	2 / 9	9.00	SJS02-SD03-000	NSV	-- / --	NSV	YES
1,2-Dichloropropane	11.0 - 39.0	1 / 13	8.30	SJS02-SD22-00-04D	NSV	0 / 13	NSV	YES
1,3-Dichlorobenzene	13.0 - 39.0	0 / 4	--	--	842	-- / --	0.046	NO
1,4-Dichlorobenzene	13.0 - 39.0	0 / 4	--	--	460	-- / --	0.085	NO
2-Butanone	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
2-Hexanone	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	11.0 - 39.0	1 / 13	5.00	SJS02-SD02-000	NSV	0 / 13	NSV	YES
Acetone	11.0 - 35.0	4 / 11	450	SJS02-SD03-000	NSV	0 / 11	NSV	YES
Benzene	11.0 - 37.0	1 / 13	5.70	SJS02-SD21-00-04D	137	0 / 13	0.042	NO
Bromodichloromethane	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
Bromoform	11.0 - 39.0	0 / 13	--	--	654	-- / --	0.060	NO
Bromomethane	11.0 - 39.0	1 / 13	6.30	SJS02-SD09	NSV	0 / 13	NSV	YES
Carbon disulfide	3.00 - 31.0	5 / 13	81.0	SJS02-SD03-000	0.85	5 / 13	95.2	YES
Carbon tetrachloride	11.0 - 39.0	0 / 13	--	--	64.2	-- / --	0.61	NO
Chlorobenzene	11.0 - 39.0	0 / 13	--	--	8.42	-- / --	4.63	YES
Chloroethane	11.0 - 37.0	1 / 13	4.20	SJS02-SD21-00-04D	NSV	0 / 13	NSV	YES
Chloroform	11.0 - 39.0	1 / 13	3.00	SJS02-SD07-001	NSV	0 / 13	NSV	YES
Chloromethane	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
Cyclohexane	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Dibromochloromethane	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
Dichlorodifluoromethane (Freon-12)	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	11.0 - 39.0	0 / 13	--	--	305	-- / --	0.13	NO
Isopropylbenzene	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methyl acetate	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methyl-tert-butyl ether (MTBE)	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methylcyclohexane	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Methylene chloride	3.30 - 140	0 / 13	--	--	NSV	-- / --	NSV	NO
Styrene	11.0 - 39.0	0 / 13	--	--	559	-- / --	0.070	NO
Tetrachloroethene	11.0 - 39.0	0 / 13	--	--	190	-- / --	0.21	NO
Toluene	11.0 - 39.0	1 / 13	4.00	SJS02-SD04-001	1,090	0 / 13	0.0037	NO
Trichloroethene	11.0 - 37.0	4 / 13	10.0	SJS02-SD08-001	96.9	0 / 13	0.10	NO
Trichlorofluoromethane(Freon-11)	13.0 - 39.0	0 / 4	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	11.0 - 37.0	3 / 13	9,800	SJS02-SD21-00-04D	31.0	1 / 13	316	YES
Xylene, total	11.0 - 39.0	0 / 13	--	--	25.2	-- / --	1.55	YES
cis-1,2-Dichloroethene	13.0 - 36.0	1 / 4	2,300	SJS02-SD21-00-04D	1,050	1 / 4	2.19	YES
cis-1,3-Dichloropropene	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO
o-Xylene	13.0 - 13.0	0 / 1	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	13.0 - 36.0	1 / 4	38.0	SJS02-SD21-00-04D	1,050	0 / 4	0.036	NO
trans-1,3-Dichloropropene	11.0 - 39.0	0 / 13	--	--	NSV	-- / --	NSV	NO

Table 8-22
Screening Statistics - Site 2-Sediment - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Dioxin/Furans (µg/kg)								
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	-- - --	6 / 6	0.42	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,4,6,7,8-Heptachlorodibenzofuran	-- - --	6 / 6	0.23	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.30E-04 - 1.30E-04	5 / 6	0.021	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.0085	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.025	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.018	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.060	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.016	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzofuran	1.50E-04 - 2.50E-04	4 / 6	0.0023	SJS02-SD11	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.70E-04 - 1.70E-04	5 / 6	0.0036	SJS02-SD09	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzofuran	2.40E-04 - 2.40E-04	5 / 6	0.0043	SJS02-SD09	NSV	-- / --	NSV	YES
2,3,4,6,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.0093	SJS02-SD09	NSV	-- / --	NSV	YES
2,3,4,7,8-Pentachlorodibenzofuran	-- - --	6 / 6	0.0070	SJS02-SD09	NSV	-- / --	NSV	YES
2,3,7,8-TCDD (dioxin)	1.30E-04 - 1.30E-04	5 / 6	9.60E-04	SJS02-SD11	NSV	-- / --	NSV	YES
2,3,7,8-Tetrachlorodibenzofuran	-- - --	6 / 6	0.0097	SJS02-SD11	NSV	-- / --	NSV	YES
Octachlorodibenzo-p-dioxin	-- - --	6 / 6	4.40	SJS02-SD11	NSV	-- / --	NSV	YES
Octachlorodibenzofuran	0.0030 - 0.0030	5 / 6	0.58	SJS02-SD09	NSV	-- / --	NSV	YES
Total heptachlorodibenzo-p-dioxin	-- - --	6 / 6	0.90	SJS02-SD11	NSV	-- / --	NSV	YES
Total heptachlorodibenzofuran	-- - --	6 / 6	0.26	SJS02-SD11	NSV	-- / --	NSV	YES
Total hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.17	SJS02-SD11	NSV	-- / --	NSV	YES
Total hexachlorodibenzofuran	-- - --	6 / 6	0.30	SJS02-SD09	NSV	-- / --	NSV	YES
Total pentachlorodibenzo-p-dioxin	1.70E-04 - 1.70E-04	5 / 6	0.020	SJS02-SD11	NSV	-- / --	NSV	YES
Total pentachlorodibenzofuran	-- - --	6 / 6	0.091	SJS02-SD11	NSV	-- / --	NSV	YES
Total tetrachlorodibenzo-p-dioxin	-- - --	6 / 6	0.0067	SJS02-SD09	NSV	-- / --	NSV	YES
Total tetrachlorodibenzofuran	-- - --	6 / 6	0.036	SJS02-SD09	NSV	-- / --	NSV	YES

Notes:

NSV - No screening criteria

Shaded cells represent hazard quotient based on reporting limits

[1]Macronutrient - Not considered to be a COPC

Table 8-23
Screening Statistics - Site 2 - Sediment - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COC
Inorganics (mg/kg)									
Aluminum	-- - --	16 / 16	33,000	SJS02-SD05-00-04D	12,908	18,000	5 / 16	0.72	NO
Arsenic	-- - --	16 / 16	19.4	SJS02-SD03-000	9.78	8.20	8 / 16	1.19	YES
Barium	-- - --	16 / 16	131	SJS02-SD06-00-04D	68.6	48.0	12 / 16	1.43	YES
Beryllium	0.21 - 1.10	14 / 16	1.50	SJS02-SD05-00-04D	0.66	NSV	0 / 16	NSV	YES
Boron	-- - --	6 / 6	27.3	SJS02-SD03-00-04D	18.9	NSV	-- / --	NSV	YES
Cadmium	-- - --	16 / 16	12.3	SJS02-SD06-00-04D	5.21	1.20	13 / 16	4.34	YES
Chromium	-- - --	16 / 16	2,630	SJS02-SD03-000	683	5.00	16 / 16	137	YES
Cobalt	1.67 - 4.06	14 / 16	12.8	SJS02-SD05-00-04D	5.75	10.0	2 / 16	0.57	NO
Copper	-- - --	16 / 16	2,620	SJS02-SD03-000	742	34.0	14 / 16	21.8	YES
Cyanide	0.13 - 2.10	5 / 15	1.80	SJS02-SD08-001	0.46	0.10	5 / 15	4.56	YES
Lead	-- - --	16 / 16	545	SJS02-SD03-000	252	46.7	14 / 16	5.40	YES
Mercury	0.050 - 0.050	15 / 16	0.94	SJS02-SD25-00-04D	0.52	0.15	14 / 16	3.47	YES
Molybdenum	-- - --	6 / 6	8.70	SJS02-SD03-00-04D	6.12	NSV	0 / 6	NSV	YES
Nickel	1.80 - 1.80	15 / 16	45.8	SJS02-SD05-00-04D	22.7	20.9	10 / 16	1.08	YES
Selenium	0.39 - 2.27	6 / 16	2.40	SJS02-SD05-00-04D	0.98	1.00	5 / 16	0.98	NO
Thallium	0.42 - 3.40	1 / 16	2.20	SJS02-SD03-000	0.81	NSV	0 / 16	NSV	YES
Vanadium	-- - --	16 / 16	147	SJS02-SD26-00-04D	57.6	57.0	7 / 16	1.01	YES
Zinc	-- - --	16 / 16	1,470	SJS02-SD06-00-04D	671	150	14 / 16	4.47	YES
Pesticide/Polychlorinated Biphenyls (µg/kg)									
4,4'-DDD	-- - --	14 / 14	980	SJS02-SD06-001	271	NSV	0 / 14	NSV	YES
4,4'-DDE	-- - --	15 / 15	130	SJS02-SD03-000	46.7	NSV	0 / 15	NSV	YES
4,4'-DDT	-- - --	15 / 15	3,200	SJS02-SD06-001	246	NSV	0 / 15	NSV	YES
Aldrin	1.70 - 8.60	0 / 15	--	--	2.19	2.00	-- / --	1.10	(YES)
Aroclor-1016	33.0 - 170	0 / 15	--	--	43.5	22.7	-- / --	1.92	(YES)
Aroclor-1221	67.0 - 350	0 / 15	--	--	87.7	22.7	-- / --	3.86	(YES)
Aroclor-1232	33.0 - 170	0 / 15	--	--	43.5	22.7	-- / --	1.92	(YES)
Aroclor-1242	33.0 - 170	0 / 15	--	--	43.5	22.7	-- / --	1.92	(YES)
Aroclor-1248	33.0 - 170	0 / 15	--	--	43.5	22.7	-- / --	1.92	(YES)
Aroclor-1254	33.0 - 170	1 / 15	110	SJS02-SD02-000	47.2	22.7	1 / 15	2.08	YES
Aroclor-1260	33.0 - 170	1 / 15	69.0	SJS02-SD03-000	43.8	22.7	1 / 15	1.93	YES
Dieldrin	3.30 - 11.0	7 / 15	36.0	SJS02-SD03-000	4.77	0.72	7 / 15	6.67	YES
Endrin	3.30 - 17.0	0 / 15	--	--	4.35	0.020	-- / --	218	(YES)
Endrin aldehyde	3.30 - 17.0	1 / 15	6.40	SJS02-SD25-00-04D	4.50	NSV	0 / 15	NSV	YES
Endrin ketone	3.30 - 17.0	1 / 15	2.20	SJS02-SD26-00-04D	4.13	NSV	0 / 15	NSV	YES
Heptachlor	1.70 - 8.60	0 / 15	--	--	2.19	0.30	-- / --	7.30	(YES)
Heptachlor epoxide	1.70 - 8.60	0 / 15	--	--	2.19	5.00	-- / --	0.44	NO
alpha-BHC	1.70 - 8.60	0 / 15	--	--	2.19	6.00	-- / --	0.37	NO
alpha-Chlordane	1.70 - 8.60	11 / 15	79.0	SJS02-SD05-001	17.4	0.50	11 / 15	34.8	YES
beta-BHC	1.70 - 8.60	0 / 15	--	--	2.19	5.00	-- / --	0.44	NO
gamma-BHC (Lindane)	1.70 - 8.60	0 / 15	--	--	2.19	0.32	-- / --	6.84	(YES)
gamma-Chlordane	1.70 - 8.60	11 / 15	96.0	SJS02-SD05-001	23.8	0.50	11 / 15	47.6	YES
Semivolatile Organic Compounds (µg/kg)									
1,2,4-Trichlorobenzene	330 - 9,100	0 / 8	--	--	889	473	-- / --	1.88	(YES)
1,2-Dichlorobenzene	330 - 9,100	0 / 8	--	--	889	16.5	-- / --	53.9	(YES)
1,3-Dichlorobenzene	330 - 9,100	0 / 8	--	--	889	842	-- / --	1.06	(YES)
1,4-Dichlorobenzene	330 - 9,100	0 / 8	--	--	889	460	-- / --	1.93	(YES)
2,4,5-Trichlorophenol	840 - 23,000	0 / 15	--	--	1,778	3.00	-- / --	593	(YES)
2,4,6-Trichlorophenol	330 - 9,100	0 / 15	--	--	707	6.00	-- / --	118	(YES)
2,4-Dichlorophenol	330 - 9,100	0 / 15	--	--	707	5.00	-- / --	141	(YES)
2,4-Dimethylphenol	330 - 9,100	0 / 15	--	--	707	29.0	-- / --	24.4	(YES)
2-Methylnaphthalene	330 - 9,100	1 / 15	250	SJS02-SD25-00-04D	695	70.0	1 / 15	3.57	YES
2-Methylphenol	330 - 9,100	0 / 15	--	--	707	63.0	-- / --	11.2	(YES)
4-Methylphenol	330 - 9,100	0 / 14	--	--	741	670	-- / --	1.11	(YES)
Acenaphthene	330 - 9,100	1 / 15	490	SJS02-SD25-00-04D	711	16.0	1 / 15	30.6	YES
Acenaphthylene	330 - 9,100	0 / 15	--	--	707	44.0	-- / --	16.1	(YES)
Anthracene	330 - 9,100	4 / 15	1,200	SJS02-SD25-00-04D	691	85.3	4 / 15	8.10	YES
Benzo(a)anthracene	480 - 9,100	12 / 16	3,500	SJS02-SD25-00-04D	810	261	6 / 16	3.10	YES
Benzo(a)pyrene	480 - 9,100	12 / 16	3,900	SJS02-SD25-00-04D	832	430	3 / 16	1.93	YES
Benzo(b)fluoranthene	480 - 930	14 / 16	3,800	SJS02-SD25-00-04D	700	3,200	1 / 16	0.22	NO
Benzo(g,h,i)perylene	440 - 9,100	11 / 16	2,700	SJS02-SD25-00-04D	739	670	2 / 16	1.10	YES
Benzo(k)fluoranthene	480 - 9,100	11 / 16	1,000	SJS02-SD25-00-04D	596	240	3 / 16	2.48	YES
Carbazole	330 - 9,100	1 / 15	120	SJS02-SD25-00-04D	687	NSV	0 / 15	NSV	YES
Chrysene	480 - 9,100	12 / 16	3,300	SJS02-SD25-00-04D	866	384	6 / 16	2.26	YES
Di-n-octylphthalate	330 - 9,100	0 / 15	--	--	707	6,200	-- / --	0.11	NO
Dibenz(a,h)anthracene	330 - 9,100	1 / 15	500	SJS02-SD25-00-04D	712	63.4	1 / 15	7.89	YES
Diethylphthalate	330 - 9,100	2 / 16	250	SJS02-SD03-000	641	200	1 / 16	1.25	YES
Dimethyl phthalate	330 - 9,100	0 / 15	--	--	707	71.0	-- / --	9.95	(YES)
Fluoranthene	330 - 930	13 / 16	4,300	SJS02-SD25-00-04D	763	600	5 / 16	1.27	YES
Fluorene	330 - 9,100	2 / 15	550	SJS02-SD25-00-04D	698	19.0	2 / 15	28.9	YES
Hexachlorobenzene	330 - 9,100	0 / 15	--	--	707	22.0	-- / --	32.1	(YES)
Hexachlorobutadiene	330 - 9,100	0 / 15	--	--	707	11.0	-- / --	64.2	(YES)
Indeno(1,2,3-cd)pyrene	440 - 9,100	11 / 16	1,800	SJS02-SD25-00-04D	649	600	1 / 16	1.08	YES
Naphthalene	330 - 9,100	1 / 15	280	SJS02-SD25-00-04D	697	160	1 / 15	1.75	YES
Pentachlorophenol	840 - 23,000	0 / 15	--	--	1,778	360	-- / --	4.94	(YES)
Phenanthrene	480 - 9,100	9 / 16	5,300	SJS02-SD25-00-04D	954	240	4 / 16	3.97	YES
Phenol	330 - 9,100	0 / 15	--	--	707	420	-- / --	1.68	(YES)
Pyrene	930 - 930	15 / 16	9,400	SJS02-SD25-00-04D	1,186	665	6 / 16	1.78	YES
n-Nitrosodiphenylamine	330 - 9,100	0 / 15	--	--	707	28.0	-- / --	25.2	(YES)

Table 8-23
Screening Statistics - Site 2 - Sediment - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COC
Volatile Organic Compounds (µg/kg)									
1,2-Dichlorobenzene	13.0 - 39.0	0 / 4	--	--	14.9	16.5	-- / --	0.90	NO
1,2-Dichloroethene (total)	11.0 - 31.0	2 / 9	9.00	SJS02-SD03-000	8.72	NSV	-- / --	NSV	YES
1,2-Dichloropropane	11.0 - 39.0	1 / 13	8.30	SJS02-SD22-00-04D	11.4	NSV	0 / 13	NSV	YES
4-Methyl-2-pentanone	11.0 - 39.0	1 / 13	5.00	SJS02-SD02-000	11.4	NSV	0 / 13	NSV	YES
Acetone	11.0 - 35.0	4 / 11	450	SJS02-SD03-000	61.6	NSV	0 / 11	NSV	YES
Bromomethane	11.0 - 39.0	1 / 13	6.30	SJS02-SD09	12.2	NSV	0 / 13	NSV	YES
Carbon disulfide	3.00 - 31.0	5 / 13	81.0	SJS02-SD03-000	15.5	0.85	5 / 13	18.3	YES
Chlorobenzene	11.0 - 39.0	0 / 13	--	--	12.2	8.42	-- / --	1.45	(YES)
Chloroethane	11.0 - 37.0	1 / 13	4.20	SJS02-SD21-00-04D	11.0	NSV	0 / 13	NSV	YES
Chloroform	11.0 - 39.0	1 / 13	3.00	SJS02-SD07-001	11.3	NSV	0 / 13	NSV	YES
Vinyl chloride	11.0 - 37.0	3 / 13	9,800	SJS02-SD21-00-04D	763	31.0	1 / 13	24.6	YES
Xylene, total	11.0 - 39.0	0 / 13	--	--	12.2	25.2	-- / --	0.48	NO
cis-1,2-Dichloroethene	13.0 - 36.0	1 / 4	2,300	SJS02-SD21-00-04D	585	1,050	1 / 4	0.56	NO
Dioxin/Furans (µg/kg)									
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	-- - --	6 / 6	0.42	SJS02-SD09	0.20	NSV	-- / --	NSV	YES
1,2,3,4,6,7,8-Heptachlorodibenzofuran	-- - --	6 / 6	0.23	SJS02-SD09	0.073	NSV	-- / --	NSV	YES
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.30E-04 - 1.30E-04	5 / 6	0.021	SJS02-SD09	0.0060	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.0085	SJS02-SD09	0.0036	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.025	SJS02-SD09	0.011	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.018	SJS02-SD09	0.0086	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.060	SJS02-SD09	0.014	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.016	SJS02-SD09	0.0079	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzofuran	1.50E-04 - 2.50E-04	4 / 6	0.0023	SJS02-SD11	9.83E-04	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.70E-04 - 1.70E-04	5 / 6	0.0036	SJS02-SD09	0.0017	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzofuran	2.40E-04 - 2.40E-04	5 / 6	0.0043	SJS02-SD09	0.0018	NSV	-- / --	NSV	YES
2,3,4,6,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.0093	SJS02-SD09	0.0039	NSV	-- / --	NSV	YES
2,3,4,7,8-Pentachlorodibenzofuran	-- - --	6 / 6	0.0070	SJS02-SD09	0.0034	NSV	-- / --	NSV	YES
2,3,7,8-TCDD (dioxin)	1.30E-04 - 1.30E-04	5 / 6	9.60E-04	SJS02-SD11	4.49E-04	NSV	-- / --	NSV	YES
2,3,7,8-Tetrachlorodibenzofuran	-- - --	6 / 6	0.0097	SJS02-SD11	0.0048	NSV	-- / --	NSV	YES
Octachlorodibenzo-p-dioxin	-- - --	6 / 6	4.40	SJS02-SD11	2.14	NSV	-- / --	NSV	YES
Octachlorodibenzofuran	0.0030 - 0.0030	5 / 6	0.58	SJS02-SD09	0.14	NSV	-- / --	NSV	YES
Total heptachlorodibenzo-p-dioxin	-- - --	6 / 6	0.90	SJS02-SD11	0.46	NSV	-- / --	NSV	YES
Total heptachlorodibenzofuran	-- - --	6 / 6	0.26	SJS02-SD11	0.13	NSV	-- / --	NSV	YES
Total hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.17	SJS02-SD11	0.092	NSV	-- / --	NSV	YES
Total hexachlorodibenzofuran	-- - --	6 / 6	0.30	SJS02-SD09	0.12	NSV	-- / --	NSV	YES
Total pentachlorodibenzo-p-dioxin	1.70E-04 - 1.70E-04	5 / 6	0.020	SJS02-SD11	0.0091	NSV	-- / --	NSV	YES
Total pentachlorodibenzofuran	-- - --	6 / 6	0.091	SJS02-SD11	0.041	NSV	-- / --	NSV	YES
Total tetrachlorodibenzo-p-dioxin	-- - --	6 / 6	0.0067	SJS02-SD09	0.0041	NSV	-- / --	NSV	YES
Total tetrachlorodibenzofuran	-- - --	6 / 6	0.036	SJS02-SD09	0.016	NSV	-- / --	NSV	YES

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits

Table 8-23
Screening Statistics - Site 2 - Sediment - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COC
Volatile Organic Compounds (µg/kg)									
1,2-Dichlorobenzene	13.0 - 39.0	0 / 4	--	--	14.9	16.5	-- / --	0.90	NO
1,2-Dichloroethene (total)	11.0 - 31.0	2 / 9	9.00	SJS02-SD03-000	8.72	NSV	-- / --	NSV	YES
1,2-Dichloropropane	11.0 - 39.0	1 / 13	8.30	SJS02-SD22-00-04D	11.4	NSV	0 / 13	NSV	YES
4-Methyl-2-pentanone	11.0 - 39.0	1 / 13	5.00	SJS02-SD02-000	11.4	NSV	0 / 13	NSV	YES
Acetone	11.0 - 35.0	4 / 11	450	SJS02-SD03-000	61.6	NSV	0 / 11	NSV	YES
Bromomethane	11.0 - 39.0	1 / 13	6.30	SJS02-SD09	12.2	NSV	0 / 13	NSV	YES
Carbon disulfide	3.00 - 31.0	5 / 13	81.0	SJS02-SD03-000	15.5	0.85	5 / 13	18.3	YES
Chlorobenzene	11.0 - 39.0	0 / 13	--	--	12.2	8.42	-- / --	1.45	(YES)
Chloroethane	11.0 - 37.0	1 / 13	4.20	SJS02-SD21-00-04D	11.0	NSV	0 / 13	NSV	YES
Chloroform	11.0 - 39.0	1 / 13	3.00	SJS02-SD07-001	11.3	NSV	0 / 13	NSV	YES
Vinyl chloride	11.0 - 37.0	3 / 13	9,800	SJS02-SD21-00-04D	763	31.0	1 / 13	24.6	YES
Xylene, total	11.0 - 39.0	0 / 13	--	--	12.2	25.2	-- / --	0.48	NO
cis-1,2-Dichloroethene	13.0 - 36.0	1 / 4	2,300	SJS02-SD21-00-04D	585	1,050	1 / 4	0.56	NO
Dioxin/Furans (µg/kg)									
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	-- - --	6 / 6	0.42	SJS02-SD09	0.20	NSV	-- / --	NSV	YES
1,2,3,4,6,7,8-Heptachlorodibenzofuran	-- - --	6 / 6	0.23	SJS02-SD09	0.073	NSV	-- / --	NSV	YES
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.30E-04 - 1.30E-04	5 / 6	0.021	SJS02-SD09	0.0060	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.0085	SJS02-SD09	0.0036	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.025	SJS02-SD09	0.011	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.018	SJS02-SD09	0.0086	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.060	SJS02-SD09	0.014	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.016	SJS02-SD09	0.0079	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzofuran	1.50E-04 - 2.50E-04	4 / 6	0.0023	SJS02-SD11	9.83E-04	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.70E-04 - 1.70E-04	5 / 6	0.0036	SJS02-SD09	0.0017	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzofuran	2.40E-04 - 2.40E-04	5 / 6	0.0043	SJS02-SD09	0.0018	NSV	-- / --	NSV	YES
2,3,4,6,7,8-Hexachlorodibenzofuran	-- - --	6 / 6	0.0093	SJS02-SD09	0.0039	NSV	-- / --	NSV	YES
2,3,4,7,8-Pentachlorodibenzofuran	-- - --	6 / 6	0.0070	SJS02-SD09	0.0034	NSV	-- / --	NSV	YES
2,3,7,8-TCDD (dioxin)	1.30E-04 - 1.30E-04	5 / 6	9.60E-04	SJS02-SD11	4.49E-04	NSV	-- / --	NSV	YES
2,3,7,8-Tetrachlorodibenzofuran	-- - --	6 / 6	0.0097	SJS02-SD11	0.0048	NSV	-- / --	NSV	YES
Octachlorodibenzo-p-dioxin	-- - --	6 / 6	4.40	SJS02-SD11	2.14	NSV	-- / --	NSV	YES
Octachlorodibenzofuran	0.0030 - 0.0030	5 / 6	0.58	SJS02-SD09	0.14	NSV	-- / --	NSV	YES
Total heptachlorodibenzo-p-dioxin	-- - --	6 / 6	0.90	SJS02-SD11	0.46	NSV	-- / --	NSV	YES
Total heptachlorodibenzofuran	-- - --	6 / 6	0.26	SJS02-SD11	0.13	NSV	-- / --	NSV	YES
Total hexachlorodibenzo-p-dioxin	-- - --	6 / 6	0.17	SJS02-SD11	0.092	NSV	-- / --	NSV	YES
Total hexachlorodibenzofuran	-- - --	6 / 6	0.30	SJS02-SD09	0.12	NSV	-- / --	NSV	YES
Total pentachlorodibenzo-p-dioxin	1.70E-04 - 1.70E-04	5 / 6	0.020	SJS02-SD11	0.0091	NSV	-- / --	NSV	YES
Total pentachlorodibenzofuran	-- - --	6 / 6	0.091	SJS02-SD11	0.041	NSV	-- / --	NSV	YES
Total tetrachlorodibenzo-p-dioxin	-- - --	6 / 6	0.0067	SJS02-SD09	0.0041	NSV	-- / --	NSV	YES
Total tetrachlorodibenzofuran	-- - --	6 / 6	0.036	SJS02-SD09	0.016	NSV	-- / --	NSV	YES

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits

Table 8-24
AVS/SEM Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Sample	SEM (uM/g dry weight)[1]							AVS (uM/g dry weight)	AVS/SEM
	Cd	Cu	Pb	Hg	Ni	Zn	SUM		
SJREF-SD01-00-04D	3.72E-03	0.22	0.10	4.00E-05	0.03	1.52	1.87	1.70	1.10
SJREF-SD04-00-04D	1.80E-03	0.09	0.05	3.00E-05	0.02	0.65	0.81	0.87	0.93
SJREF-SD05-00-04D	3.19E-03	0.19	0.13	4.00E-05	0.02	1.42	1.77	1.30	1.36
SJS02-SD03-00-04D	0.03	0.99	0.78	1.20E-04	0.10	4.51	6.42	13.00	0.49
SJS02-SD05-00-04D	0.04	1.65	1.35	9.00E-05	0.12	7.49	10.64	3.90	2.73
SJS02-SD06-00-04D	0.07	0.25	1.90	7.00E-05	0.21	16.90	19.33	4.50	4.30
SJS02-SD24-00-04D	0.02	0.68	0.78	5.00E-05	0.07	5.70	7.26	3.10	2.34
SJS02-SD25-00-04D	0.07	0.51	2.30	6.00E-05	0.20	16.60	19.67	5.60	3.51
SJS02-SD26-00-04D	0.07	3.44	1.49	8.00E-05	0.16	9.49	14.65	4.00	3.66

[1] One-half of the reporting limit was used for non-detected samples.

Table 8-25
Screening Statistics - Pore Water - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Volatile Organic Compounds (**µg/L**)								
1,1,1-Trichloroethane	1.00 - 1,000	0 / 15	--	--	11.0	-- / --	90.9	YES
1,1,2,2-Tetrachloroethane	2.00 - 2,000	0 / 15	--	--	90.2	-- / --	22.2	YES
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	1.00 - 1,000	0 / 15	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	1.00 - 1,000	0 / 15	--	--	550	-- / --	1.82	YES
1,1-Dichloroethane	1.00 - 1,000	0 / 15	--	--	47.0	-- / --	21.3	YES
1,1-Dichloroethene	1.00 - 50.0	1 / 15	730	SJS02-PW04-07B	25.0	1 / 15	29.2	YES
1,2,4-Trichlorobenzene	5.00 - 5,000	0 / 15	--	--	5.40	-- / --	926	YES
1,2-Dibromo-3-chloropropane	5.00 - 5,000	0 / 15	--	--	NSV	-- / --	NSV	NO
1,2-Dichlorobenzene	2.00 - 2,000	0 / 15	--	--	0.70	-- / --	2,857	YES
1,2-Dichloroethane	1.00 - 1,000	0 / 15	--	--	100	-- / --	10.0	YES
1,2-Dichloropropane	1.00 - 1,000	0 / 15	--	--	2,400	-- / --	0.42	NO
1,3-Dichlorobenzene	2.00 - 2,000	0 / 15	--	--	28.5	-- / --	70.2	YES
1,4-Dichlorobenzene	2.00 - 2,000	0 / 15	--	--	19.9	-- / --	101	YES
Bromodichloromethane	2.00 - 2,000	0 / 15	--	--	NSV	-- / --	NSV	NO
Carbon tetrachloride	1.00 - 1,000	0 / 15	--	--	13.3	-- / --	75.2	YES
Chlorobenzene	1.00 - 1,000	0 / 15	--	--	1.30	-- / --	769	YES
Chloroethane	5.00 - 5,000	0 / 15	--	--	NSV	-- / --	NSV	NO
Chloroform	1.00 - 1,000	0 / 15	--	--	1.80	-- / --	556	YES
Chloromethane	5.00 - 5,000	0 / 15	--	--	2,700	-- / --	1.85	YES
Dibenzofuran	2.00 - 2,000	0 / 15	--	--	3.70	-- / --	541	YES
Dichlorodifluoromethane (Freon-12)	5.00 - 5,000	0 / 15	--	--	NSV	-- / --	NSV	NO
Methylene chloride	5.00 - 5,000	0 / 15	--	--	98.1	-- / --	51.0	YES
Tetrachloroethene	1.00 - 1,000	0 / 15	--	--	45.0	-- / --	22.2	YES
Trichloroethene	-- - --	15 / 15	5,100	SJS02-PW04-07B	21.0	3 / 15	243	YES
Trichlorofluoromethane(Freon-11)	5.00 - 5,000	0 / 15	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	2.00 - 2,000	9 / 15	4,400	SJS02-PW05-07B	930	1 / 15	4.73	YES
cis-1,2-Dichloroethene	-- - --	15 / 15	87,000	SJS02-PW04-07B	NSV	-- / --	NSV	YES
cis-1,3-Dichloropropene	1.00 - 1,000	0 / 15	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	1.00 - 50.0	2 / 15	710	SJS02-PW04-07B	970	0 / 15	0.73	NO
trans-1,3-Dichloropropene	1.00 - 1,000	0 / 15	--	--	NSV	-- / --	NSV	NO

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits

Table 8-26
Screening Statistics - Pore Water - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value[1]	Frequency of Exceedance	Mean Hazard Quotient	COC
Volatile Organic Compounds (**µg/L**)									
1,1,1-Trichloroethane	1.00 - 1,000	0 / 15	--	--	37.1	11.0	-- / --	3.37	(YES)
1,1,2,2-Tetrachloroethane	2.00 - 2,000	0 / 15	--	--	74.1	90.2	-- / --	0.82	NO
1,1,2-Trichloroethane	1.00 - 1,000	0 / 15	--	--	37.1	550	-- / --	0.067	NO
1,1-Dichloroethane	1.00 - 1,000	0 / 15	--	--	37.1	47.0	-- / --	0.79	NO
1,1-Dichloroethene	1.00 - 50.0	1 / 15	730	SJS02-PW04-07B	52.4	25.0	1 / 15	2.10	YES
1,2,4-Trichlorobenzene	5.00 - 5,000	0 / 15	--	--	185	5.40	-- / --	34.3	(YES)
1,2-Dichlorobenzene	2.00 - 2,000	0 / 15	--	--	74.1	0.70	-- / --	106	(YES)
1,2-Dichloroethane	1.00 - 1,000	0 / 15	--	--	37.1	100	-- / --	0.37	NO
1,3-Dichlorobenzene	2.00 - 2,000	0 / 15	--	--	74.1	28.5	-- / --	2.60	(YES)
1,4-Dichlorobenzene	2.00 - 2,000	0 / 15	--	--	74.1	19.9	-- / --	3.73	(YES)
Carbon tetrachloride	1.00 - 1,000	0 / 15	--	--	37.1	13.3	-- / --	2.79	(YES)
Chlorobenzene	1.00 - 1,000	0 / 15	--	--	37.1	1.30	-- / --	28.5	(YES)
Chloroform	1.00 - 1,000	0 / 15	--	--	37.1	1.80	-- / --	20.6	(YES)
Chloromethane	5.00 - 5,000	0 / 15	--	--	185	2,700	-- / --	0.069	NO
Dibenzofuran	2.00 - 2,000	0 / 15	--	--	74.1	3.70	-- / --	20.0	(YES)
Methylene chloride	5.00 - 5,000	0 / 15	--	--	185	98.1	-- / --	1.89	(YES)
Tetrachloroethene	1.00 - 1,000	0 / 15	--	--	37.1	45.0	-- / --	0.82	NO
Trichloroethene	-- - --	15 / 15	5,100	SJS02-PW04-07B	349	21.0	3 / 15	16.6	YES
Vinyl chloride	2.00 - 2,000	9 / 15	4,400	SJS02-PW05-07B	379	930	-- / --	0.41	NO
cis-1,2-Dichloroethene	-- - --	15 / 15	87,000	SJS02-PW04-07B	6,365	25	-- / --	254.6	YES

Notes:

NSV - No screening criteria

Shaded cells represent hazard quotient based on reporting limits

[1]Screening value for 1,1-Dichloroethene used for cis-1,2-Dichloroethene

Table 8-27
Screening Statistics - RI Surface Water - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (UG/L)								
Aluminum	18.7 - 38.2	7 / 7	9,390	SJS02-SW06-001	25.0	7 / 7	376	YES
Antimony	2.70 - 2.80	1 / 7	3.30	SJS02-SW08-002	30.0	0 / 7	0.11	NO
Arsenic	2.00 - 3.60	1 / 7	4.40	SJS02-SW04-001	10.0	0 / 7	0.44	NO
Barium	0.20 - 0.30	6 / 7	59.7	SJS02-SW05-001	10,000	0 / 7	0.006	NO
Beryllium	0.10 - 0.20	1 / 7	3.50	SJS02-SW06-001	5.30	0 / 7	0.66	NO
Cadmium	0.30 - 0.30	7 / 7	2.50	SJS02-SW05-001	0.53	3 / 7	4.72	YES
Calcium [2]	31.1 - 57.9	7 / 7	184,000	SJS02-SW08-001	NSV	-- / --	NSV	NO
Chromium	0.60 - 1.10	7 / 7	83.6	SJS02-SW05-001	2.0	1 / 7	41.80	YES
Cobalt	0.50 - 0.80	2 / 7	55.0	SJS02-SW06-001	35,000	0 / 7	0.002	YES
Copper	0.80 - 1.10	7 / 7	107	SJS02-SW05-001	2.85	7 / 7	37.5	YES
Cyanide	5.00 - 5.00	2 / 7	18.9	SJS02-SW03-001	1.00	2 / 7	18.9	YES
Iron	17.2 - 30.8	7 / 7	18,800	SJS02-SW06-001	320	7 / 7	58.8	YES
Lead	1.00 - 1.40	5 / 7	44.4	SJS02-SW05-001	3.20	5 / 7	13.9	YES
Magnesium [2]	24.3 - 243	7 / 7	576,000	SJS02-SW08-001	NSV	-- / --	NSV	NO
Manganese	0.30 - 0.40	7 / 7	2,490	SJS02-SW06-001	10.0	7 / 7	249	YES
Mercury	0.10 - 0.10	0 / 7	--	--	0.01	-- / --	8.33	YES
Nickel	0.90 - 0.90	7 / 7	81.4	SJS02-SW06-001	8.30	1 / 7	9.81	YES
Potassium [2]	13.5 - 135	7 / 7	205,000	SJS02-SW08-001	NSV	-- / --	NSV	NO
Selenium	2.60 - 3.10	0 / 7	--	--	5.00	-- / --	0.62	NO
Silver	0.70 - 0.90	0 / 7	--	--	0.0001	-- / --	9000.00	YES
Sodium [2]	148 - 2,040	7 / 7	4,930,000	SJS02-SW08-001	NSV	-- / --	NSV	NO
Thallium	3.20 - 5.20	0 / 7	--	--	40.0	-- / --	0.13	NO
Vanadium	0.60 - 0.70	2 / 7	15.8	SJS02-SW05-001	10,000	0 / 7	0.0016	NO
Zinc	0.70 - 1.90	7 / 7	1,310	SJS02-SW06-001	37.0	4 / 7	35.4	YES
Pesticide/Polychlorinated Biphenyls (UG/L)								
4,4'-DDD	0.10 - 0.12	5 / 7	0.20	SJS02-SW04-001	0.6	0 / 7	0.33	NO
4,4'-DDE	0.10 - 0.12	0 / 7	--	--	14.0	-- / --	0.009	NO
4,4'-DDT	0.10 - 0.12	0 / 7	--	--	0.001	-- / --	120	YES
Aldrin	0.052 - 0.060	0 / 7	--	--	1.30	-- / --	0.05	NO
Aroclor-1016	1.00 - 1.20	0 / 7	--	--	0.01	-- / --	85.7	YES
Aroclor-1221	2.10 - 2.40	0 / 7	--	--	0.03	-- / --	80.0	YES
Aroclor-1232	1.00 - 1.20	0 / 7	--	--	0.03	-- / --	40.0	YES
Aroclor-1242	1.00 - 1.20	0 / 7	--	--	0.03	-- / --	40.0	YES
Aroclor-1248	1.00 - 1.20	0 / 7	--	--	0.03	-- / --	40.0	YES
Aroclor-1254	1.00 - 1.20	0 / 7	--	--	0.03	-- / --	40.0	YES
Aroclor-1260	1.00 - 1.20	0 / 7	--	--	0.03	-- / --	40.0	YES
Dieldrin	0.10 - 0.12	0 / 7	--	--	0.002	-- / --	63.2	YES
Endosulfan I	0.052 - 0.060	0 / 7	--	--	0.01	-- / --	6.90	YES
Endosulfan II	0.10 - 0.12	0 / 7	--	--	0.01	-- / --	13.8	YES
Endosulfan sulfate	0.10 - 0.12	0 / 7	--	--	0.01	-- / --	13.8	YES
Endrin	0.10 - 0.12	0 / 7	--	--	0.002	-- / --	52.2	YES
Endrin aldehyde	0.10 - 0.12	0 / 7	--	--	0.002	-- / --	52.2	YES
Endrin ketone	0.10 - 0.12	0 / 7	--	--	0.002	-- / --	52.2	YES
Heptachlor	0.052 - 0.060	0 / 7	--	--	0.004	-- / --	16.7	YES
Heptachlor epoxide	0.052 - 0.060	0 / 7	--	--	0.004	-- / --	16.7	YES
Methoxychlor	0.52 - 0.60	0 / 7	--	--	0.03	-- / --	20.0	YES
Toxaphene	5.20 - 6.00	0 / 7	--	--	0.0002	-- / --	30,000	YES
alpha-BHC	0.052 - 0.060	0 / 7	--	--	0.34	-- / --	0.18	NO
alpha-Chlordane	0.052 - 0.060	0 / 7	--	--	0.004	-- / --	15.0	YES
beta-BHC	0.052 - 0.060	0 / 7	--	--	0.34	-- / --	0.18	NO
delta-BHC	0.052 - 0.060	0 / 7	--	--	0.34	-- / --	0.18	NO
gamma-BHC (Lindane)	0.052 - 0.060	0 / 7	--	--	0.08	-- / --	0.75	NO
gamma-Chlordane	0.052 - 0.060	0 / 7	--	--	0.004	-- / --	15.0	YES
Semivolatile Organic Compounds (UG/L)								
1,2,4-Trichlorobenzene	10.0 - 11.0	0 / 7	--	--	50.0	-- / --	0.22	NO

Table 8-27
Screening Statistics - RI Surface Water - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,2-Dichlorobenzene	10.0 - 11.0	0 / 7	--	--	129	-- / --	0.085	NO
1,3-Dichlorobenzene	10.0 - 11.0	0 / 7	--	--	763	-- / --	0.01	NO
1,4-Dichlorobenzene	10.0 - 11.0	0 / 7	--	--	129	-- / --	0.085	NO
2,2'-Oxybis(1-chloropropane)	10.0 - 11.0	0 / 7	--	--	NSV	-- / --	NSV	YES
2,4,5-Trichlorophenol	26.0 - 29.0	0 / 7	--	--	11.0	-- / --	2.64	YES
2,4,6-Trichlorophenol	10.0 - 11.0	0 / 7	--	--	970	-- / --	0.011	NO
2,4-Dichlorophenol	10.0 - 11.0	0 / 7	--	--	365	-- / --	0.030	NO
2,4-Dimethylphenol	10.0 - 11.0	0 / 7	--	--	2,120	-- / --	0.01	NO
2,4-Dinitrophenol	26.0 - 29.0	0 / 7	--	--	150	-- / --	0.19	NO
2,4-Dinitrotoluene	10.0 - 11.0	0 / 7	--	--	230	-- / --	0.048	NO
2,6-Dinitrotoluene	10.0 - 11.0	0 / 7	--	--	NSV	-- / --	NSV	YES
2-Chloronaphthalene	10.0 - 11.0	0 / 7	--	--	7.50	-- / --	1.5	YES
2-Chlorophenol	10.0 - 11.0	0 / 7	--	--	970	-- / --	0.01	NO
2-Methylnaphthalene	10.0 - 11.0	0 / 7	--	--	300.0	-- / --	0.04	NO
2-Methylphenol	10.0 - 11.0	0 / 7	--	--	13.0	-- / --	0.85	NO
2-Nitroaniline	26.0 - 29.0	0 / 7	--	--	NSV	-- / --	NSV	YES
2-Nitrophenol	10.0 - 11.0	0 / 7	--	--	150	-- / --	0.073	NO
3,3'-Dichlorobenzidine	10.0 - 11.0	0 / 7	--	--	NSV	-- / --	NSV	YES
3-Nitroaniline	26.0 - 29.0	0 / 7	--	--	NSV	-- / --	NSV	YES
4,6-Dinitro-2-methylphenol	26.0 - 29.0	0 / 7	--	--	2.30	-- / --	12.6	YES
4-Bromophenyl-phenylether	10.0 - 11.0	0 / 7	--	--	1.50	-- / --	7.33	YES
4-Chloro-3-methylphenol	10.0 - 11.0	0 / 7	--	--	0.30	-- / --	36.7	YES
4-Chloroaniline	10.0 - 11.0	0 / 7	--	--	29700	-- / --	0.0004	NO
4-Chlorophenyl-phenylether	10.0 - 11.0	0 / 7	--	--	NSV	-- / --	NSV	YES
4-Methylphenol	10.0 - 11.0	0 / 7	--	--	NSV	-- / --	NSV	YES
4-Nitroaniline	26.0 - 29.0	0 / 7	--	--	NSV	-- / --	NSV	YES
4-Nitrophenol	26.0 - 29.0	0 / 7	--	--	150	-- / --	0.19	NO
Acenaphthene	10.0 - 11.0	0 / 7	--	--	520	-- / --	0.021	NO
Acenaphthylene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Anthracene	10.0 - 11.0	0 / 7	--	--	0.10	-- / --	110.0	YES
Benzo(a)anthracene	10.0 - 11.0	0 / 7	--	--	6.30	-- / --	1.75	YES
Benzo(a)pyrene	10.0 - 11.0	0 / 7	--	--	0.21	-- / --	52	YES
Benzo(b)fluoranthene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Benzo(g,h,i)perylene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Benzo(k)fluoranthene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Butylbenzylphthalate	10.0 - 11.0	0 / 7	--	--	3.00	-- / --	3.67	NO
Carbazole	10.0 - 11.0	0 / 7	--	--	NSV	-- / --	NSV	YES
Chrysene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Di-n-butylphthalate	10.0 - 11.0	0 / 7	--	--	3.40	-- / --	3.24	YES
Di-n-octylphthalate	10.0 - 11.0	0 / 7	--	--	0.30	-- / --	36.67	YES
Dibenz(a,h)anthracene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Dibenzofuran	10.0 - 11.0	0 / 7	--	--	20.0	-- / --	0.55	NO
Diethylphthalate	10.0 - 11.0	0 / 7	--	--	3.00	-- / --	3.67	NO
Dimethyl phthalate	10.0 - 11.0	0 / 7	--	--	3.00	-- / --	3.67	NO
Fluoranthene	10.0 - 11.0	0 / 7	--	--	16.0	-- / --	0.69	NO
Fluorene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Hexachlorobenzene	10.0 - 11.0	0 / 7	--	--	3.68	-- / --	2.99	YES
Hexachlorobutadiene	10.0 - 11.0	0 / 7	--	--	9.30	-- / --	1.18	YES
Hexachlorocyclopentadiene	10.0 - 11.0	0 / 7	--	--	5.20	-- / --	2.1	YES
Hexachloroethane	10.0 - 11.0	0 / 7	--	--	540	-- / --	0.02	NO
Indeno(1,2,3-cd)pyrene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
Isophorone	10.0 - 11.0	0 / 7	--	--	12,900	-- / --	0.001	NO
Naphthalene	10.0 - 11.0	0 / 7	--	--	100	-- / --	0.11	NO
Nitrobenzene	10.0 - 11.0	0 / 7	--	--	668	-- / --	0.02	NO
Pentachlorophenol	26.0 - 29.0	0 / 7	--	--	7.90	-- / --	3.67	YES
Phenanthrene	10.0 - 11.0	0 / 7	--	--	4.60	-- / --	2.39	YES

Table 8-27
Screening Statistics - RI Surface Water - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Phenol	10.0 - 11.0	0 / 7	--	--	79.0	-- / --	0.14	NO
Pyrene	10.0 - 11.0	0 / 7	--	--	300	-- / --	0.04	NO
bis(2-Chloroethoxy)methane	10.0 - 11.0	0 / 7	--	--	11,000	-- / --	0.001	NO
bis(2-Chloroethyl)ether	10.0 - 11.0	0 / 7	--	--	2,380	-- / --	0.005	NO
bis(2-Ethylhexyl)phthalate	10.0 - 11.0	1 / 7	84.0	SJS02-SW07-001	30.0	1 / 7	2.80	YES
n-Nitroso-di-n-propylamine	10.0 - 11.0	0 / 7	--	--	NSV	-- / --	NSV	YES
n-Nitrosodiphenylamine	10.0 - 11.0	0 / 7	--	--	5,850	-- / --	0.002	NO
Explosives (UG/L)								
1,3,5-Trinitrobenzene	1.00 - 1.20	0 / 7	--	--	NSV	-- / --	NSV	YES
1,3-Dinitrobenzene	1.00 - 1.20	0 / 7	--	--	NSV	-- / --	NSV	YES
2,4,6-Trinitrotoluene	1.00 - 1.20	0 / 7	--	--	NSV	-- / --	NSV	YES
2,4-Dinitrotoluene	1.00 - 1.20	0 / 7	--	--	230	-- / --	0.01	NO
2,6-Dinitrotoluene	1.00 - 1.20	0 / 7	--	--	NSV	-- / --	NSV	YES
2-Amino-4,6-dinitrotoluene	1.00 - 1.20	0 / 7	--	--	NSV	-- / --	NSV	YES
2-Nitrotoluene	2.10 - 2.60	0 / 7	--	--	NSV	-- / --	NSV	YES
3-Nitrotoluene	2.10 - 2.60	4 / 7	3.50	SJS02-SW04-001	NSV	-- / --	NSV	YES
4-Amino-2,6-dinitrotoluene	1.00 - 1.20	0 / 7	--	--	NSV	-- / --	NSV	YES
4-Nitrotoluene	2.10 - 2.60	0 / 7	--	--	NSV	-- / --	NSV	YES
HMX	2.10 - 2.60	0 / 7	--	--	NSV	-- / --	NSV	YES
Nitrobenzene	1.00 - 1.20	0 / 7	--	--	6,680	-- / --	0.0002	NO
RDX	2.10 - 2.60	0 / 7	--	--	NSV	-- / --	NSV	YES
Tetryl	2.10 - 2.60	0 / 7	--	--	NSV	-- / --	NSV	YES
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	1.00 - 1.00	0 / 7	--	--	11	-- / --	0.0909	NO
1,1,2,2-Tetrachloroethane	1.00 - 1.00	0 / 7	--	--	2,400	-- / --	0.0004	NO
1,1,2-Trichloroethane	1.00 - 1.00	0 / 7	--	--	550	-- / --	0.0018	NO
1,1-Dichloroethane	1.00 - 1.00	0 / 7	--	--	47	-- / --	0.021277	NO
1,1-Dichloroethene	1.00 - 1.00	2 / 7	0.70	SJS02-SW04-001	25	0 / 7	0.028	NO
1,2,4-Trichlorobenzene	1.00 - 1.00	2 / 7	0.40	SJS02-SW08-001	5.4	0 / 7	0.074	NO
1,2-Dibromo-3-chloropropane	1.00 - 1.00	0 / 7	--	--	NSV	-- / --	NSV	YES
1,2-Dibromoethane	1.00 - 1.00	0 / 7	--	--	NSV	-- / --	NSV	YES
1,2-Dichlorobenzene	1.00 - 1.00	0 / 7	--	--	0.70	-- / --	1.43	YES
1,2-Dichloroethane	1.00 - 1.00	0 / 7	--	--	100	-- / --	0.0100	NO
1,2-Dichloropropane	1.00 - 1.00	0 / 7	--	--	2,400	-- / --	0.0004	NO
1,3-Dichlorobenzene	1.00 - 1.00	0 / 7	--	--	28.5	-- / --	0.035	NO
1,4-Dichlorobenzene	1.00 - 1.00	0 / 7	--	--	19.9	-- / --	0.05	NO
2-Butanone	5.00 - 5.00	0 / 3	--	--	14,000	-- / --	3.6E-04	NO
2-Hexanone	5.00 - 5.00	0 / 7	--	--	99	-- / --	0.05051	NO
4-Methyl-2-pentanone	5.00 - 5.00	0 / 7	--	--	170	-- / --	0.02941	NO
Acetone	5.00 - 5.00	1 / 2	1.60	SJS02-SW08-002	1,500	0 / 2	1.07E-03	NO
Benzene	1.00 - 1.00	0 / 7	--	--	110	-- / --	0.009	NO
Bromochloromethane	1.00 - 1.00	0 / 7	--	--	NSV	-- / --	NSV	YES
Bromodichloromethane	1.00 - 1.00	2 / 7	1.30	SJS02-SW06-001	2,700	0 / 7	0.0005	NO
Bromoform	1.00 - 1.00	2 / 7	0.80	SJS02-SW08-001	320	0 / 7	0.003	NO
Bromomethane	1.00 - 1.00	0 / 7	--	--	120	-- / --	0.01	NO
Carbon disulfide	1.00 - 1.00	3 / 7	10.3	SJS02-SW08-001	0.92	2 / 7	11.20	YES
Carbon tetrachloride	1.00 - 1.00	0 / 7	--	--	13.3	-- / --	7.5E-02	NO
Chlorobenzene	1.00 - 1.00	0 / 7	--	--	1.3	-- / --	0.77	NO
Chloroethane	1.00 - 1.00	0 / 7	--	--	NSV	-- / --	NSV	YES
Chloroform	1.00 - 1.00	3 / 7	5.40	SJS02-SW06-001	1.8	3 / 7	3.00	YES
Chloromethane	1.00 - 1.00	0 / 7	--	--	2,700	-- / --	3.70E-04	NO
Dibromochloromethane	1.00 - 1.00	2 / 7	0.30	SJS02-SW06-001	NSV	0 / 7	NSV	YES
Ethylbenzene	1.00 - 1.00	1 / 7	0.20	SJS02-SW08-001	25	0 / 7	0.0080	NO
Methylene chloride	2.00 - 2.00	0 / 7	--	--	98	-- / --	2.04E-02	NO
Styrene	1.00 - 1.00	0 / 7	--	--	72	-- / --	NSV	YES
Tetrachloroethene	1.00 - 1.00	0 / 7	--	--	45	-- / --	0.022	NO

Table 8-27
Screening Statistics - RI Surface Water - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Toluene	1.00 - 1.00	0 / 7	--	--	2	-- / --	0.500	NO
Trichloroethene	1.00 - 5.00	6 / 7	59.2	SJS02-SW06-001	21	3 / 7	2.82	YES
Vinyl chloride	1.00 - 5.00	4 / 7	21.9	SJS02-SW04-001	930	0 / 7	0.024	NO
Xylene, total	1.00 - 1.00	1 / 7	0.80	SJS02-SW08-001	13	0 / 7	0.06	NO
cis-1,2-Dichloroethene	1.00 - 5.00	6 / 7	78.6	SJS02-SW04-001	970	0 / 7	0.08	NO
cis-1,3-Dichloropropene	1.00 - 1.00	0 / 7	--	--	NSV	-- / --	NSV	YES
trans-1,2-Dichloroethene	1.00 - 1.00	4 / 7	0.50	SJS02-SW04-001	970	0 / 7	5.15E-04	NO
trans-1,3-Dichloropropene	1.00 - 1.00	0 / 7	--	--	NSV	-- / --	NSV	YES

Table 8-28
Screening Statistics - RI Surface Water - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (UG/L)									
Aluminum	18.7 - 38.2	7 / 7	9,390	SJS02-SW06-001	2,038	25.0	7 / 7	81.5	YES
Cadmium	0.30 - 0.30	7 / 7	2.50	SJS02-SW05-001	0.95	0.53	3 / 7	1.79	YES
Chromium	0.60 - 1.10	7 / 7	83.6	SJS02-SW05-001	14.7	2.0	1 / 7	7.36	YES
Cobalt	0.50 - 0.80	2 / 7	55.0	SJS02-SW06-001	8.34	35,000	0 / 7	0.0002	NO
Copper	0.80 - 1.10	7 / 7	107	SJS02-SW05-001	28.7	2.85	7 / 7	10.1	YES
Cyanide	5.00 - 5.00	2 / 7	18.9	SJS02-SW03-001	7.06	1.00	2 / 7	7.06	YES
Iron	17.2 - 30.8	7 / 7	18,800	SJS02-SW06-001	4,281	320	7 / 7	13.4	YES
Lead	1.00 - 1.40	5 / 7	44.4	SJS02-SW05-001	11.3	3.20	5 / 7	3.54	YES
Manganese	0.30 - 0.40	7 / 7	2,490	SJS02-SW06-001	433	10.0	7 / 7	43.3	YES
Nickel	0.90 - 0.90	7 / 7	81.4	SJS02-SW06-001	14.5	8.30	1 / 7	1.75	YES
Silver	0.70 - 0.90	0 / 7	--	--	0.44	0.0001	-- / --	4357	(YES)
Zinc	0.70 - 1.90	7 / 7	1,310	SJS02-SW06-001	232	19.0	4 / 7	12.2	YES
Pesticide/Polychlorinated Biphenyls (UG/L)									
4,4'-DDD	0.10 - 0.12	5 / 7	0.20	SJS02-SW04-001	0.06	0.6	0 / 7	0.10	NO
4,4'-DDT	0.10 - 0.12	0 / 7	--	--	0.05	0.0010	-- / --	54.3	(YES)
Aroclor-1016	1.00 - 1.20	0 / 7	--	--	0.54	0.014	-- / --	38.8	(YES)
Aroclor-1221	2.10 - 2.40	0 / 7	--	--	1.11	0.030	-- / --	37.1	(YES)
Aroclor-1232	1.00 - 1.20	0 / 7	--	--	0.54	0.030	-- / --	18.1	(YES)
Aroclor-1242	1.00 - 1.20	0 / 7	--	--	0.54	0.030	-- / --	18.1	(YES)
Aroclor-1248	1.00 - 1.20	0 / 7	--	--	0.54	0.030	-- / --	18.1	(YES)
Aroclor-1254	1.00 - 1.20	0 / 7	--	--	0.54	0.030	-- / --	18.1	(YES)
Aroclor-1260	1.00 - 1.20	0 / 7	--	--	0.54	0.030	-- / --	18.1	(YES)
Dieldrin	0.10 - 0.12	0 / 7	--	--	0.054	0.0019	-- / --	28.6	(YES)
Endosulfan I	0.052 - 0.060	0 / 7	--	--	0.028	0.0087	-- / --	3.20	(YES)
Endosulfan II	0.10 - 0.12	0 / 7	--	--	0.054	0.0087	-- / --	6.24	(YES)
Endosulfan sulfate	0.10 - 0.12	0 / 7	--	--	0.054	0.0087	-- / --	6.24	(YES)
Endrin	0.10 - 0.12	0 / 7	--	--	0.054	0.0023	-- / --	23.6	(YES)
Endrin aldehyde	0.10 - 0.12	0 / 7	--	--	0.054	0.0023	-- / --	23.6	(YES)
Endrin ketone	0.10 - 0.12	0 / 7	--	--	0.054	0.0023	-- / --	23.6	(YES)
Heptachlor	0.052 - 0.060	0 / 7	--	--	0.028	0.0036	-- / --	7.74	(YES)
Heptachlor epoxide	0.052 - 0.060	0 / 7	--	--	0.028	0.0036	-- / --	7.74	(YES)
Methoxychlor	0.52 - 0.60	0 / 7	--	--	0.28	0.030	-- / --	9.29	(YES)
Toxaphene	5.20 - 6.00	0 / 7	--	--	2.79	0.0002	-- / --	13,929	(YES)
alpha-BHC	0.052 - 0.060	0 / 7	--	--	0.028	0.034	-- / --	0.82	NO
alpha-Chlordane	0.052 - 0.060	0 / 7	--	--	0.028	0.0040	-- / --	6.96	(YES)
beta-BHC	0.052 - 0.060	0 / 7	--	--	0.028	0.3	-- / --	0.08	NO
delta-BHC	0.052 - 0.060	0 / 7	--	--	0.028	0.3	-- / --	0.08	NO
gamma-BHC (Lindane)	0.052 - 0.060	0 / 7	--	--	0.028	0.016	-- / --	1.74	(YES)
gamma-Chlordane	0.052 - 0.060	0 / 7	--	--	0.028	0.0040	-- / --	6.96	(YES)
Semivolatile Organic Compounds (UG/L)									
2,4,5-Trichlorophenol	26.0 - 29.0	0 / 7	--	--	13.9	11.0	-- / --	1.26	(YES)
2-Chloronaphthalene	10.0 - 11.0	0 / 7	--	--	5.43	0.75	-- / --	7.24	(YES)
4,6-Dinitro-2-methylphenol	26.0 - 29.0	0 / 7	--	--	13.9	2.30	-- / --	6.02	(YES)
4-Bromophenyl-phenylether	10.0 - 11.0	0 / 7	--	--	5.43	1.50	-- / --	3.62	(YES)
4-Chloro-3-methylphenol	10.0 - 11.0	0 / 7	--	--	5.43	0.30	-- / --	18.1	(YES)
Anthracene	10.0 - 11.0	0 / 7	--	--	5.43	0.73	-- / --	7.44	(YES)
Benzo(a)anthracene	10.0 - 11.0	0 / 7	--	--	5.43	6.30	-- / --	0.86	NO
Benzo(a)pyrene	10.0 - 11.0	0 / 7	--	--	5.43	0.21	-- / --	25.9	(YES)
Di-n-butylphthalate	10.0 - 11.0	0 / 7	--	--	2.50	3.40	-- / --	0.74	NO
Di-n-octylphthalate	10.0 - 11.0	0 / 7	--	--	5.43	0.3	-- / --	18.1	(YES)
Hexachlorobenzene	10.0 - 11.0	0 / 7	--	--	5.43	3.68	-- / --	1.48	(YES)
Hexachlorobutadiene	10.0 - 11.0	0 / 7	--	--	5.43	9.30	-- / --	0.58	NO
Hexachlorocyclopentadiene	10.0 - 11.0	0 / 7	--	--	5.43	5.20	-- / --	1.04	(YES)
Pentachlorophenol	26.0 - 29.0	0 / 7	--	--	13.9	7.90	-- / --	1.75	(YES)
Phenanthrene	10.0 - 11.0	0 / 7	--	--	5.43	4.60	-- / --	1.18	(YES)
bis(2-Ethylhexyl)phthalate	10.0 - 11.0	1 / 7	84.0	SJS02-SW07-001	15.9	30.0	1 / 7	0.53	NO
Explosives (UG/L)									
3-Nitrotoluene	2.10 - 2.60	4 / 7	3.50	SJS02-SW04-001	1.28	NSV	-- / --	NSV	YES
Volatile Organic Compounds (UG/L)									
Carbon disulfide	1.00 - 1.00	3 / 7	10.3	SJS02-SW08-001	2.28	2.00	2 / 7	1.14	YES
Chloroform	1.00 - 1.00	3 / 7	10.3	SJS02-SW08-001	1.57	1.80	3 / 7	0.87	NO
Trichloroethene	1.00 - 5.00	3 / 7	10.3	SJS02-SW08-001	18.25	21	3 / 7	0.87	NO

Table 8-29
Screening Statistics - Expanded RI Surface Water - Step 2
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Screening Value[1]	Frequency of Exceedance	Maximum Hazard Quotient	COPC?
Volatile Organic Compounds (**µg/L**)								
1,1,1-Trichloroethane	0.50 - 0.50	0 / 2	--	--	11.0	-- / --	0.045	NO
1,1,2,2-Tetrachloroethane	0.50 - 0.50	0 / 2	--	--	90.2	-- / --	0.0055	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	0.50 - 0.50	0 / 2	--	--	550	-- / --	9.09E-04	NO
1,1-Dichloroethane	0.50 - 0.50	0 / 2	--	--	47.0	-- / --	0.011	NO
1,1-Dichloroethene	0.50 - 0.50	0 / 2	--	--	25.0	-- / --	0.020	NO
1,2,3-Trichlorobenzene	0.50 - 0.50	0 / 2	--	--	8.00	-- / --	0.063	NO
1,2,4-Trichlorobenzene	0.50 - 0.50	0 / 2	--	--	5.40	-- / --	0.093	NO
1,2-Dibromo-3-chloropropane	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
1,2-Dichlorobenzene	0.50 - 0.50	0 / 2	--	--	0.70	-- / --	0.71	NO
1,2-Dichloroethane	0.50 - 0.50	0 / 2	--	--	100	-- / --	0.0050	NO
1,2-Dichloropropane	0.50 - 0.50	0 / 2	--	--	2,400	-- / --	2.08E-04	NO
1,3-Dichlorobenzene	0.50 - 0.50	0 / 2	--	--	28.5	-- / --	0.018	NO
1,4-Dichlorobenzene	0.50 - 0.50	0 / 2	--	--	19.9	-- / --	0.025	NO
2-Butanone	5.00 - 5.00	0 / 2	--	--	14,000	-- / --	3.57E-04	NO
2-Hexanone	5.00 - 5.00	0 / 2	--	--	99.0	-- / --	0.051	NO
4-Methyl-2-pentanone	5.00 - 5.00	0 / 2	--	--	170	-- / --	0.029	NO
Acetone	4.50 - 5.00	0 / 2	--	--	1,500	-- / --	0.0033	NO
Benzene	0.50 - 0.50	0 / 2	--	--	110	-- / --	0.0045	NO
Bromochloromethane	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Bromodichloromethane	0.50 - 0.50	1 / 2	4.20	SJS02-SW10-03D	2,700	-- / --	1.9E-04	NO
Bromoform	0.50 - 0.50	0 / 2	--	--	320	-- / --	0.0016	NO
Bromomethane	0.50 - 0.50	0 / 2	--	--	120	-- / --	0.0042	NO
Carbon disulfide	0.50 - 0.50	0 / 2	--	--	0.92	-- / --	0.54	NO
Carbon tetrachloride	0.50 - 0.50	0 / 2	--	--	13.3	-- / --	0.038	NO
Chlorobenzene	0.50 - 0.50	0 / 2	--	--	1.30	-- / --	0.38	NO
Chloroethane	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Chloroform	0.50 - 0.50	1 / 2	12.0	SJS02-SW10-03D	1.80	1 / 2	6.67	YES
Chloromethane	0.50 - 0.50	0 / 2	--	--	2,700	-- / --	1.85E-04	NO
Cyclohexane	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Dibromochloromethane	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Dichlorodifluoromethane (Freon-12)	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	0.50 - 0.50	0 / 2	--	--	25.0	-- / --	0.020	NO
Isopropylbenzene	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Methyl acetate	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Methyl-tert-butyl ether (MTBE)	0.50 - 0.50	1 / 2	0.77	SJS02-SW11-03D	11,070	0 / 2	6.96E-05	NO
Methylcyclohexane	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Methylene chloride	0.50 - 0.50	0 / 2	--	--	98.1	-- / --	0.0051	NO
Styrene	0.50 - 0.50	0 / 2	--	--	72.0	-- / --	0.0069	NO
Tetrachloroethene	0.50 - 0.50	0 / 2	--	--	45.0	-- / --	0.011	NO
Toluene	0.50 - 0.50	0 / 2	--	--	2.00	-- / --	0.25	NO
Trichloroethene	-- - --	2 / 2	140	SJS02-SW10-03D	21.0	1 / 2	6.67	YES
Trichlorofluoromethane(Freon-11)	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	-- - --	2 / 2	5.20	SJS02-SW11-03D	930	0 / 2	0.0056	NO
Xylene, total	0.50 - 0.50	0 / 2	--	--	13.0	-- / --	0.038	NO
cis-1,2-Dichloroethene	-- - --	2 / 2	31.0	SJS02-SW10-03D	970	-- / --	3.2E-02	NO
cis-1,3-Dichloropropene	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	0.50 - 0.50	0 / 2	--	--	970	-- / --	5.15E-04	NO
trans-1,3-Dichloropropene	0.50 - 0.50	0 / 2	--	--	NSV	-- / --	NSV	NO

Notes:
NSV - No screening criteria
Shaded cells represent hazard quotient based on reporting limits
[1]Screening value for chloromethane used for bromodichloromethane

Table 8-30
Screening Statistics - Expanded RI Surface Water - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COC
Volatile Organic Compounds (**µg/L**)									
Chloroform	0.50 - 0.50	1 / 2	12.0	SJS02-SW10-03D	6.13	1.80	1 / 2	3.40	YES
Trichloroethene	-- - --	2 / 2	140	SJS02-SW10-03D	76.0	21.0	1 / 2	3.62	YES

Table 8-31
Summary of Hazard Quotients for Food Web Exposures - Step 2
Site 2 Expanded Remedial Investigation Report
St Juliens Creek Annex
Chesapeake, Virginia

Chemical	NOAEL	LOAEL	MATC
American Woodcock			
Inorganics			
Lead	240.3	48.1	107.5
Zinc	1223.1	135.4	406.9
Pesticides/PCBs			
4,4'-DDE	27.8	2.8	8.8
Aroclor-1260	19.0	3.8	8.5
Belted Kingfisher			
Inorganics			
Mercury	32.6	10.9	18.8

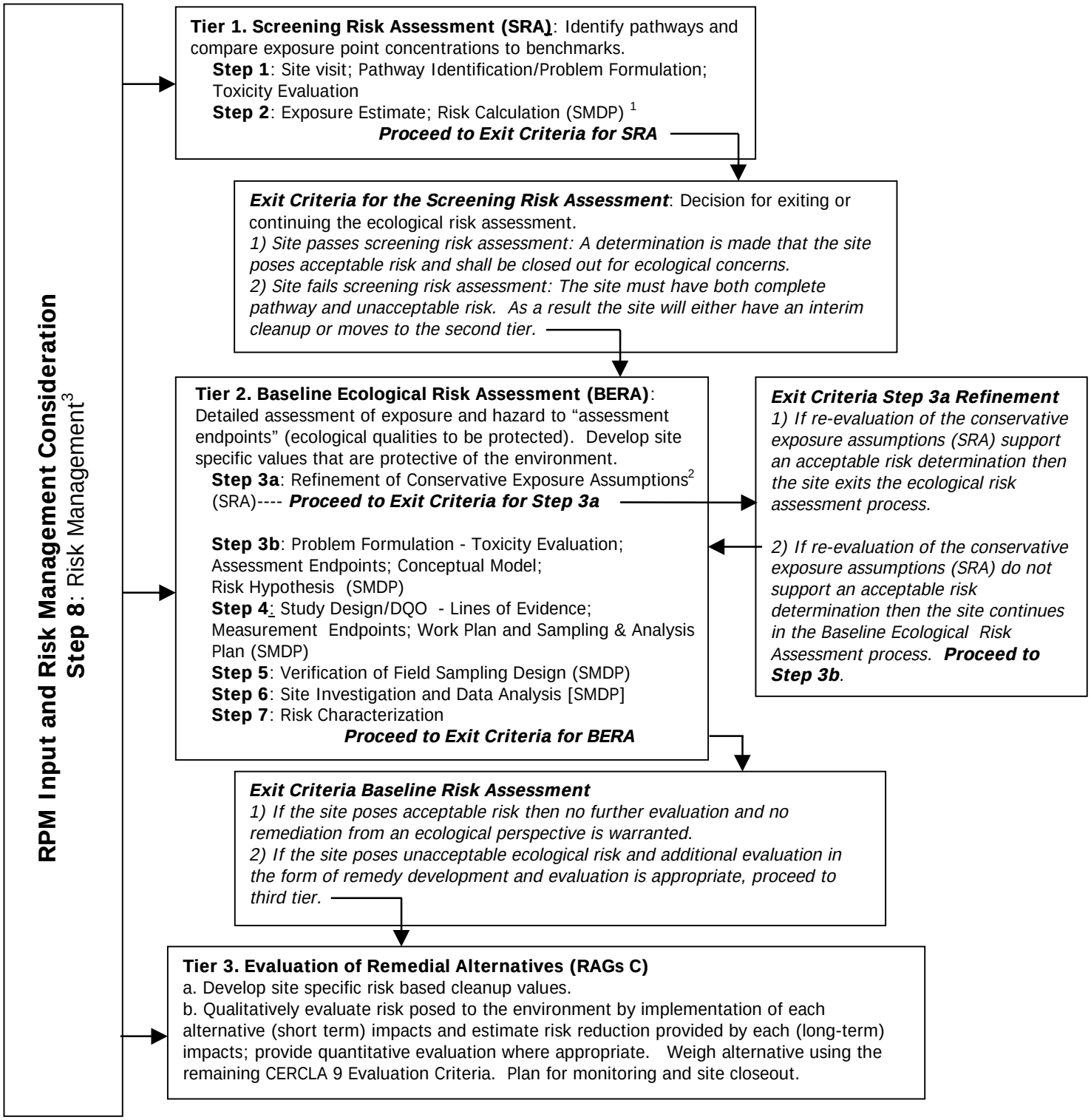
Table 8-32
Summary of Hazard Quotients for Food Web Exposures - Step 3
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	NOAEL	LOAEL	MATC
American Woodcock			
Inorganics			
Lead	5.4	1.1	2.4
Zinc	16.2	1.8	5.4
Pesticides/PCBs			
4,4'-DDE	1.5	0.2	0.5
Aroclor-1260	0.2	0.04	0.1
Belted Kingfisher			
Inorganics			
Mercury	7.1	2.4	4.1

Table 8-33
Ecological Risk Drivers
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

COPCs	Surface Water HQ>1 (Investigation)[A]	Sediment HQ>1 (Investigation)[A]	Surface Soil HQ>1
Total Inorganics			
Aluminum	X (1)		X
Arsenic		X	
Barium		X	
Cadmium	X (1)	X	
Chromium	X (1)	X	
Copper	X (1)	X	X
Cyanide	X (1)	X	
Iron	X (1)		X
Lead	X (1)	X	X
Manganese	X (1)		
Mercury		X	
Nickel	X (1)	X	
Vanadium		X	X
Zinc	X (1)	X	X
Pesticides/PCBs			
4,4'-DDD			X
4,4'-DDE			X
4,4'-DDT			X
Aroclor-1254		X	
Aroclor-1260		X	X
Chlordane		X	
Dieldrin		X	
Semi-volatile Organic Compounds			
2-Methylnaphthalene		X	
Acenaphthene		X	X
Acenaphthylene			X
Anthracene		X	X
Benzo(a)anthracene		X	X
Benzo(a)pyrene		X	X
Benzo(b)fluoranthene			X
Benzo(g,h,i)perylene		X	X
Benzo(k)fluoranthene		X	X
Chrysene		X	X
Dibenz(a,h)anthracene		X	X
Diethylphthalate		X	
Fluoranthene		X	X
Fluorene		X	X
Inde(1,2,3-cd)pyrene		X	X
Naphthalene		X	X
Phenanthrene		X	X
Pyrene		X	X
Volatile Organic Compounds			
1,1-Dichloroethene		X (3)	
Carbon disulfide	X (1)	X	
Chloroform	X (2)		
Trichloroethene	X (2)	X (3)	
cis-1,2-Dichloroethene		X (3)	
Vinyl chloride		X	

Figure 1.1. Navy Ecological Risk Assessment Tiered Approach



Notes: 1) See EPA's 8 Step ERA Process for requirements for each Scientific Management Decision Point (SMDP).
2) Refinement includes but is not limited to background, bioavailability, detection frequency, etc.
3) Risk Management is incorporated throughout the tiered approach.

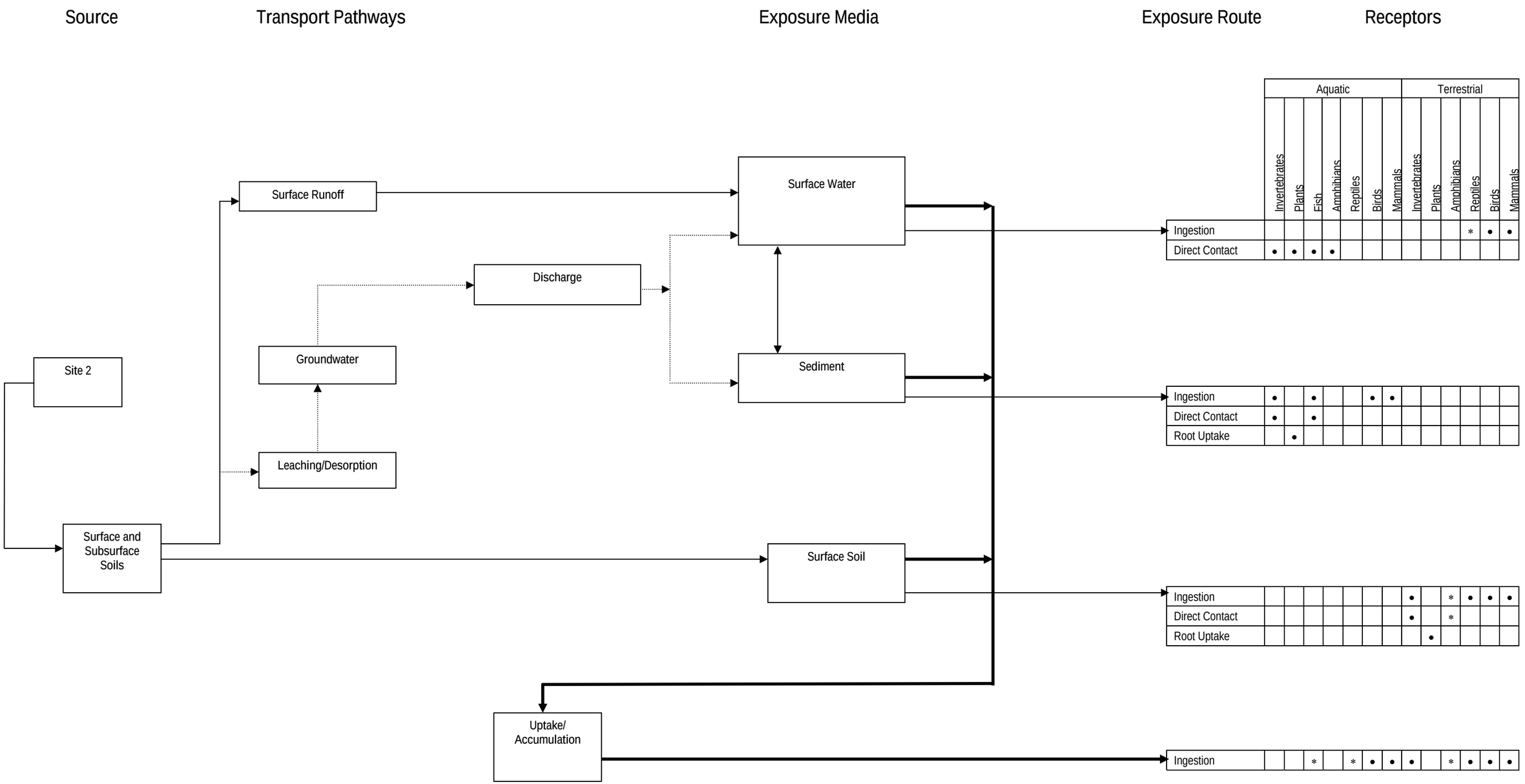


FIGURE 8-2
ERA Conceptual Model
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex, Chesapeake, Virginia

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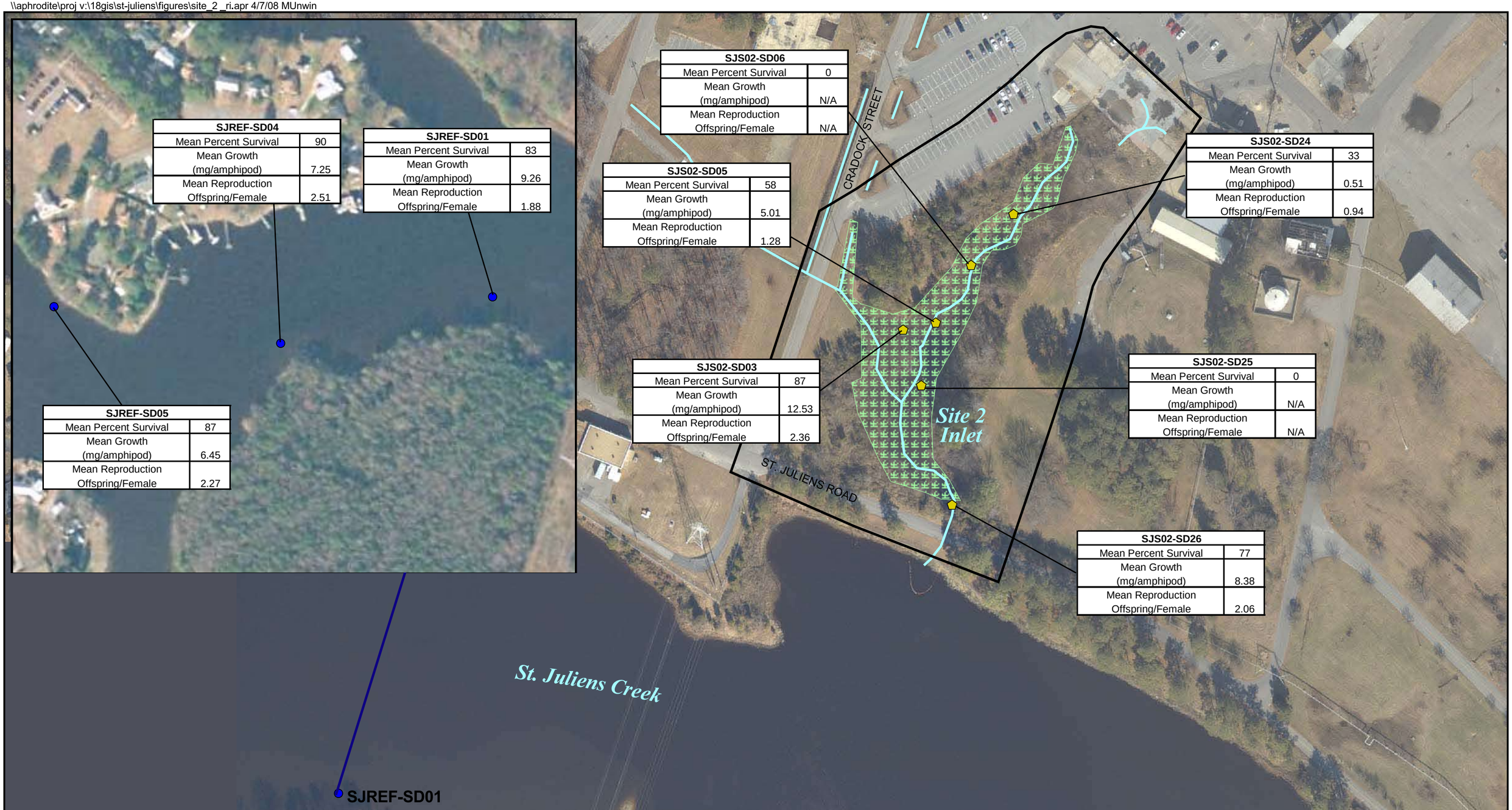

LEGEND
- Site Boundary
- Wetland
- Drainage
- Site 2 Inlet Sediment Sample Locations
- Reference Sediment Sample Locations

Notes:
Results are based on survival growth and reproduction of *Leptocheirus plumulosus*.
NA - Not applicable due to no survival rate

N

0 125 250 Feet

Figure 8-3
Sediment Bioassay Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 9

Risk Management Considerations

The constituents identified that pose potential unacceptable risk to human health and the environment are presented in Sections 7 and 8, respectively. Based on a review of the results, risk management considerations are presented herein to focus future remedial activities on COCs that are site-related, and eliminate those COCs identified that are not site-related or pose minimal risk.

9.1 Human Health Risk

The constituents that pose potential unacceptable risk to human receptors and/or exceed the MCLs for site media are shown on **Table 9-1**. Several of these constituents are not considered to be site-related or pose minimal risk. Therefore, the following presents some general lines of evidence and the rationale for risk management for each of those constituents in shallow groundwater:

- **2,6-Dinitrotoluene –** The RME non-cancer HI of 1.3 was slightly above USEPA's target HI of 1 for ingestion by a future child resident. However, the CTE non-cancer hazard was below 1. Additionally, 2,6-Dinitrotoluene was only detected at one well (20 µg/L at MW10S). Due to the mobile nature of explosives, and the fact that it was only detected at one location, this constituent is most likely naturally attenuating, which is limiting its migration.

- **Arsenic –** The RME non-cancer HI of 2.3 was above USEPA's target HI of 1 for ingestion by a future child resident. The RME cancer risk (2.4×10^{-4}) to the future lifetime resident was slightly above USEPA's target cancer risk range (10^{-4} to 10^{-6}) for ingestion. However, the CTE non-cancer hazard was below 1 and the cancer risk was within the target cancer risk range.

  Arsenic was only detected above the MCL (10 µg/L) and background UTL (8 µg/L total and 2.4 µg/L dissolved) at one well, SJS02-MW09S (31 µg/L total and 28.8 µg/L dissolved), which is located adjacent to the identified petroleum impacted area. Most likely, degradation of petroleum compounds has resulted in reducing conditions in this area, as indicated by the low DO and relatively low ORP (below 0 mV) or E_H (below 150 mV). These reducing conditions may have increased the mobility of naturally occurring arsenic, resulting in elevated arsenic concentrations at SJS02-MW09S.

- **Iron –** The RME non-cancer HIs of 2.7 and 6.3 for ingestion by adult and child residents, respectively, and the CTE non-cancer HI of 1.4 for child residents were above USEPA's target HI of 1. However, total and dissolved iron concentrations only exceeded the background UTLs (107,000 µg/L total and 94,000 µg/L dissolved) at one well (SJS02-MW02S) (maximum total 377,000 J µg/L and dissolved 367,000 µg/L).

- **Lead –** Although total and dissolved lead concentrations were sporadically above both the action level (15 µg/L) and background UTL (3.5 µg/L total and 2.1 µg/L dissolved)

at MW02S and MW03S, the average total lead concentration (5.2 µg/L) across the site was below the action level and no human health risks were identified.

- **Manganese –** The RME non-cancer HIs of 1.2 for ingestion by adult residents and 2.9 for ingestion by child residents and the CTE non-cancer HI of 1.5 for ingestion by child residents, were above USEPA's target HI of 1. However, all total and dissolved manganese concentrations (ranging from 121 to 2,550 µg/L) were significantly below the background UTLs (13,700 µg/L total and 11,800 µg/L dissolved).
- **Thallium –** Thallium was reported above its MCL (2 µg/L) in only two monitoring wells, SJS02-MW02S (6.9 J µg/L total and 9.6 J µg/L dissolved) and SJS02-MW06S (2.3 J µg/L dissolved). It was detected below the MCL in a subsequent sample at SJS02-MW02S and only the dissolved thallium concentration from SJS02-MW02S exceeded the background UTL (7.9 µg/L). Additionally, no human health risks were identified.

9.2 Ecological Risk

The constituents that pose potential unacceptable risk to ecological receptors for site media are shown on **Table 8-33**. Several of these constituents are not considered to be site-related or pose minimal risks. Therefore, the following presents some general lines of evidence and the rationale for risk management for each of those constituents in sediment and surface water.

9.2.1 Sediment

- **Carbon disulfide** – Carbon disulfide was detected above the ecological screening value (0.85 µg/kg) at SJS02-SD02, SD21, SD22, and SD23 at concentrations ranging from 15 to 81 µg/kg. Carbon disulfide is released into the environment from a wide variety of natural sources. Soil, marshes, and coastal regions tend to be the largest biogenic sources. Production of carbon disulfide from soil and plants occurs naturally from the metabolic action of soil bacteria and plants during the growing season. Worldwide, at least 40 percent and possibly as much as 80 percent of releases are a result of natural or biogenic activity. Carbon disulfide is rapidly metabolized by organisms and does not bioconcentrate or biomagnify (Staubes et al., 1987).
- **Arsenic –** The mean HQ for the site (1.19) was only slightly above the acceptable HQ value of 1 and arsenic was not detected at a concentration above the established background UTL (30.4 µg/kg).
- **Mercury** – Mercury concentrations were all reported below the established background UTL (1.4 mg/kg) and are consistent with values detected in many urbanized soil and sediment (Eisler, 1987). Therefore, mercury does not appear to be site-related.
- **Vanadium –** The mean HQ (1.01) is at the HQ of 1, and therefore does not pose risk.

9.2.2 Surface Water

Carbon disulfide – Carbon disulfide is released into the environment from a wide variety of natural sources. Soil, marshes, and coastal regions tend to be the largest biogenic sources. Production of carbon disulfide from soil and plants occurs naturally from the metabolic

action of soil bacteria and plants during the growing season. Worldwide, at least 40 percent and possibly as much as 80 percent of releases are a result of natural or biogenic activity. Carbon disulfide is rapidly metabolized by organisms and does not bioconcentrate or biomagnify (Staubes et al., 1987). Therefore, carbon disulfide does not appear to be site-related.

Table 9-1
Summary of HHRA Constituents of Concern
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

COCs	Surface Soil	Combined Soil	Shallow Groundwater	Sediment
Volatile Organic Compounds				
1,1,2-Trichloroethane			X	
1,1-Dichloroethene			X	
Chloroform			X	
Methylene chloride			X	
Tetrachloroethene			X	
Trichloroethene		X	X	
cis-1,2-Dichloroethene		X	X	
trans-1,2-Dichloroethene			X	
Vinyl chloride		X	X	
Semivolatile Organic Compounds				
Naphthalene			X	
Pesticides/PCBs				
Heptachlor epoxide			X	
Explosives				
2,6-Dinitrotoluene			X	
Inorganics				
Arsenic			X	
Antimony		X		
Chromium				X
Iron		X	X	
Lead	X	X	X	
Manganese			X	
Thallium			X	
Vanadium	X	X		

SECTION 10

Conclusions and Recommendations

The Expanded RI has sufficiently defined the nature and extent of contamination and potential risks to human health and ecological risk at Site 2. The results will be used to finalize RAOs and develop and evaluate remedial alternatives in the FS. Based on the results of the risk assessments presented in Sections 7 and 8, as well as the risk management considerations presented in Section 9, the following potential risks and recommendations have been identified for each media.

10.1 Soil and Waste

The risk drivers identified in soil are listed below:

- Current/future adolescent trespasser, future child resident, and future industrial worker - dermal contact with vanadium
- Future child resident – ingestion of antimony, iron, and vanadium
- Current/future adolescent and adult trespasser, current/future landscaper, current/ future construction worker, future industrial worker, and future child and adult resident - exposure to lead
- Future construction worker, future industrial worker, and future resident - exposure to TCE, cis-1,2-DCE and VC in saturated subsurface soil
- Plants and soil invertebrates - exposure to six inorganics, 16 PAHs, four pesticides, and one PCB
- Avian vermivores - exposure to lead, zinc, and 4,4-DDE

Risk drivers identified above risk-based screening criteria and background are shown on **Figure 10-1**.

In addition, based on the nature of waste materials, the waste has not been fully characterized and is assumed to pose a potential risk to human health and the environment.

Based on the presence of these risks, a FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable human health and ecological risks in soil and waste at Site 2.

10.2 Shallow Groundwater

The risk drivers identified in shallow groundwater are listed below:

- Current/future construction worker – dermal contact with TCE and VC
- Future industrial worker – ingestion of TCE, cis-1,2-DCE, and VC

- Future resident – ingestion of nine VOCs (1,1,2-TCA, 1,1-DCE, cis-1,2-DCE, chloroform, methylene chloride, trans-1,2-DCE, PCE, TCE, and VC), one SVOC (naphthalene), and one pesticide (heptachlor epoxide); dermal contact with three VOCs (TCE, VC, cis-1,2-DCE) and one SVOC (naphthalene); and inhalation (showering) of TCE, VC, and trans-1,2-DCE

Risk drivers identified above risk-based screening criteria are shown on **Figure 10-2**.

Based on these risks and MCL exceedances, a FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable human health risks in shallow groundwater at Site 2. Although arsenic was identified as a potential risk driver, it is not attributed to a CERCLA release and the remedial alternatives do not need to address it; however, the evaluation of remedies should take into consideration the potential for mobilizing naturally occurring arsenic.

10.3 Deep Groundwater

No unacceptable risks have been identified in deep groundwater; therefore, no further action is recommended.

10.4 Sediment

The risk drivers identified in sediment are listed below:

- Future resident – dermal contact with chromium
- Aquatic organisms – 16 PAHs and eight inorganics

Risk drivers identified above risk-based screening criteria and background are shown on **Figure 10-3**.

A FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable human health and ecological risks in sediment at Site 2 and at the outfall to St. Juliens Creek.

10.5 Surface Water

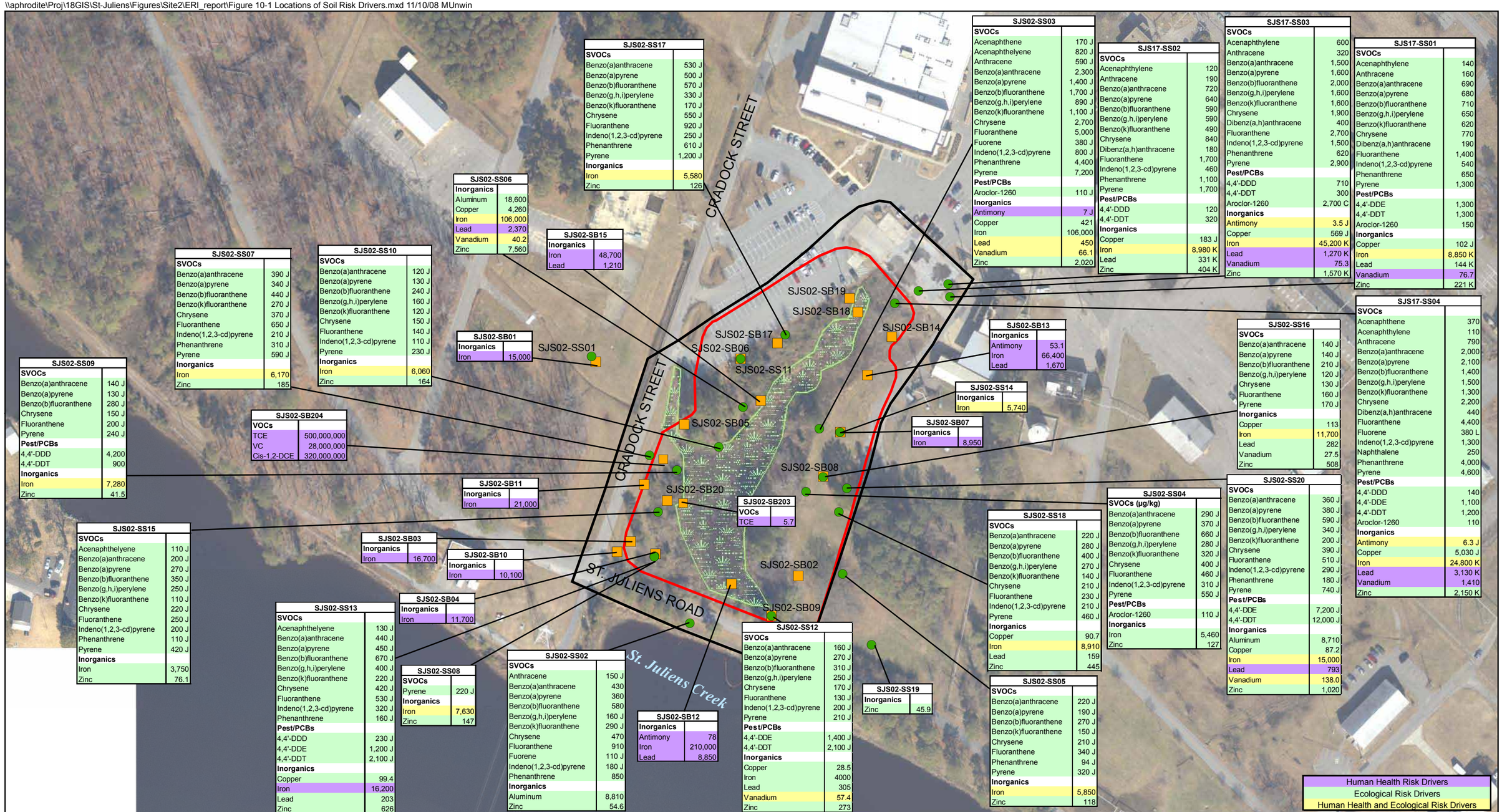
The risk drivers identified in surface water are listed below:

- Aquatic organisms – three VOCs and ten inorganics

Risk drivers identified above risk-based screening criteria are shown on **Figure 10-4**.

A FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable ecological risks in surface water at Site 2.

\\aphrodite\Proj\18GIS\St-Juliens\Figures\Site2\ERI_report\Figure 10-1 Locations of Soil Risk Drivers.mxd 11/10/08 MUnwin



SJS02-SS17	
SVOCs	
Benzo(a)anthracene	530 J
Benzo(a)pyrene	500 J
Benzo(b)fluoranthene	570 J
Benzo(g,h,i)perylene	330 J
Benzo(k)fluoranthene	170 J
Chrysene	550 J
Fluoranthene	920 J
Indeno(1,2,3-cd)pyrene	250 J
Phenanthrene	610 J
Pyrene	1,200 J
Inorganics	
Iron	5,580
Zinc	126

SJS02-SS06	
Inorganics	
Aluminum	18,600
Copper	4,260
Iron	106,000
Lead	2,370
Vanadium	40.2
Zinc	7,560

SJS02-SB15	
Inorganics	
Iron	48,700
Lead	1,210

SJS02-SS07	
SVOCs	
Benzo(a)anthracene	390 J
Benzo(a)pyrene	340 J
Benzo(b)fluoranthene	440 J
Benzo(k)fluoranthene	270 J
Chrysene	370 J
Fluoranthene	650 J
Indeno(1,2,3-cd)pyrene	210 J
Phenanthrene	310 J
Pyrene	590 J
Inorganics	
Iron	6,170
Zinc	185

SJS02-SS10	
SVOCs	
Benzo(a)anthracene	120 J
Benzo(a)pyrene	130 J
Benzo(b)fluoranthene	240 J
Benzo(g,h,i)perylene	160 J
Benzo(k)fluoranthene	120 J
Chrysene	150 J
Fluoranthene	140 J
Indeno(1,2,3-cd)pyrene	110 J
Pyrene	230 J
Inorganics	
Iron	6,060
Zinc	164

SJS02-SB01	
Inorganics	
Iron	15,000

SJS02-SS09	
SVOCs	
Benzo(a)anthracene	140 J
Benzo(a)pyrene	130 J
Benzo(b)fluoranthene	280 J
Chrysene	150 J
Fluoranthene	200 J
Pyrene	240 J
Pest/PCBs	
4,4'-DDD	4,200
4,4'-DDT	900
Inorganics	
Iron	7,280
Zinc	41.5

SJS02-SB204	
VOCs	
TCE	500,000,000
VC	28,000,000
Cis-1,2-DCE	320,000,000

SJS02-SB11	
Inorganics	
Iron	21,000

SJS02-SS15	
SVOCs	
Acenaphthelyene	110 J
Benzo(a)anthracene	200 J
Benzo(a)pyrene	270 J
Benzo(b)fluoranthene	350 J
Benzo(g,h,i)perylene	250 J
Benzo(k)fluoranthene	110 J
Chrysene	220 J
Fluoranthene	250 J
Indeno(1,2,3-cd)pyrene	200 J
Phenanthrene	110 J
Pyrene	420 J
Inorganics	
Iron	3,750
Zinc	76.1

SJS02-SB03	
Inorganics	
Iron	16,700

SJS02-SB10	
Inorganics	
Iron	10,100

SJS02-SB04	
Inorganics	
Iron	11,700

SJS02-SS13	
SVOCs	
Acenaphthelyene	130 J
Benzo(a)anthracene	440 J
Benzo(a)pyrene	450 J
Benzo(b)fluoranthene	670 J
Benzo(g,h,i)perylene	400 J
Benzo(k)fluoranthene	220 J
Chrysene	420 J
Fluoranthene	530 J
Indeno(1,2,3-cd)pyrene	320 J
Phenanthrene	160 J
Pest/PCBs	
4,4'-DDD	230 J
4,4'-DDE	1,200 J
4,4'-DDT	2,100 J
Inorganics	
Copper	99.4
Iron	16,200
Lead	203
Zinc	626

SJS02-SS08	
SVOCs	
Pyrene	220 J
Inorganics	
Iron	7,630
Zinc	147

SJS02-SS02	
SVOCs	
Anthracene	150 J
Benzo(a)anthracene	430
Benzo(a)pyrene	360
Benzo(b)fluoranthene	580
Benzo(g,h,i)perylene	160 J
Benzo(k)fluoranthene	290 J
Chrysene	470
Fluoranthene	910
Fuorene	110 J
Indeno(1,2,3-cd)pyrene	180 J
Phenanthrene	850
Inorganics	
Aluminum	8,810
Zinc	54.6

SJS02-SB12	
Inorganics	
Antimony	78
Iron	210,000
Lead	8,850

SJS02-SS12	
SVOCs	
Benzo(a)anthracene	160 J
Benzo(a)pyrene	270 J
Benzo(b)fluoranthene	310 J
Benzo(g,h,i)perylene	250 J
Chrysene	170 J
Fluoranthene	130 J
Indeno(1,2,3-cd)pyrene	200 J
Pyrene	210 J
Pest/PCBs	
4,4'-DDE	1,400 J
4,4'-DDT	2,100 J
Inorganics	
Copper	28.5
Iron	4000
Lead	305
Vanadium	57.4
Zinc	273

SJS02-SS19	
Inorganics	
Zinc	45.9

SJS02-SS03	
SVOCs	
Acenaphthene	170 J
Acenaphthelyene	820 J
Anthracene	590 J
Benzo(a)anthracene	2,300
Benzo(a)pyrene	1,400 J
Benzo(b)fluoranthene	1,700 J
Benzo(g,h,i)perylene	890 J
Benzo(k)fluoranthene	1,100 J
Chrysene	2,700
Fluoranthene	5,000
Fuorene	380 J
Indeno(1,2,3-cd)pyrene	800 J
Phenanthrene	4,400
Pyrene	7,200
Pest/PCBs	
Aroclor-1260	110 J
Inorganics	
Antimony	7 J
Copper	421
Iron	106,000
Lead	450
Vanadium	66.1
Zinc	2,020

SJS17-SS02	
SVOCs	
Acenaphthylene	120
Anthracene	190
Benzo(a)anthracene	720
Benzo(a)pyrene	640
Benzo(b)fluoranthene	590
Benzo(g,h,i)perylene	590
Benzo(k)fluoranthene	490
Chrysene	840
Dibenz(a,h)anthracene	180
Fluoranthene	1,700
Indeno(1,2,3-cd)pyrene	460
Phenanthrene	1,100
Pyrene	1,700
Pest/PCBs	
4,4'-DDD	120
4,4'-DDT	320
Inorganics	
Copper	183 J
Iron	8,980 K
Lead	331 K
Zinc	404 K

SJS17-SS03	
SVOCs	
Acenaphthylene	600
Anthracene	320
Benzo(a)anthracene	1,500
Benzo(a)pyrene	1,600
Benzo(b)fluoranthene	2,000
Benzo(g,h,i)perylene	1,600
Benzo(k)fluoranthene	1,600
Chrysene	1,900
Dibenz(a,h)anthracene	400
Fluoranthene	2,700
Indeno(1,2,3-cd)pyrene	1,500
Phenanthrene	620
Pyrene	2,900
Pest/PCBs	
4,4'-DDD	710
4,4'-DDT	300
Aroclor-1260	2,700 C
Inorganics	
Antimony	3.5 J
Copper	569 J
Iron	45,200 K
Lead	1,270 K
Vanadium	75.3
Zinc	1,570 K

SJS17-SS01	
SVOCs	
Acenaphthylene	140
Anthracene	160
Benzo(a)anthracene	690
Benzo(a)pyrene	680
Benzo(b)fluoranthene	710
Benzo(g,h,i)perylene	650
Benzo(k)fluoranthene	620
Chrysene	770
Dibenz(a,h)anthracene	190
Fluoranthene	1,400
Indeno(1,2,3-cd)pyrene	540
Phenanthrene	650
Pyrene	1,300
Pest/PCBs	
4,4'-DDE	1,300
4,4'-DDT	1,300
Aroclor-1260	150
Inorganics	
Copper	102 J
Iron	8,850 K
Lead	144 K
Vanadium	76.7
Zinc	221 K

SJS02-SB13	
Inorganics	
Antimony	53.1
Iron	66,400
Lead	1,670

SJS02-SS14	
Inorganics	
Iron	5,740

SJS02-SB07	
Inorganics	
Iron	8,950

SJS02-SB203	
VOCs	
TCE	5.7

SJS02-SS18	
SVOCs	
Benzo(a)anthracene	220 J
Benzo(a)pyrene	280 J
Benzo(b)fluoranthene	400 J
Benzo(g,h,i)perylene	270 J
Benzo(k)fluoranthene	140 J
Chrysene	210 J
Fluoranthene	230 J
Indeno(1,2,3-cd)pyrene	210 J
Pyrene	460 J
Inorganics	
Copper	90.7
Iron	8,910
Lead	159
Zinc	445

SJS02-SS05	
SVOCs	
Benzo(a)anthracene	220 J
Benzo(a)pyrene	190 J
Benzo(b)fluoranthene	270 J
Benzo(k)fluoranthene	150 J
Chrysene	210 J
Fluoranthene	340 J
Phenanthrene	94 J
Pyrene	320 J
Inorganics	
Iron	5,850
Zinc	118

SJS02-SS04	
SVOCs (µg/kg)	
Benzo(a)anthracene	290 J
Benzo(a)pyrene	370 J
Benzo(b)fluoranthene	660 J
Benzo(g,h,i)perylene	280 J
Benzo(k)fluoranthene	320 J
Chrysene	400 J
Fluoranthene	460 J
Indeno(1,2,3-cd)pyrene	310 J
Pyrene	550 J
Pest/PCBs	
Aroclor-1260	110 J
Inorganics	
Iron	5,460
Zinc	127

SJS02-SS16	
SVOCs	
Benzo(a)anthracene	140 J
Benzo(a)pyrene	140 J
Benzo(b)fluoranthene	210 J
Benzo(g,h,i)perylene	120 J
Chrysene	130 J
Fluoranthene	160 J
Pyrene	170 J
Inorganics	
Copper	113
Iron	11,700
Lead	282
Vanadium	27.5
Zinc	508

SJS02-SS20	
SVOCs	
Benzo(a)anthracene	360 J
Benzo(a)pyrene	380 J
Benzo(b)fluoranthene	590 J
Benzo(g,h,i)perylene	340 J
Benzo(k)fluoranthene	200 J
Chrysene	390 J
Fluoranthene	510 J
Indeno(1,2,3-cd)pyrene	290 J
Phenanthrene	180 J
Pyrene	740 J
Pest/PCBs	
4,4'-DDE	7,200 J
4,4'-DDT	12,000 J
Inorganics	
Aluminum	8,710
Copper	87.2
Iron	15,000
Lead	793
Vanadium	138.0
Zinc	1,020

SJS17-SS04	
SVOCs	
Acenaphthene	370
Acenaphthylene	110
Anthracene	790
Benzo(a)anthracene	2,000
Benzo(a)pyrene	2,100
Benzo(b)fluoranthene	1,400
Benzo(g,h,i)perylene	1,500
Benzo(k)fluoranthene	1,300
Chrysene	2,200
Dibenz(a,h)anthracene	440
Fluoranthene	4,400
Fluorene	380 L
Indeno(1,2,3-cd)pyrene	1,300
Naphthalene	250
Phenanthrene	4,000
Pyrene	4,600
Pest/PCBs	
4,4'-DDD	140
4,4'-DDE	1,100
4,4'-DDT	1,200
Aroclor-1260	110
Inorganics	
Antimony	6.3 J
Copper	5,030 J
Iron	24,800 K
Lead	3,130 K
Vanadium	1,410
Zinc	2,150 K

Legend

- Site 2 Boundary
- Wetland
- Extent of Waste (3.9 acres)
- Surface Soil Sample Locations
- Subsurface Soil Sample Locations

Notes:
C - Presence confirmed by GC/MS
J - Reported value is estimated
K - Reported value may be biased high
Concentrations reported in µg/kg except inorganics which are reported in mg/kg.
This figure shows human health and ecological COC risk drivers that exceed background UTLs.
Sample Locations without text boxes have no COC risk drivers.

N

0 150 300 Feet

Figure 10-1
Risk Drivers in Soil
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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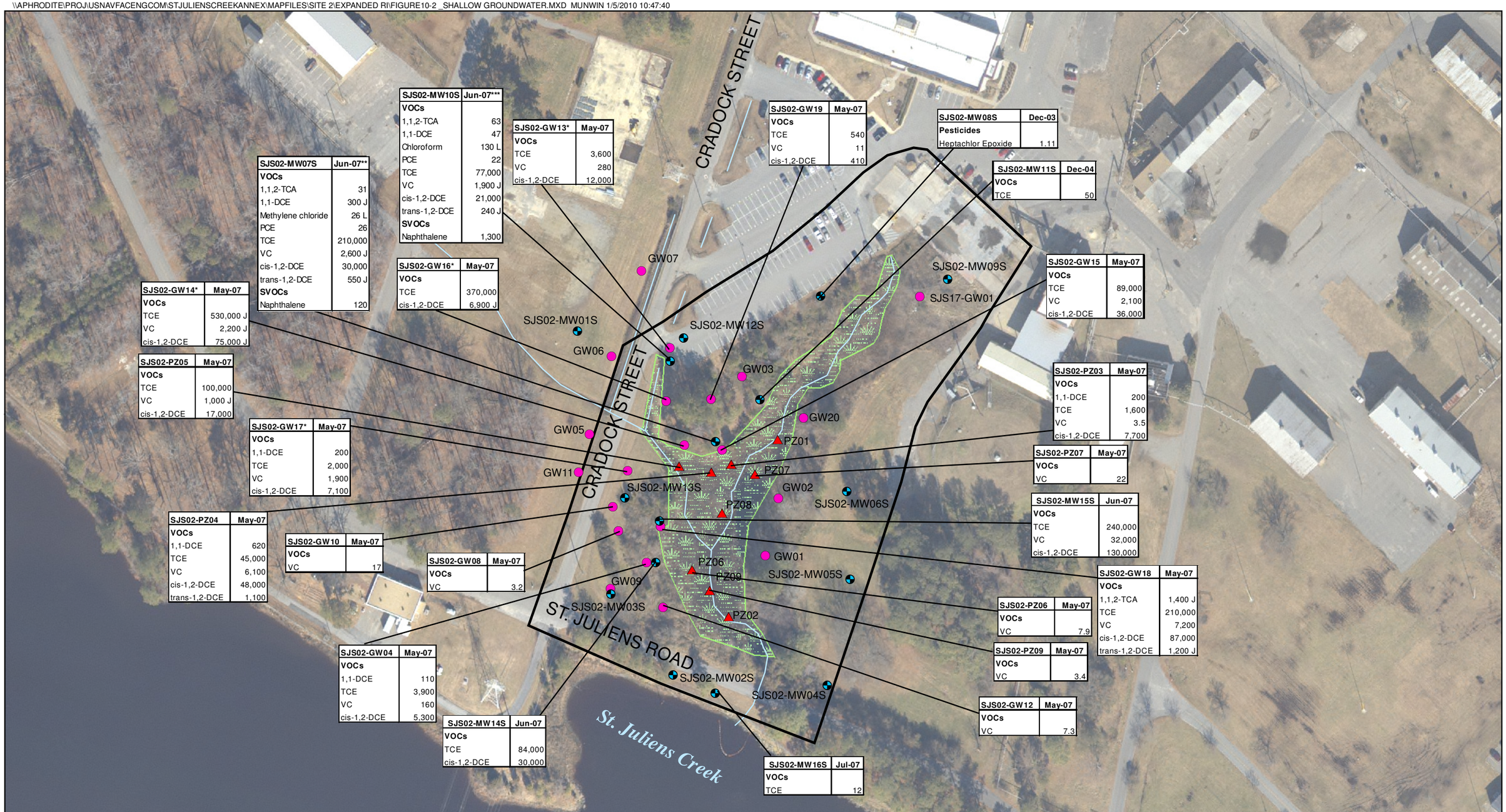
\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\SITE 2\EXPANDED RI\FIGURE10-2 _SHALLOW GROUNDWATER.MXD MUNWIN 1/5/2010 10:47:40



Legend

- Site 2 Boundary
- Drainage
- Wetland
- Shallow Monitoring Well Locations
- Groundwater Sampling Locations
- Piezometer Sampling Locations
- Estimated Groundwater Flow Direction

Notes:
J - Reported value is estimated
DCE - Dichloroethene
PCE - Tetrachloroethene
TCA - Trichloroethane
TCE - Trichloroethene
VC - Vinyl chloride

Concentrations reported in µg/kg
* Highest concentrations for each COC shown for sample locations with multiple depth intervals
Concentrations shown are the most recent risk-driving results, with the following exceptions to the date indicated:
** SJS02-MW07S - methylene chloride, Dec-04
***SJS02-MW10S - chloroform, Dec-04
Sample Locations without text boxes have no COC risk drivers

N

0 120 240 Feet

Figure 10-2
Risk Drivers in Shallow Groundwater
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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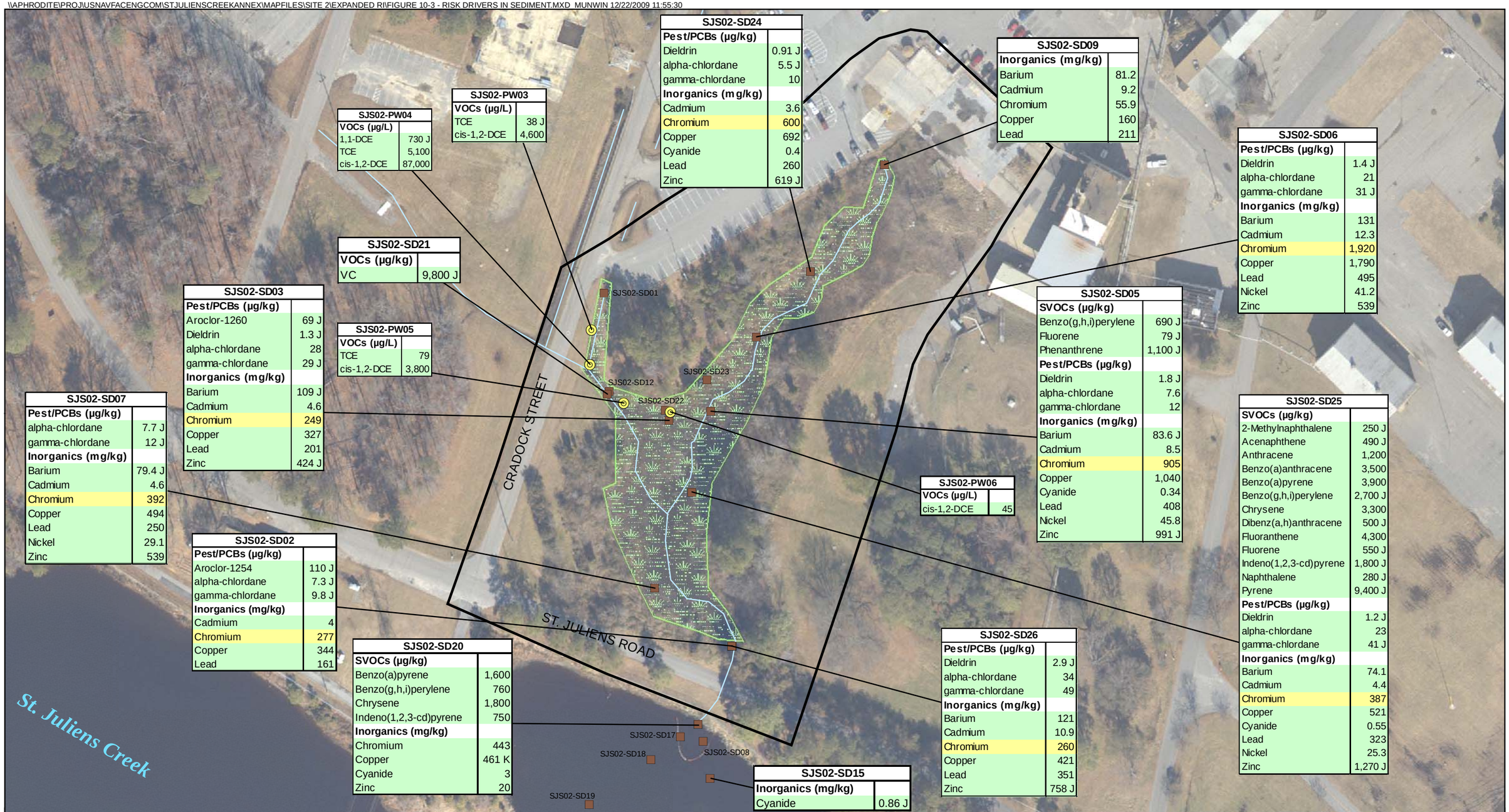
\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\SITE 2\EXPANDED RI\FIGURE 10-3 - RISK DRIVERS IN SEDIMENT.MXD MUNWIN 12/22/2009 11:55:30



SJS02-SD24	
Pest/PCBs (µg/kg)	
Dieldrin	0.91 J
alpha-chlordane	5.5 J
gamma-chlordane	10
Inorganics (mg/kg)	
Cadmium	3.6
Chromium	600
Copper	692
Cyanide	0.4
Lead	260
Zinc	619 J

SJS02-SD09	
Inorganics (mg/kg)	
Barium	81.2
Cadmium	9.2
Chromium	55.9
Copper	160
Lead	211

SJS02-PW03	
VOCs (µg/L)	
TCE	38 J
cis-1,2-DCE	4,600

SJS02-PW04	
VOCs (µg/L)	
1,1-DCE	730 J
TCE	5,100
cis-1,2-DCE	87,000

SJS02-SD06	
Pest/PCBs (µg/kg)	
Dieldrin	1.4 J
alpha-chlordane	21
gamma-chlordane	31 J
Inorganics (mg/kg)	
Barium	131
Cadmium	12.3
Chromium	1,920
Copper	1,790
Lead	495
Nickel	41.2
Zinc	539

SJS02-SD21	
VOCs (µg/kg)	
VC	9,800 J

SJS02-SD03	
Pest/PCBs (µg/kg)	
Aroclor-1260	69 J
Dieldrin	1.3 J
alpha-chlordane	28
gamma-chlordane	29 J
Inorganics (mg/kg)	
Barium	109 J
Cadmium	4.6
Chromium	249
Copper	327
Lead	201
Zinc	424 J

SJS02-PW05	
VOCs (µg/L)	
TCE	79
cis-1,2-DCE	3,800

SJS02-SD05	
SVOCs (µg/kg)	
Benzo(g,h,i)perylene	690 J
Fluorene	79 J
Phenanthrene	1,100 J
Pest/PCBs (µg/kg)	
Dieldrin	1.8 J
alpha-chlordane	7.6
gamma-chlordane	12
Inorganics (mg/kg)	
Barium	83.6 J
Cadmium	8.5
Chromium	905
Copper	1,040
Cyanide	0.34
Lead	408
Nickel	45.8
Zinc	991 J

SJS02-SD07	
Pest/PCBs (µg/kg)	
alpha-chlordane	7.7 J
gamma-chlordane	12 J
Inorganics (mg/kg)	
Barium	79.4 J
Cadmium	4.6
Chromium	392
Copper	494
Lead	250
Nickel	29.1
Zinc	539

SJS02-PW06	
VOCs (µg/L)	
cis-1,2-DCE	45

SJS02-SD25	
SVOCs (µg/kg)	
2-Methylnaphthalene	250 J
Acenaphthene	490 J
Anthracene	1,200
Benzo(a)anthracene	3,500
Benzo(a)pyrene	3,900
Benzo(g,h,i)perylene	2,700 J
Chrysene	3,300
Dibenz(a,h)anthracene	500 J
Fluoranthene	4,300
Fluorene	550 J
Indeno(1,2,3-cd)pyrene	1,800 J
Naphthalene	280 J
Pyrene	9,400 J
Pest/PCBs (µg/kg)	
Dieldrin	1.2 J
alpha-chlordane	23
gamma-chlordane	41 J
Inorganics (mg/kg)	
Barium	74.1
Cadmium	4.4
Chromium	387
Copper	521
Cyanide	0.55
Lead	323
Nickel	25.3
Zinc	1,270 J

SJS02-SD02	
Pest/PCBs (µg/kg)	
Aroclor-1254	110 J
alpha-chlordane	7.3 J
gamma-chlordane	9.8 J
Inorganics (mg/kg)	
Cadmium	4
Chromium	277
Copper	344
Lead	161

SJS02-SD20	
SVOCs (µg/kg)	
Benzo(a)pyrene	1,600
Benzo(g,h,i)perylene	760
Chrysene	1,800
Indeno(1,2,3-cd)pyrene	750
Inorganics (mg/kg)	
Chromium	443
Copper	461 K
Cyanide	3
Zinc	20

SJS02-SD26	
Pest/PCBs (µg/kg)	
Dieldrin	2.9 J
alpha-chlordane	34
gamma-chlordane	49
Inorganics (mg/kg)	
Barium	121
Cadmium	10.9
Chromium	260
Copper	421
Lead	351
Zinc	758 J

SJS02-SD15	
Inorganics (mg/kg)	
Cyanide	0.86 J

Legend
- Site Boundary
- Wetland
- Drainage
- Sediment Sample Locations
- Pore Water Sample Locations

Notes:
J - Reported value is estimated
K - Reported Value is biased high
L - Reported value may be biased low
DCE - Dichloroethene
TCE - Trichloriethene
VC - Vinyl Chloride
This figure shows human health and ecological COC risk drivers that exceed sediment background UTLs.
Concentrations shown are the most recent results, unless the detection limit was above the screening values and a previous result was available.

Ecological Risk Drivers
Human Health and Ecological Risk Drivers

N

0 100 200 Feet

Figure 10-3
Risk Drivers in Sediment
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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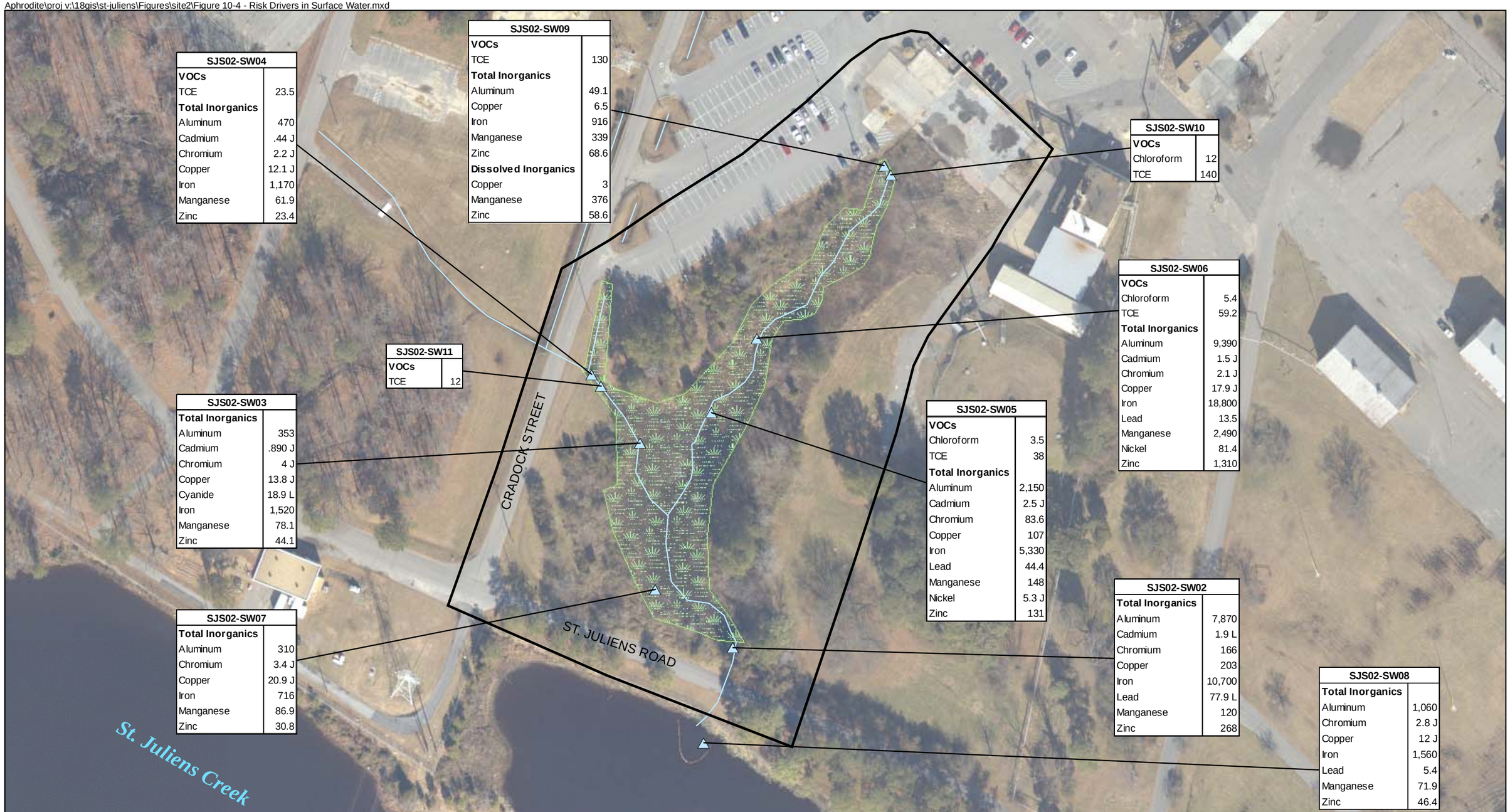
Aphrodite\proj v:\18gis\st-juliens\Figures\site2\Figure 10-4 - Risk Drivers in Surface Water.mxd



SJS02-SW04	
VOCs	
TCE	23.5
Total Inorganics	
Aluminum	470
Cadmium	.44 J
Chromium	2.2 J
Copper	12.1 J
Iron	1,170
Manganese	61.9
Zinc	23.4

SJS02-SW09	
VOCs	
TCE	130
Total Inorganics	
Aluminum	49.1
Copper	6.5
Iron	916
Manganese	339
Zinc	68.6
Dissolved Inorganics	
Copper	3
Manganese	376
Zinc	58.6

SJS02-SW10	
VOCs	
Chloroform	12
TCE	140

SJS02-SW06	
VOCs	
Chloroform	5.4
TCE	59.2
Total Inorganics	
Aluminum	9,390
Cadmium	1.5 J
Chromium	2.1 J
Copper	17.9 J
Iron	18,800
Lead	13.5
Manganese	2,490
Nickel	81.4
Zinc	1,310

SJS02-SW11	
VOCs	
TCE	12

SJS02-SW03	
Total Inorganics	
Aluminum	353
Cadmium	.890 J
Chromium	4 J
Copper	13.8 J
Cyanide	18.9 L
Iron	1,520
Manganese	78.1
Zinc	44.1

SJS02-SW05	
VOCs	
Chloroform	3.5
TCE	38
Total Inorganics	
Aluminum	2,150
Cadmium	2.5 J
Chromium	83.6
Copper	107
Iron	5,330
Lead	44.4
Manganese	148
Nickel	5.3 J
Zinc	131

SJS02-SW02	
Total Inorganics	
Aluminum	7,870
Cadmium	1.9 L
Chromium	166
Copper	203
Iron	10,700
Lead	77.9 L
Manganese	120
Zinc	268

SJS02-SW07	
Total Inorganics	
Aluminum	310
Chromium	3.4 J
Copper	20.9 J
Iron	716
Manganese	86.9
Zinc	30.8

SJS02-SW08	
Total Inorganics	
Aluminum	1,060
Chromium	2.8 J
Copper	12 J
Iron	1,560
Lead	5.4
Manganese	71.9
Zinc	46.4

Legend
- Site 2 Boundary
- Wetland
- Drainage
- Surface Water Sample Locations

Notes:
J - Reported value is estimated
L-Reported value may be biased low
TCE - Trichloroethene
Concentrations reported in µg/L
Concentrations shown are the most recent results, unless the detection limit was above the screening value and a previous result was available.

N

0 50 100 200 Feet

Figure 10-4
Risk Drivers in Surface Water
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 11

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Appendix A
Field Logs

Project / Client

Sturdevant

1615 continued Stick up 2.4'

Vol of water in well 63.8' x [0.163] = 10.4

~~Vol~~ ft of filter pack 51-67' = 16'

SS 7/14/97 5" Dia. borehole

16 x [1.02 - 0.163] x .3 = 4.1

Vol of water in well + filter pack ~~16~~ 10.4 + 4.1 = 14.5 SS 7/14/97

1629 Begin purging - ~ 1 gpm

V. silty

1638 Water clearing pH ~9 using pH paper

Turb 435 NTU ~ 7 gal

WL ~ 7.6 (PVC) Stabilizing

1646 Used pump to surge well ~ 1 minute

1647 Pump on - Purge water V. silty

1653 Water clearing Turb - 217 NTU ~ 24 gal

1657 Shut off pump ~ 28 gal - Surge

1709 Surge

1715 Stop surging

1722 Begin pumping again - V. silty w. VF sand

1725 Todd Stribley drops off pH meter Orion 250 A for calibration See Site Logbook # 2.

Using H.F. Scientific Turbidimeter DRT-15CE

Use 0.02 NTU Solution to calibrate

Sturdevant 7/14/97 Hach # 6882

Project / Client

Sturdevant

1726 gal ~~30~~ 32 SS 7/14/97 Turb off scale, pH 9.51

Temp 22.0°C

1729 Rate ~ 1 gpm. Water clearing

Turb 729 NTU gal 35.

1737 Todd took pH meter.

1748 55 gal purged Turb 493. pH ~7 (pH paper)

1754 60 gal Turb. 408

1805 Moved pump to the top of the water column

approx 75 gal purged

water level remaining approx 6.8' (PVC)

Pump located - intake ~ 13.5' (PVC)

1808 Turb ~ 85 NTU

1818 gal 80 Turb 22, PH 8.71, Temp 22.1°C

1830 Gal 90 Turb 14, pH 8.99, Temp 21.5°C

pH meter Orion model 250A S/N 006771

meter reading 9.99 in pH 10.00 solution

1846 Gal 97 Turb 8 NTU pH 8.69 Temp 20.8°C

Flow Rate 0.6 gal.

1907 110 gal purged, Turb 10 NTU, pH 8.19 Temp 20.8°C

1938 129 gal purged

2006 145 gal Turb 2.6 NTU pH 8.09, Temp 20.5°C

2007 Finished purging ~ 145 gal purged

2020 left Site - back to office

2040 Sturdevant left Site for the night.

Sturdevant 7/14/97

Project / Client

SBudney

2100 SBudney transcribes notes taken for the development of MW-2S at Landfill B developed at the same time as MW-2D

1820 WL of MW-2S = 8.42' (PVC)
Tide is high
Stick up is 2.4' ~~gal~~ 7/14/97 WL ~ 6.0' BGS
Total depth 16.30' (PVC)
Water Column 7.9'
Water in well 7.9' x 0.163 = 1.3 gal
Water in filter pack 7.9 x [4.08 - 0.163] x .3 = 9.3 gal
Water in well + filter pack 1.3 + 9.3 gal = 10.6 gal

1830 Surged well
1835 Stopped surging
1840 Began to bail - MW-2S
1850 Gal purged 3, Turb 1125 NTU, pH 5.86
Temp 20.5 water silty light yellowish brown color.
1922 Bailed total of 8 gal from well
Very Silty
1936 Water Level 15.65' (PVC) Bailed 9 1/2 gal
almost dry. let recharge
2000 WL 15.00' (PVC)
SBudney 7/14/97

Project / Client

SBudney

2020 Return to office - will try to pull more water from MW-2S after it recharges - water very silty.
2110 SBudney signs out of log book for the night.

SBudney 7/14/97

 Location MW-1D Landfill B Date 7/15/97

Project / Client Development

SBudney

0915 SBudney calls Dave Schroeder
Mike ~~Ransier~~ Ransier SB 7/15/97 of AEDS wants to
have 150 gal of water pulled from
MW-1D at Landfill B to see if the
pH changes before he will consent
to install a replacement well

0950 SBudney drops off equipment at MW-1D
and goes to get drums. Dave asked
that the drums be labeled the same lot add
a different
mark so that AEDS can pay
for the analysis + disposal of
these drums - if necessary.

0955 Began purging well MW-1D - Silty
on the bottom - almost coagulates
with some V.F. sand. Set well
on the bottom of the well

1002 Water Clearing pH - using pH paper = 11.

1023 Gal ~25 pH Paper = 10 pH.

1045 Lisa Campbell + Chris Washington drop
off pH meter Orion 250A SN 006771 Calibrated
this morning See Site logbook #2 6/7/15/97
and the Conductivity meter YSI
Model 33 S-C-T meter - Calibrated
this morning See Site logbook #2 6/15/97
SBudney 7/15/97

Location MW-1D Development Date 7/15/97

Project / Client

SBudney

1050 SBudney checked pH meter using
pH 10.01 solution - meter read 10.02.

1055 Gal 60 pH Meter - 10.28, Temp 19.3°C
pH paper ~9.5 (Between 9 + 10). Cond 310 µMHOS
Pumping from just above the Screen.
in the Riser. Turbidity 9.0 NTU
Using HF Scientific DRT-15CE Turbidimeter
Reference - 0.02 NTU Exp. 7/97 Lot 60158
- Meter adjusted to 0.02 NTU
Hach to 65882.

1150 110 gal purged - Cond 320 µMHOS
pH ~~8.5~~ 9.99 SB 7/15/97 Temp 19.7°C Turb 8.5 NTU

1205 Gal 130 PH 9.87 Temp 19.4°C

1210 Gal 135 PH 9.77 Temp 18.9°C

1220 gal ~~13~~ 142 SB 7/15/97 pH 9.81 Temp 18.6°C

1230 gal 149 pH 9.88 Temp 18.6°C

1238 gal 155 pH 9.72 Temp 19.1°C

12:43 gal 165 pH 9.78 Temp 18.7°C

1244 Shut pump off 165 gal purged.

1300 Return to office to call Dave Schroeder
to inform him of the progress on the well

1310 Talk to Dave - Give him pH Readings
well still needs to be replaced

1320 SBudney Signs out of logbook for the day
SBudney 7/15/97

Location MW-25 Development Date 7/16/97

Project / Client

SBudney

1100 SBudney arrives at MW-25 Landfill B
Weather - Sunny Very humid Temp's
90's °F
Will continue to develop MW-25 with
a bailer - Using Level D PPE
1105 DTW 11.57' (PVC) - Tide is low
Total Depth - 16.30
Stick up 2.4' = WL 9.2' BGS
Water column - 4.7'
Well volume = 4.7 x 0.163 = 0.7 gal
Borehole - Filter pack water volume
4.7 x [4.08 - 0.163] x .3 = 5.5 gal
1110 Begin to bail well
1135 Bailed 4 gallons from well - Very slow recharge
- bailed almost dry - water coming into
well - appears less silty
1140 WL 15.34
1145 Pack equipment leave MW-15
1200 SBudney signs logbook over to Lisa Campbell
1201 I, Lisa Campbell assume control of
this logbook.
~~1740 depart for LFB~~ LC 7/16/97
1700 depart for decon pad; decon
pump w/ BG tubing ~~and off~~ LC 7/16/97
Lisa Campbell 7/16/97

Location Date 7/16/97

Project / Client

Lisa Campbell

switch tubing to LFB tubing
decon pump w/ LFB tubing
1740 depart decon pad for LFB
~~1745~~ arrive at LFB, MW15 LC 7/16/97
DTW = 7.25 well vol = 1.63
DTB = 17.44 purge vol = 10.89
WC = 10.19
1759 begin purging

Time	gal vol	temp °C	pH	cond	DO %	NTU Turb
1805	3	21.0	6.90	800	29.0	275
1810	6	19.3	7.04	720	21.4	214
1813	9	19.2	7.08	650	20.3	273
1818	11	18.6	7.12	600	24.7	62

lowered pump approximately 6" at ≈ 8 gallons
1830 collect SJS02-GW15-001 and SJS02-GW15-001F

Note: TB-160797 was collected at 0805 (See Burning Grounds logbook, p. 49)
EB-160797-GW was collected at 0930 (See Burning Grounds logbook, p. 49)
Lisa Campbell 7/16/97

Location: Groundwater Sampling Date: 7.16.97

Project / Client: Lisa Campbell

1840 depart LFB, MWIS, return to site office to finish packing samples

1845 LC signing out of logbook
Lisa Campbell 7.16.97

LC 7.16.97

Lisa Campbell 7.16.97

Location: Groundwater Sampling Date: 7.17.97

Project / Client: Lisa Campbell

Personnel: Lisa Campbell, Todd Stribley, Chris Worthington

PPE: Level D

Weather: 90°F, hot, hazy, humid

Equipment: Orion pH, elt meter, YSI conductivity meter, YSI DO meter, HF Scientific turbidimeter (see site logbook 2 for calibration)

0700 arrive at site office
calibrate equipment, gather bottleware & equipment

0730 collect trip blank TB-170797

we will collect the metals fraction, both filtered and unfiltered from the 7.15.97 GW ~~Equipment~~ Field blank (TAP water) ec 7.17.97

0830 10 ec 7.17.97 depart for decon pad; LC & TS decon pump, LW goes to get baggies & a battery for the ~~D~~ pH meter ec 7.17.97

~~collect the metals and~~ ec 7.17.97

will collect metals (filtered and unfiltered) for the GW Field blank for tap water ec 7.17.97

~~collect FB 170797 TAP GW~~ and

Lisa Campbell 7.17.97

Project / Client

Lisa Campbell

0815 collect FB-170797-TAP GW
FB-170797F-TAP GW

0930 GW returns

0930 collect EB-170797-GW and
EB-170797F-GW

0940 depart decon pad

0944 empty purge water from yesterday

1000 at CFB MW35, setup
OVM at TOC = 0.0 ppm
DTW: 7.43' btoc well vol = 1.39 gal
DTB: 15.98' btoc purge vol = 4.2 gal
wc = 8.55

1010 begin purging
MW35 parameters:

time	gal	pH	cond	temp °C	DO %	turb NTU
1016	1	6.98	24000	22.5	12.3	78
1019	2.3	6.63	23000	21.4	17.3	119
1021	3.4	6.57	23500	21.1	17.4	144
	4.5	6.67	24000	21.1	15.5	176

1030 collect SJS02-MW35-001
SJS02-MW35-001F

Lisa Campbell

Project / Client

Lisa Campbell 7.17.97

1035 depart MW35

1036 empty purge water

1047 return to decon pad to decon pump & deep well hose

1118 proceed to MW2D

1120 at MW2D
OVM = 2 ppm at TOC, 0 ppm in breathing zone
DTW = 6.60 btoc well vol = 9.84
DTB = 66.96 btoc purge vol = 29.5
WC = 60.36

MW2D parameters:

time	gal vol	pH	temp °C	cond	DO %	turb NTU
1139	5	8.28	20.0	BATTERY DIED	7.4	3.98
1144	10	8.41	20.7		5.4	1.20
1150	15	8.50	20.4		4.8	0.69
1158	20	8.45	20.2		9.7	0.74
1207	25	8.25	20.0		5.8	0.64
1205	30	8.31	20.1		6.2	0.62

1130 begin purging

1135 conductivity meter battery died

1210 collect SJS02-GW1D-001 and
SJS02-GW1D-001F

1220 depart LFB MW2D

Lisa Campbell 7.17.97

Location Groundwater Sampling Date 7.17.97

Project / Client Lisa Campbell

1221 empty purge water into drum
1230 pick up hose for LFC
1255 back at decon pad to decon pump.
1320 CW goes to get lunch while LC, TS decon
1340 break for lunch
1341 LC signing out of logbook
Lisa Campbell 7.17.97
1645 I, Lynne Flanes, assume custody of this logbook. Weather: Sunny, 90's. This page is to document well construction activities that occurred at this site earlier today.

A replacement well is being constructed at the upgrading location (MW-1D) to replace a well that showed evidence of grout contamination.

At 1100 the drillers set up to drill a pilot hole with 4 1/4" ID HSA. They sampled 44-46' - clay. Was in the original borehole.

They removed the augers and redrilled with 8 1/4 ID HSA with a

Lynne Flanes 7/17/97

Location Lynne Flanes Date

Project / Client 7/17/97

PVC plug in the bottom. At 1330 they pressed the well material (casing) in the hole. The 6" ID PVC isolation was placed at a depth of 44' and could not be pushed deeper, due to the plug and stiff clay. When all augers were removed clay was found on the entire lead auger so the casing is well within clay.

Grouting was conducted with 1" tremie pipe. Approximately 340 gallons of grout was used. Grouting was completed at 1600.

1655 At Landfill B, a map of the geophysical survey lines at this site is on p. 57 of this logbook. Points were selected as shown on this sketch, to be surveyed in for reference.

1730 No further entries

Lynne Flanes 7/17/97

Location [illegible] Date

Project / Client 7/17/97

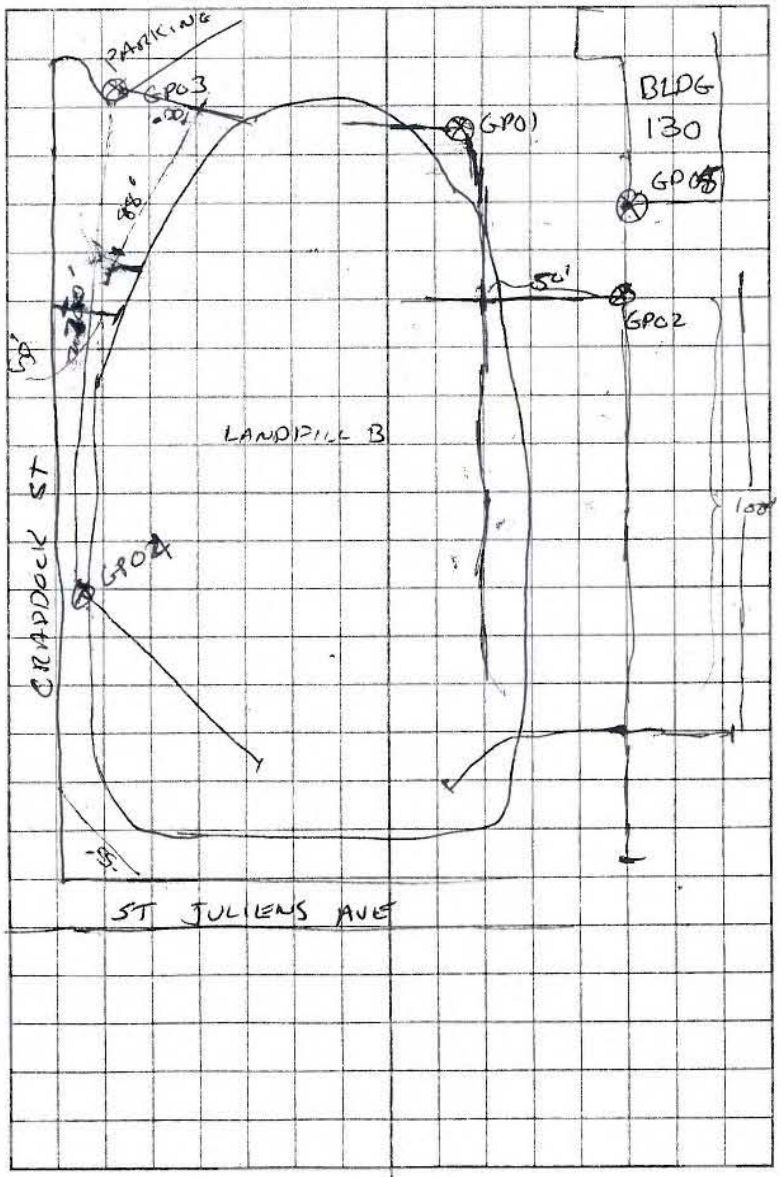
[illegible] 7/17/97

[illegible] 7/17/97

Location Date

Project / Client

LANDFILL B



Location: Lynn France Date: 7/18/97

Project / Client

1100 I, Lynne France, assume control of the logbook. Weather: Sunny, slight breeze 80's-90's.

On-site for CDM Federal:

Lynne France, Geologist

On Site for AEDS, Drilling Subcontractor,

Jack Oliver, Driller

James Johnson, Helper

Jason Stanghorn, Helper.

Setup to drill 2FB-MW1D replacement well. All work will be conducted in level D PPE. (Upgradient well, no organic vapors noted in previous well MW1D).

1105 Start drilling to 68'. Will screen screened interval 58-60' and 64-66'.

1305 Sand at ~~58-68~~ 7/18/97 58-60' fine grained. GLEY 5/1 Dk greenish gray.

1310 Collected Sample 64-66'. Sand. Screen 58-60'. Will set Screen.

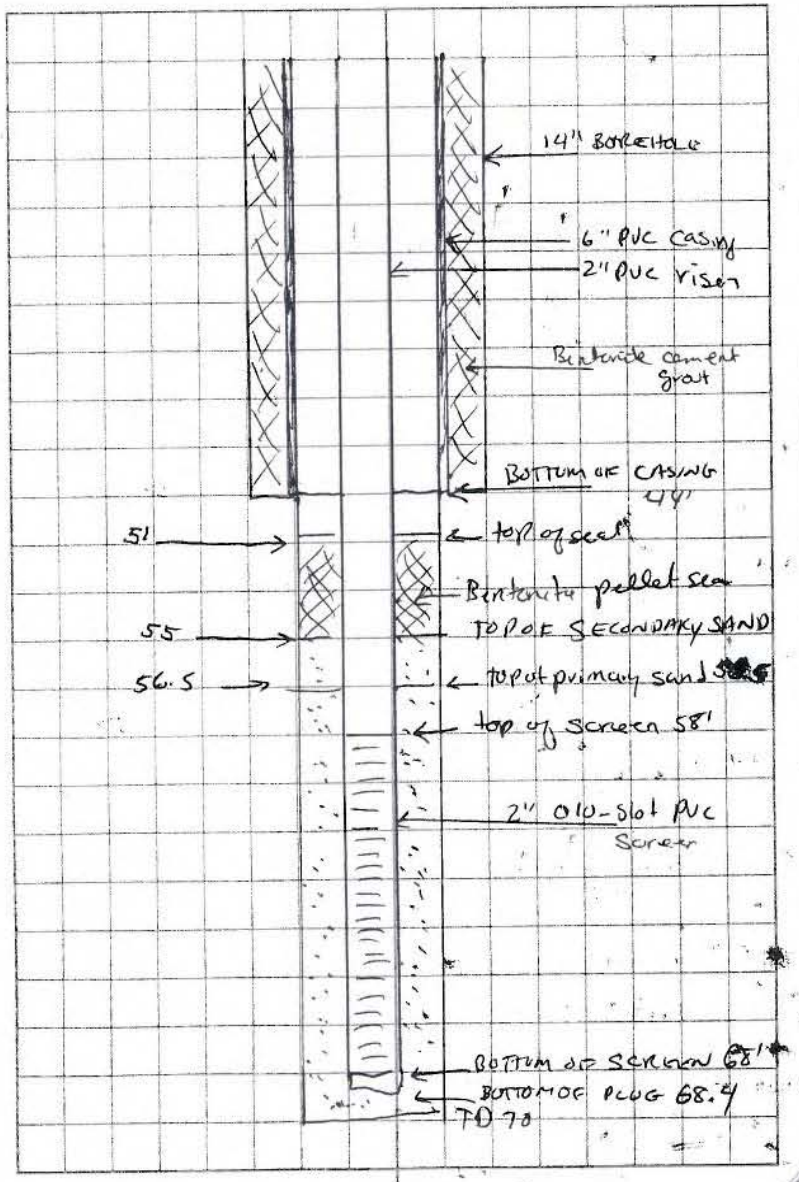
1330 Drilled to 70'. Drillers added bentonite to drilling fluid.

1405 Well materials in hole. Tremmied Sand (medium, primary) to 56.5'

See p. 59 for well diagram

Location: Lynn France Date: 7/18/97

Project / Client: MW1D (Replacement)



Project / Client

1420 I, Lynne Franz relinquish the logbook to Dan Schroeder, CDM Federal.
1420 D. Schroeder (CDM) accepts logbook
1425 Primary sand TO 56' BGS, Secondary sand TO 55' bgs, bentonite pellets TO 51' bgs
1434 R. Jackson (NJB) arrives onsite.
1443 - Begin abandonment of 05 deep well at LF B upgradient location. measure bottom depth, at 68.5 bgs.
1500 Sand TO 54.5' BGS.
1507 Pellets TO 48' BGS. R. Jackson leaves site.
1520 Ramp grout into abandoned well
1530 Begin grouting MW1D
1540 Finish grouting MW1D.
1541 Top off grout in abandoned well
1637 - Secured site. Installed expandable cap on well + locked.
1730 - Drillers leave for day.
2100 - CDM leaves site for day.
* Have entry. Installed Troll 4000 loggers in MW2D + MW25 wells at Landfill B. Will collect data at 0600 on 7/19/97. [illegible]

Project / Client

Lisa Campbell

Personnel: Lisa Campbell, Todd Stribley.
PPE: Level D
Equipment: See logbook ~~#~~ 2 pages 32
well development pump & reel
surge block
1330 LC removes data logger from MW~~25~~ 2D. [illegible] 7.22.97
1335 LC removes data logger from MW25
1550 arrive at MW1D for well development

well vol
DTW = 7.10
DTB = 69.80
WC = 62.70
well vol = 10.22

sand pack vol
sp column = 68.5 - 54.5 = 14.0
sp well vol = 14 × 0.164 = 2.30
sp vol = 0.7 [(14 × 1.469) - 2.30]
= 0.7 (18.27) = 12.80

sp vol + well vol = ~~surge vol~~ [illegible] 7.22.97
~~purge vol~~ 7.22.97 = 10.22 + 12.80 = 23.02 gallons
purge vol = 5 × 23.02 = 115.1 gallons
1620 TS brings 3 drums and 5' surge pipe extension
~~Note~~ James Johnson on site for well development.
1630 surge well; TS leaves LFB
1637 begin purging
NOT: Have not had opportunity to download data logger data
Lisa Campbell 7.22.97

Location MW-1D Development Date 7-22-97

Project / Client Lisa Campbell

Time	vol	pH	cond	turb	temp	clarity
1715	45	11.66/≈10	360	524	18.3	light gray
1730 SURGE WELL (see note)						
1747	55	10.33/10.11 10.44	800	719	19.6	dark gray/green
1810	70	10.44 ≈10.2	0		18.3	
1830	SURGE WELL					
1905	105	10.22/9	300	TURBIDITY METER DIED	18.0	light gray
1940	165	9.6/9	320		18.0	light gray

LS 7/22/97

1645 light rain starts

1714 TS returns w/ me

1730 ~~while surging~~ began to put surge block down well. The bailer would not go past

Lisa Campbell 7.22.97

Location MW-1D Development Date 7-22-97

Project / Client Lisa Campbell

≈ 64' middle (top of 10' screen). Something is blocking the well at this depth. Try surging just above blockage. Surge block is getting stuck. No luck - ~~try~~ tried for ≈ 10-15 minutes to surge above blockage. Blockage is still preventing surge block to go to bottom.

1830 So when surging well, the surge block got stuck at ≈ 65' btoc (middle of screen). Got it unstuck but with great effort & 2 people.

No notable sediment on end of surge block when it was removed.

1835 Heavy rain started.

1848 Craig arrives to pick up James

1850 Craig & James depart site.

1910 return to site office to town land clerk logsers.

Lisa Campbell 7.22.97

GROUNDWATER SAMPLING

Location _____ Date 7.23.97

Project / Client _____

Lisa Campbell

~~07~~ 07/23/97 Personnel: Lisa Campbell, Todd Stribley

PPE: Level D

Weather: overcast, humid; 85°

Equipment: orion pH / temp meter, YSI turbidity meter, YSI conductivity meter, Dometer (see site logbook #2, p33 for calibration information)

0745 collected trip blank TB-230797

0815 collect field blank on new shipment of DI water ~~FB-030797~~ FB-230797-~~GWB~~ DI & FB-230797F-DI

0840 collect EB-~~0~~230797-GWB ~~& EB-230797F~~ LC 7.23.97 EB-230797F-GWB

~~LC 7.23.97~~

~~#~~ 0755 TS at mw2S

DTW = 8.81

DTB = 16.07

WC = 7.26

~~purge~~ well vol = 1.38

purge vol = 4.14

LC 7.23.97

Lisa Campbell 7.23.97

GROUNDWATER SAMPLING

Location _____ Date 7.23.97

Project / Client _____

Lisa Campbell

Time	(gal) vol	pH	cond	% DO	(°C) temp	NTU turb
0815	2.8	5.40	5100	20.6	22.1	87
0820	3.8	5.03	6000	20.5	21.3	206
0821	well is dry at approximately 4 gallons					
1152	5	5.43	6900	16.9	22.2	127

LC 7.23.97

1130 LC arrives at MW-2S to purge for sampling

DTW = 11.40

transfer ~~w~~ purge water to carboys & dump into drums

1240 collect SJS05-mw2S-001

SJS05-mw2S-001F

NOTE: Time on labels is 1230

Notes recorded on 7/23/97 - transfered into log book of 7/24/97 by Todd Stribley

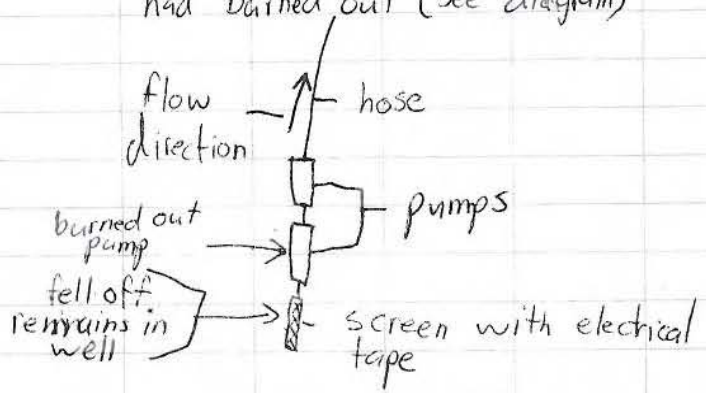
0930 T. Stribley arrives at MW-1D to continue ~~1/2~~ Development activities

Lisa Campbell 7.23.97

MW-1D. DTW = 7.28
DTB - 66.25

0940 Begin pumping well.

1010 Approximately 45 gallons purged, could not collect a sample for water quality parameters - pumps had stopped pumping. Pulled up pumps - pump was ~~stuck~~ initially stuck on the bottom of well. After pumps removed from well discovered that a wire mesh screen with electrical tape had been torn off pump and was still in the well, also the lower pump had burned out (see diagram)



1100 Attempt to remove screen w/ electrical tape with trible hook attached to water level meter. Cannot hook screen or tape.

1130 Call Dave Schroeder - CDM Federal inform him of situation - Approximately ~~0930~~ 7/24/97 210 gallons was purged from the well and approximatey 5' of the 10' screen interval is not filled in with silt/clay. Dave decides that the well development is complete and that it should be sampled last.

Note: Drill crew has arranged Drum storage area and transfered material from 2 drums into new drums - CDM Federal will inspect area in the morning

No more entries

WELL INSPECTION CHECKLIST

68 Location _____ Date 7.25.97

Project / Client

Lisa Campbell

1200 Lisa Campbell, Todd Stribley, onsite to conduct well & decon area inspection

WELL INSPECTION - LANDFILLS

	1S	1D	2S	2D	3S
concrete pad	✓	✓	✓	✓	✓
protective casing	✓	✓	✓	✓	✓
sound	✓	✓	✓	✓	✓
painted	✓	✓	peeling	✓	peeling
lock	✓	✓	✓	✓	✓
hole in cap	✓	✓	✓	✓	✓
bumperposts	✓	✓	✓	✓	✓
tag	✓	✓	✓	✓	✓
weephole	✓	✓	✓	✓	✓
area clean	✓	✓	✓	✓	✓

Drum Storage area Checklist

✓ drums on pallets

✓ lidson drums, bolts accessible

✓ area clean

✓ accessible by forklift / bobcat

closed top ~~[illegible]~~ 23

open top 25

drums replaced - 3

empty 1

Lisa Campbell 7.25.97

Location _____ Date 7.25.97 69

Project / Client

Lisa Campbell

wells left to sample: MW 1D.

1200 complete inspection

LC signing out - Lisa Campbell 7.25.97

LC 7.25.97

Lisa Campbell 7.25.97

Location: Groundwater Sampling Date: 7.31.97

Project / Client: Lisa Campbell

Personnel: Lisa Campbell, Chris Worthington
PPE: Level D
Weather: 80°, sunny, rained yesterday
Equipment: YSI conductivity meter, YSI DO meter, Orion pH/temp meter, HF Scientific turbidity meter (see site logbook #2 p 38 for calibration) Grundfos Red Flo 2, Honda 5 kw generator

0815 collect TB-310797

LC, CW onsite for groundwater sampling, demobilization
change hoses on pump ec 7.31.97
do immunoassay from yesterday
Samples to collect today:
MW-1D full suite, MS/MSD (incl nitramines)
MW-35 nitramine only, dup, ~~MS/MSD~~ ec 7.31.97
ec 7.31.97 ~~1000~~ 1000 collect EB-310797-CW and EB-310797F-CW
above EB also collected for nitramines
1015 CW goes to get gas for the generator & van
1036 CW returns
1045 proceed to MW-1D

Lisa Campbell 7.31.97

Location: Groundwater Sampling Date: 7.31.97

Project / Client: Lisa Campbell

1050 at MW1D, unload equipment, set up
DTW = 6.32 well vol = 9.7 gallons
DTB = 66.15 purge vol = 29.1
WC = 59.83
ec 7.31.97 begin purging

time	vol	meter pH	paper pH	cond	turb	DO	temp
1130	5	11.50	10.5	700	OFFSCALE THAN 999	2.6	16°
1135	10	10.89	9.5	300		3.0	19.5°
1140	15	10.05	8.5	300	500	5.3	19.5°
1145	20	9.71	8.5	300	400	5.6	19°
1148	25	9.50	8.0	300	200	5.6	19°
1155	29	9.39	8.0	250	100	5.6	19°

1200 collect SJS00-MW1D-001/SJS00-MW1D-001 for MS/MSD

Note: time on labels is 1115 ec 7.31.97

1220 finish collecting sample, ec 7.31.97 pack up equipment
1229 depart MW1D
1232 back at ec 7.31.97 field office, ice samples, change out hose on pump
1300 empty MW1D purge water into drum at drum storage area, label drum

Lisa Campbell 7.31.97

Location: Groundwater Sampling Date: 7.31.97

Project / Client: Lisa Campbell

1330 decon pump
1345 at MW3S for nitramine sample collection & duplicate
DTW = 6.75 well vol = 1.5
DTB = 16.0 purge vol = 4.5
WC = 9.25

begin purging

time	vol	water pH	pump pH	mS/cm cond	DO %	NTU turb	°C temp
1406	1	7.83	7	1700	12.0	≈100	22.4
1409	2	7.38	6.5	1550	12.7	≈100	22.5
1412	3	7.30	7	1550	10.1	≈75	22.2
1415	4.5	7.31	7	1550	9.1	25	22.3

1415 Collect SJS02-MW3S-001
SJS02-MW3S-001P
FOR NITRAMINES ONLY

1420 pack up equipment, depart MW3S, return to field office
~~Back~~ put samples once. 7.31.97
Start packing for demob
End of groundwater sampling activities.
2220 ~~at~~ 7.31.97 LC, CW at LF B for round & water levels & drum inventory
Lisa Campbell 7.31.97

Location: Groundwater levels & Drum Inventory Date: 7.31.97

Project / Client: Lisa Campbell 7.31.97

WELL	TIME	WATER LEVEL BTOC
1S	2230	6.65
1D	2229	6.13
2S	2236	8.01
2D	2237	5.34
3S	2234	6.65

NOTE: there were no surveyors marking on the inner casing, so water level measurements were measured from the north side of the inner PVC casing.

DRUM INVENTORY: 59 TOTAL

Development/purge water =	20	59 total
Drill mud =	14	
soil/drill cuttings =	20	
"drill wastewater" =	3	
unspecified soil (not rd cas IDW) =	1	
empty =	1	
empty/damaged =	2	

2253 depart LF B, end of days field work LLC 7.31.97

LLC 7.31.97

Lisa Campbell 7/31/97

1030 Lisa Campbell, Todd Stribley, Chris Worthington - CDM Federal
Prepare for groundwater sampling at MW-1S and MW-1D
PPE - Level D

1035 MW-1S - OVM 0 ppm
DTW - 6.25 DTB - 17.30 WC - 11.5
WV = 1.80 PV = 5.4

1040 MW - 1D - 0 ppm
DTW = 5.97 DTB = 66.3 WC - 60.33
WV = 9.83 PV = 29.5

1042 T. Stribley signs logbook over to Lisa Campbell - [signature]

1044 Lisa Campbell assumes control of logbook. 1045 begin purging MW-1D parameters

time	vol	pH	cond	turb	DO	temp	clarity
1050	5	10.46	0.21	9	9.70	16.9	cloudy
1056	10	10.24	0.236	7	8.63	17.0	cloudy
1101	15	10.08	0.251	9	8.61	17.0	slightly cloudy
1106	19	9.97	0.254	10	9.01	17.0	clear
1110	23	9.89	0.258	10	8.89	17.0	
1114	26	9.83	0.260	10	8.58	17.2	
1120	30	9.76	0.264	10	9.09	17.1	

Lisa Campbell 11.6.97

~~1135~~ 1130 collect SJS02-GW1D-002/002F
(VOA, SVOA, Pest/PCB, metals - tot & diss, cyanide, total phosphorus)

MW-1S parameters

time	vol	pH	cond	turb	DO	temp
1056	1	6.14	0.93	76	9.05	18.7
1059	2	5.98	0.783	50	8.91	19.2
1102	3	6.02	0.800	3	3.83	19.3
1105	4	6.05	0.774	4	8.83	19.3
1108	5	6.01	0.778	7	8.77	19.3

1125 collected SJS02GW1S-002/002F

NOTE: ① trip blank TB-061197 collected earlier today at 0715
② equipment blank EB-061197-GW/EB-061197F-GW collected at 1035

1145 LC, CW depart to decon pumps
1205 LC, CW at MW-3S, set up

MW 3S
DTW = 5.87 DTB = 16.04
WC = 10.17
WV = 1.65 PV = 5
begin purging

1212 Lisa Campbell relinquishes logbook to T. Stribley
Lisa Campbell 11.6.97

Location _____ Date 11.6.97 CC

Project / Client GW Sampling

MW3S parameters

time	vol	pH	cond	turb	DO	temp	clarity
12:28	1	6.40	1.16	104	9.92	18.3	semi turbid/brown
12:31	2	6.29	1.13	28	2.24	18.8	CLEAR
1234	3	6.23	1.15	7	2.20	19.0	CLEAR
1238	4	6.27	1.17	11	9.13	19.4	CLEAR
1241	5	6.2	1.2	-0	2.4	19.7	CLEAR

1250 COLLECT SJS02-GW3S-002+002F

Nitramine sample

1353 MW-2S - OVM - 0 ppm
DTW - 7.57 DTB - 15.87 WC = 8.3
WV - 1.35 PV - 4.05

1355 MW-2D - OVM - 0 ppm
DTW - 4.75 DTB - 66.68 WC = 61.93
WV = 10.09 PV = 30.2

MW-2S

Time	Vol	pH	Cond	Turb	DO	Temp
1417	1	6.94	3.78	36	4.35	19.5
1419	2	6.81	3.19	34	4.34	19.9
1421	2.5	6.80	3.24	16	3.58	20.2
1425	3.5	6.79	3.60	6	3.00	20.8
1427	4.5	6.77	4.15	16	3.28	20.7

1445 Collect SJS02-GW2S-002 and 002F

Location _____ Date 11.6.97 CC

Project / Client GW Sampling

1450 Collect SJS02-GW2D-002 and 002F
1455 Collect SJS02-GW2D-002P and 002FP
The following was recorded by C. Worthington

Site 2, MW 2D parameters

Time	Vol	Temp	Cond	pH	Turb	DO
1418	5	18	0.42	7.3	270	9.4
1424	10	18	0.39	7.2	10	9.5
1431	15	18	0.40	7.2	0	2.1
1436	20	18	0.39	7.2	0	2.7
1442	25	18	0.39	7.2	0	2.4
1448	30	17	0.39	7.2	0	2.2

~~1450 Coll~~ completion of notes recorded by C. Worthington
1450 Collect SJS02-GW2D-002 and 002F
~~1455~~
1510 Return to bldg 124 packup samples. Completion of ~~field~~ field work at Landfill B

Location _____ Date 4/13/99

Project / Client _____

SUR. WATER SAMPLING Lynne France

1115 I, Lynne France assume custody of this logbook. Weather, Sunny, 60's, windy. Onsite: Lynne France, Todd Stubley, samplers.
All activities today will be conducted in Level D PPE.
Activities include surface water sampling at locations where no sediment samples will be collected.
NOTE Location SW-01 is dry.
Will attempt to collect before the week of thanksgiving.

1120 Water Quality readings for SW03. Collected with Horiba U-10 #808031

pH	6.69	See calibration
temp	15.4°C	logbook for
Cond.	17.5 ms/cm	Calibration
Salinity	1.06	Documentation.
DO	7.62 mg/L	Time on bottle 1030
Turbidity	20 NTU	

1130 Collected SJS02-SW03 Directly into bottles. Placed immediately on ice

1145 No Further Entries
Lynne France 4/13/99

Location _____ Date _____

Project / Client _____

Lynne France 4/14/99

1205 I, Lynne France, assume control of this logbook. Weather is Sunny, breezy, 60's
Onsite: L. France, FTL
T. Stubley + L. Campbell samplers.
All activities will be performed in Level D PPE. Activities today include surface water and sediment sampling. Sampling will be performed using a stainless steel ponar dredge and bowl. Decontamination See Site Logbook #3 for decontamination procedure

Collect water parameter readings with a Horiba U-10 #808031 calibrated earlier. See Calibration logbook.

1210 Collect SJS02SW08 + SJS02SD08
time on bottle 1100

pH	7.07
Cond	19.2
temp	16.9
Salinity	1.13
DO	7.01
Turb.	36

NOTE ALL SAMPLES COLLECTED DURING OUTGOING LOW TIDE (LOW TIDE AT 1145)

Lynne France 4/14/99

Location _____ Date _____

Project / Client SED/SW Sampling

Lyn Allen 4/14/99

Sample SJS02-SW08P is a duplicate of surface water. Time on bottle is 1115. Sample from St. J. Creek. Fast flow out of culvert from pond at LFB. Water from pond is turbid. Sample was collected approximate 20' downstream of culvert in depositional area around the floating berm that circles the culvert opening. Surface water samples will be analyzed for low con VOCs, SVOC, Pest, PCB, Cyanide total phosphorus, and Metals (total). Also Nitrammine. Sediment samples will be analyzed for VOCs, SVOCs, Pest/PCB, Metals, Cyanide, Soil classification, Total phosphorus, TOC and Soil pH.

1230 No Further entries.

Lyn Allen 4/14/99

Location _____ Date 4/16/99

Project / Client _____ LC

SW/SD-4, SW/SD-5

I, Lisa Campbell, assume custody of this logbook.

1430 LC + TS at LFB for SW & SD Sampling

LC at SW/SD-04; TS going to SW/SD-05

SW-4 water parameters

pH	7.00		Water depth: 6-8"
COND	7.81	mS/cm	Soil desc: dark gray-brown fine SAND, w/ some silt
TURB	27	NTU	
DO	8.47	mg/l	
TEMP	22.4	°C	
SAL	42	%	

1500 collect SJS02-SW04-001 and SJS02-SD04-001

Notes from TS:

~~AA~~SW-05 water parameters

pH	6.90		
COND	6.86	mS/cm	Water depth: 4-5"
TURB	21	NTU	
DO	7.32	mg/l	
TEMP	21.4	°C	
SAL	0.36%	%	

Soil desc: fine sand & silt 4" organic on top

Lisa Campbell 4-16-99

Project / Client _____

LC SW/SD-05 + SW/SD-06 + SW/SD07

1445 collected SJS02-SW05-001 MS/MSD and
SJS02-SD05-001 MS/MSD
also collected earlier by TS - SW/SD7

SW/SD-07 parameters

pH 7.29 Water depth: 4.5"
cond 18.6 mS/cm
turb 5 NTU
DO 5.86 mg/l
temp 22.5 °C
sal 1.11 %

Soil desc: SILT & organics

1400 collected SJS02-SW07-001 and
SJS02-SD07-001

1520 TS moves to SW/SD-06

SW-6 water parameters

pH Water depth: 4.5"
COND mS/cm
TURB NTU
DO mg/l
TEMP °C
SAL %

Soil desc:

1530 collect SJS02-SW06-001 and
SJS02-SD06-001

Lisa Campbell 4.16.99

Project / Client _____ LC

1540 LC + TS depart LFB;
NO MORE ENTRIES TODAY

Lisa Campbell 4.16.99

Lisa Campbell 4.16.99

Location _____ Date _____

Project / Client _____

Lynn Franz 4/20/99

0715 I, Lynne Franz assume custody of this logbook. Weather: 50's, p-cloudy, breezy. Activities today include surface and subsurface soil sampling, well drilling and UXO clearing. All activities will be performed in Level D PPE.

All samples collected will be collected with equipment decontaminated according to procedures on p. 9 and 26 of Site Logbook #3. All samples will immediately be placed on ice.

0750 I Lynn Franz relinquish control of this logbook.

0751 I John Bowling assume control of this logbook

0755 Arrive at Landfill B. Present are J. Rambusch & Franz of CRA, Geophex UXO personnel, Tim Patrick, Larry Westmiller and Matthew Van Houson, and Groundwater Systems drillers, Dwayne Stuart, Josh Bone and Chris Dennis

Weather is clear, sunny 35°F

John Bowling 4/20/99

Location _____ Date _____

Project / Client SSC

John Bowling 4/20/99

Planned activities: UXO Avoidance, surface and subsurface ~~[illegible]~~ soil sampling and monitoring well installation

0800 Rambusch, Franz and UXO personnel walk over surface soil sample location

0815 UXO personnel clear SB17 Rambusch says to sample. UXO personnel check other locations

0825 Collect SJ5B2-SS17-000 pre recorded sample label time 0800 Description: Dk Br. (7.5YR3/2) moist silt and f. sand some m. sand, tr. c sand + c gravel with roots and shell fragments

0900 Collected SJ5B2-SS19-000 pre recorded sample label time 0745 Description: Dk Br. (7.5YR3/2) moist silt and f. sand, some m. sand, tr. c sand and fg gravel w/ roots

0915 Collected SJ5B2-SS18-000 pre recorded sample label time 0815 Description: Dk. Br. (7.5YR3/2) moist silt and tr c sand little tr. gravel, with roots

John Bowling 4/20/99

Project / Client

John Bonfiglio 4/21/99

0930 Collected [SJ502-SS20-000] pre-recorded sample label since 0830
Description - Dk brown (7.5YR 3/3) medium, silt and f-m sand, tr c sand + gravel w roots
0955 I John Bonfiglio relinquish logbook to Lynn France
1000 I, Lynn France assume control of this logbook.
Late note: UXO/drilling work completed so far: Clearing MW45. Initial UXO clearing indicated numerous, widespread ferrous metal debris throughout the proposed well location. decided to hand excavate and found shell (ordnance) fragment and rebar fragments. Consulted with D. Schroeder, ON Federal project manager about well placement. Decided to stay with (near) original location unless we hit fill material at depth. UXO team cleared 2', drillers proceeded to sample 2' increments. Drilling started at 0915
Lynn France 4/21/99

Project / Client

Lynn France 4/21/99 LC

1010 finish logging at 10' bgs at MW45.
1015 Start clearing ~~5'~~ 4/21/99 SJ502MW55. numerous surface debris.
1040 could not clear area - too much debris. Will move location east ~30 ft.
1050 Diane Baily, LAWTDV-EUI, on site reviewed decisions concerning UXO.
1145 Finished logging MW55 to 10'. UXO cleared to 12'. Start clear MW5D location moved 25' to be sidegradient to MW55.
1155 Start sampling MW5D.
1250 Finish clearing UXO at MW5D
1300 Drillers set up to drill MW5D
1350 I, Lynn France relinquish control of this logbook.
1400 I, Lisa Campbell, assume control of this logbook.
LC, TS, JB at LFB with B. Lewis (geoprobe) and Wes Miller & Matt (geophysics) UXO clearance
1407 at SB07.
1410 SB07 cleared 1st 2' bgs
1419 push 2' at SB07. 'pull up
Lisa Campbell 4.21.99

+ clear boring
1420 SB07 cleared 0-4' bgs
1424 push geoprobe 0-4' bgs
1425 clean SB08 0-2' bgs
push geoprobe 0-2' @ SB08
clean SB08 2-4' bgs
1439 push geoprobe 2-4' bgs
TS + JB onsite collecting SB samples
with hand auger; LF onsite
with drillers drilling mud borings.
1450 SB 10 cannot be cleared
1455 SB-11 cannot be reached with
geoprobe - can't be cleared
4.21.99 1502 SB06 also cannot be reached
with geoprobe - can't be cleared
1506 LC + B.Lewis at Bldg 1556 (SIMA)
to find UPS shipment of
geoprobe liners
Meet with LF, B.Lewis + Wes
Miller to find alternate
locations for SB-10, SB-11 & SB06
try area to NW 20-50' away
in brians (other side of the fence
SB06) - too many readings
Lisa Campbell 4.21.99

with UXO probe - Wes thinks it
could be chunks of concrete
with rebar - B.Lewis still can't
get rig in will need to use
hand auger there
1540 at SB11 with LF - trying to clear
4.21.99 1535 a spot for the geoprobe rig
move SB-11 to west/NW to grass
area, 15-20' away
** See pg 15 for site sketch of
SB locations changes.
at SB 10 4.21.99 location moved approx
15' SE SB14
1600 clean spot for SB-11 0-2' bgs
push geoprobe 0-2' bgs
clean SB11 2-4' bgs
push geoprobe 2-4' bgs
1605 collect SB02-SB11-001
1615 TS collected SB02-SB06-001
1635 move to SB-10
1635 clean new location 0-2' bgs
1640 push geoprobe 0-2' bgs
1645 clean SB-10 2-4' bgs
1650 push geoprobe 2-4' bgs
Lisa Campbell 4.21.99

Project / Client _____

1655 collect SJS02-SB10-001

* Note: time on bottles is 1635 late entries

1445 collected SJS02-SB07-001

4.21.99 1445 collected SJS02-SB08-001

1715 LC + TS depart for LFC; JB will collect SS-15 + SS-16.

1716 LC relinquishes control of logbook to JB Lisa Campbell 4.21.99

1750 I John Bambrick assume control of this log book - John Bambrick

1740 Collected 025JS-SS16-000 and 025JS-SS16-00P Pre-record sample lable time 1715

Description - Dk-brn moist, silt and f-m sand little c-sand - c gravel, wood Note, JB uninformed of moved location of 025JS SB11-001 and sampled at original flag location

1755 Collected 025JS-SS15-000

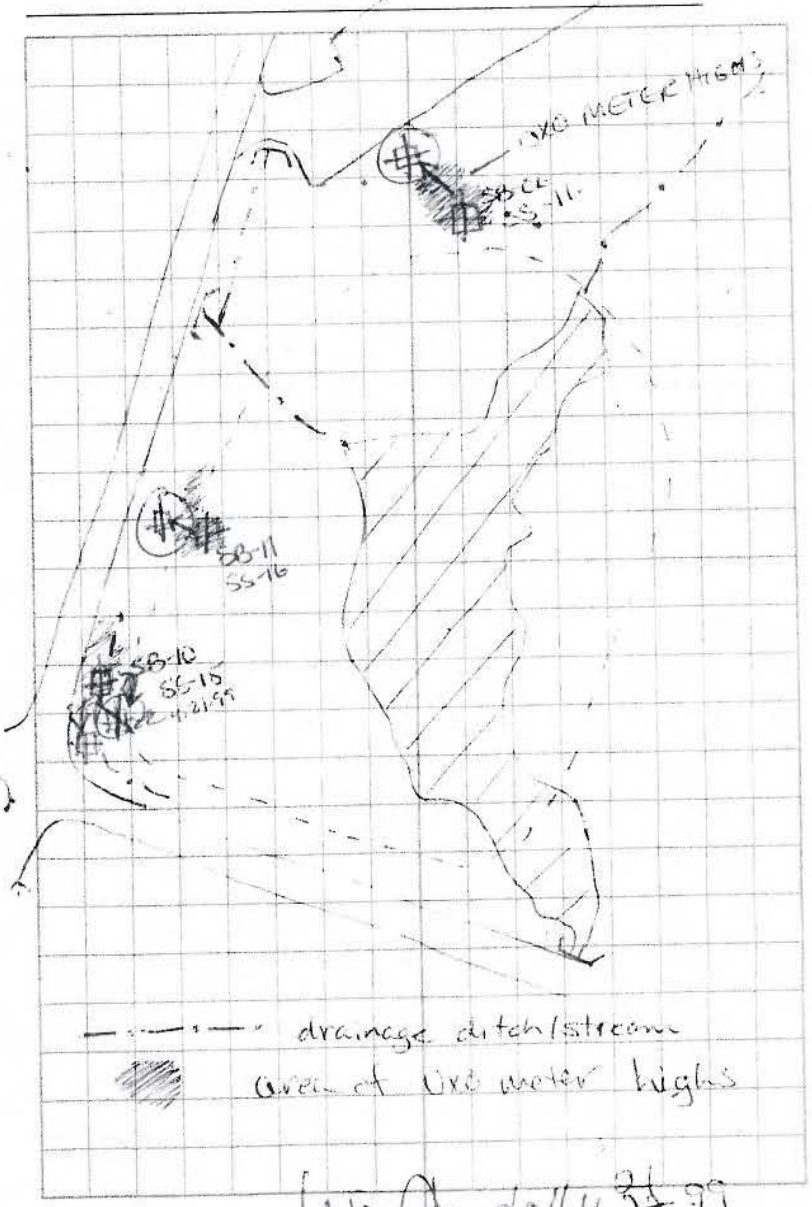
Pre-recorded sample lable time 1745

Description - Dk-brn moist silt and f. sand, lit m sand to f gravel

1800 JB signs out of logbook - John Bambrick

John Bambrick 4/21/99

Project / Client _____



Lisa Campbell 4.21.99

Project / Client _____

Lynne Frame 4/22/99

0900 I, Lynne Frame assume control of this logbook. This notes is to document drilling and monitoring well installation activities that occurred on 4/20/99. Original information is from boring log.

DRILLING MW5D

Start drilling 1155 cleaning at 2' intervals for UXO. Hit water table at ~2.5'

Stopped drilling at 1300 at 10' using CME Sampler

Resumed drilling at 1420

Formation soft at 17' - probably clay

Used 2' split spoon to sample 20-22' - good plastic clay

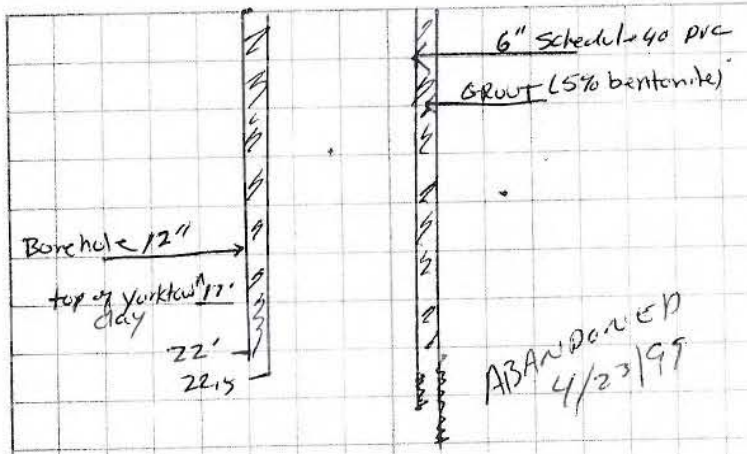
1515 - start drilling with 8 1/4" ID HSA drilled to 22'. Pushed 6" PVC isolation casing to 22.5'. Grouted into place with 5% cement-bentonite grout pressure tremied.

Finish at ~~1715~~ 4/22/99 1715

See Boring log for stratigraphy.

Project / Client _____

MW5D



Note: This hole was abandoned by pumping (pressure tremie) grout. This was done when it was determined that the isolation casing should be set deeper. Possible connection of sand layers with water table aquifer.

Lynne Frame 4/27/99

1215 I, Lynne France, assume control of this logbook. Weather, 80's, Sunny, breezy.

Onsite:

L. France, CDM FPC Geologist
Duane Sturgil, Groundwater System, Driller
Chris Dennis, " "
Josh Bono, " , Helper

Activities today include drilling sampling and constructing MW5D. See p. 17 for diagram. Also see boring logs and well construction logs.

All activities will be conducted in Level D. PPE. Air will be monitored with an OVM 580B #38721-258E calibrated earlier, see calibration logbook.

Drilling will be done with an Acker AD-2 rig. and 6" roller bit / water/mud rotary.

Drillers setting up on hole. Will start

Lynne France 4/23/99

by drilling out bottom of grout/clay in 6" casing

Using NQ2 Rock 6" spade bit hollow to allow sampling with split spoons through the rod.

1245 Pumped water out of casing prior to drilling through clay, Will containerize water.

1230 have sampled to 31'. There is about 6' of sand under clay that was cased into. Some clay layers in sand.

1240 Called Dave Schroeder to discuss well construction. Drillers will continue to sample

1515 D. Schroeder + L. France decide to abandon well and re-install with casing at 34'-36'. Clay from 30.5 to 40.5'. Potential for sandy layer under upper clay to be in contact with water table in sandy/clay layers near creek.

Drillers set up to tremie grout this well.

Lynne France 4/23/99

1815 Bambrick to office
1830 Campbell + Bambrick take samples to Fed Ex.
1900 Work accomplished today:
- collected surface and subsurface samples at LFC – all locations except DPT Line.
- Completed DPT Line #3 at LFC
- collected 2 each, sub and surface soil sample from N side of LF D.

See sample logs and individual site logbook for sample details
- Drillers moved, set up down area and decomned the rig.

1905 Frame off site.
Straley labeling bottles.

Lynne France 4/20/99

0700 I, Lynne France, assume custody of this logbook. Weather: 40-50s, p. cloudy, breezy.
Onsite today for CDM Federal:
Lynne France, Field Team Leader
Lisa Campbell, Geologist
Todd Straley, Sampler
John Bambrick, Sampler
Activities today will include surface and subsurface soil sampling at Burning Ground, LFB and LFC and well drilling at LFB.
UXO clearance will be conducted this morning.
All activities will be conducted in Level D PPE with air monitoring with a Thermo ~~Dynamic~~ 7/1 4/14/99 Environmental 580B OVM.
All sampling will be conducted with sampling equipment decontaminated according to the procedures listed on p. 4 and p. 20 of this logbook.

Lynne France 4/21/99

0710 Groundwater systems personnel onsite: Dwayne Stygill, drillers Chris Dennis, Josh Bane Helpers. Held H&S meeting

0720 Brad Lewis, Columbia Technologies onsite

0730 Calibrated OVM SN# 38721-258LE
See calibration log for details

0735 Calibrate OVM SN# 580B-31211-2411
See calibration log for details

0745 Geoprobe on site: Jim Pertuck, Pres. Larry Westmiller, Matthew VanHorn. Held H&S meeting, reviewed plans to work.
Campbell to Burning grounds to collect samples with geoprobe.

0800 Bambrick, France + Geoprobe to LFB. Drillers already there. Waiting.

1030 Diane Baily at LFB. Reviewed UXO decisions and LFC decisions for sample/DPT placement.
She will come to 202 at 0830 Friday 4/23/99.

[illegible] 4/21/99

1300 Drillers break for lunch. France to office

1310 Leave office to look for outside sleeves delivered to incinerator Bldg. (for Columbia Technologies).

1410 UPS is tracking driver with cell phone.
France to LFB
Geoprobe crew have started UXO clearing at LFB.

1530 Had to move location of SB06 at LFB
See LFB logbook.

1630 Geoplex, UXO clearing company off-site

1650 Finish sampling at LFB except for surface soil. Geoprobe crew to LFC to finish work there.

1800 Drillers off site.

1930 Geoprobe off site
All to ~~free~~ office 4/24/99 to place samples

1945 Stribley and Bambrick off site with samples.

2030 France + Campbell off site
See next page for work accomplished

[illegible] 4/21/99

(30) YF 4/21/99

Work accomplished:

Cleared all sampling and monitored well location for UXO (to a depth of 12' for well locations). Sampled all surface and subsurface soil locations at LFD. Completed all DPT lines (#4) at LFC. Collected one sample from each DPT line. Collected 4 subsurface soil samples and 4 surface soil samples at the Burning Grounds.

See individual site logbooks for details. Sample details can be found in the sample logbook.

YF 4/21/99

YF 4/21/99

YF F 4/21/99

YF 4/22/99 (32)

0700 Q. Lynne France, assume custody of this logbook. Weather: 60s, partly cloudy.

Onsite today for OAM FDC:

L. France FTL

L. Campbell Geologist

T. Stubley, Ecological Assessor

Bruce Plato, Senior Ecological Assessor

J. Bumbrick Sampler.

On site for Columbia Technologies, the geoprobe subcontractor: Brad Lewis, operator. Onsite for Groundwater Systems, the drilling subcontractor: Duane Stygall, Driller, Chris Dennis, Driller, Josh Bone, helper.

Activities today will include subsurface and surface soil sampling at LFD and Burning grounds, Sediment sampling at B.G., Ecological transects and evaluation, and monitor well installation at Background locations and the Burning grounds.

All activities will be conducted in Level D. Air will be monitored with OVMs.

YF 4/22/99

(34) [illegible] 4/22/99

0700 J. Lynne France assume control of this logbook, weather, 70's, p. cloudy.
On site today for CDM FPC:
L. France, FTL, Geologist
J. Bambrick, Sampler (JB)
L. Campbell, Geologist (LC)
T. Stribley, Ecolo. Assessor. T
Activities today will include drilling and installing isolation casing at BKMW3D and installing SJSMW2D.
On site for Groundwater System, the drilling subcontractor:
Duane Sturgil, Driller
Chris Dennis, Driller
Josh Bono, Helper
Other activities include and meeting with Diane Bailey to discuss DPT line placement at LFC. and a visit by Sharon Wilcox, VADEQ.
LC + JB will containerize PPE and leave site.
TS will continue Ecological assessment transects.

[illegible] 4/22/99

All work today will be in Level D. Air monitoring during drilling will be conducted with a ThermoEnvironmental OVM 580B#
Calibrated this morning
0710 Calibrated OVM#38 7216-258E
0715 France to BKMW3D to meet drillers
0730 Stribley starts ecolog. transects to identify receptors
0800 Bambrick to Decon area to containerize EPW.
0830 Diane Bailey, LANDR ENV. on site to discuss reasoning 4/22/99 behind DPT line location.
0900 France back at BKMW3D
0910 Bailey and Sharon Wilcox, VADEQ, on site to review reference sample locations. France and Stribley identify all locations (including site specific
1100 Wilcox and Bailey off site. Wilcox indicated that she was satisfied with the field effort. France to office

[illegible] 4/22/99

1130 France to meet drillers at LFB. Bambrick and Campbell offsite.
Weather, Sunny 70's-80s, breezy.
1600 France to office. Stribley has completed transects.
1630 France at decon. Drillers will set up on BKMW1D. Have decomed all equipment.
1650 Stribley offsite.
1730 Drillers off site
Work Accomplished:
- Ecologic receptor transects nearly completed
- Install surface isolation casing in BKMW3D
- drill + sample SJS02-MW5D then abandon

See individual site logbooks for details.
also contaminated all IDW from sampling.

LF LFr 4/23/99

0645 I, Lynne France, assume control of this logbook. Weather: 40's, windy, cloudy.
On site: Lynne France, Geologist
Activities today will include monitoring well construction at background location. Groundwater Systems is the drilling subcontractor
All activities will be conducted in Level D.
Air monitoring will be done with an OVM580B # 38721-258E
0650 Calibrated 38721-258E OVM.
See calibration log.
0750 D. Stargill, driller, called to say drillers will be on site at 0730.
~~0700~~ 0730 Groundwater Systems on site:
LF 4/24/99 Duane Stargill ~~on site~~ 4/24/99, Driller
Chris Dennis, Driller
Josh Bones Helper
1200 Weather: Sunny, V. windy.
1830 Drillers off-site
Work Accomplished: Install BKMW1D, Sample BKMW2D to 56.5'.

LF LFr 4/24/99

(38) Lynne France 4/24/99

1835 France to office.
~~0835~~ O/P 4/24/99
1840 France off site

4/24/99 Lynne France

Lynne France 4/25/99 (39)

0645 I, Lynne France, assume control of this logbook. Weather: Sunny, 40's.
On site today: Lynne France, CDM Geologist.
Groundwater System, drilling Sub contractor will have the following personnel on site:
Duane Stargill, Driller
Chris Dennis, helper
Josh Bono, helper.
Activities today will include well installation at background locations (BKMW 2D and BKMW 3D).
All activities will be conducted in Level D
0650 Calibrated OVM 580B #38721-258E
See calibration logbook.
0655 France leaves office to meet driller at BKMW1D.
0610 Drillers off site
Work Accomplished:
Installation of BKMW 2D and BKMW 3D. See Background Logbook for details.
1615 France off site
Lynne France

0700 J. Lynne Franco assume custody of this logbook. Weather: Sunny, 50's.

On site today: L France, CDM Geologist
Duane Sturgill, Groundwater Systems driller
C. Dennis " Helper
J. Bono " "

Activities today will include: installation of isolation casing at SJS02-MW5D, installation of well SJS05-MW4D and installation of shallow wells. A second drill rig and crew should arrive from Groundwater Systems today. Lisa Campbell, CDM FPC Geologist should also arrive.

All activities will be conducted in Level D PPE.

Air monitoring will be conducted with a Thermo-environmental OVM 580B
France will have OVM #38721-285E
Campbell will have OVM #58013 31211-241

0710 Calibrated OVM #38721-285E
See Calibration Logbook.

LF Fran 4/26/99

0945 Lisa Campbell on site
1000 Called Diane Baily to see if she could arrange for pallet from DRMO.
1035 Mark McClellan and Mike Belew, (driller + Helper) from Groundwater Systems on site.
1045 Met with Lisa Campbell + M. McClellan to plan drilling with Rig #2
1200 France to SJS05 MW 4D, Campbell at BKMW15
1730 Campbell finishes drilling for day
~~1530~~ 1930 France at office Drilers off site
DAF 4/26/99

Work accomplished today:
- Install BKMW15, BKMW25, BKMW45, ~~BKMW~~ 4/26/99 ~~SJS4~~ SJS05 MW 4D and the installation of isolation casing at SJS02-MW5D.

1945 France off site

LF Fran 4/26/99

(42) Lynne France 4/27/99

0630 I, Lynne France, assume control of this logbook. Weather: 50's, p. cloudy, windy.

Onsite today: Lynne France, CDM FPC, FTL.

0645 Lisa Campbell, CDM Geologist and John Bambrick, CDM field team member on site.

Conducted Health + Safety Meeting

0655 Activities today will include Well construction and well development. We will also stake all locations for surveyors

0700 Calibrate OVM # 31211-241

0705 Calibrate OVM # 38721-285E and Horiba U-10 # 80 8031

See calibration logbook

0715 Out to down area to coordinate activities with driller

Onsite for Groundwater System, Drilling Sub contractor:

Duane Sturgul - Driller
Chris Dennis, Helper
Josh Bono, Helper

Lynne France 4/27/99

Lynne France 4/27/99 (43)

Mark McClellan, Driller
Mike Belew, Helper.

0730 Campbell and Crew (McClellan and Belew) to SJS05-MW4S

Bono, IDW Management

Will wait until 1100 to start drilling SJS02-MW5D.

0740 Bambrick to Burning Grounds to make sure all locations are staked/marked.

0900 Dave Schroeder, CDM project mgr.
John Tomec, CH2M Hill, project mang.
Tim Reeder, Navy, LANTDIV Envir. Proj. Mgr
on site. to discuss project status.

0940, Schroeder, Tomec, Reeder start site tour.

Campbell and all drillers at SJS05-MW5S.

1000 Bambrick finishes marking location at Site 5. From to Site 3 and Site 4 to mark location

1101 France at LFB to drill MW5D
Well developing started at BKM W10

Lynne France 4/27/99

(44) Yr 1 Fr 4/27/99

1430 John Tomik, CH2MHILL, off site
Schroeder to Landfill B.
NOTE: Drillers are having
difficulty developing BKMW 1D
Bambrick, Campbell Schroeder, Frame
at LFB discuss problem with
Stugill.

4/27/99 ~~1530~~ 1400 Schroeder off site

1530 Stugill to BKMW1D for well development.

~~1545 Frame Lynne Frame relinquish~~

~~4/F Bus logbook to Lisa Campbell~~
4/27/99

1530 Frame to BKMW1D. to check
on Monitor well development
Tried using pump on order 40-2
for development. attached to surge
block. - Works better than other
pump.

1715 Campbell on last well
location (SJS03-MW6S). Development
crew at BKMW2D - Well Start
tonight. Frame at office.

2000 All at Office drillers
off site

Yr 1 Fr 4/27/99

WORK ACCOMPLISHED:
Installed SJS2MW5D, BKMW3S,
SJS02MW4S, SJS02MW5S, ~~BKM~~ 4/27/99
SJS05MW4S, SJS03MW5S.
Also started well development
developed BKMW1D and 1S.
All off site

4/27/99

 4/28/99

BKMW 2D has been developed.

1020 Horiba U-10 ~~[illegible]~~ 4/28/99 # 406070 CDM FPC000256 was calibrated at Frame to LFB to stake/check locations.

Campbell will develop BKMW2S. Bumbrick will be at BKMW3S.

1145 Frame at office. Have checked sampling locations at LFD - all are marked.

1355 France leaves office to check stakes in tidal influence SE/SW sample locations.

1600 Frame at office. Campbell developing BKMW4S. Bumbrick developing ~~[illegible]~~ 4/28/99 SJS05 MW4S/4D

1730 Campbell at BKMW3S

1825 all at office

Work accomplished:

Developed: BKMW2D, BKMW2S, BKMW4S, SJS054D, BKMW3S

Start

I, Lisa Campbell assume control of this logbook.

Personnel Onsite: Lisa Campbell, Lynne France, John Bumbrick (CDM); Duwayne Stargill, Mike Beland, Jack Bono (Geotechnical Systems Inc.), Chris Dennis

Weather: mid 50s, rain

PPE: level D

Todays Planned Activities: continue well development

0635 L Campbell onsite, calibrate Horiba U-10 #406070

0700 LC departs for decon area to meet drillers; JB not onsite yet

0702 LC at decon; drillers not onsite yet

0716 JB + drillers onsite

LC will develop BK-MW-3S; BK-MW-4S + MW5S

JB will develop LFB-MW4S, MW5S MW5D, LFC-MW6S, MW5S

Lisa Campbell 4.29.99

(50) ec

4.29.99

1500 LF departs site; LC checking Trolls - no software

1600 call TMC + D. Schroeder
TMC will overnight software - decide w/ DS that we will push the Tidal study schedule back 1 day (TMS will not charge us extra)

DAILY SUMMARY:

0 wells developed (all wells developed now)

LFC	MW-5S
	MW-6S
LFB-	MW4S
	MW5S
	MW5D
BG	MW4D
	MW5S
	MW4S
BACKGRD	MW3S

Lisa Campbell

Lisa Campbell 4.29.99

ec (51)

4.30.99

I, Lisa Campbell, assume control of this logbook.

Personnel: Lisa Campbell, John Bombrick (CDM) Duayne Sturgill, Mike Bolew, Chris Dennis, & Josh Bono (Groundwater Systems Inc.) and PHR&A (surveyors)

Weather: overcast, 40°F, very windy

PPE: Level D

Todays Planned Activities:

1. drillers to finish completion of all wells (locks, paint, tags, etc) and to address any IDW issues before they demob + depart site
2. install 8 Troll data loggers in designated wells
3. finish up paperwork; clean office
4. read staff gauge on SJC at 4:10 pm

0630 LC onsite - check locks on old wells that will have Trolls put in - locks are rusted shut

0710 JB onsite - will do well checklist

0900 LC at Creekmore Hardware

0930 LC returns

Lisa Campbell 4-30-99

(52) ec

4.30.99

0935 call Jeff Davis (TMD) regarding whereabouts of Win Situ software
he says it is on the FedEx truck for delivery
JB packing rental equipment
~~1300~~ 1200 all wells finished - drillers depart
1300 LC + JB depart site
LC signing out

Lisa Campbell 4.30.99

5.1.99
~~4.31.99~~ ec 5.1.99

ec (52)

I, Lisa Campbell, assume control of this logbook.
1045 LC onsite to install Troll data loggers in 8 designated wells, as follows:

~~Time~~ ec 5.1.99	WELL #	probe #
LFB	MW1S	00764
LFB	MW4S	01163
LFB	MW5S	00484
LFB	MW5D	01160
LFC	MW1D	00890
LFD	MW3D	00369
BG	MW2D	00353
BACKGROUND	MW2D	01169

1125 LC calls In-Situ help line to ask:
① at what point can Trolls be disconnected from computer, and
② is it necessary to record the depth from TOC of the probe?
The 72-hour tests will be set to read every 30 minuts, starting 5.1.99 at 1400.
left msg with help line
1140 ~~begin~~ programming ~~probes~~ Trolls ec 5.1.99

Lisa Campbell 5.1.99

Drany Baily
444 3009 EXT 394

CONTENTS

PAGE NO.	REFERENCE	DATE

[illegible] 4/12/99 (1)

7AM I, Lynne France, assume control of this logbook. Weather 50's windy, clear.
Onsite: Lynne France Field Team Leader
Thad Stribley, Field Team Member.
Meet with Tim Fische at front gate
all to Larry Eaves office at Quarters B.
0715 L. Eaves assigns Bldg 202 as
our site office. Stribley to set up office
0725 Reisch + France to office. Unload
van.
0745 all to ~~B~~ 4/12/99 LFB.
LATE NOTE: Reisch + France went to Security office to discuss procedures. We will get a schedule of activities for Security. Also went to the Base fire station to notify them that we were on site. Spoke with MR. Heinrich.
0815 all at Burning grounds. Located SW/SE sampling locations. Moved SS23 South to Northern tributary of ditch in order to evaluate an area where water ponds. Reisch will notify Sharon Wilcox of the change.

[illegible] 4/12/99

Y. J. France 4/12/99

0845 At LF C. Radar Testing in progress. May interfere with our schedule for DPT at the site. Radar Engineer will check with his management to see if it can be done this weekend.

0920 All back at Bldg 202
Reisch off-site. Stribley + France set up office.

1100 Stribley + France to LF B to stake locations

1200 Stribley + France finish staking locations at LFB. Drive to St. Johns Creek up stream SW15ed locations along City Ball Parks (south of the Base).

1215 Stribley + France off site for lunch.

1300 Back on site

1310 To Burning Ground to stake locations

1540 Finish staking locations at Burning Ground

1545 Start marking locations at CFC

1650 Finished all location except DPT lines at LFC

Y. J. France 4/12/99

Y. J. France 4/12/99

Note: Staked SW03 ~ 25 N of point shown on map due to the presence of more surface water.
Also staked SW07/SD07 at ~ 50-100' S of point shown in Work Plan
The new location is a low point that drains toward SW02. The original location is a dry "high" point.

1700 France and Stribly at Bldg 202 to measure aerial photos for locating DPT lines at LFC.

1730 Leave office to stake soil samples located between LFC and LFD.

1750 Finished staking soil sample locations between ~~the~~ 4/12/99 YJF LFC + LFD.
Stribley + France to LFD to stake sample locations.

1855 Finish staking locations at LFD
Stribly + France to office

1857 Late Note: All work today was performed in Level D.

1905 France and Stribly off site
Staked all Locations except DPT Lines at LFC.

Y. J. France 4/12/99

Lynne France 4/13/99

0700 I, Lynne France, assume control of this logbook. Weather: Sunny, 50's
On site: Lynne France, Field Team Leader
Todd Stribley, Field Team Member
Activities today include finishing staking locations for CTO15 work. Collect surface water samples at locations where no sediment is being sampled. This includes Landfill B, Landfill C and Landfill D.
Water at LFB is tidally influenced and surface water samples will be collected during out-going low tide. Low tide today is 1330 in Portsmouth.
0705 Conducted Health and Safety Meeting.
0710 Started unpacking additional equipment that came in yesterday.
0805 Stribley offsite to buy supplies
0845 France to Security office
0850 France leaves Security office
Left list of personnell and schedule of activities for the duration of the project.
LATE NOTE: All work today will be in Land D.

Lynne France 4/13/99

Lynne France 4/13/99

0945 France finished staking background well locations. Returned to office
Stribley on site, setting up bailer for surface water sampling.
0955 Collected Trip Blank TB-130499
1005 Collected Field Blank of DI water for this week FB130499-DI
This will be analyzed for Low con VOAs, SVOCs, Pest, PCB, Nitrogenous, Total Metals, Phosphorus and Cyanide.
Late Note TB-130499 will be analyzed for Low con VOCs. All samples were immediately placed on ice.
1045 France and Stribly to sample surface water at LFB and Burning Grounds.
1240 France to office. Checked messages
1300 France at Front gate to meet Utility Clearance personnel.
1310 Called Miss Utilities - no cuts and other did not show for meeting. Ticket was voided.
New Meeting Thurs 4/15/99 ~~1:30 PM~~ 1330
Ticket # 178421

Lynne France 4/13/99

(6) [illegible] 4/13/99

1450 Finish conversation with Miss Utilities
Obtained the following ticket #s. associated with Subcontractors
Columbia Technologies:
178643 LFC+D
178644 Burning Grounds
178822 LFB
Groundwater Systems
178893 LFB
178918 LFC
178934 Burning grounds 1 BKGR Well
178983 Background Wells on St Julien Road
178984 Background Wells on Patal Road.

1455 France to office Stribly off site to get Boat from Navy Recreation Dept. for sed/Surface water sampling in Blows Creek + St. Johns Creek

1510 France Checked with security about getting Gate key.

1515 Off site for Lunch (France)

[illegible] 4/13/99

[illegible] 4/13/99 (7)

1545 France Back on site, Stribley still gone.

1645 Stribley Back on site. with Boat

1700 France off site to buy ice
Stribly to sites C+D to sample Surface water.

1805 France + Stribly Back at office at office to ship samples.

1900 Work Accomplished today:
Sampled SJS02 and SJS05 and SJS04
Surface water samples not associated with a sediment site sample.
See individual logbook for details of sampling

1940 France and Stribly off-site for day

LATE NIGHT: Collected FB130499-TAP at 1400. Tap water for decon. [illegible] 4/13/99

[illegible] 4/13/99

0700 I, Lynne Franz, ST assume control of this logbook. Weather: Sunny, 50's.
Onsite: Lynne Franz Field Team Leader
Todd Stirley Field Team Member (FTM)
Lisa Campbell (FTM)
All activities today will be conducted in Level D.
Activities today will be:
Surface water and sediment sampling in ST Juliers Creek at LFB. Also LFC. See individual logbooks for details.
0725 Held Health and Safety Meeting planned work.
0745 Set up bottle ware / paperwork for sampling. Decon equipment
1030 Set appointment for utility clearance by Base (Mr. Christopher) for 9Am tomorrow.
1035 Calibrated Horiba U-10 #708031. See calibration logbook for details.
1100 All to gate of Foundation to put boat in water to start

Sampling in St. Juliers Creek
1800 Late note Decon procedure used for all stainless steel sampling equipment during the sampling event is as follows
① Liquinox wash and scrub
② potable water rinse
③ DI water rinse
④ nitric acid (10%) rinse
⑤ DI water rinse
⑥ isopropanol rinse
⑦ air dry
LATE NOTE: Collected Equipment rinsate on stainless steel bowls and spoon and petite ponar dredge decontaminated this morning
EB-140499-SD
1930 WORK Accomplished today:
Collected surface water / sediment samples from reference locations in ST Juliers Creek. Also on site 2 (LFB) samples from creek. Also surface water from LFC where no sed. sample is associated
1945 All off site
Lynne Franz 4/14/95

0700 I, Lynne France, assume custody of this logbook. Weather: overcast, 60s windy. Onsite: Lynne France, FTL
Todd Stribley, Field Team Member
Lisa Campbell, Field Team Member
Activities today will include surface water and sediment sampling at LFC, LFB, Berring Grounds and reference sampling Bloods Creek. All work will be performed in Level D

0745 Conducted Health and Safety Meeting

0800 Collected Trip blank @ TB160499

0830 Collected an Equipment Blank EB160499-SD on stainless steel bowl and spoon cleaned according to the procedure on p. 9.

0835 Calibrated Horiba U-10 Water Quality Meter #508831. See Calibration Logbook.

0840 All samples today will be collected with outgoing tide. High tide is at 1011 in Portsmouth today. Samples from non-tidal areas may be collected earlier.

Lynne France 4/16/99

France and Stribley to LFC to Sampler SJS03-SD/SW04.

0920 France + Stribley to office

0935 France to Berring grounds to Sampler SJS05/SD/SW05.

1030 France returns to office. Unable to find Sediment behind fragmites because. will use a hand auger next week to sample.

1040 Stribley off site to return the boat to Navy recreation at NSN.

1100 France + Campbell to Berring Grounds to collect SJS05-SD/SW06.

1200 Stribley on site

1210 Campbell to office to setup holleman

1230 France + Stribley at office to get waders to collect SJS13K09 (SW/SD)

Late Note: SJS05-SD06 was not collected due to thick biomass. Will consult B. Pluta next week

1235 Calibrate Horiba #U10 809010 See Calibration Logbook.

1240 France + Stribley to DK SD/SW09 and SD/SW10.

Lynne France

(16) [illegible] 4/16/99

1330 Franer + Stibley to office
1350 Franer + Stibley to LFB to start surface water / sed sampling at SJS02-SW/SD07. All sampling units green during outgoing tide
Late NOTE: Spoke with Tim Reisch, NAVY project manager. He and Sharon Wilcox, VADEQ, are ok with moving DPT lines to get a higher chance of hitting something.
He'll be on site at 1400. today.
1430 Tim Reisch on site.
1500 Franer and Reisch to Burning Grounds + LFC to review location of downgradient monitoring wells at Burning Grounds and DPT Line he thinks that maybe the line should be closer to center of road (midway point) we'll check air photo
1540 Reisch off-site
1600 Samplers at office to pack samples for shipment.
1800 Stribley and Campbell to FedEx with sampler shipment

[illegible] 4/16/99

[illegible] 4/16/99 (17)

1545
1900 Tim Reisch on site to discuss air photos
[illegible] 4/16/99 Decided to do the two DPT lines as marked in field on North side of road at LFC. We'll do one line on south side through F-70 air photo west disposal on east end of road. (See EPC study). Then, based on findings decide where to do next line.
1940 Work accomplished today
- Sampled surface water / sed locations (see sample logbook)
- Reviewed staked locations with Tim Reisch.
- Determined that Ecol. assessor input is needed at SJS05-SD06.
1945 Franer off site

[illegible]

Location _____ Date _____

Project / Client Lynne France 4/23/99

1545 Finish trench geotech well
Work accomplished:
Sampled stratigraphy to 40.5'
at SJSMW6D.

Lynne France 4/23/99

Location _____ Date 4/26/99

Project / Client Lynne France

0730 I, Lynne France, assume control of this logbook. Weather: 50's, sunny, breezy.
On site: L. France, cdm geologist
D. Sturgill, Groundwater Systems, driller
C. Dennis, " "
J. Bono " , helper
Activities today include installation of an isolation casing at ~35'.
This is reinstallation of casing at a deeper depth at the location. The hole was move ~10'E of original, damaged at of the shallow well.
0745 Start set up of rig at new location dig through ~8' of fill, brick, gravel, soil to native materials
0855. Start augering with 8 1/4" HSA.
All activities today will be conducted in level D. Air monitoring is with a Thermo Environmental OVM 580B # 38721-2856. Calibrated earlier (See calibration logbook).
0815 Augers to 10'. Drillers charging with water.

Lynne France 4/26/99

Location _____ Date _____

Project / Client SJSO2-MW5D

Lynne France 4/26/99

0820 Drillers hit clay at 14' based on lack of augering.

0855 Sampling 30-32'

0930 have sample to 36'. Clay from 30.75', 1.1ft sand to 33.2 ft. Will set casing in borehole to 35' and push 6" into clay.

0940 Have drilled to 35' Set up to mix cement bentonite grout.

1045 Finish grouting into place. Work accomplished today: Set 6" PVC isolation casing to 35' pushed to 35.5'.

Lynne France 4/26/99

Lynne France 4/26/99

Location _____ Date _____

Project / Client Lynne France 4/27/99

SJSO2-MW5D

1100 I, Lynne France assume custody of this logbook. Weather: Sunny, breezy, 60's-70's.

On site: L. France, CDM FPC Geologist

D. Sturgl Driller

C. Dennis, Helper.

Activities today will include Drilling and installation of SJSO2-MW5D. Drillers have pumped water from isolation casing and containerized it.

All activities will be conducted in Level D PPE. Air monitoring will be conducted with a Thermo Environmental OVM SERIES #38721-258E. Calibrated earlier today (See Calibration Logbook).

1110 Collecting first sample at 36.5-38.5 bgs. isolation casing is to 35.5'. See p. 24 for diagram

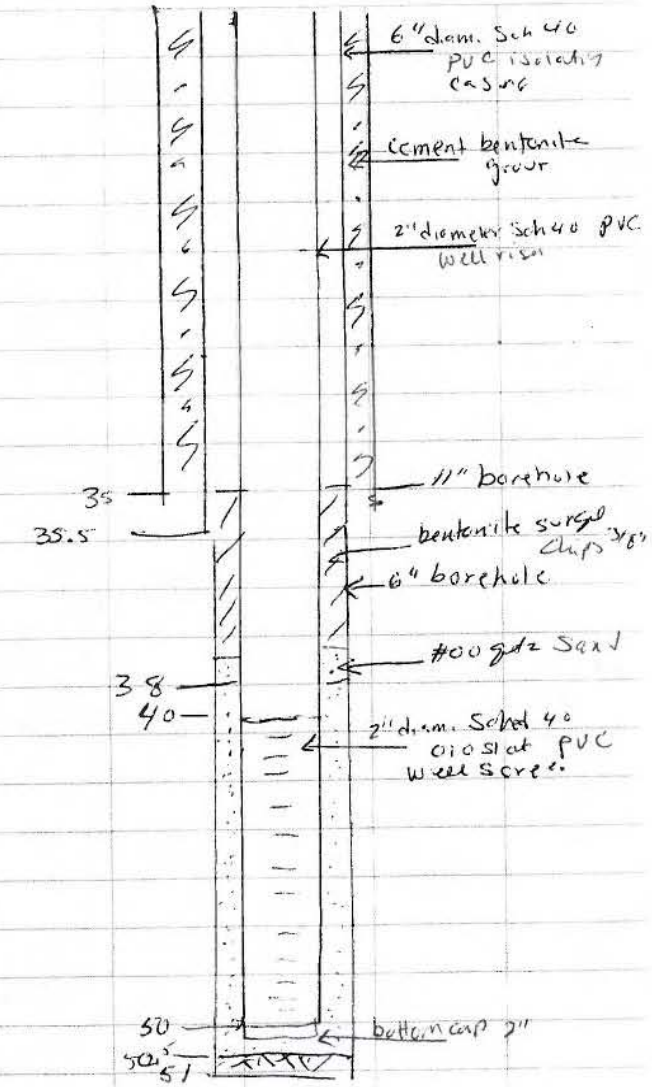
1150 Finish sampling to 57.5'. clay to 38 then yorktown shells to 51.5'. Will set screen 40-50 filter #1 sand to 38, fine (#00) to 37.5. See p. 24

Lynne France 4/27/99

Location _____ Date 4/27/99

Project / Client Yr. 7 Fm

SJS02-MW5D



Location _____ Date _____

Project / Client 4/27/99

Yr. 7 Fm

Note: drilling was done with a Acker AD-2 rig, NQ rod with a spade bit with mud/water rotary. Sampled with 2' split spoon. See Boring Logs and Well construction Log for more details.

1400 Set well at 50'0".

1405 Start installing ~~#00~~ filter pack #1 WG qtz sand. Firm caved from 50.5 to 51.

~~1350 Fm~~

1450 Finish placing sand pack: #1 Sand to 38' #00 to 37.5'.

1455 Placed bentonite seal to 35'

1525 Start mixing grout (5% bentonite)

1330 Start grouting - pressure - tremie with side discharge.

1545 Finish grouting

1549 Lynne France relinquished logbook to L. Campbell

1550 I, Lisa Campbell, assume control of logbook

NOTE: Late Entries in logbook are due to the fact that L. France and L. Campbell were both

Lisa Campbell 4.27.99

Project / Client _____

MW-4S

at the LFB at the same time - LFrance had logbook.

~~1231~~ 1230 LC at LFB, MW-4S; crew still at demo area

1246 crew arrives; set up on MW-4S

NOTE: MW-4S has already been augered to 10' bgs for UXO clearance.

- able to see water level at 2' bgs - will not need to collect split spoons
- drilling at low tide (approx high water level in borehole)

will set screen from 2-12' bgs, sand to 1.5' bgs + bentonite to ground surface

1313 begin augering; using bottom plug

1322 augers at 13' bgs - add water to hole

1324 screen/riser in hole; plug knocked out

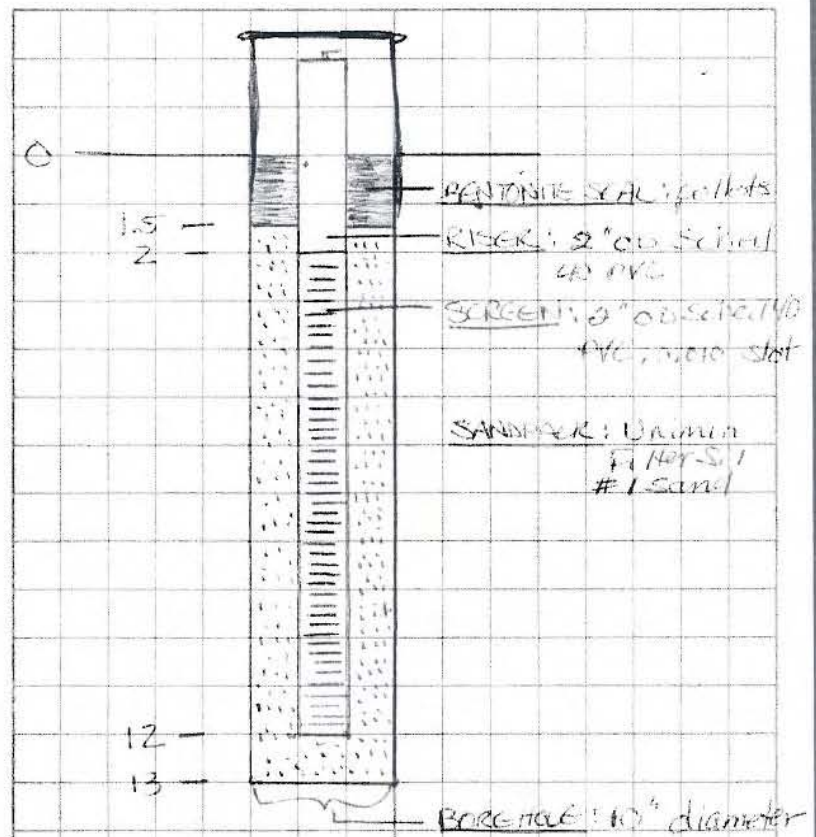
1325 begin adding sand; # 50-lb bags used: ~~IIII~~ ~~IIII~~ (10)

1340 top of sand at 1.5' bgs

Lisa Campbell 4.27.99

Project / Client _____

MW-4S



WELL CONSTRUCTION LOG
MW-4S

Lisa Campbell 4.27.99

Project / Client _____

MW-~~45~~ 55

1312 add bentonite to ground surface + hydrate

install outer protective casing

1355 crew departs to decon, get lunch

1630 LCS signs out of logbook

LATE ENTRY:

1500 crew at MW55 - no SS needed

water @ 3' bgs, screen 3-13' bgs

1520 begin augering

1533 augers at 14' bgs; add water

1534 screen/riser in hole; knock bottom plug out, add more water

1539 begin adding sand - # bags used 3 (11)

1555 Sand at 1.5'

1557 bentonite pellets to surface, hydrate w/ 10 gal of water

1650 install outer protective casing

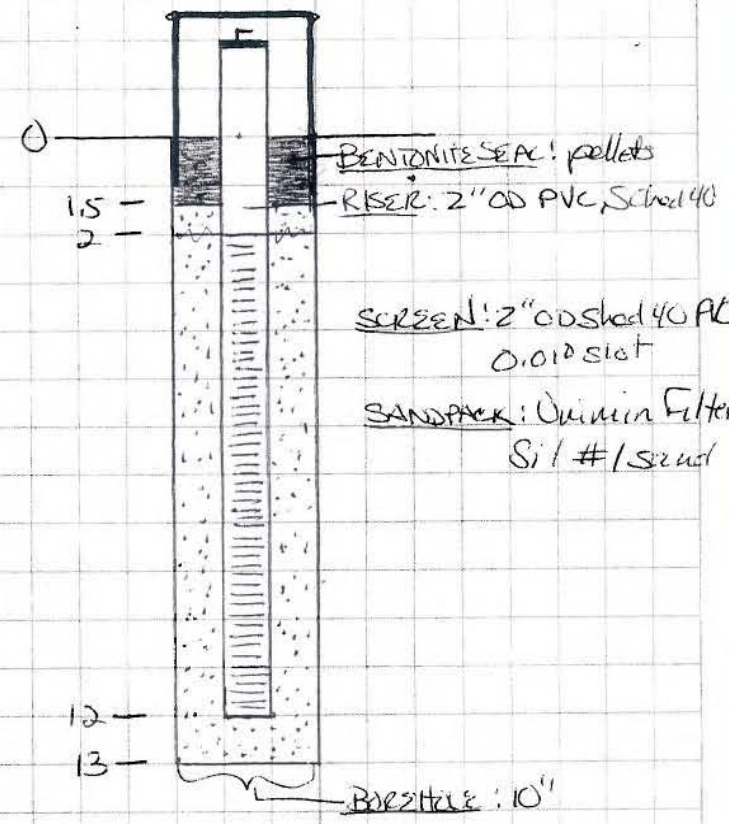
Lisa Campbell 4.27.99

Lisa Campbell 4.27.99

Lisa Campbell 4.27.99

Project / Client _____

MW-55



WELL CONSTRUCTION LOG
MW-55

Lisa Campbell 4.27.99

Location _____ Date 4/29/99

Project / Client MW55/MW5D

John Bambrick

0745 I John Bambrick assume control of this logbook. John Bambrick
Arrive at Landfill B. Present is John Bambrick (JB), Drillers are deconing pumps. Plan Activities: develope monitoring wells at Landfill B. Weather is cloudy, raining, 50°F PPE is level D
Equipment used:
Horiba U-10 # 808031
Water Level meter #15755
0815 Ground water systems drilling Duane Sturgill arrives
0843 Begin developing MW55
DTW 6.22 (from TOC) DTB: — (from TOC)
WC: — WV
pump used: whale pump
(Developing data for MW55 found in Well Development Log of MW55)
0845 Begin developing MW5D
DTW: 6.34 (from TOC) DTB: — (from TOC)
WC: — WV: —
(Developing data for MW5D found in Well Development Log of MW5D)
John Bambrick 4/29/99

Location _____ Date 4/29/99

Project / Client MW45/MW55/MW5D

John Bambrick

1030 Completed developing MW5D
Volume pumped ≈ 245 (5 drums)
1032 Begin developing MW45
DTW: — (from TOC) DTB: — (from TOC)
WC — WV: —
(Development data for MW45 found in Well Development Log of MW45)
1215 Complete developing MW55
Volume pumped ≈ 215 (4 drums
1340 Complete developing MW45
Vol. pumped ≈ 165 gal (3 drums)
~~1400~~ 1350 departed Landfill B. Drillers to decon, JB to office

John Bambrick
4/29/99

ec

L.L. Campbell Assume control of this logbook

1540 LC + CW at MW-1S & MW1D for GW sampling

MW-1D

DTW = 5.58' btic DTB = 66.80
WC = 60.22 ~~PV~~ WV = 9.8
PV = 29.4

1640 begin purging

time	VOL	pH	cond	turb	temp	eH
~~1642~~ CAW 1703	1 gal	9.50	.238	-10	17.8	233
1712	5 gal	8.80	.316	-10	17.7	199
1750	10 gal	8.87	.338	-10	18.2	147
1806	15 gal	8.71	.328	-10	18.1	159
1812	20 gal	8.68	.326	-10	17.8	131
1817	25 gal	8.63	.330	-10	17.6	CAW 123
1820	29 gal	8.59	.332	-10	17.3	124

1712 AFTER PARAMETER, CW WENT TO DUMP PURGE WATER AND GET EMPTY DRUMS

1730 collect SJS02-GW1S-003 and SJS02-GW1S-003F MS/MSD

1830 collect SJS02-GW1D-003 and SJS02-GW1D-003F

1850 LC + CW depart site

Lisa Campbell 5-17-99

ec

MW 1S

DTW = 4.20' btic DTB = 15' btic
WC = 10.60 WV = 1.7 PV = 5.1

1640 begin purging

time	VOL	pH	cond	turb	temp	eH
1642	1 gal	6.47	.784	52	18.2	
1645	2 gal	6.50	.733	52	17.5	
1651	3 gal	6.46	.759	-10	16.6	
1653	4 gal	6.47	.764	-10	16.7	
1656	5 gal	6.46	.762	-10	16.6	

end of today's entries

Lisa Campbell 5-17-99

Lisa Campbell 5-17-99

I, Lisa Campbell, assume control of this logbook
0840 crew decomming
0915 LC + DW at site
MW-2S 5.87' btic
MW-2D 4.5' btic
[MW-~~2D~~ 5D]
DTW: ~~5.87~~ btic TD: ~~50' btic~~ bgs
WC ≈ 48' bgs WV ≈ 7.8
PV: 23.5
[MW-~~2S~~ 5S]
DTW: 5.87' btic DTB: 12' bgs
WC ≈ 11' WV ≈ 1.8
PV ≈ 5.4
0940 begin purging both wells
[MW-5S]

Time	VOL	pH	COND	TURB	TEMP	ORP
0947	1	5.51	0.387	218	16.8	118
0953	2	5.67	.319	109	16.7	121
1000	3	5.67	.315	75	17.0	123
1007	4	5.66	.314	77	17.0	121
1015	5.5	5.55	0.314	9	16.5	109

1020 collect SJS02-MW5S-001
and SJS02-MW5S-001F
Lisa Campbell 5.18.99

[MW-5D] purge rate ≈ 0.5 gal/min

Time	VOL	pH	cond	turb	temp	ORP
0949	5	7.29	0.380	536	17.3	095
0955	10	7.41	0.369	159	17.4	085
1012	15	7.36	0.363	83	17.5	086
1015	20	7.39	0.360	28	17.6	088
1019	25	7.28	0.358	23	18.8	

1030 Collect SJS02-MW5D-001
and SJS02-MW5D-001F
1100 depart to decon + prepare samples
1150 LC + DW at MW-2S + MW-2D
MW-2S
DTW: 4' btic TD: 15'
WC ≈ 11' WV ≈ 1.8 PV ≈ 5.4
1205 begin purging

Time	VOL	pH	cond	turb	temp	ORP
1208	1	6.63	3.02	54	19.1	-106
1219	2	6.57	2.47	28	20.2	-40
1223	3	6.59	2.86	13	18.7	-13
1229	4	5.88	8.20	27	18.2	-48

1230 ~~55~~ well dry at 4 gal; wait for recharge
NOTE! trip blank, field blanks, & equipment blanks are recorded
Lisa Campbell 5.18.99

(MW-2D)
DTW = 6' btic TD ≈ 60'
WC ≈ 54' WV ≈ 8.8 PV ≈ 26.5
1205 begin purging

time	Vol	pH	cond	turb	temp	ORP
1209	1	7.46	0.423	8	18.9	-079
1220	5	7.47	0.368	36	18.7	-046
1230	10	7.63	0.459	36	18.6	-054
1241	15	7.46	0.579	12	18.8	-133 5.18.99
1248	20	7.43	0.379	6	19.1	-092
1308	25	7.42	0.381	5	19.2	088
1315	27	7.43	.368	4	19.2	-025

in the site logbook #3. Calibration recorded in calibration logs

1300 collect SJS02-MW2D-003
and SJS02-MW2D-003F

1305 collect SJS02-MW2S-003
and SJS02-MW2S-003F

time on bottles for MW2S is 1230

1615 LC + DW at MW-4S
DTW = 3' btic DTB = 12' bgs
WC = 11' WV ≈ 1.8 PV ≈ 5.5
1620 begin purging
Lisa Campbell 5.18.99

(MW-4S) rate = .02 gal/min

time	Vol	pH	cond	turb	temp	ORP
1635	1	6.17	0.329	275	19.6	152
1640	2	5.37	0.317	51	17.8	176
1644	3	5.22	0.322	23	16.8	193
1650	4	5.13	0.324	12	16.6	199
1655	5.5	5.07	0.322	3	16.6	200

1700 collect SJS02-GW4S-001F
and SJS02-GW4S-001P 5.18.99

1715 collect SJS02-GW4S-001P
and SJS02-GW4S-001FP

1730 depart site; no more entries today

Lisa Campbell 5.18.99

Lisa Campbell 5.18.99

Location _____ Date 5.19.99

Project / Client _____

I, Lisa Campbell, assume control of logbook

0840 LC + DW at site - MW35

(MW35)

DTW = 39' btoc DTB ≈ 13' bgs

WC ≈ 11' @ PWV ≈ 1.8 PV ≈ 5.5

time	vol	pH	cond	turb	temp	ORP
0853	0.5	6.67	1.17	265	17.3	096
0901	1.5	6.78	1.10	138	17.4	-002
0909	2.5	6.83	1.10	27	17.2	098
0915	3.5	6.84	1.10	14	17.3	102
0921	4.5	6.84	1.10	10	17.3	098
0927	5.5	6.83	1.10	10	17.5	091

0925 Collect SJSO-GW35-003 and SJSO-GW35-003F

Note: actual sample time of above is 0930

0935 depart site, no more notes today

Lisa Campbell 5.19.99

Lisa Campbell 5.19.99

Location LANDFILL B - SITE 2 Date ~~5.19.99~~ 10.26.99 RD

Project / Client SJC ANNEX - SLUG TESTING - TUESDAY OCT 26, 99

PERSONNEL: RICHARD DOUCETTE / CDM FEDERAL

WEATHER: CLEAR, 50°, HI 68°

PPE: MODIFIED LEVEL D

EQUIPMENT: WATER LEVEL METER
HERMIT 1000C DATALOGGER +
10 PSI TRANSDUCER

OBJECTIVES: PERFORM SLUG TESTS ON MONITORING WELLS MW-1S, 1D, 2D, 3S, 5S, 5D

0500 LEAVE NORTHERN VA FOR SITE

0900 ARRIVE ON SITE - OPEN BLDG 202 - & UNLOAD EQUIPMENT

0915 SET UP DATALOGGER
- HERMIT SE 1000C
IN-SITU INC # R03816
- TRANSDUCER - IN-SITU PXD-260
10 psi - 150' - S/N 204754

QUAD COEFFICIENTS
LINEARITY = 0.0432 (0.04)
SCALE = 10.0854 (10.09)
OFFSET = -0.0991 (-00.10)
(NUMBER IN PARANTHESES INPUTTED)

Richard Doucette 10.26.99

0930 COMPILE INFORMATION ON MONITORING WELLS TO TEST

2-INCH MW	TOTAL DEPTH (BGS)	SCREEN INTERVAL	WATER (TOC) LEVEL	STICK UP (FT AGS)	REF #
1S	15.1	5.1-15.1	5.26	2.53	11.22
1D	70	59-69	5.53	2.67	~~15.53~~ 11.22
2D	67	54.5-64.5	4.66	3.33	17.52
3S	13.7	3.2-13.2	4.50	2.58	10.13
5S	13	2-12	4.95	≈2.42	10.59
5D	51	40-50	6.60	—	15.85

1000 SET UP @ SITE 2 MW-1S
WATER ABOVE SCREEN
RUN FALLING HEAD TEST
TEST 0
WILL ALLOW TEST TO RUN FOR 10 min. or UNTIL WATER RETURNS TO WITHIN 0.05 ft OF ORIGINAL WATER LEVEL
1037 WATER LEVEL @ 10.22
STOP TEST
1040 PERFORM RISING HEAD TEST
TEST 1 ON MW-1S
XD = 17.45'

Richard Doucette 10/26/99

1045 DECON SLUG W/ LIQUINOX & DI WATER - WIPE DRY
1054 STOP TEST 1 - W.L. @ 5.29'
DECON TRANSDUCER
1100 SET UP AT MW-1D
WATER LEVEL @ 5.53' btoc
1105 RUN TEST 2 - FALLING HEAD TEST @ MW-1D
1120 TODD STRIBLEY & JOHN BAMBRICK ON SITE
LET TEST RUN WHILE RD OFF TO DROP CANOE @ 202
1130 RD BACK @ SITE
WL @ 5.51' btoc - STOP TEST
1135 START RISING HEAD TEST 3 @ MW-1D
1140 STOP TEST
DECON EQUIP
1150 OFFSITE FOR LUNCH
1220 BACK FROM LUNCH
SET UP @ MW-2D
HAVING PROBLEMS SMOOTHLY DROPPING SLUG - WILL RUN RISING HEAD

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& THEN SWITCH SLUGS
XD = 11.40 @ START OF TEST
1250 FINISH RUNNING RISING HEAD
PERFORM FALLING HEAD &
THEN RISING HEAD w/
SMALLER DIAMETER PIG
(TESTS 5 ↓ & 6 ↑)
1345 FINISH PERFORMING TESTS
DECON EQUIPMENT & MOB
TO MW-3S
1400 LOWERED TRANSDUCER &
ALLOWED TO EQUILIBRATE
RUN FALLING HEAD TEST 7
@ MW-3S - RECOVERED
TO 4.50 - PULL SLUG
& RUN TEST 8
1440 FINISH TEST - DECON EQUIP
& MOB TO MW-5S
1505 START FALLING HEAD
TEST 9 @ MW-5S
1530 STOP FALLING HEAD TEST
9 - START RISING HEAD
TEST 10 @ MW-5S
1555 FINISH TEST 10 - DECON
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1600 BEGIN FALLING HEAD TEST 11
@ MW-5D
1635 STOP FALLING HEAD TEST
@ MW-5D W.L. @ 6.59
START RISING HEAD TEST
@ MW-5D
1710 FINISH RUNNING RISING
HEAD TEST @ MW-5D
W.L @ 6.57
DECON EQUIPMENT
1730 RD BACK TO HOTEL
TO DOWNLOAD DATALOGGER
AND CHECK DATA QUALITY
1800 ARRIVE @ HOTEL
BREAK FOR DINNER & CALLS
2030 BEGIN DOWNLOADING DATA
2315 FINISH CHECKING DATA
ALL INFORMATION ON
PG 44-45 - BACKUP MADE
END OF DAY

BLANK
Richard Doucette
10/26/99

Richard Doucette 10/26/99

Location LANDFILL B-SITE 2 Date 10/26/99

Project / Client SLUG TESTING @ ST. JULIENS CREEK

SUMMARY OF DATA FILES & TESTS

MONITORING WELL	TEST TYPE	HERMIT TEST #	FILE NAME	
1S	FH	0	S2MW1SFH.DAT	X
1S	RH	1	S2MW1SRH.DAT	X
1D	FH	2	S2MW1DFH.DAT	X
1D	RH	3	S2MW1DRH.DAT	X
2D	RH	4	S2M2DRH1.DAT	X
2D	FH	5	S2MW2DFH.DAT	X
2D	RH	6	S2MW2DRH.DAT	X
3S	FH	7	S2MW3SFH.DAT	X
3S	RH	8	S2MW3SRH.DAT	X
5S	FH	9	S2MW5SFH.DAT	X
5S	RH	10	S2MW5SRH.DAT	X
5D	FH	11	S2MW5DFH.DAT	X
5D	RH	12	S2MW5DRH.DAT	X

BLANK
Richard Donnetta
10/26/99

Richard Donnetta 10/26/99

Location Landfill B-SITE 2 Date 10/26/99

Project / Client SLUG TESTING @ ST. JULIENS CREEK

SUMMARY OF DATA FILES & TESTS

GENERAL NOTES REGARDING DATA
RECOVERY IN 15 min.
RECOVERY IN 15 min.
RECOVERY IN 2 min.
RECOVERY IN 1 min.
RECOVERY IN 2 min.
RECOVERY IN 1 min.
RECOVERY IN 2 min
RECOVERY IN 7 min.
RECOVERY IN 6 min.
RECOVERY IN 5 min.
RECOVERY IN 5 min.
RECOVERY IN 5 min. (1 min)
RECOVERY IN 5 min. (1 min)

BLANK
Richard Donnetta
10/26/99

Richard Donnetta 10/26/99

Location

Date 6/27/01

Project / Client

TRENCHES. WILL LEAVE FOR DAY AND RETURN AT 0730 TOMORROW

W J Zweemann

Location

Date ~~6/27/01~~ 6/28/01 pl

Project / Client

-0750 - ARRIVE ON SITE. IMS AND UJA ON SITE.

-0840 - DUG SJS05 - TRENCH 36. LOTS OF METAL ON SURFACE LAYER, BUT NO BURNT OR CONTAMINATED SOIL HORIZON. PHOTO 35(1). TOTAL DEPTH 3'3"

0-5" TOP SOIL, DARK BROWN, ORGANIC, ABUNDANT ROOTS. PIECES OF METAL

5-11" - TAN TO BROWN SILT, FINELY LAYED, COHESIVE, FRIABLE, NON PLASTIC DRY.

11-39" - DARK GRAY SILT, DRY AT TOP BECOMING MOIST, FRIABLE, COHESIVE, NON PLASTIC, STICKY WHEN MOIST. DEBRIS IN TOP SOIL, BUT NO INDICATION OF CONTAMINATED SOILS.

PHOTO 34-33 (2) OF EXCAVATOR AT TRENCH 36.

TRYING TO FIND LOCATION FOR 37 ALONG WETLAND NEAR PRACTICE POWER LINES, BUT LOTS OF SIGNAL FROM DETECTOR.

Location

Date 6/28/01

Project / Client

0910- DUG SJS05-TRENCH 37 TOTAL DEPTH 3'7". PHOTO 32 (3). WATER IN HOLE, DEPTH TO WATER 2'6"

0-6" - TOP SOIL, HIGH ROOT STRUCTURE

6-18" - TAN TO GRAY TO YELLOW SILT, FINELY LAYERED, FRIABLE, COHESIVE, NON PLASTIC

18-43" DARK GRAY SILT, WET, STICKY, NON PLASTIC.

TOP SOIL HAD BOLTS AND NAILS. NO OTHER SIGN OF FILLING

0940- DUG SJS05-TRENCH 38 TOTAL DEPTH 4'0". SCRAP METAL IN TOP SOIL LAYER. FILTER FABRIC PRESENT PHOTO 31 (4)

0-2" TOP SOIL, SANDY GRAVEL WITH ROOTS DARK BROWN.

2-6" - BROWN GRAVEL AND SAND, LOOSE DRY.

FILTER FABRIC THEN

6-24" - TAN. TO GRAY, FINELY LAYERED. ROOTS, FRIABLE

24-48 - SILT FINE SAND, COHESIVE, MOIST, FRIABLE, SLIGHTLY COARSIVE. NO INDICATION OF BURNT OR

Location

Date 6/28/01

Project / Client

STAINED SOIL.

1005- DUG SJS05 - TRENCH 39. TOTAL DEPTH 3'-6" NO VISIBLE GW IN BOTTOM OF HOLE.

0-2" TOPSOIL

2-6" COARSE GRAVEL W/ SAND FILL. UNDERLAIN BY FILTER FABRIC.

6-18" GREY STIFF CLAYEY SILT W/ BROWN MOTTLES. (LAYERED)

18-36" SAME AS ABOVE, NOT SEEING SAND AT BOTTOM. GREY STIFF CLAYEY SILT IS NOT MOTTLED NEAR BOTTOM.

PHOTO # 30 (5). NO SIGNS OF WASTE, STAINED SOIL

1030 DUG SJS05. TRENCH 40. TOTAL DEPTH - 4'-0"

0-2" TOPSOIL, HEAVY ROOTS

2-8" COARSE GRAVEL W/ SAND. NO FILTER FABRIC AT THIS LOCATION?

8"-24" GREY CLAYEY SILT STIFF W BROWN & ORANGE MOTTLES

Location _____ Date 6/28/01

Project / Client _____

24"-27" DK BROWN TO BLACK ORGANIC ~~LAYER~~, MOIST ROOTS

27"-48" FINE TO MEDIUM SAND; WET TO MOIST, TRACE CLAY LT. BROWN TO TAN. GROUNDWATER FILLING IN VERY BOTTOM OF HOLE.
NO SIGNS OF WASTE, STAINED SOIL. PHOTO # 29 (28 USED TOO) (6)

1045 FINISH @ SITE 5. DECON BACKHOE & MOVE TO SITE 2.

1120 USA & IMS ARRIVE AT SITE 2. SHOW THEM FIRST LOCATION

1135 CLEAR PATH TO SJS-02 TRENCH 1

1150 SJ02 TRENCH 1 EXCAVATION FROM JUST INSIDE WATER LINE APROX 10' INLAND. REMOVED LARGE CHUNKS OF CONCRETE. USA REPORTS METAL MITS ~ LIKELY REBAR IN CONCRETE. CONCRETE UP TO 8" THICK X 2' X 3'
SURFACE - PHRAGMITES
0-6" TOPSOIL, ROOTS

Location SJS-02 Date 6/28/01

Project / Client _____

6-12' ORGANIC SANDY SILT DARK GREY, WET (NEAR WATER LINE

8' IN ~ 0-2' ALL ORGANIC TOPSOIL, BROWN, MOIST LOTS OF ROOTS. NO STAINING OR DEBRIS OTHER THAN CONCRETE & BRICK PIECE.
PHOTO #26 (7)

1210 - EXCAVATION SJS-02 - TRENCH 2 TO 2.5'. 10' BACK FROM TRENCH 1 ASK TO EXCAVATE 10' OTHER TO CHECK

1225 SJS-02 - TRENCH 2 EXCAVATED
0 - 8" TOPSOIL, LT BROWN ROOTS (ORGANIC) ~~THE~~ IN BRICK PIECES.
PHOTO #26 (8)

8"-24" ~ LT GREY FINE TO MED SAND W/ BROWN & ORANGE STAINING. MOIST
#25 (9) [CULVERT]

24"-72" GRAY ORGANIC SILT WITH TRACE SAND. NO WATER VISIBLE IN EXCAVATION NO SIGNS OF STAINING OR DEBRIS

Location

Date 6/28/01

Project / Client

1300 - DUG SJS-02 TRENCH 3
0-6" ROOTS & ORGANICS
HEAVY BLAST GRIT - ONLY
IN TOP 6".
6-18" ORGANIC SILT, ABUNDANT
ROOTS UP TO 1" Ø
18"-4.5' WET GRAY SILT, SOFT.
HEAVY ORGANICS. WATER IN
BOTTOM 6" OF HOLE. SMALL
AMOUNTS OF MISC DEBRIS -
BOTTLE, WELL CAP. NO
SIGNS OF STAINING.
PHOTO #23 (10) NOTE: 24 USED UP.
PHOTO #22 (11) OF TRENCH

1340 EXTENDED SJS-02 TRENCH 3
BACK 10' FROM WETLANDS
BLAST GRIT EVIDENT AMONG
ROOTS DOWN TO ~3.5' BGS
APPROX 3.5' GRAY SOFT
ORGANIC SILT. SMALL
AMOUNT OF WATER
IN BOTTOM, TOTAL DEPTH ~4'
TOTAL LENGTH 12'. NO VISIBLE
BLAST GRIT BELOW 3.5' BGS

Location

Date 6/28/01

Project / Client

1410 - COLLECT SUBSURFACE SOIL
SAMPLE SJS02-SB12-001. SAMPLE
COLLECTED FOR TAL METALS AND
DIOXINS. (2)(13) #20, 21
TWO PHOTOS

1420 DUG SJS02 - TRENCH 4
APPROX 20' BEHIND TRENCH 3
TOTAL DEPTH 4.5' BGS
BLAST GRIT / SOIL MIX DOWN
TO 18" BGS. DOES NOT APPEAR
TO BE CONSISTENT LENSE
0-4" TOPSOIL W ROOTS LT
BROWN TO TAN
4"-18" LT. BROWN TO TAN
MED SAND. BLAST GRIT / SOIL
MIX 20% TO 100% GRIT
18"-4.5' BROWN TO LT BROWN
SANDY CLAY. GRADING MORE
SANDY W DEPTH. WATER
COMING IN BOTTOM OF HOLE
NO OTHER SIGNS OF DEBRIS OR
STAINING OTHER THAN BLAST
GRIT MIX IN TOP 18".
PHOTO #19 (14) OF TRENCH 4

Location

Date 6/28/01

Project / Client

1430 DAWN HAYES ARRIVES ON SITE. DEZON @ SITE 2

1500 MOVE TO SITE 3 TO LOOK AT ADJACENT TEST PITS W DAWN (LANTDIV) & TODD RICHARDSON (EPA R3)

1735 LEAVE SITE FOR DAY

1640 SJS05-SB25-001 TCLP

Location ST. JULIENS ANNEX

Date 6-29-01

Project / Client 144308.F1.TR

0740 ARRIVE AT SITE 3. USA & IMS ARE ON SITE. IMS IS DE-CONNING BACKHOE FROM YESTERDAY. USA GIVES H&S DAILY BRIEFING

0810 ARRIVE @ SITE 2. SHOW USA WHERE TO PLACE SJS02-TRENCHES APPROXIMATELY 100' SOUTH OF THE TRENCHES 3 & 4. WILL INVESTIGATE WHAT BERM IS MADE OF.

0825 DUG SJS02-TRENCH 5. INSIDE BERM (TOWARDS CHANNEL) TOTAL DEPTH - 3'
0-12" HEAVY ROOTED SOIL (TOPSOIL) SOME GRAVEL
12-36" BROWN ORGANIC TOPSOIL WITH GNC. & BRICK CHUNKS
SOME GRAY SILT IN BOTTOM OF EXCAVATION. SOME CONCRETE CHUNKS VERY LARGE, NO SIGN OF STAINING OR DEBRIS OTHER THAN CONCRETE
PHOTO # 35 (1)
MOVE TO LOOK AT BERM. MOVE

Location _____ Date 6/29/01

Project / Client _____

BACKHOE BACK ABOUT 10'

0850 LOOK AT SJS02-T6

NOTE (T= TRENCH IN NOTES)

THROUGH BERM. CLEAN FILL APPROX 2' HIGH NO SIGN OF DEBRIS. ASK TO GO ~2' DEEPER TO INVESTIGATE

0855 SJS02-T6 DUG TO 6' DEPTH FROM TOP OF BERM.

BERM ~ APPROX 2.5', 8' WIDE

BERM MADE OF TAN MED. TO FINE SAND. LOTS OF ROOTS, ORGANICS.

FROM GRADE (EXCLUDING BERM) ORGANIC SILT W/ ROOTS BROWN, MOIST, SMALL CONCRETE CHUNKS (LARGE EMBEDDED IN EAST SIDE OF TRENCH) SOME SMALL METAL STRAPS. NO STAINING, BLAST GRIT OR OTHER DEBRIS.

WILL MOVE BACK ~20' FOR SJS02-T7

PICTURE # 34,33 (2)

0925 DUG SJS02-T7 TO 3' 8" BGS

Location _____ Date 6/29/01

Project / Client _____

0-4" TOPSOIL W ROOTS & ORGANICS

4"-24" ORGANIC SILTY SAND. LT BROWN, SOME GRAVEL, SMALL METAL WIRES. TRACE BLAST GRIT MIXED IN SOIL

24-48" GRAY SANDY CLAY. MOIST TO WET, PLASTIC. TRACE ORGANICS

HOLE APPEARS PRETTY CLEAN EXCEPT FOR TRACE BLAST GRIT & SOME METAL, & ASPHALT CHUNKS

0930 FILL BACK IN. MOVE BACK ABOUT 30'. PHOTO # 32 (3)

0950 DUG SJS02-T8 TO 4' BGS

TOP 4" TOPSOIL, BROWN, ORGANICS

TRACE BLAST GRIT MIX IN TOPSOIL. 1 PIECE OF BURNT WOOD.

4"-4" LT. BROWN TO TAN CLAYEY SAND, SEMI-PLASTIC. NO METAL HITS W DETECTOR. NO SIGNS OF DEBRIS OR STAINING OTHER THAN BURNT WOOD

PHOTO # 31 (4)

MINIMAL BLAST GRIT & TRACE

Location [illegible] Date 6/29/01

Project / Client

IN SURFACE ONLY IN LINE OF TRENCHES 5-8. MOVE NORTH HALFWAY BETWEEN TRENCHES 3 & 4 TO SEE IF I CAN FIND SOUTHERN LIMITS OF BLAST GRIT.

1025 DUG SJS02-79 @ EDGE OF TREE LINE. 3' TOTAL DEPTH

- 0-2' HEAVY ROOTED TOPSOIL W/ ABUNDANT BLAST GRIT ON NORTH SIDE OF TRENCH. NO SIGN ON SOUTH SIDE.
- ~~2-4~~ 2-3' WET SILTY FINE SAND, TAN TO LT. BROWN POORLY GRADED
- NO OTHER SIGNS OF DEBRIS OTHER THAN ~~ASH~~ BLAST GRIT (HEAVY) IN TOP 2'. APPARENT EDGE ON SOUTH SIDE. WILL MOVE BACK ~25'

PHOTO #30 (5) OF S. WALL W/ OUT GRIT

PHOTO #29, 28 (6) OF N. WALL W/ GRIT

1055 DUG SJS02-T10 TO 3'9" BGS

0-8" ORGANIC TOPSOIL W/ LOTS OF ROOTS, SANDY, BROWN

Location Date 6/29/01

Project / Client

TO DARK BROWN WITH SMALL PORCENTAGE OF BLAST GRIT MIX (ESTIMATE 10%)

8"-3'-9" LT. BROWN TO TAN CLAYEY SAND OR SANDY CLAY. MOIST. SLIGHTLY PLASTIC. WATER SLOWLY COMING IN @ BOTTOM OF HOLE. NO SIGNS OF STAINING OR DEBRIS OTHER THAN HORSE SHOE FOUND AT SURFACE & SMALL PIECE OF METAL STRAPPING AT ABOUT 18". NO VISIBLE BLAST GRIT OTHER THAN SMALL PORCENTAGE IN SURFACE SOIL

PHOTO #27 (7)

1135 DUG SJS02-T11. IN WOODS BETWEEN 1 & 2 AND 5-8.

0-8" ORGANIC TOPSOIL WITH LOTS OF ROOTS DK. BROWN.

8"-3.5' BGS APPEARS TO BE GENERAL FILL. GRAVEL & COBBLES. IN A GREY SILTY SAND. SOME SMALL PIECES OF METAL. LARGE CONCRETE PIECE IN BOTTOM. NO SIGNS

Location Date 6/29/01

Project / Client

OF BLAST GRIT. SMALL TRACE IN TOPSOIL - [NOT MUCH]
PHOTO #26(8) OF SJS02-T11
PHOTO #25(9) OF SURFACE DEBRIS LOCATED JUST NORTH OF SJS02-T11. APPEARS TO BE EMPTY CANS, BOTTLES, WOOD, AND MISC. STEEL.

1200 FILL HOLE BACK IN - BREAK FOR LUNCH

1250 SJS02-T12 EXCAVATION TO 4' BGS
0-12" TOPSOIL WITH HEAVY ORGANICS SANDY. NO VISIBLE BLAST GRIT
12-48" BROWN TO TAN CLAYEY SAND. SOMEWHAT PLASTIC, MOIST. NO TRACE BLAST GRIT. NO METAL HITS DURING EXCAVATION. NO SIGNS OF DISPOSAL
PHOTO #24(10)

1320 EXCAVATED SJS02-T13
0-4" TOPSOIL, ROOTS, ORGANICS LT BROWN TO BROWN
4"-18 MED TO FINE SAND. TAN TO LIGHT BROWN. POORLY

Location Date 6/29/01

Project / Client

GRADED
18"-20" SMALL LENSE OF DARK BROWN SILT W/ ORGANICS. EVIDENCE OF BROKEN GLASS;
~~20"-48"~~ PL & GRAVEL
20"-48' TAN TO BROWN SANDY CLAY SLIGHTLY PLASTIC. NO SIGNS OF DEBRIS, STAINING, OR BLAST GRIT OTHER THAN GLASS IN LENSE 18"-20"
PHOTO #23,22(11)

1355 EXCAVATED SJS02-T14 FROM EDGE OF WETLANDS AGAIN 10' OUT TO EAST
WETLANDS:
0-12" ROOTS IN ORGANIC TOPSOIL. VERY HEAVY (PHRAGMITES)
WATER IN HOLE AT 12".
UPLAND SLOPE:
0-12" TOPSOIL W/ ROOTS, ORGANICS
20% BLAST GRIT; BROWN TO BLACK
BOTTOM OF TRENCH WET BLACK SILT W/ GRAVEL, ORGANICS
ALSO IRON-STAINED SILTY SAND

Location ( ) Date 6/29/01

Project / Client

AT TOE OF SLOPE. ALSO GRAVEL UP TO 2" INTERMIXED. MANY TREEPIECES – 1 FT DIA × 4' LENGTH AT MOST. 2 METAL PIPES – 6" DIA. BY 4' LENGTH

MID SLOPE

0-12" TOPSOIL W/ ROOTS

12-36" ORGANIC SOIL WITH HEAVY BLAST GRIT PERCENTAGE TOO MUCH GRAVEL & WOOD IN BOTTOM – ASK JIMS TO TAKE AN ADDITIONAL BUCKETFULL. TOTAL DEPTH NOW 5' AT APPROX TOP OF SLOPE.

AFTER ADD'L EXCAVATION – STILL SHOWING LOTS OF BLAST GRIT IN SIDEWALL (5' DEPTH)

BOTTOM OF HOLE VERY WET BLACK SILT W/ HEAVY ORGANICS

SOMEWHAT TOUGH TO JUDGE DUE CAVING IN OF LOOSE BLAST GRIT/SOIL MIX. NEAR 50/50 SPLIT

PICTURE #21 (12) LOOKING ALONG TRENCH TOWARD WETLANDS

Location Date 6/29/01

Project / Client

1430 COLLECT SAMPLE SJS02-SB13-002 FOR TAL METALS ANALYSIS

MAY HAVE BEEN FAINT PETROLEUM ODOR NEAR BOTTOM OF TRENCH WHEN COLLECTING SAMPLE – VERY FAINT, BUT ORGANIC. I PUT A PIECE OF SOIL IN QW IN BOTTOM OF HOLE & NO SHEEN DEVELOPED – ASSUME ORGANIC DECAY.

FILL HOLE BACK IN

1515 DUG SJS02-T15 TO 3' DEPTH AT TOP OF SLOPE TO WETLANDS. SAME AS T14 FROM LOWER LEVEL OF WETLANDS APPROX 10-12' UPLAND/INLAND

0-18". TOPSOIL WITH LOTS OF ROOTS. SOME SMALL POCKETS OF BLAST GRIT IN TOP 6" – NONE APPEARS BELOW SOME SMALL GRAVEL AREAS IN TOP 18" (MAX.)

18"-36" GRAY FINE SAND WITH TAN MOTTLES. STILL CONTAINS

Location [illegible] Date 6/29/01

Project / Client

ROOTS. NO SIGNS OF BLAST GRIT.
BOTTOM OF HOLE IS WET @ 36"
BGS. GRADING TO SOFT DARK
GRAY TO BLACK SILT IN BOTTOM
OF HOLE. MORE GRAVEL
ON W. SIDE OF TRENCH
IN TOP 18" → MORE OBVIOUS FILL
PHOTO #21 (13). NOTE: ACCIDENTALLY
HAD DIGITAL CAMERA ON WRONG
SETTING. MAY HAVE MISSED
LAST PICTURE AT T14.
PICTURE HAS STANDING H2O IN
MOST OF THE BOTTOM OF EXCAVATION
& STADIA ROD ON RIGHT HAND
SIDE IN MIDDLE OF TRENCH
1530. FILL HOLE BACK IN. MOVE
BACK ≈ 20'
1545 DUG OUT SJS02-T16 APPROX.
20' E. OF T15 → TOWARD ROAD
& UNDER FORMER BUILDING
0-6" TOPSOIL W/ ORGANICS &
ROOTS. NO SIGN OF BLAST GRIT
6"-42" TAN TO GRAY FINE SAND
WITH ORANGE & BROWN

Location Date 6/29/01

Project / Client

MOTTLES. POORLY GRADED. DRY
TO MOIST. NO SIGN OF BLAST
GRIT OR DEBRIS
42"-54" (3.5-4.5) GRAY TO DARK
GRAY SANDY CLAYEY SILT
SOMEWHAT PLASTIC, SOME TO
TRACE ORGANICS. NO SIGNS
OF STAINING OR DEBRIS IN
ENTIRE TRENCH.
PHOTO #20 (14). ASK TO
HAVE HOLE FILLED IN &
WILL CALL IT FOR DAY.
1610 FINISH CLEANING UP AROUND
LAST TRENCH (T16) BREAK
FOR DAY
1615 LEAVE BASE FOR DAY

Location: ST. JULIEN'S CREEK ANNEX Date: 6/30/01

Project / Client: TRENCHING 144308.FI.TR

0730 ARRIVE @ SITE 2. MEET WITH USA & IMS. DANNY OF USA GIVES H&S BRIEFING — HEAT OUR MAIN CONCERN

0750 BEGIN LOOKING AT TEST PIT/TRENCH AREAS. THERE IS A SMALL BERM NEAR THE NORTH END OF THE FORMER BUILDING. ASK IMS TO REMOVE BUCKETFULL. DID NOT LOG BERM — ALL APPEARED TO BE CLEN FILL.

0805 PROCEED WITH SJS02-T17. JUST SOUTH OF BERM LOCATION. WILL USE SAME APPROACH AS BEFORE — START IN WETLANDS & MOVE UPLAND

0825 LOOK @ SJS02-T17. EXCAVATED TO ABOUT 2' DEPTH IN WETLANDS. ESTIMAT 8' IN LENGTH. SLOPE UPLAND/BANK CONSTRUCTED OF CONCRETE CHUNKS & BRICKS. SOME APPARENT OIL/PETROLEUM STAINING FROM BOTTOM

Location: Date: 6/30/01

Project / Client:

OF EXCAVATION. DARK BLACK W/ MILD ODOR IN BOTTOM.

TRENCH —

0-12" TOPSOIL W/ LOTS OF ROOTS & ORGANICS. DARK BROWN TO BLACK — NOTHING POTTING SOIL — ONLY TRACE ~~FINE~~ PEA SAND CONTENT

12-24" CONCRETE & BRICK RUBBLE INTERMIXED W/ SILTY SAND DARK BROWN MOIST. PERHAPS TRACE BLAST GRIT — NOT LARGE FRACTION.

OIL/PETROLEUM LEAKING INTO TRENCH FROM NORTH SIDE — DARK BLACK AREAS & SHEEN ON WATER. WILL FLAG OFF & LEAVE OPEN FOR NOW. USA FLAGGED OFF AREA. PHOTO #35 (1)

0910 EXCAVATED SJS02-T18 NORTH OF BERM & OUTSIDE WETLANDS. PIECE OF CIRCULAR FOOTING ON GROUND NEAR HOLE. NOT SURE OF EXTENT

Location: Date 6/30/01

Project / Client

TRENCH SJS02 - T18 [TOTAL DEPTH 4']
0-12" DARK BROWN TO BLACK TOPSOIL WITH ORGANICS. SOME SIGN OF BLACK STAINED (BURNING) IN TOP 12" ALSO CONTAINS TRACE (SAY <15%) BLAST GRIT

12"-48" TAN TO LT. BROWN SANDY CLAY TO CLAYEY SAND. SOMEWHAT PLASTIC. SOME COBBLES. NO SIGN OF BLAST GRIT, DEBRIS, OR STAINING BELOW TOP 12" PHOTO # 34, 33 (2)

0950 CALLED OVER TO LOCATION OF SJS02-T19. AT ABOUT 2.5' DEPTH WE HIT A PIPE THAT APPEARS TO BE COMING FROM THE ABANDON BUILDING (BY DIRECTION). NO HITS WITH METAL DETECTOR → LIKELY TERRA COTTA. BOTTOM OF HOLE FILLED IN WITH WATER BUT NOT UNDER PRESSURE. ASK GUYS TO LEAVE OPEN FOR NOW & MOVE

Location: Date 6/30/01

Project / Client

INTO EDGE OF WETLANDS

1005 GO OVER TO LOOK AT PROPOSED LOCATION. WILLIS FOUND AN OLD CONCRETE STORM CULVERT AFTER CLEARING WEEDS. DOES NOT APPEAR TO HAVE HAD ANY SIGNIFICANT FLOW LATELY. THERE ARE PHRAGMITES GROWING ABOVE INVERT ELEV. BELIEVE THE PIPE WE HIT AT T19 WAS A SMALL FEEDER PIPE TO THE STORM SEWER. HAVING WILLIS MOVE BACK AND CLEAN OUT AROUND PIPE. (PVC ≈ 10")

1025 CALL BILL F. TO LET HIM KNOW WHAT'S GOING ON. SAYS HE'LL BE OUT LATER. PROCEED AROUND TO NORTH SIDE

1035 MOVE OVER TO WEST SIDE OF WETLANDS. ABANDON FURTHER DIGGING ON THE EAST SIDE. GO LOOK AT TRENCH LOCATIONS.

Location

Date 6/30/01

Project / Client

1045 SETTING UP LOCATION FOR SJS02-T20 (10 PARKING SPACES AWAY FROM BLDG 278) ON WEST SIDE OF SITE 2.
TRENCH DEPTH - 2' WATER IN BOTTOM - FILLING SLOWLY.
0-18" ORGANIC SILT W/ LOTS OF ROOTS, LEAVES - TYPICAL "MARSH MUD".
18-24" VERY SOFT DARK GRAY SILT W/ ORGANICS, ROOTS, etc.
NO SIGNS OF METAL OR DEBRIS
DARK STAINED THROUGHOUT W/ ORGANIC (DECAY) ODOR.
PHOTO # 32 (3)

1125 SJS02-T21 EXCAVATED TO 3' BGS
18" MIS FILL FROM SAND & GRAVEL TO CLAY & SILT. SMALL PIECES OF DEBRIS (PLASTIC)
18-30" SOFT GRAY CLAYEY SILT. VERY SOFT W/ ORGANICS
— LENSE OF WHITE MATERIAL? AT 14-16" BGS.

Location

Date 6/30/01

Project / Client

1135 BREAK FOR LUNCH - WILL ASK BILL WHEN HE GETS HERE

1140 BILL SHOWS UP. SKIP LUNCH FOR NOW.
PHOTO #31 (4)

1215 CALL DONNA C. TO TELL HER ABOUT SITUATION - SUGGESTS BILL'S THOUGHT TO CAP NOW & INFORM NAVY & BASO ON MONDAY SINCE THE LINE IS INACTIVE

1225 COLLECT SMALL BAG SAMPLE OF WHITE MATERIAL FROM SJS02-T21

1235 GO TO COLLECT SAMPLE FOR [JPH] FROM [SJS02-T17]
PHOTO #30 (4)

1255 JMS RETURNS FROM LUNCH (1HR 20MINS). FILL IN T21 COME BACK TO ~~SOUTH~~ EAST SIDE AND FILL IN T17. SEND RON (JMS) TO GET PARTS TO REPAIR BROKEN PIPE

1430 NOTHING EXCAVATED (BY HAND) AROUND SJS02-T19. WILL NOW LOG TRENCH SINCE IT IS

Location [illegible] Date 6/30/01

Project / Client

EXPOSED FOR PATCHING OF PARKING.
SJS02-T19
0-4" TOPSOIL LT BROWN, SILTY ORGANIC
LOTS OF ROOTS
4-24" GENERAL DEBRIS FILL
INCLUDING CONCRETE CHUNKS,
METAL STRAPPING, SMALL
PIPES, ETC ABOUTS TO HAVE
BEEN THERE A WHILE → ALL
VERY RUSTED. MIXED IN WITH
ASSORTMENT OF SOIL INCLUDING
DARK BLACK SOIL - BLAST GRIT
IN POCKETS BUT NOT CONSISTENT
DOWN TO 24"
24-48" GRAY MED TO FINE SAND W/
ORANGE MOTTLES; TRACE
CLAY / SILT.
PHOTO #29, 28 (5)
1440 WILLIS CALLED BACK - STILL AT
OFFICE. FENCE OFF AREA AROUND
T19 AND PROCEED TO NORTH SIDE
RESUME W SJS02-T22

Location Date 6/30/01

Project / Client

1525 SJS02-T22 3' TOTAL DEPTH
0-4" TOPSOIL W ROOTS. GRAY TO
LT. BROWN. TRACE GRAVEL. DRY.
4"-3' GRAVEL TO COBBLE TO
BOULDER FILL. SOME SILT
& SAND. SOME LARGE PIECES
OF ASPHALT UP TO 4"
SOME DARK ORGANIC SILT ON
BOTTOM. NO OBVIOUS SIGNS
OF DEBRIS, METAL, SOIL STAINING,
OR BLAST GRIT.
PHOTO # 27 (6) LOOKING INTO
MARSH.
1550 SJS02-T23 2.5' TOTAL DEPTH
0-4" RICH ORGANIC TOPSOIL
4"-2.5' LOOSE GRAVEL TO COBBLE
FILL. SOME LARGER CONCRETE
CHUNKS UP ≈ 1' SQUARE
& ASPHALT. NO SIGNS OF
BLAST GRIT OR SOIL STAINING
PHOTO #26 (7) [MAY BE DARK]
- NELSON (USA) HAS TEMPORARILY
PATCHED BROKEN PIPE. FENCED OFF
W CAUTION TAPE. WILL FINALIZE MONDAY

Location

Date 6/30/01

Project / Client

SJS02-T24 - 3' TOTAL DEPTH.
MUCH THE SAME AS T23.
4" OF TOPSOIL UNDERLAIN BY
GRAVEL TO COBBLE FILL W/
ASHPALT & CONCRETE. BLAST
GRIT IS ABUNDANT IN TOP 6".
ANY BELOW THAT APPEARS TO
HAVE FALLEN IN DURING EXCAVATION.
VERY BOTTOM OF HOLE HAS GRAY
SANDY SILT W/ ORGANICS (@ 3' DEPTH)

1615 FILL IN SJS02-T24. MOVE BACK
~20' FOR T25. NOTE: I
FORGOT TO PHOTOGRAPH T24. WAS
VERY SIMILAR TO T23.

1630 SJS02-T25 - 2' TOTAL DEPTH
FROM NORTH EDGE OF BANK NORTH
TOWARD PARKING LOT.
0-6" TOPSOIL & ROOT STRUCTURE
FOR PHRAGMITES.
6"-2' GRAVEL TO COBBLE FILL
WITH CONCRETE & ASPHALT CHUNKS
SOME SILT.
- BLAST GRIT NOT OBSERVED
EXCEPT FOR DUSTING ON SURFACE

Location

Date 6/30/01

Project / Client

FILL HOLE BACK IN. MOVE TO AREA
BEHIND T25 W/ BLAST GRIT ON
SURFACE. PHOTO #25 (@)

1645 - SJS02-T26 EXCAVATED
TO APPROX 1'. TO CHECK SURFACE
BLAST GRIT VS. SUBSURFACE
0-1' GRAVEL TO COBBLE FILL
WITH CHUNKS OF ASPHALT &
CONCRETE. BLAST GRIT
ONLY ON SURFACE → ASSUMING
THIS LOCATION SIMILAR TO
OTHERS IN THIS AREA WITH
FILL PRESENCE. DID NOT
PHOTOGRAPH.

1700 SJS02-T27. ALSO EXCAVATED
TO 1' ONLY AS T26 TO
LOOK FOR SIGNS OF BLAST
GRIT UNDER SURFACE. BLAST
GRIT PRESENT ONLY ON SURFACE
SOIL COMPRISED SAME AS T26.
GRAVEL, COBBLE,
PHOTO #24 (@)
- COLLECTED SAMPLE SJS02-SB15
FROM BOTTOM of T27 FOR METALS & DIOXINS

Location _____ Date 6/30/01

Project / Client _____

SAMPLED T27 FROM 1' INTERVAL (DEPTH) SINCE WE'D ONLY ENCOUNTERED MISC. FILL BELOW THAT DEPTH IN OTHER TRENCHES.

1710 CLEAN UP
1725 LEAVE SITE FOR DAY

Location ST JULIENS CREEK Date 7/2/01

Project / Client 138804. FT. TR

-0730 - ARRIVE ON SITE AND MEET USA AND IMS. GOING OVER H&S I WILL CONTINUE TRENCHING WEST SIDE OF LANDFILL B.

-0800 - ALYN CHRISTOPHER OF PWC LOOKS AT BROKEN PIPE. THE PIPE WAS ALSO SEALED OFF UPSTREAM OF BREAK. WE ARE OK TO SEAL OFF BREAK.

IMS DIGGING SJS02-TRENCH 28 ON SATURDAY, JUNE 30, & SPENT SHELL WAS FOUND ON THE GROUND WHERE TRENCH 28 IS LOCATED. ORDNANCE FOUND. USA WILL TRY TO DETERMINE IF LIVE OR SPENT BY DIGGING MORE OF IT OUT. THE ITEMS ARE TWO 5" SHELLS WHICH HAVE BEEN PUSHED TOGETHER PHOTO 35 + 34 (1) 5" MARK 5 38 CALIBER. WILL CONTINUE DIGGING HOLE. PHOTO 33 (2) LOGGING HOLE. NO BLAST GRIT APARENT. TOTAL DEPTH 3' 8" PHOTO 32 (3).

0~12" - GRAY SILTY SAND WITH

Location ST JULIENS CREEK Date 7/2/01

Project / Client 138804. FI. TR

GRAVEL.

12-26" - SANDY SILT, LESS GRAVEL LOCATION OF 5" ROUNDS

WATER LEVEL WENT TO ABOUT 2' 10"

26-44" - WET GRAVEL ROCK, DEBRIS MORE OE (FUSE CAP, LOOKS LIKE ANOTHER 5" ROUND) PIPE, WOOD

PHOTO 31 (4) APPEARS TO BE SLIGHT STAIN ON SOIL PILE.

-0930 - REOPENED TRENCH 27 TO LOOK AT DEPTH OF DEBRIS. TOTAL DEPTH ~~CURRENT~~ NOW 4'0" WILL OPEN TRENCH UNTIL HIT NATURAL MATERIAL. LOOKS LIKE WOOD AND ASPHALT AT ~~THE~~ AND BELOW THE WATER TABLE.

-0950 - DUG TRENCH 27 DOWN TO 5'0" HIT SILT LAYER AT 4'6". WATER RUNNING IN HOLE. NO METAL

0-14" - GRAVEL AND SAND. BLAST GRIT RIGHT ON SURFACE, BLACK

14-42" - BROWN SAND AND GRAVEL, BRICKS,

42-50" - ASPHALT PIECES, BLACK, ODOR

50-54 - SAME WOOD

Location ST JULIENS CREEK Date 7/2/01

Project / Client 138804. FI. TR

54-60" - GRAY SILT.

WATER AT 3' BGS.

-1030 - DUG SJS02 - TRENCH 29.

TOTAL DEPTH 2'0". NO INDICATION OF GRIT, DEBRIS OR FILLING.

PHOTO 27

0-14" TOP SOIL AND ORGANIC MATERIAL. WET, SANDY SILT, ABUNDANT ROOTS.

14-24" DARK GRAY TO BLACK, SANDY SILT, WET, NO FILL, DECREASE IN ROOTS. WATER COMING IN HOLE.

THERE WAS SOME CONCRETE AND RAILROAD TIES ON SURFACE.

TRENCH WAS ABOUT 7' IN LENGTH.

-1105 DIGGING SJS02 TRENCH 30, ASPHALT IN HOLE, WILL DIG UNTIL ~~OF~~ INTO NATURAL MATERIAL. I SUSPECT THAT THIS AREA WAS BUILT UP

-1115 FINISHED DIGGING TRENCH 30

NATURAL MATERIAL AT 5' BGS.

FILL TO SURFACE. DEBRIS ALL THE WAY DOWN. GLASS, METAL, CONCRETE WOOD. PHOTOS 26 + 25, ASPHALT

Location _____ Date 7/2/01

Project / Client _____

WATER LOOKS LIKE IT WILL FILL IN TO AT LEAST 4' BGS. NO EVIDENCE OF BLAST GRIT.

- 1220 - PHOTO 24. DUG SJSO2 TRENCH 31 TOTAL DEPTH 2'10" LOOKS NATURAL HIGH ROOT CONTENT

0-10" - TOP SOIL SILTY SAND, ROOTS DRY

10-34" - GRAY TO DARK GRAY SILTY SAND, WET, STICKY, NON PLASTIC. TRENCH LENGTH 10'.

- 1250 - DIGGING SJSO2 - TRENCH 32. TOTAL DEPTH 6'0". HIT GRAY SILT LAYER AT 4'6" JUST ABOVE THE SILT IS AN ABUNDANCE OF TREE LIMBS SEVERAL INCHES IN DIAMETER. PHOTO 23+22

0-4" DRY, BROWN, SILTY SAND, NO BLAST GRIT, ABUNDANT ROOTS.

4-36" - BROWN SANDY SILT, COHESIVE, NON PLASTIC, PLANT ROOTS.

36-52" - BLACK SILTY SAND AND ABUNDANT TREE LIMBS, NO ODOR AND NO INDICATION OF BURNT

Location SJS Date 7/2/01

Project / Client _____

MATERIAL. WOOD IS NOT BURNT.

52-72" - GRAY TO DARK GRAY SAND. NO ASPHALT SEEN. PIECES OF CONCRETE AT SURFACE.

WATER FILLING TO ABOUT 4' BGS

TRENCH 32 HAD ~~MUCH~~ NO ASPHALT BUT ABUNDANT TREE LIMBS.

- 1334 - DUG SJSO2 - TRENCH 33 TOTAL DEPTH 5'0" PHOTO 21

0-12" BROWN TO TAN, DRY SANDY SILT, ROOTS, LOOSE,

12-36" DEBRIS INCLUDING WOOD, PAPER CANS BOTTLES, METAL SPIKES, PLYWOOD. WILL COLLECT SAMPLE. NO INDICATION OF BLAST GRIT.

36"-48" - GRAY SILTY SAND, COHESIVE, NON PLASTIC, MOIST.

48-60" - TAN TO BROWN SAND, MOIST, NATURAL, SOME SILT.

- 1350 - COLLECT SJSO2-SB16-001 MAY SUBMIT FOR DIOXINS ALTHOUGH MATERIAL DID NOT APPEAR TO BE BURNT.

- PHOTO 20 TRENCHING # 34

Location _____ Date 7/2/01

Project / Client _____

- 1427 - DOG SJS02 TRENCH 34. COULD NOT REACH BOTTOM BECAUSE OF COLLAPSING. TOTAL DEPTH 5'6" WATER AT 5' BGS. APPEARS TO BE BURNT MATERIAL AT 2'6" TO 3'6"
  0-30" BROWN TO TAN SILTY SAND, DRY LOOSE TO SLIGHTLY COHESIVE,
  30-42' - DARK STAINED HORIZON - WILL COLLECT SAMPLE
  42-66" - BLACK SILTY SAND AND ABUNDANT WOOD, TREE BRANCHES TO ~~PLUGGED~~ 1'x4", PHOTO 19 (TRENCH)
- 1440 - COLLECT SJS02-SB17-001. A BETTER SAMPLE TO SUBMIT OVER SD16-001.
- 1450 - WILL FILL IN TRENCH 34 AND 27 THEN FILL IN TRENCH WITH BROKEN PIPE LINE.
- 1540 - BEGIN TRENCHING #35 WHICH IS ADJACENT TO TRENCH 19. PHOTOS 18-17-16.
- 1610 - DUG SJS02-TRENCH 35. TOTAL DEPTH 4'0". SIGNS OF PETROLEUM CONTAMINATION, BRICKS, WATER

Location SJS Date 7/2/01

Project / Client _____

AT 3'6". PHOTOS 18-16. NO INDICATION OF BLAST GRIT.
0-12" GRAVEL AND BRICK IN A SILTY SAND MATRIX, DRY, LOOSE, GRAY
12-24" - SAME AS ABOVE, MORE SILT, SLIGHTLY MORE COHESIVE
24-48" BRICK, SAND AND SILT. PETROLEUM ODOR. BOTTOM COULD NOT BE REACHED BECAUSE OF COLLAPSING WALLS. WILL HAUL IN'S CLEAN BUCKET OFF BEFORE MOVING TO NEXT LOCATION.
- 1656 - DUG SJS02-TRENCH 36 TOTAL DEPTH 2'6" NATURAL, BLACK ORGANIC, PETROLEUM ODOR
  0-6" TOP SOIL, BROWN, SILTY CLAY, MOIST TO WET, STICKY, NON PLASTIC
  6-24" BLACK ORGANIC LAYER, PETROLEUM ODOR
  24-30" - BROWN, SILT, STICKY, NON PLASTIC. WILL COLLECT A SAMPLE FOR TPH. SLIGHT SHEEN ON WATER.
- 1700 - COLLECT SAMPLE SJS02-SB18-001

Location

Date 7/2/01

Project / Client

MAY SUBMIT FOR TPH ANALYSIS

Location

Date 7/3/01

Project / Client

-0720- ARRIVE ON SITE.

-0730- IMS ARRIVES ON SITE DANNY PAUL OF USA GIVES SAFETY OVERVIEW.

-0800- BEGIN TRENCHING. SJS02-TRENCH 37 DONNA CALDWELL WILL ARRIVE ON SITE TO DISCUSS FINDINGS AT SITE 2, 3 + 5.

-0815- DUG SJS02-TRENCH 37

0-24"- SMALL TOP SOIL HORIZON THEN SILTY SAND, FINE TO MEDIUM, DRY LOOSE, PIECE OF BRICK, PIPE, OF

24-60" TARPAPER, BLACK SOILS, WOOD, MATERIAL MAY BE BURNED

SANDY SILT, NO ODOR, WET. COHESIVE, NON FRIABLE

60"- BROWN, SILTY SAND, BACK OF HOE. WILL KEEP DIGGING.

PHOTO 36 + 35 OF DEBRIS FROM TRENCH 37

60-84- SAND, BROWN WITH SILT SOME WOOD. SAMPLE SJS02-SB19-001 DEPTH 29"

TOTAL DEPTH 7'0". WATER FILLING HOLE. PHOTOS 34-32 TWO PHOTOS

-1000- AT SITE 5 DUG SJS05 TRENCH 41 TOTAL DEPTH 5'5" NO INDICATION OF BURNING OR CONTAMINATED SOILS

Location _____ Date 7/3/01

Project / Client _____

0-12" TOP SOIL, BROWN, SANDY SILT, SOME DEBRIS (GLASS, NAILS), IRON STAINING.

12-41 - SILT, YELLOW TO BROWN, FINELY LAYERED, IRON OXIDIZED HORIZONS

41-65-" TAN SILTY SAND, FINE TO MEDIUM, WET, WATER FILLING HOLE, ROOTS.

PHOTO 31

- 1020 - DUG SJS05 - TRENCH 42. TOTAL DEPTH 4'2". APPEARS TO BE SOME BLACK STAINED HORIZON AT ABOUT 18-20" BGS. THE LAYER IS DISCONTINUOUS WILL COLLECT SAMPLE FOR DIOXINS TRENCH SIMILAR TO TRENCH 33

0-4 - BROWN TO DARK BROWN TOPSOIL SILT, ROOTS, DRY,

4-18 - TAN TO BROWN SAND WITH CONCRETE AND WOOD. IRON STAINED HORIZON AT 18",

- 18-20 - GRAY TO BLACK SILTY CLAY. MAY BE INDICATION OF BURNT SOIL COHESIVE, SLIGHTLY PLASTIC.

- 20-50 - SILT, GRAY, NON PLASTIC

Location _____ Date 7/3/01

Project / Client _____

PHOTO 30

- 1040 COLLECT SAMPLE SJS05-SB26-001 FOR DIOXINS. SAMPLE MAY OR MAY NOT SHOW SIGNS OF CONTAMINATION. SAMPLE COLLECTED FROM TRENCH 42

- 1135 - DUG SJS03 TRENCH 47. NO INDICATION OF BURNED OR STAINED SOILS. TOTAL DEPTH 4'6"

0-6" - TOP SOIL DARK BROWN, SILTY, ROOTS, MOIST, COHESIVE, COUPLE OF NAILS AND BOLTS AT SURFACE.

6-18 - TAN TO BROWN ~~SILT~~, COHESIVE, SANDY SILT, TO SILTY SAND MOIST, SLIGHTLY COHESIVE.

18-36 - GRAY SAND WITH SILT, FINE TO MEDIUM, SLIGHTLY COHESIVE,

36-54" - DARK GRAY SILT, COHESIVE, NON PLASTIC.

PHOTO 29

- 1200 - DUG SJS03 - TRENCH 48. TOTAL DEPTH 4' 10" PHOTO 28 + 27

0-6" - TOP SOIL, BROWN, SILTY, SAND, ROOTS, DRY,

Location _____ Date 7/3/01

Project / Client _____

6-22" TAN TO BROWN, SILTY SAND, MOIST, COHESIVE, NON PLASTIC

22-34" - GRAY WITH BROWN MOTTLED SILTY SAND, MOIST,

34-58" DARK GRAY, SILT, COHESIVE, NON PLASTIC, BECOMING WET.

NO INDICATION OF FILLING OF STAINING. SOME DEBRIS (NAILS) AT SURFACE.

- 1238 - DUG SJS03 - TRENCH 49 TOTAL DEPTH 4'10" PHOTO 26

NO INDICATION OF STAINED OR CONTAMINATED SOILS

0-8" TOP SOIL, BROWN, SILTY, ROOTS, DRY.

8-26" BROWN TO GRAY SANDY SILT, COHESIVE, NON PLASTIC, MOIST.

26-34" TAN, SILTY SAND, BECOMING WET, COHESIVE.

34-58" - GRAY TO DARK GRAY SILT WITH OYSTER SHELLS, COHESIVE, NON PLASTIC, STICKY WHEN WET,

- 1330 - BEN FRANCISCO ON SITE. PHOTO 25

Location _____ Date 7/3/01

Project / Client _____

- 1335 Dug SJS02 Trench 38, Total Depth 4', Photo 24

0-1' Brown organic sand w/ silt, roots, moist

1'-5' - Black silty sand, wet, wood frags observed. Black staining, signs of petroleum contamination.

5'-7' Grey silt, saturated, root material in top 1'. Appears to be natural.

Water table @ 3' bgs.

- 1415 DUG SJS02 - Trench 39, Total Depth - 2'1", Photo 22

0-4" Brown silty sand - topsoil, very moist.

4"-2' Mottled tan & gray sand w/ trace fines. Gravel from a drain or pipe bed approx. 6" bgs on side of excavation ~~closest~~ BF closest to culvert.

Water table @ 1.5' bgs.

No apparent contamination @ this location.

Location _____ Date 7/3/01

Project / Client _____

- 1445 Dug SJS02 Trench 40, Total Depth - 5' Photo - 21
  0-1.5' Brown sand w/ some silt, moist. Probable fill - plastic & gravel pieces visible
  1.6'-5' Brown & orange silty sand, moist to very moist. Appears to be natural soil.
  No apparent contamination @ this location.
  There is a 1" layer of ~~brown~~ dark brown silty sand @ 1.6' bgs. Contains porcelain frags. No unusual odors.

- 1530 Dug SJS02 Trench 41. Total Depth - 4'6" Photo - 20-19
  0-4" Brown sandy silt, moist. Brick, clay tile, & concrete frags.
  4'-4.5' Gray silt, wet, Black staining observed, petroleum odor.
  Staining occurs @ top of silt layer.
  Water table @ 4' bgs.
  Silt appears to be natural soil.

Location _____ Date 7/3/01

Project / Client _____

- 1615 Dug SJS02 Trench 42, Total Depth = 5'3" Photo - 18
  0-3.5' Brown sandy silt, damp. Concrete, brick frags visible.
  3.5'-5' Gray organic silt, saturated. Decayed vegetation & oyster shell frags observed @ 5' bgs. This is the probable boundary between natural wetland soil & fill.
  Water table @ 4.5' bgs.

- 1645 Dug SJS02 Trench 43, Total Depth - 5' Photo - 17-16
  0-1' Brown silty sand, moist. 40mm cartridge casing observed. Asphalt observed in top 1'.
  1'-5' Dark grey to dark brown silty sand fill w/ concrete & metal frags. No unusual odors.
  Water table @ 4.5' bgs.

1715 Depart site.

Location _____ Date 7/5/01

Project / Client _____

0730 Arrive on site.

0735 Paul of USA gives a safety briefing.

- 0755 Dug SJS02 Trench 44
  Total Depth - 5'6", Photo - 35-34
  0-1.5' Brown sandy silt, damp - Asphalt & concrete frags observed.
  1.5'-1.8' ~~Brown sand w/ some fines,~~ BF ~~very moist~~ Black sandy silt w/ organic matter, organic odor, moist.
  1.8'-5.5' Brown sand w/ some fines, very moist, appears to be natural soil.
  No apparent contamination @ this location.
- 0825 Dug SJS02 Trench 45
  Total Depth 5'4" Photo - 33
  0-1.5' Brown sandy silt, damp,
  1.5'-1.6' Black sandy silt, moist.
  1.6'-4.5' Brown sand w/ some fines, moist.
  4.5'-5.5' Gray sandy silt, very moist
  Organic matter - tree limbs associated

Location _____ Date 7/5/01

Project / Client _____

w/ top of silt layer.
No apparent contamination @ this location.

- 0900 Dug SJS02 Trench 46.
  Total Depth - 5'2", Photo - 32
  0-2.5' Brown sandy silt, damp - Concrete, brick, & metal pipe frags observed.
  2.5'-5' Gray silt, saturated - appears to be ~~natural soil~~ BC natural soil
  Water table @ 3' bgs.
  No apparent contamination @ this location
- 0950 Dug SJS02 Trench 47
  Total Depth 4', Photo 31
  0-2'9" Brown sandy silt, damp, Brick, concrete & wood frags observed.
  2'9"-4' Gray silt, saturated
  Some black staining of silt probably due to organic material @ surface of silt layer
  Water table @ 3' bgs.

Location

Date 7/5/01

Project / Client

- 1020 Dug SJS02 Trench 48
Total Depth - 4'4", Photo - 30-29
Burned paper & insulating material observed @ 4' bgs. Trench depth was extended to 6'7".
Burned material & trench shown in photo - 28
0-3.5' Brown sandy silt, damp.
Brick concrete & metal frags observed.
Encountered what appears to be an abandoned pipe @ 4' bgs. Burned material @ approx 4' bgs.
3.5'-6.5' Gray silt, saturated.
brick, concrete & wood frags observed.
No apparent staining @ this site.

1040 Sample SJS02-SB20-001 collected @ this location for Dioxin. Sample taken @ 4' bgs.

Due to it's considerable depth, the hole was covered up & the pipe was reported to Mr. Cristopher of PWC. The pipe was metal, approx 4" in diam. Nothing came out

Location

Date 7/5/01

Project / Client

of the pipe - it appeared to be abandoned.

- 1120 Dug SJS02 Trench 49
Total Depth 6', Photo 27
0-2' Brown sandy silt, damp
BF ~~2'~~ Brick, timber, concrete frags.
2'-2.5' Gray sandy silt, damp.
2.5'-5.5' Gray silty sand, Black staining present from 4' down.
5.5'-6' Gray silt, saturated. Appears to be natural soil.

1130 Collect sample SJS02-SB21-001 @ depth of 6' for metals.
Small seam of blast grit or black stained sand observed above silt layer. Will get Bill Friedman to observe a sample & confirm if substance is blast grit.
SJS02-SB21-001 was collected in silt beneath sand.
Water table @ 5' bgs.

Location _____ Date 7/5/01

Project / Client _____

- 1205 Dug SJS02 - Trench 50
  Total Depth - 6' 7", Photo 26
  0-3.5' Brown Sandy silt, moist.
  Concrete frags observed.
  3.5'-6' 7" Gray gravelly silt w/ some sand, very moist, wood, brick frags observed.
  No apparent staining or contamination.

- 1230 Dug SJS02 - Trench 51
  Total Depth 6', Photo 25-24
  0-3' Brown sandy silt, damp - wood concrete & metal frags observed.
  3'-6' Mottled blue gray sandy silt w/ wood fragments & organic material, saturated. Strong organic odor
  Water table @ 6' bgs.
  No apparent contamination @ this location.

Location _____ Date 7/5/01

Project / Client _____

- 1315 Dug SJS02 Trench 52
  Total Depth 6'6", Photo 23
  0-4" Topsoil
  4" - 1.5' Brown sandy silt, damp
  Brick, plastic & metal frags observed.
  Concrete frags also found.
  1.5'-6.5' Brown silty sand, moist to saturated. Appears to be natural material.
  Water table @ 6.5' bgs.
  BF ~~To~~ No apparent contamination @ this location.

- 1345 Dug SJS02 Trench 53
  Total Depth 6'5", Photo -22
  0-1' Dark Brown topsoil, damp, Brick, & concrete frags observed.
  1'-6.5' Mottled tan & gray silty sand, moist to ~~sat~~ BF saturated. Appears to be natural soil.
  No apparent contamination @ this location.
  Water table @ 5.5' bgs.

Location

Date 7/5/01

Project / Client

- 1410 Dug SJS02 Trench 54
  Total depth - 6'1", Photo 21
  0-5" Dark brown topsoil, damp, brick & gravel frags observed.
  5"-6' Tan silty sand, moist to saturated. Appears to be natural material.
  No apparent contamination @ this location
  Water table @ 5.5' bgs.

- 1435 Dug SJS02 Trench 55
  Total depth 5'6". Photo 20-19
  0-4.5' Brown sandy silt, damp brick, metal sheeting & large 1'-2' concrete blocks observed.
  4.5'-5.5' Gray gravelly silt w/some sand - Appears to be fill.
  Water table @ 5.5' bgs.

  No apparent contamination @ this location.

Location

Date 7/5/01

Project / Client

- 1505 Dug SJS02 Trench 56
  Total depth - 5'9", Photo 18
  0-3" Mottled Tan, black & brown topsoil w/ organics & wood frags.
  3" to 6' Tan silty sand, moist to saturated - Appears to be natural soil. Water table @ 5.5' bgs.
  No blast grit or apparent contamination @ this site.

- 1530 Dug SJS02 Trench 57
  Total Depth 4'1", Photo 17
  0-2" Brown silty sand topsoil w/ rounded quartz gravel, & brick & glass frags.
  2"-4' Orange brown silty sand, moist. Appears to be natural soil.

  No apparent contamination @ this location. No blast grit observed.

1615 Depart site.

Location

Date 7/6/01

Project / Client

0725 Arrive onsite. Bill Friedman is also onsite.

0730 IMS arrives.

0735 Paul from USA gives a safety briefing.

- 0810 Dug SJS02 Trench 58
  Total Depth 6'2" Photo 35
  0-4.5' Brown silty sand w/ gravel, large concrete blocks, & metal pipe.
  4.5'-6' Gray gravelly sand w/ some silt, brick fragments observed, organic
  All material @ this location appears to be fill.

- Water table @ 5' bgs.

Location

Date 7/6/01

Project / Client

- 0835 Dug SJS02 Trench 59
  Total Depth 6'6" Photo 34-33
  As directed by Bill Friedman, the hole is further excavated to determine the extent of the fill & the depth to natural soil.
  Total depth - 8'3", Photo 32
  0-2' Brown sandy silt, damp. Brick, concrete frags observed.
  2'-6' Dark brown silty sand w/ blast grit observed.
  6'-7.5' Brown silty sand w/ organic material.
  7.5'-8' Gray sandy silt, saturated, some brick frags observed.

  Photo 31, 30 - general setup photos

- 0850 Collect sample SJS02-SB22-001 for TAL Metals.
  Sample collected @ 0.5-7' bgs.

Location

Date 7/6/01

Project / Client

- 0910 Dug SJS02 Trench 60
  Total Depth 7'6", Photo 29-28
  0-15" Brown sandy silt, damp. Brick, concrete & wood frags observed.
  15"-19" Black silty sand, damp. no blast grit present.
  19"-7.5' Mottled Tan & gray silty sand, moist to saturated. Appears to be natural soil. Water table @ 3' bgs.

  Photo 27 - picture of silt fence along marshland.

- 0950 Dug SJS02 Trench 61
  Total Depth 7'2", Photo 26
  0-3' Brown sandy silt, damp - rounded quartz gravel, concrete blocks & glass bottles observed.
  3'-4.5' Black gravelly silt w/ some sand, damp, slag & ~~brig~~ SF brick frags observed.

Location

Date 7/6/01

Project / Client

4.5'-7' Mottled tan & gray silty sand, saturated - appears to be natural soil.

1000 Collect sample [SJS02 - SB23-001] for metals @ 4' bgs.

1015 Bill Friedmann departs site.

- 1025 Dug SJS02 Trench 62
  Total Depth 7'3", Photo
  0-6" Brown sandy silt, damp. small concrete blocks.
  6"-7' Mottled Tan & gray silty sand, moist. Appears to be natural soil.

  No apparent contamination @ this location

  Continued excavation @ Trench 62 to evaluate silt layer. However could not dig below 8' bgs due to continual collapse of the trench.

Location _____ Date 7/6/01

Project / Client _____

- 1120 Dug STS02 Trench G3
Total Depth 6'9", Photo 24:23
0-3' Brown sandy silt, damp, Large concrete blocks, intact wood boards, & brick frags.
3'-6'9" - Sandy silt, gray, moist, silt is mixed w/ organic material & stained black.
No burned material or blast grit present. Staining likely due to organics.

- 1200 Dug STS02 Trench G4
Total Depth 7'3", Photo 22
0-2.5' Brown sandy silt, damp - large blocks of concrete, bricks, & metal pipe pieces observed.
2.5'-7' Black stained coarse to medium grained sand w/ some fines. Probable fill.
7'-7'3" Gray silt - some black staining - Appears to be natural soil.

Water table @ 6.5' bgs.
1210 Collect Sample [STS02-SB24-001] @ 7' bgs for metals.

Location _____ Date 7/6/01

Project / Client _____

1230 Reopen trench STS02-Trench 48 to collect more volume for the soil sample. The sample collected 7/5/01 will be discarded. The new sample will be collected as an MS/MSD.

1240 Collect sample [STS02-SB20-001] for Dioxin @ 4' bgs. An MS/MSD was taken @ this location.

1315 GPS Trench locations.

1355 Depart site.

Location

Date 7/18/01

Project / Client

-0950- ARRIVE AT BASE, WILL TAKE SURFACE WATER READINGS AT BLOW'S CREEK. TIDE IS MOVING OUT, WATER FLOWING DOWNSTREAM

CALIBRATE

pH 4.0, COND. 4.4, TURB 0 NTU

D.O. 6.6 mg/L

-0957- TAKING MEASUREMENTS AT UPGRADIENT LOCATION

pH 7.7

COND. 42.5

TURBIDITY 1 NTU

D.O. 4.50

TEMP 24.1°C

SALINITY 2.76%

-1005- TAKING MEASUREMENTS ON ROADWAY, DOWNSTREAM OF FIRST LOCATION

pH 7.25

COND. 45.3

TURBIDITY N/A

TEMP. 24.8

SALINITY. 2.95

D.O. 4.35

Location

Date

Project / Client

1010- AT MOUTH OF BLOW'S CREEK LEADING INTO S. BRANCH OF ELIZABETH RIVER

pH 7.50

COND. 4.49

TURBIDITY N/A

TEMP 26.7

D.O. 5.07

SALANITY 2.92

1020- ARRIVE AT SITE 2 TO COLLECT A SURFACE WATER SAMPLE AND SEDIMENT SAMPLES.

-1040- COLLECT SJS02-SW09

pH 7.18

COND. 0.636

TURBIDITY N/A

TEMP. 27.0

SALINITY 0.02

D.O. 4.01

SAMPLES COLLECTED FOR VOCs, SVOCs, PEST/PCBs, AND TOTAL AND DISSOLVED TAL METALS.

-1105- COLLECT SEDIMENT SAMPLE SJS02-SD09 FOR VOCs, SVOCs,

Location _____ Date 7/18/01

Project / Client _____

PEST/PCBs, TAL METALS, NITRAMINES, AND DIOXINS

-1140- COLLECT SJS02-SD10 FOR DIOXINS ONLY. SAMPLE COLLECT JUST DOWN STREAM FROM TRENCH 9

-1230- SURFACE WATER AT SITE 2 WHERE STORM DRAIN ENTERS FROM ROAD

pH 7.67
COND. 40.9
D.O. 4.5
TEMP 24.5
SALINITY 2.64

-1240- TAKE SURFACE WATER READING AT MOUTH TO ST. JOHNS CREEK

pH 7.50
COND 37.4
DO 3.95
TEMP 26.0
SALINITY 2.39
TURBIDITY 14

-1250- COLLECT SAMPLE SJS02-SD11 FOR DIOXINS.

-1310- COLLECT SAMPLE SJS02-SDR TRIPLE VOLUME FOR MS/MSD

Location _____ Date 7/18/01

Project / Client _____

-1325- COLLECT SAMPLE SJS02-SD13 FOR DIOXINS, ADJACENT TO TRENCH 55, NO GRIT IN AUGER

-1340- COLLECT SAMPLE SJS02-SD14 FOR DIOXINS. NO BLAST GRIT IN AUGER

-1410- COLLECT FIELD BLANK SJS02-EB01-0718 FOR VOCS, SVOC, PEST/PCBs, DIOXINS, TAL METALS, AND NITRAMINES

-1440- SURVEY UTILITY LOCATIONS AT SITE 2. THERE IS AN ELECTRIC LINE IN NORTHWEST CORNER NEAR PARKING LOT. FIBER OPTIC AND WATER ON SOUTH SIDE

-1600- COLLECT EQUIPMENT RINSE FOR THE DAY, SJS02-EB01-0718 FOR VOCS, SVOC, PEST/PCBs, DIOXINS, NITRAMINES, AND TOTAL METALS

— W J Friedmann

Location

Date 8/16/01

Project / Client

0900 - ARRIVE AT SITE TO COLLECT A ROUND OF WATER LEVELS FROM SITES 2, 3, 4, AND 5 AND BACKGROUND WELLS. BILL FRIEDMANN AND KIM HENDERSON

MW#	TIME	DEPTH TO WATER (FT)
* SJSBK-MW2S	09:14	7.22
* SJSBK-MW2D	09:16	6.84
* SJSBK-MW4S	09:20	7.43
* SJSBK-MW3D	09:30	8.69
* SJSBK-MW3S	09:32	8.17
* SJS02-MW3S	09:38	7.16
* SJS02-MW2S	09:41	6.38
* SJS02-MW2D	09:45 *	COULD NOT GET LOCK OFF
* SJS02-MW4S	09:50	7.14
* SJS02-MW5S	09:56	7.60
* SJS02-MW5D	09:55	6.83
* SJS02-MW1D	10:00	COULD NOT GET LOCK OFF
* SJS02-MW1S	10:01	6.80
* SJSBK-MW1D	10:07	~~7.88~~ KH 7.78
* SJSBK-MW1S	10:11	6.31
* SJS05-MW5S	10:15	7.39
* SJS05-MW3S	10:30	8.52

* Needs new lock • Locked

Location

Date 8/16/01

Project / Client

MW#	TIME	DEPTH TO WATER (FT)
* SJS05-MW2S	10:40 KH	6.81
* SJS05-MW2D	10:44	COULD NOT GET LOCK OFF
• SJS02-MW2D	12:40	5.57
• SJS02-MW1D	12:44	6.37
• SJS05-MW2D	12:50	6.03
• SJS05-MW1S	13:00	5.98
• SJS05-MW1D	13:01	7.34
• SJS05-MW4D	13:10	~~8.~~ KH 9.00
• SJS05-MW4S	13:11	7.55
• SJS03-MW5S	13:16	5.89
• SJS03-MW3S	13:25	7.60
• SJS03-MW4S	13:	→ WASPS
• SJS03-MW6S	14:05	6.20
• SJS03-MW2D	14:18	13.15
• SJS03-MW2S	14:20	4.71
FLUSH MOUNT SJS03-MW1S	14:25	3.41 NEEDS NEW CAP
• SJS03-MW1D	14:30	10.81
• SJS04-MW1S	14:36	5.09
• SJS04-MW1D	14:40	11.99
• SJS04-MW2S	14:44	7.03
• SJS04-MW-4S	14:50	→ WASPS
• SJS04-MW3S	14:55	5.44

* Needs new lock • Locked

SJS04-MW3D → WASPS

Location _____ Date 3/25/02

Project / Client _____

1330 ARRIVE ONSITE AT ST. JULIENS CREEK TO COLLECT A ROUND OF WATER LEVELS AT SITE 2 & REPLACE LOCKS AT SITE 3 & 4 THAT WERE NOT CHANGED 8/16/01 DUE TO WASPS.

REPLACED LOCKS AT:
SJS03-MW4S (STILL WASPS)
SJS04-MW4S
SJS04-MW3D

SITE 2 WATER LEVELS:

MW#	TIME	DTW (FT)
SJS02-MW1D	1355	6.54
SJS02-MW1S	1357	5.43
SJS02-MW3S	1404	5.08
SJS02-MW2S	1406	6.67
SJS02-MW2D	1408	5.69
SJS02-MW5D	1412	7.49
SJS02-MW5S	1415	5.18
SJS02-MW4S	1417	5.38

LOW TIDE

Location SITES 3-6 Date 7/30/02

Project / Client _____

1040 ARRIVE ONSITE AT ST. JULIENS CREEK TO MEASURE DEPTH OF UPLAND DRAINAGE CHANNELS & SHALLOW WELLS NEARBY AT SITES 3-6

MW	TIME	DTW	CASING
SJS03-MW03D	1035	6.72'	21'
SJS04-MW01S	1145	6.25	22.5'
SJS04-MW04S	1150	6.44	21
SJS04-MW03S	1200	5.90	23'
SJS03-MW05S	1215	9.2	21
SJS03-MW03S	1230	9.3	21

1044 TOOK PHOTOS OF LOW AREA AT SITE 3 (975, 974, 973)
1100 TOOK PHOTO OF SJS03-SD/SW01 LOCATION (972 ALONG FENCE, 971 IN ROAD CORNER)
1105 TOOK PHOTO OF BEGINNING OF SITE 3 DITCH AT CROSSROAD (970)
1135 969 - AT CULVERT SITE 4 LOOKING TO SITE 3.
1150 968 SITE 4 ALONG RD.

Location SJCA Date 10/17/03

Project / Client Site 3 Waste Characterization

1035 Bathroom Break
1045 Back on Site
1100 Collect [SJS03-IS05-030] for RCRA, TCLP, TOX, TPH.
1125 Collect [SJS03-IS06-030] for RCRA, TCLP, TOX, TPH
1135 Collect [SJS03-IS07-030] for RCRA, TCLP, TOX, TPH
1155 Collect [SJS03-IS08-030] for RCRA, TCLP, TOX, TPH
1200 Break for Lunch
1300 Collect [SJS03-IS09-030] for RCRA, TCLP, TOX, TPH.
1325 Collect [SJS03-IS10-030] for RCRA, TCLP, TOX, TPH.
1400 Collect [SJS03-IS11-030] for RCRA, TCLP, TOX, TPH
1410 Collect [SJS03-IS12-030] for RCRA, TCLP, TOX, TPH
1435 Collect [SJS03-IS13-030] for RCRA, TCLP, TOX, TPH.
1500 Finish Sorting & will go get ice to wait for Gupse... Sub contractor
1645 Power Screen onsite Return to UXO to Rabel and Skip Gaster

Location SJCA Date 12/8/03

Project / Client Site 2 MW Instl. w/UXO
Sites 2 and 5 CGI CJO-0024

0830 Meet UXO at NNSY for Plans information.
1000 Onsite St. Juliens Creek Annex with UXO to clear locations for Site 2 and 5 [illegible]
Field Crew: D. Blitzer and J. Wallorth.
Conduct H&S Brief for UXO.
Weather: Sunny Low 40's.
1100: Meet Drillers at NNSY Pass office.
1130 Drillers, UXO, at Chism Hill onsite St. Juliens Creek annex to begin MW Installation.
1200 Drillers Set up Decon Staging area at Prop. Ris to begin Sampling
Parsett Wolf employees - Lewis Lefever at Site.
USA employees - George Edwards, at Daniel.
B. Friedman is onsite for first MW installation.
1240 Call Sebsore onsite from Lunch. Will begin MW Installation

Location SSCA Date 12/8/03

Project / Client Sites 2 and 5 GRI

1300 USAO Gross H&S Briefing; Stream Start;
1305 D. Blitzer Calibrates PID.
1315 Set up on SS502-MW06S
1445 B. Friedmann offsite. Complete installation of MW06S. Will construct MW at later date.
1500 Set up on SS502-MW09S
Water table was at 1.2' bgs
YCU was at 10' bgs. Set 5ft screen to ensure productivity and quality of MW.
1610 Complete MW Installation. Will complete construction on Tuesday Dec 9.
1630 Clean Gauger sky and set up for following day of MW installation.
1700 Show permit wolf running holes for schematics of mob through the woods. USA Environmental offsite.
1730 Permit wolf stream clean materials off/site

12/8/03

Location SSCA Date 12-8-03

Project / Client Sites 2 and 5 GRI

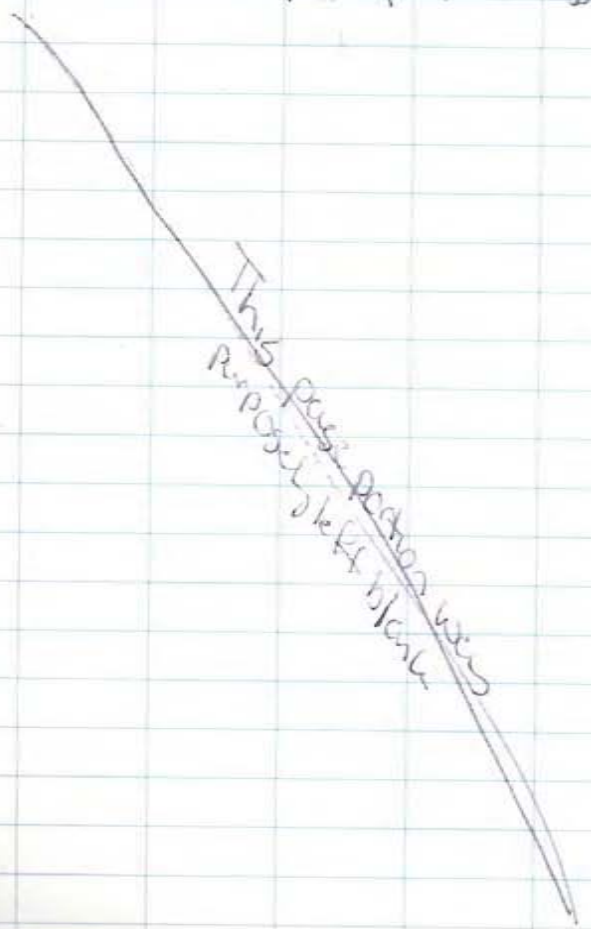
Bore log SS502-MW06S

0-.6" - Top soil Dusky Brown 5yr 2/2; moist, medium density, silty clay, ML.
0.6"-1.2' - 10yr 5/4; medium sand w/ trace silts, slightly moist, medium density; SM. 2-4' - Same
2nd Split Spoon 24" recovery
4-4.5' 10yr 6/8, clayey med sand, moist, medium density, SC
4.5-6' - Wet clean sand, medium WT at 4.5'; Saturated; SW.
1345 - Collect PID - 0 ppm
3rd Split Spoon 9-11' bgs 24" recovery
9-9.5' - 10yr 4/6 clay sand, saturated, dense; SC
9.5-10.5' - Medium Sand; 10yr 4/6, Saturated; dense; SW.
10.5'-11' - Same as above.
4th Split Spoon 14-16'
14-14.5' - Same as previous
14.5-15.6' - ~~Stiff~~ SC, fat clay; gray 5y 5/2; Yorktown Cohesive unit; CH

Location SSCA Date 12/4/03

Project / Client Sites 2 and 5 EIA

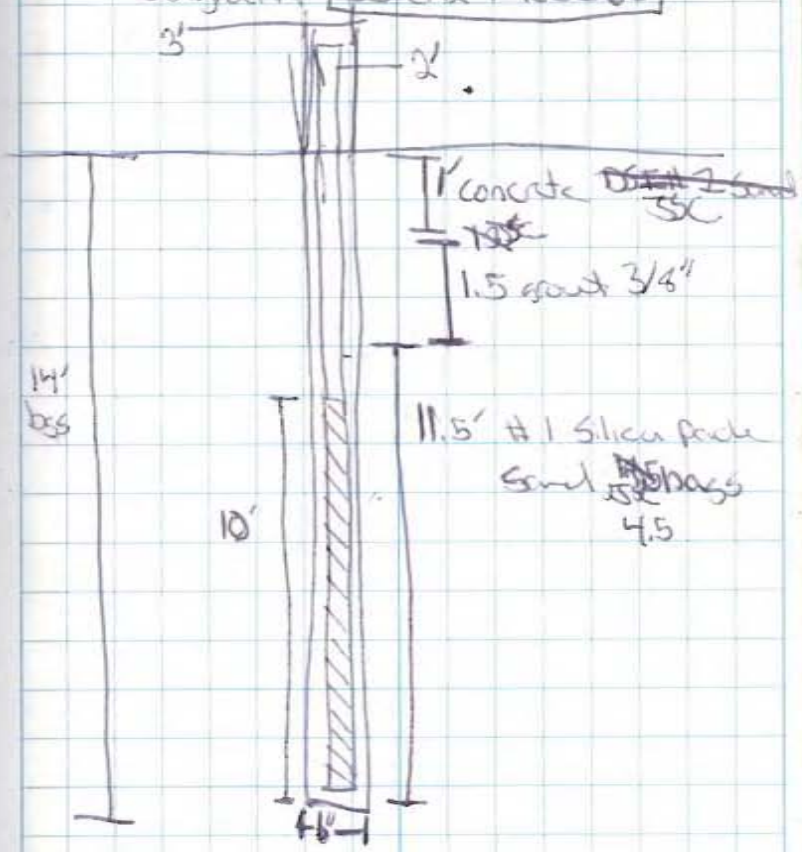
15.6-16' 5yr 5/2, sandy Clay, low plasticity, ML, gray.
Will set screen from 14-14' bgs



Location SSCA Date 12/4/03

Project / Client Sites 2 and 5 EIA

1401 Monitoring well installation
Diagram SS502-MW065



Location SSCA Date 12/9/03

Project / Client Sites 2 and 5 EGI

SS502-MW09S Borelog

0-1" - Top Soil; Silty Clay; slightly moist medium; ML; 5YR 2/2.

1-5c

0.1-1' - Fill material mixed with sandy Clay; 5yr 2/2; ML; moist; soft.

1-1.2' - Saturated at 1'; 5yr 3/2. Soft; Clay Sand. Coarsening Down; SC. Some organic matter at 1'; HNU comment 0-3' bgs is noisy with trash. Snowstat quit at 3' bgs

2nd Split Spoon

4-5' Sandy Clay, 5yr 2/2., petroleum odor, saturated, very soft; CL. NO PID=0.0ppm

5-6' Light Grey Sand; Subrounded; SP 10yr 6/2; wet; medium density; NO PID=0.0ppm

3rd Split Spoon

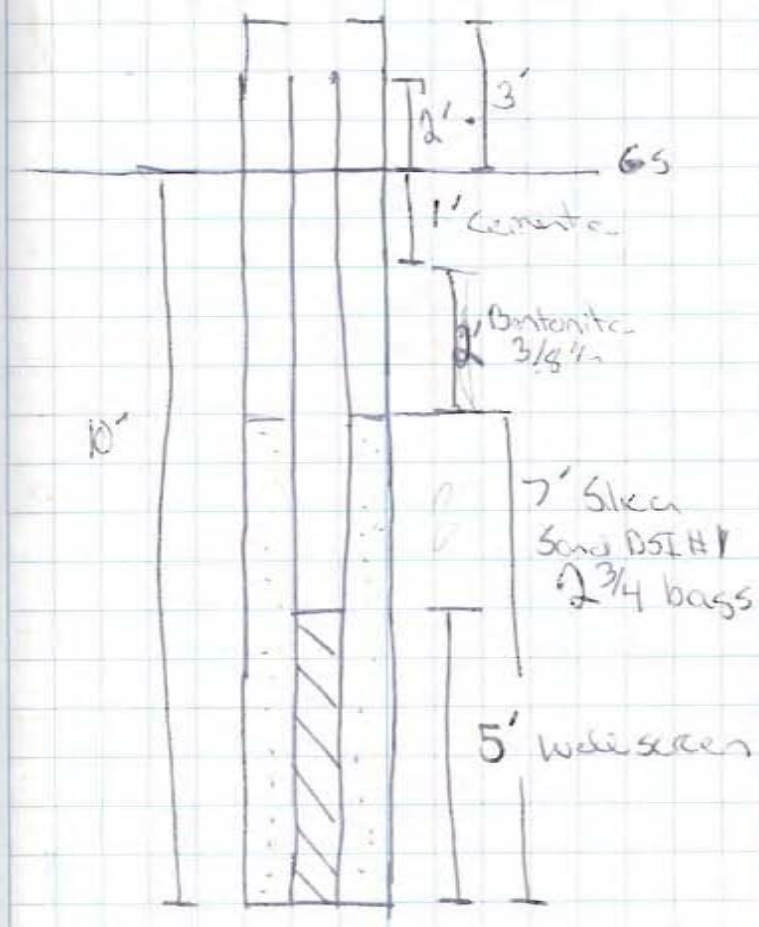
9-10' - Saturated; Silty sand; 5yr 5/6, loose; some oxidation; SC.

10-11' - Stiff; Silty Clay 10yr, moist CH. HNU.

Location SSCA Date 12/9/03

Project / Client Sites 2 and 5

SS502-MW09S Well Diagram



Location SSA Date 12/9/03

Project / Client Sites w/ 5 GII

0730 On Site St. Julians Creek wex for Groundwater Well installation w/ well construction.

0735 Conduct Health w/ Safety Brief on Well operations w/ personnel.

0740 Field Crew: D Blitzer w/ J. Culbertson. Weather: Sunny Low 60's

Subcontractors - Perrett Well: Driller
USA Environmental: UXO.

0745 D. Blitzer Calibrate PID

0750 Begin installation of SJS02-MW08S
Depth of Screen 5-15' bgs.
2' Silica pack above screen
2' Bentonite Seal
1' Cement grout.

0900 Complete MW08S MOB to next location
Clearing brush for drill rig access

1010 Begin installing SJS02-MW07S
Spooning to sand to estimate ABM to set outer casing.

1050 Push to 6' bgs with 2' split spoons.
Decision to set temp casing at 6' bgs.
Drillers go out PUC. UXO marks Bollard locations

Location SCA Date 12/9/03

Project / Client Sites 2 w/ 5 GII

Borelog SJS02-MW08S

1st Split Spoon

0-0.4' Topsoil, organic, 5yr 3/2, Silty Clay, slightly moist, medium, ML

0.4-1.0' 5yr 3/2, Organic Matter, Sandy Clay, SC, stiff, moist, friable
Fill material from 0.4-0.6' SC
1.0-2.0' - Same as above, more silts present, SC, stiff.
PID = 0.0 PPM

2nd Split Spoon 1' recovery

4-4.2' - OL, Clay with silt, 5yr 3/2, slightly moist, soft;

4.2-5.1' - 10yr 6/2, medium grained sand, Saturated at 4.2', SW.
PID = 0.0 ppm

3rd Split Spoon 9-11'

9'-9.5' - SM, Clay, medium, 5yr 3/2, dry moist, CL;

Location SSCA Date 12/9/03

Project / Client Sites 2 and 5 ERI

9.3-11' - 10YR 6/6, Silty Sand, saturated, medium density, SM

4th Split Spoon

14-14.5' - Sand Same as above

14.5-15.1' - Silty Clay 5Y 5/2, medium SSC, very moist, CL

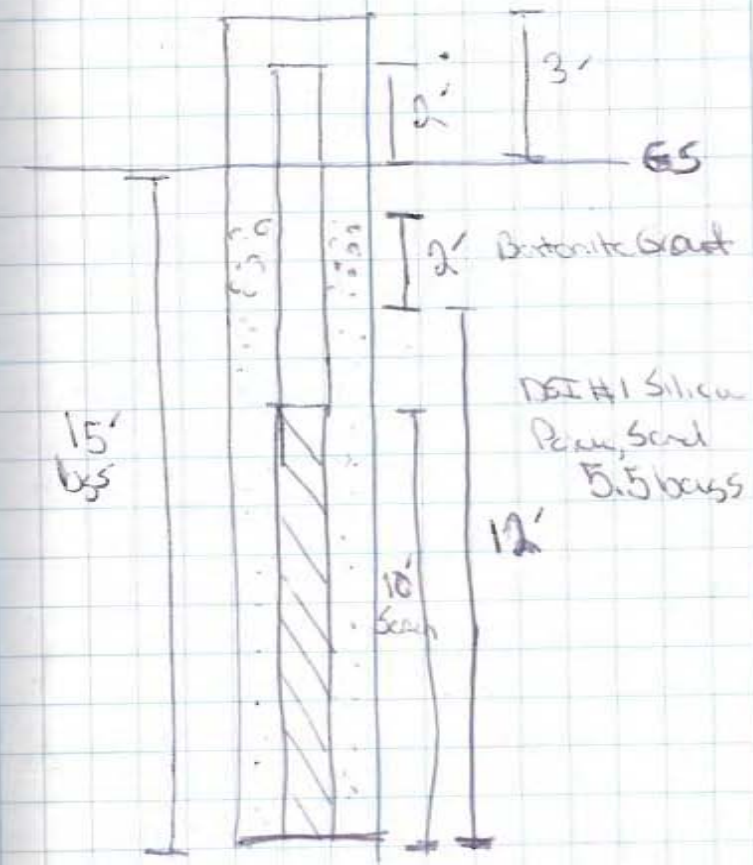
15.1-15.5' - Silty Sand, coarse grained, 5Y 5/2, SM.

15.5-16' - 5Y 5/2, Silty Clay, High Plasticity, very moist, CH. YCH

Location SSCA Date 12/9/03

Project / Client Sites 2 and 5 ERI

Well Construction
SSSOU2-MW085



Location SJCA Date 12/9/03

Project / Client Situs 2 and 5 RI

Borelog SS02-MW07S

1st Split Spoon

0-0.1' Top Soil organic matter silty clay, 5yr 3/2,

0.1-0.5' - ABM, Black, medium grained

0.5-1.1' - mixture of gravel, abm, fill material, silty sand, 5yr 3/2; GC/SW.

Slightly porous at medium density, quartz gravel, angular.

2nd Split Spoon 5 inches recovery

2'-2.5' - Fill material, abm pieces, some silt gravel Backfill.

Two screw augers, will push another two feet to retrieve another one out of the blast pit cover.

3rd Split Spoon 2.4' recovery

4-5.2' - Sandy Clay, Trace ABM, 5yr 3/2, saturated at 5.2, Root layer at 5.0', SC, Trace gravels

5.2-6.0' - medium sand, coarse dense, bgy 6/2, bsct, medium density, SW

PID = 1.0 at hole, 0.0 ppm at Breathing Zone

Location SJCA Date 12/9/03

Project / Client Situs 2 and 5 RI

4th Split Spoon 9-11' bgs

2.4" recovery

9-11' 10yr 6/2, medium sand, saturated, dense, poorly sorted, SW, more gray color at 11' bgs

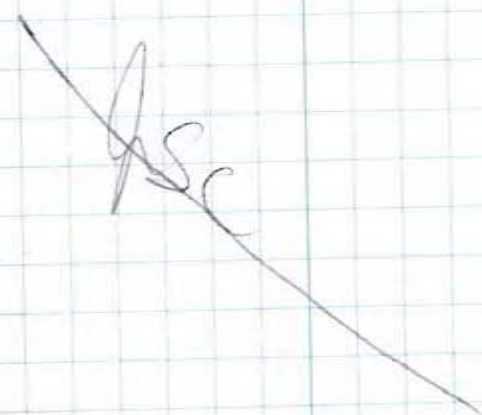
5th Split spoon 14-16' bgs

14-14.5' - 10yr 6/2, medium sand with fines, poorly sorted, SW.

14.5-15.1' 10yr 6/2, CL, Gray, clay, ~~soft~~

15.1-15.4' - 10yr 6/2, Sand lense coarse grained with oxidation

15.4-16' - Silty Clay, 10yr 6/2, Gray, very stiff but clay, CH.



Location SSA Date 12/9/05

Project / Client Sites 2 and 5 ERI

1100 Calibrate Horiba U-22
pH = 3.99 Cond = 4.61 Turb = 0
DO = 12.83 Sal = 0.2 ORP = 278

1138 Encountered Difficulty with temp Casing Drillers Pond 1 bag of #1 Silica back down at grout hole.

12.50 Begin Surface water Sampling

1255 Collect [SSS02-SW11-030] for TCL LC VOCs.
pH = 5.75 Cond = 382 Turb = 13
Sal = 0.2 DO = 11.59 ORP = 227
Temp = 8.9.

13.0 Collect [SSS02-SW10-030] for TCL LC VOCs.
pH = 6.34 Cond = 0.44 Turb = 11
DO = 9.03 Temp = 13.5 Sal = 0
ORP = 161

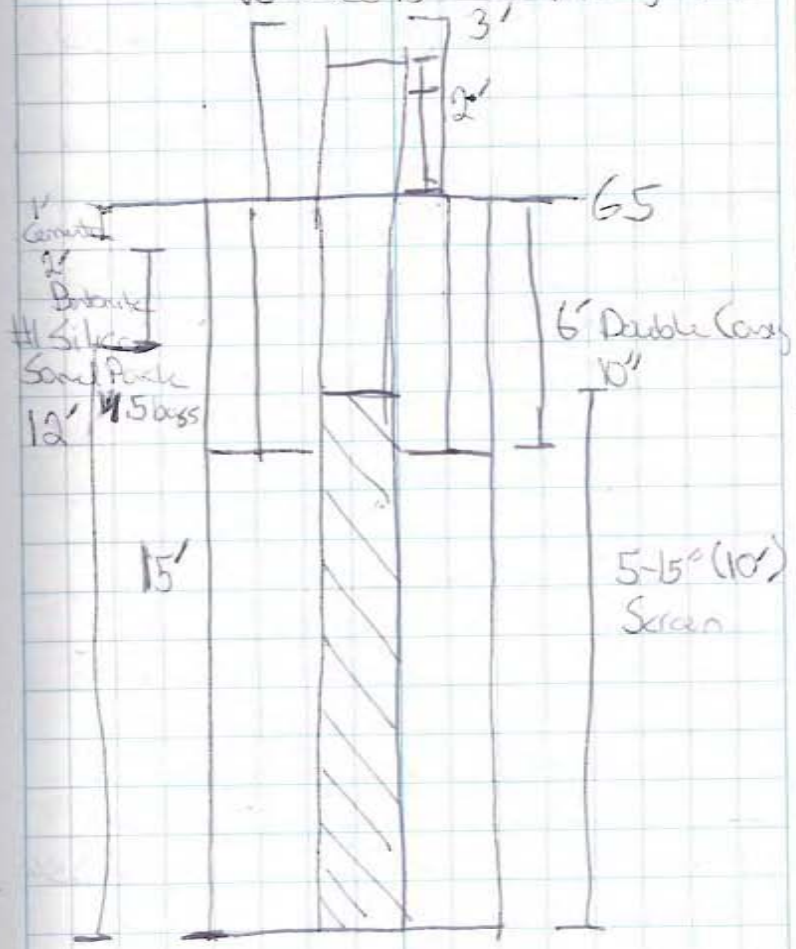
1330 Break for lunch

1430 Collect [SSS02-ST01-030] for TCL LC VOCs. Depth to water = 3.55 ft
Total Depth of manhole = 5.06 ft
pH = 6.47 Cond = 0.47 Turb = 12
DO = 9.34 Sal = 0 ORP = 142
Temp = 15.3 Also Collect Dup [SSS02-ST01-030-A] at this Location

Location SSA Date 12/9/05

Project / Client Sites 2 and 5 ERI

SSS02-MW07S
Well Construction Diagram



Location SSCA Date 12/9/03

Project / Client Sites 2 and 5 ERI

1445 Check on Drillers who have begun purging/Developing SS02-MW06S.

Development Reading

pH = 6.44 Cond = 0.314

Turb = 62.1 DO = 11.33 Temp = 16.2

Sal = 0 ORP = 176

1512 Collect SS02-ST02-030 for TKI LC VOCs

pH	cond	turb	DO	temp	sal	orp
6.24	0.71	25	5.44	15.2	0	127

DTW ▽ 5.54'

7.24'

1530 Collect SS02-ST03-030 for TKI LC VOCs.

pH	Cond	Turb	DO	Sal	Temp	Orp
6.93	0.33	0	11.9	0	15.0	76

Depth to Water = 5.35 Depth of Water = 4"

~~Depth of manhole 5.5~~

1540 Collect SS02-ST04-030 for TKI LC VOCs.

pH	Cond	Turb	DO	Temp	Sal	orp
6.81	0.33	0	12.77	14.8	0	169

Depth of Water: 4" Deep

Location SSCA Date 12/9/03

Project / Client Sites 2 and 5 ERI

Depth To Water: 5.20'

1550 WXO expressed concern with SS44. Decision to keep them onsite for Dioxin Samples ½ day Wednesday.

1610 Collect development parameters for SS02-MW09S

~~Cond 5x pH = 0.439~~ pH = 6.51 Cond = 0.439

Turb = 107.0 DO = 11.85 Temp = 16.4

Sal = 0 Orp = -55.

1630 Collect SS02-ST05-030 for TKI LC VOCs.

pH	Cond	Turb	DO	Temp
6.33	0.30	52	13.1	13.3

Sal	ORP
0	33

DTW = 4.95'

Depth of Water = 2"

1640 Collect SS02-ST06-030 for TKI LC VOCs. DTW = 1.02'

Dept of Water = 2.85'

PH	Cond	Turb	DO	Temp	Sal	Orp
6.69	0.21	19	9.94	12.7	0	9

Location SJCA Date 12/9/03

Project / Client Sites 2 and 5 ERI

1650 Collect [SS502-STO3-030] for TCL VOCs.

pH	Cond	Turb	DO	Temp	Sal	orp
6.90	0.57	0.7	14.8	11.8	0	314

Depth to water = 1.01'

Depth of water = 1.70'

1705 Check with Perrett Well. They will finish construction of MW09S and collect an every. CH2M Hill offsite to pack and ship samples.

12/9/03

Location SJCA Date 12/10/03

Project / Client Sites 2 and 5 ERI

0730 Offsite St Juliens creek area to continue Sites 2 and 5 ERI field effort.

0740 Conduct H&S meeting with Perrett Well Drilling and LWO. LWO conducts H&S meeting with CH2M Hill.

Weather Sunny; rain this afternoon.

Field Crew D Blitzer and J. Culbreth

Objective Conduct Soil Sampling at Site 5 and complete MW installation.

0800 Calibrate Horiba U-22

pH	Cond	DO	Turb	Sal
3.97	4.57	11.9	0	0.2

Orp
305

0805 Water Quality for SS502-MW09S

pH	Cond	Turb	DO	Temp
5.84	1.68	104.0	8.03	16.5

Sal	Orp
0.1	114

0810 Complete meeting and LWO and CH2M Hill mob to site 5 to begin Soil Sampling.

Location SJCA Date 12/10/03

Project / Client Sites 2 and 5 ERT

1630 Pack up and Escort Drillers off Site. Mob back to the office to pack and ship coolers

12/10/03

Location SJCA Date 12/11/03

Project / Client Sites 2 and 5 ERT

0830 Mob to St. Julians Creek Cumax to conduct Soil and GW Sampling for Sites 2 and 5. Call Subcontractors on off site. Field Crew: J Gulbertson and D Blitzer Weather: Cloudy turning to sunshine later today. Highs in the low 50's.

0930 On Site St. Julian Creek Site 5 to Complete Soil Sampling.

0955 Collect [55505-5541-00-030] for TAL Metals, Cyanide, TCL Pest, TCL PAHs Silty Clay, Dark Brown, Dry

1000 Collect [55505-5540-00-030] for TAL Metals, Cyanide, TCL Pest, TCL PAHs Sandy Clay Silt, Dark Brown Red, Gravelly.

1010 Meet Rebecca for Water level Inducator at Firehouse training center just outside of the Main Gate.

1020 Back on Site St. Julians.

1025 Collect [55505-5542-00-030] and [55505-5542-00-030-P] for TAL Metals Cyanide, TCL Pest, TCL PAHs. Brown Gray Silty Clay Saturated; Oil Smell

Location SJCA Date 12/11/03
Project / Client Sites 2 and 5 ERI

1055 Collect [SJS05-SS61-00-03D] for
TAL Metals, Cyanide, TCL Pest, TCL PAHs,
Medium Brown Sandy Clay. Earthworms
1100 Collect [SJS05-SS56-00-03D] for
TAL Metals, Cyanide, TCL Pest, TCL PAHs.
Sandy Clay, Loose, Orange Grey Brown
1105 Collect [SJS05-SS57-00-03D] for
TAL Metals, Cyanide, TCL Pest, TCL PAHs.
Silty Clay, Loose, Moist, Grey Brown
1120 Collect [SJS05-SS58-00-03D]
for TAL Metals, Cyanide, TCL Pest, TCL PAHs
Silty Clay, Slightly Moist, some organics, Grey Brown
1125 Collect [SJS05-SS59-00-03D] for
TAL Metals, Cyanide, TCL Pest, TCL PAHs.
Silty Clay, Orange Dark Brown with Organics
1130 Collect [SJS05-SS60-00-03D] for
TAL Metals, Cyanide, TCL Pest, TCL PAHs
~~1200 Collect SS~~
Silty Clay, Brown, moist, some organics
1200 Collect [SJS05-FB121103] for.
TAL Metals, Cyanide, TCL Pest, TCL PAHs
1205 Break for lunch
1239 On Site SJ Sulley Crew arrives
to begin GW Sampling at Site 2

Location SJCA Date 12/11/03
Project / Client Sites 2 and 5 ERI

1255 ~~Set Upon~~ SJ will compute a
Round of Water Levels at Site 2
prior to sampling
1300 SJS02-MW06S - 3.88 ft
1303 SJS02-MW05S - 3.51 ft
1305 SJS02-MW05D - 5.96 ft
1308 SJS02-MW04S - 3.78 ft
1320 SJS02-MW09S - 3.33 ft
1325 SJS02-MW08S - 5.91 ft ←
1330 SJS02-MW07S - 4.30 ft
1335 SJS02-MW03S - 4.84 ft
1340 SJS02-MW02S - 7.64 ft
1345 SJS02-MW02D - 4.45 ft
1350 SJS02-MW01S - 4.46 ft
1355 SJS02-MW01D - 5.27 ft
1400 Set up on SJS02-MW06S
DTW = 3.88 ft
1405 Calibrate Horiba U-22
Dit Cond Turb DO Temp Sal
3.99 4.52 0 10.77 14.1 0.2
ORP
76.5
1410 Begin Purging SJS02-MW06S

Location SSCA Date 12/1/03

Project / Client Sites 2 and 5 ERT

1435 Collect [SS502-MW065-030] for TAL Total and Dissolved Metals, Cyanide, TCL SVOCs, TCL Pest/PCBs, Explosives, TCL Low Conc. VOCs. Screen interval (4-14 ft)

1500 Set up on [SS502-MW095].
DTW = 3.33 ft. Begin Purging

1525 Collect [SS502-MW095-030] for TAL Total and dissolved Metals Cyanide, TCL SVOCs, TCL Pest/PCBs, Explosives and TCL LC VOCs. (Screened from 5-10 ft bgs)

1545 Off-Site St. Juliens Creek Annex.
Return to office to pack coolers.

12/1/03

Location SSCA Date 12/1/03

Project / Client Sites 2 and 5 ERT

SS502-MW065

Time	pH	Cond	Temp	DO	Temp	Sal	ORP	DTW	Flow
								3.80	
1414	5.54	0.35	31	4.58	15.5	0	198	4.15	380
1417	6.00	0.354	39.8	3.31	15.6	0	189	4.15	380
1422	6.00	0.357	15.4	3.04	15.5	0	185	4.17	380
1427	6.02	0.357	11.6	3.11	15.4	0	183	4.15	360
1432	[illegible]	0.35	[illegible]	3.05	15.5	0	183	4.15	360

Total Vol = 2.0 Gal

SS502-MW095

Time	pH	Cond	Temp	DO	Temp	Sal	ORP	DTW	Flow
1503	6.37	0.592	14.7	4.11	16.7	0	-91	3.62	380
1508	6.47	0.521	23.1	0.49	16.7	0	-117	3.87	380
1513	6.49	0.500	12.7	0.39	16.7	0	-120	3.87	380
1518	6.50	0.519	11.6	0.36	16.7	0	-128	3.87	380

Total Vol = 2.0 Gal

Location SSA Date 12/12/03

Project / Client Sites 2 and 5 ERI

0900 Onsite St. Johns Creek area to compute GW Sampling for Sites 2 and 5 ERI.
Weather: Sunny highs in low 50's.
Field Crew D Blitzer and J Culbreth

0905 Calibrate Horiba U-22

PH	Cond	Turb	DO	Sal	ORP
399	4.61	0	13.03	0.2	300

0910 Setup on SS502-MW075
DTW = 4.90 ft. Begin Purging.

0940 Collect SS502-MW075-030 for TAL Metals, Cyanide, Explosives, TKN, TCL SVOCs, TCL Pest/PCBs, and Dissolved Metals. MS/MSD collected here

1030 Setup on SS502-MW085.
DTW ≈ 4.00 ft bgs. Water level indicator is malfunctioning. We will take approximate water levels and purge at a low rate.

1130 Collect SS502-FB121203 for Dioxin/Furan, Explosives, TAL Total Metals, Cyanide, TCL SVOCs, TCL Pest/PCB

1143 Collect SS502-MW085-030 for Explosives, TAL Total and Diss Metals, Cyanide, TCL SVOCs, TCL Pest/PCB, TKN, Chlorides

Location SSA Date 12/12/03

Project / Client Sites 2 and 5 ERI

SS502-MW075

Time	Temp	Sal	DO	Turb	Cond	pH	ORP	Level
1000	17.3	0.1	1.5	0.25	400	5.56	400	0.12
1005	17.6	0.1	1.8	0.40	400	5.56	400	0.22
1010	17.5	0.1	1.7	0.25	400	5.58	400	0.22
1015	17.6	0.1	1.8	0.29	400	5.58	400	0.22
1020	17.5	0.1	1.8	0.0	400	5.59	400	0.22

Turbidity is running high. However sample appears to clear with no clarifiers. Will discuss turbidity to collect sample.

Total Vol = 4.0 gal

Location SCA Date 12/12/03

Project / Client Sites 2 and 5 ERI

1300 ~~at~~ Site St. Julians Creek Arms

12/12/03

Location SCA Date 12/12/03

Project / Client Sites 2 and 5 ERI

SS00-mass 5

Time	Ph	Cond	Tub	DO	Temp	Sal	Orp	DTW	FWW
1103	5.76	0.774	107	5.93	17.8	0	73	6.49	.380
1105	5.85	0.776	99	5.99	17.9	0	69	6.49	390
1111	5.89	0.778	146.0	5.17	17.8	0	67	6.49	300
1117	5.90	0.798	165	3.67	17.6	0	64	6.49	300
1118	5.96	0.827	210	3.40	17.7	0	59	6.45	250
1127	5.99	0.860	214	3.13	17.7	0	56	6.35	280
1130	6.01	0.916	143	2.94	17.7	0	55	6.33	280
1137	6.02	0.996	184	2.51	17.7	0	52	6.33	280
1143	6.04	1.10	188	2.28	17.7	0	46	6.33	280

Total 101 - 4.0 gal

Tub would not stabilize

Location SJCA Date 1/6/04

Project / Client Site 2

0830 On site SJCA Site 2 to conduct Sediment Sampling.
Field Crew: D. Blitz, J. Butler, B. Freedman, and M. Ellis.
0830 Current HES Meteorology
Weather: Sunny, low 40's
Objective: D. Blitz and M. Ellis will review sediment sampling locations to verify sediment descriptions.

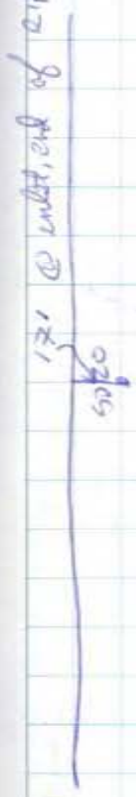
0900 Collect [SJSC2-FB010604]
TCL SVOCs, Pest/PCB, Total Total Metals, Cyanide.

~~1130 Collect SJSC2-S~~ ~~SJSEF-SD02-00-000 04A~~

1230 Collect [SJSEF-SD02-00-04A]
for TAL Metals, Cyanide, TOC, Grain Size, Pest/PCB, and SVOCs
Gray silty clay, high plasticity.
GPS Location SD02
pH = 7.12 Cond = 18.6 Turb = 0 DO = 9.29
Temp = 13.61 Sal = 1.09 Orp = 121

Location SJCA Date 1/6/04

Project / Client Site 2



Location SSCA Date V/6/04

Project / Client Site 2

1240 Calibrate Horiba U-22
pH 3.99 DO = 10.73 Orp = 233
Cond 4.54 Turb = 0

1300 Collect SSREF-SD03-00-04A for
TAL Metals, Cyanide, TOC, Grain Size,
TCL SVOCs, TCL Pest/PCBs. Also collect
duplicate sample SSREF-SD03DU-04A-P
at this location.
pH = 6.23 Cond = .24 Turb = 8
DO = 9.60 Temp 12.8 Sal = 1.50
Orp = 163
Grey Silty Clay, high plasticity.
No visible redox layer.

1330 Collect SSREF-SD01-00-04A for
TAL Metals, Cyanide, TOC, Grain Size
TCL SVOCs and TCL Pest/PCB
pH = 6.68 Cond = .22 Turb = 9 DO = 9.24
Temp = 12.8 Sal = 1.31 ORP = 136
Grey Silty Clay, high plasticity, No
visible Redox layer

Location SSCA Date V/6/04

Project / Client Site 2

1340 Collect SSREF-SD01-00-04A
for TAL Metals, Cyanide, TOC,
Grain Size, TCL SVOC, Pest/PCB
pH = 6.95 Cond = 1.62 Turb = 0
DO = 6.55 Temp 13.4 Sal = 0.94
Orp = 116
Grey Silty Clay, high plasticity,
No redox layer apparent.

1400 Collect SSREF-SD05-00-04A
for TAL Metals, Cyanide, TOC, TCL Pest
PCB and TCL SVOCs.
pH = 7.0 Cond = 17.5 Turb 0
DO = 8.94 Temp = 13.4 Sal = 0.91
Orp 125
Clam shells present, Sandy Clay,
lower plasticity, soft.

1430 Collect SSSD2-SD20-00-04A
for TCL SVOCs, TAL Metals, TOC, Grain
Size, TCL Pest/PCB.
pH = 7.12 Cond = 18.3 Turb = 0
DO = 9.43 Temp 13.1 Sal 1.08
ORP = 88
Silty Clay, high organic matter, Sticks
and leaves present, Active Grey, Hydrogen Sulfide

Location SJC A Date 11/6/04

Project / Client Site 2

1440 Collect [SS502-SD17-00-04A]
for TCL SVOC, PCB/PCB, TOC, Grain
Size, TAL Metals, Cyanide
pH=7.15 Cond 20.4 Turb=0
DO=10.57 Temp=13.4 Sal=1.17
ORP=97
Clay Silty with Shell fragments;
medium plasticity, dark brown
1500 Collect [SS502-SD18-00-04A]
for TCL SVOC, TCL PCB/PCB, TOC,
Grain Size, TAL Metals, Cyanide
pH=7.29 Cond=21.4 Turb=0
DO=9.7 Temp=13.5 Sal=1.28
ORP=119
Silty Clay, medium Plasticity,
trace bio, with Snails.
1520 Collect [SS502-SD19-00-04A]
for TAL Metals, TCL SVOC, PCB/PCB, TOC, Grain size, Cyanide
pH=7.33 Cond 21.4 Turb=0 DO=9.0
Temp=13.7 Sal 1.28 ORP=119
Clay, Some Silt, High plasticity, trace
No organic matter present

Location SJC A Date 11/6/04

Project / Client Site 2

1535 Collect [SS502-SD15-00-04A]
for TCL PCB/PCB, SVOC, TAL Metals,
Cyanide, TOC, and Grain Size, MS/MSD
pH=7.31 Cond=20.5 Turb=0
DO=10.5 Temp 13.4 Sal=1.22
ORP=129
Silty Clay high plasticity, shell
fragments, Gray
1550 Collect [SS502-SD16-00-04A]
(MS [SS502-SD16-00-04A-P]) for
TCL PCB/PCB, SVOC, TAL Metals,
Cyanide, TOC, and Grain Size
pH=7.31 Cond=16.6 Turb=0
DO=10.37 Temp 13.9 Sal=1.57
ORP=155
1630 Collect [SS502-EB010604] for
TCL PCB/PCB, TCL SVOC, Metals, Cyanide
and TOC.
1730 Pick up Retrieve boat from
water. Off Site STurkey Creek.

Location Site 2 Date 05/01/06

Project / Client

1215 Arrive onsite - Field Crew - B. Francisco & A. Dickson. Objective - Background water level measurements

1225 Conduct health & safety briefing.

1235 Open wells to vent vapors.

Time	DTW	Well ID
1250	4.68	MW12S
1252	7.83	~~MW01S~~ BF MW10S
1253	6.40	MW10D
1255	5.09	MW01D

1315 Begin deploying transducers in wells MW12S, MW01D, MW10S, & MW10D.

1345 Complete deploying transducers, transducers are operating.

1415 Depart site.

Location Site 2 Date 05/02/06

Project / Client

1145 Arrive onsite. Field Crew - B. Francisco. Today's objective - water level measurements & check equipment for the background event.

Time	Well ID	DTW
1159	MW10D	6.50
1201	MW10S	7.81
1203	MW01D	5.18
1207	MW12S	4.63

1225 Finish checking equipment @ the site. The transducers placed in wells MW10D, MW10S, MW01D, & MW12S yesterday, appear to be functioning normally & are recording background water levels.

1230 Depart site.

Location Site 2 Date 5/3/06

Project / Client

1045: Arrive onsite.
field crew: A. Dodson
Objective: Water level measurement and equipment check for background event.

TIME	WellID	DTW
1055	12MWS	4.71
1058	MW10D	6.69
1100	MW10S	7.78
1102	MW01D	5.37

1125 Finish checking transducers. All transducers appear to be functioning and are recording background water levels

1130 Depart Site

AED

Location Site 2 Date 5/4/06

Project / Client

1210 Arrive onsite. Field Crew - B. Francisco & A. Dodson.
Objective - water level measurements & complete background event.

Time	Well ID	DTW
1220	MW12S	4.73
1221	MW10D	6.83
1222	MW10S	7.92
1224	MW01D	5.50

1240 Stop background event testing & remove Trolls from the wells.

1300 Depart Site.

Ben

Location: Site 2 Date: 5/16/06

Project / Client:

1130 Arrive onsite. Field crew - B. Francisco & A. Dodson. Objective - well Yield testing.

1140 Conduct health & safety briefing. Topics include - safety awareness of Baker tank & TCE contaminated groundwater.

1150 Calibration of Mini RAE 2000 PID, Serial # PGM7600. ZeroCal = 0, Span Cal = 104ppm.

1155 Calibration of Horiba U-22, Serial # 2012132. pH = 3.99, BF ~~Temp~~ Turb = 0, Cond = 4.48, DO = 5.64.

1215 Hose barbs do not fit hose provided. Depart site to get appropriate barbs

1340 Setup @ well MW10D. DTW = 6.69.

1400 Begin pumping MW10D See p. 77

Location: Site 2 Date: 5/16/06

Project / Client:

Time	pH	Cond (mS/cm)	Turb	MW10D DO	Temp	Cl	ORP	DTW	Flowrate (ml/min)
1410	6.54	2.31	56	4.82	22.9	0.1	-173	7.22	300
1415	7.17	0.29	60	4.77	24.6	0.0	-176	7.20	150
1420	7.19	1.6	33	4.73	24.5	0.1	-151	7.36	250
1425	7.16	0.60	12	4.34	25.1	0.0	-78	7.30	225
1430	7.22	0.17	7	3.81	25.6	0.1	-1	7.50	500
1435	7.23	0.37	3	3.78	25.5	0	-1	7.75	425
1450	7.14	0.34	9	4.60	24.2	0	-21	7.55	400
1455	7.23	0.37	7	3.58	24.7	0	-13	7.54	350
1600	7.18	0.38	4	4.05	24.2	0	-22	7.52	300
1605	7.20	0.38		4.00	24.7	0		7.51	300

BF

Total vol purged @ 7 gal.

Note: Several gallons were purged from the well during adjustment of the flowrate prior to water quality readings

Location Site 2 Date 5/16/06

Project / Client

1510 Collect sample [SJS02-MW10D-06B] for VOCs.

1620 Setup @ MW10D to conduct well yield test. Initial DTW = 6.90.

1644 Begin well yield test for MW10D.

Time	DTW	Flowrate
1646	13.30	.75 gal/min.
1649	26.49	2.5 gal/min
1651	39.72	4 gal/min
1657	~~Unable to~~	4 gal/min

~~measure water level~~ - below top of pump water level indicator temporarily not functioning.

1702	42.03	4 gal/min
1707	41.91	4 gal/min
1712	Pump shut down	
1718	44.53	4.8 gal/min
1722	46.11	5 gal/min
1730	46.15	5 gal/min

Location Site 2 Date 5/16/06

Project / Client

Time	DTW	Flowrate
1735	46.43	5 gal/min
1740	shut down pump to adjust tubing.	
1744	46.33	5 gal/min
1746	Pump shutdown - GFCI on generator switched off.	
1811	45.92	5 gal/min
1930	Depart site.	

Location Site 2 Date 5/17/06

Project / Client Pump Test

0745: Arrive on site. Field Crew -
B. Francisco
A. Dodson
Objective: Site 2 Pump Test

0750 Conduct Health and Safety Briefing. Topics include
- Safety awareness around Baker tank, use caution when climbing ladder
- TCE contamination in well - use gloves, take PID readings frequently
- Heat awareness - temp should reach upper 70's low 80's today.

0800 Calibrate PID, Mini Rae 2000 w/ Isobutylene 100 ppm
fresh air = 0.0 ppm Cal Sol = 102 ppm

0810 All well caps are opened to vent prior to taking water level measurements.

Location Site 2 Date 5/17/06

Project / Client Pump Test

Well ID	DTW	TIME
MW10D	7.05	8:22
MW10S	7.63	8:25
MW12S	4.44	8:56
MW01D	5.71	8:59
MW02D	4.82	9:02
MW05D	6.61	905

DTW Measurement after Transducer Deployment

Well ID	DTW	TIME
MW10S	7.64	0957
MW12S	4.45	1000
MW01D	5.67	1002
MW10D	6.99	1006

1013 Begin pump test @ MW10D.

Time	DTW	Flow rate	Well ID
1015	30.29	4.8 gal/min	MW10D
1017	41.38	5.2 gal/min	MW10D
1028	43.86	5.5 gal/min	MW10D
1036	5.75	—	MW01D
1039	4.72	—	MW02D
1041	6.55	—	MW05D

Location Site 2 Date 5/17/06

Project / Client Pump Test

TIME	DTW	Flow rate	~~Time~~ WELL ID
1047	4.45	—	MW12S
1048	42.69	5.2 gal/min	MW10D
1049	7.64	—	MW10S
1134	42.70	5.0 gal/min	MW10D
1136	4.44	—	MW12S
1138	5.72	—	MW01D
1208	4.63	—	MW02D
1212	6.45	—	MW05D
1220	42.45	5.0 gal/min	MW10D
1223	5.67	—	MW01D
1226	4.62	—	MW02D
1229	6.43	—	MW05D
1234	4.45	—	MW12S
1235	7.65	—	MW10S
1320	42.28	5.0 gal/min	MW10D
1322	4.44	—	MW12S
1324	5.65	—	MW01D
1331	4.63	—	MW02D
1335	6.40	—	MW05D
1339	7.66	—	MW10S
1433	42.35	5.0 gal/min	MW10D
1434	4.44	—	MW12S
1434	5.72	—	MW01D

Location Site 2 Date 5/17/06

Project / Client Pump Test

Time	DTW	Flowrate	Well ID
1442	4.73	—	MW02D
1445	6.45	—	MW05D
1450	7.68	—	MW10S
1546	45.0	5.5 gal/min	MW10D
1549	4.47	—	MW12S
1552	5.81	—	MW01D
1557	6.52	—	MW05D
1559	4.89	—	MW02D
1602	7.68	—	MW10S
1627	46.65	5.6 gal/min	MW10D
1631	4.48	—	MW12S
1633	5.88	—	MW01D
1635	4.97	—	MW02D
1638	6.59	—	MW05D
1646	7.69	—	MW10S
1747	46.49	5.6 gal/min	MW10D
1751	4.50	—	MW12S
1753	5.98	—	MW01D
1757	5.11	—	MW02D
1800	6.72	—	MW05D
1804	7.72	—	MW10S
1826	45.92	5.6 gal/min	MW10D
1826	4.50	—	MW12S

Location Site 2 Date 5/17/06

Project / Client

Time	DTW	Flowrate	Well ID
1828	6.03	—	MW01D
1831	5.15	—	MW02D
1834	6.75	—	MW05D
1839	7.71	—	MW10S

1845: Pump shutoff and recovery test begins.

Time	DTW	Flowrate	Well ID
1848	8.32	—	MW10D
1849	7.89	—	MW10D
1850	7.50	—	MW10D
1851	7.40	—	MW10D
1852	7.36	—	MW10D
1853	7.33	—	MW10D
1854	7.32	—	MW10D
1855	7.32	—	MW10D
1856	7.31	—	MW10D
1857	7.29	—	
~~1858~~	~~AO~~		
1902	7.28	—	MW10D

Location Site 2 Date 5/17/06

Project / Client

TIME	DTW	Well ID
1904	4.50	MW12S
1906	5.93	MW01D
1909	5.13	MW02D
1912	6.77	MW05D
1921	7.25	MW10D
1922	7.72	MW10S

1930 Collect sample STS-MW10D-0682 for VOCs. Collected MS/MSD also

1935 Collect sample STS-MW10D-0682P for VOCs - Duplicate sample

Recovery Test was completed @ 1928.
Water quality parameters for MW10D during sample collection are as follows: pH = 6.49, Cond = 0.54, Turb = ~~100~~ 86, DO = 2.76, Temp = 20.9, Sal = 0.2, ORP = -68.

2000 Depart Site.

Location Site 2 Date 5/18/06

Project / Client

1000 Arrive onsite. Field Crew - B. Francisco & A. Dodson. Objective - Demobilize pump test & collect TCLP sample.

1010 Conduct health & safety briefing. Topics include biological hazards & generator safety.

1050 Complete removal & decon of transducers.

1110 Break for lunch.

1220 Collect sample SJS02-TCLP-051806 for full TCLP & RCI.

1245 Collect SJS02-EB051806 for VOA's

1250 Collect SJS02-FB051806 for VOA's

Location Site 2 Date 5/18/06

Project / Client

1300 SJS02-TB051806 parm: VOA's

1430 Depart site.

Location ST JULIENS CREEK ANNEX Date 09/29/2004

Project / Client SITE 2

- 1040 - ARRIVE ON SITE WITH REBEKAH IVES/VBO. PURPOSE IS TO COLLECT BLIND LABORATORY SAMPLES FOR NAVFAC-ATLANTIC. TWO SURFACE WATER SAMPLES FOR SVOCs, PEST/PCBS, ~~EXP~~ (PF) + METALS. WE WILL ALSO SHIP EMPTY BOTTLES TO THE LAB FOR SEDIMENT SAMPLES. THE LAB (ERA) WILL CREATE SEDIMENT SAMPLES FOR SVOCs, PEST/PCBs, METALS AND EXPLOSIVES.
WEATHER IS OVERCAST, CHANCE OF RAIN, TEMPERATURE ~ 75°F. HIGH TIDE AT THE SITE 2 INLET IS AT APPROX 11:00AM.
- 1100 - AT SURFACE WATER SAMPLING STATION. WATER QUALITY READINGS*
T° = 24.3°C, Sal = 1.07%, TDS = 11.2g/L, ORP = 13 mV, pH = 6.34, Cond = 18.0 ms/cm
Turb = 0.3 ~~mg~~/L * ~~Meter~~ (ABS)
- 1110 - Collect blind surface H_2O sample for SVOCs, Pest./PCBs, + metals
1112 - Collect blind sediment sample for SVOCs, Pest./PCBs, Metals + explosives.
1138 - Depart site.

Location St. Juliens Creek Annex Date 09/29/2004

Project / Client Site 2

* Meter was not calibrated in the field due to lack of autocal soln. Calibrated back at the office.

1230 - Calibrate Horiba U-22; pH = 4.02, Cond. = 4.50
Turb. = 0.2, DO = 8.38, Temp = 22.99, Sal = 0.23
TDS = 2.89, ORP = 316.

ERA
Attn: John Laferty
6000 West 54th Ave.
Arvada, CO 80002
*303-431-8454

Lab address + phone # to ship samples to for spiking.

1240 - Re-measure surface H_2O sample at office. pH = 5.40 Cond. = 15.0 Turb. = 65.1
DO = 7.71, Temp. = 22.89, Sal. = 0.88, TDS = 9.3, ORP = 183

Location St. Juliens Creek Annex Date 10-5-04

Project / Client Site 2 at BERA

0635: Arrive at NNSY Pass office for Jamie to renew her pass.

0845 Proceed to St Js marina to pick up Field Crew D. Bellemy, J. Butler, M. Elias, and B. Friedman.

Weather: Sunny, windy, highs in lower 60's.

Purpose: Stake locations for BERA Phase III sampling and Collect St. Js Site 2 Sediment Samples.

0930 Meet Valerie/CARMA on site at Bridge crossing for Blows Creek. Had pull boat under bridge and get the boat over the fence line.

0935 B. Friedman goes with Carmen to Site 2 to figure out how to access St Juliens creek complex.

0940 J. Butler, D. Bellemy and M. Elias on boat to shoot coordinates.

Note: When collecting samples for BERA to be sure to collect the material with out of the actual Blows Creek just to sandy and not to clayey.

1100 Off site Blows Creek, Proceed to Site 2

Location St. Juliens Creek Annex Date 10-5-04

Project / Client Site 2 at BERA

to drop off Boat. Team will go to lunch and get passes for St. Js for both D. Bellemy and M. Elias.

1200 Depart from pass office for lunch

1305 On Site 2 for first access to St Juliens Creek Annex

Calibrate Hach pH 2.2

pH 4.02

COND. 4.48 mS/cm

TURB. 2.0 NTU

1329 Depart station for SSREF locations

1335 Set up on SSREF-S001

pH = 4.7 Cond = 29.3 mS Turb = 5.5 NTU

DO = 6.90 mg/L Temp = 25.3°C Sal = 1.83 %

ORP = 159 mV

1342 Collect SSREF-S001-00-040 for SVOCs, Pest/PCB, Metals, CN, TOC, Ammonia and AVS/SEM, Grain Size. Also Collect SSREF-S001-00-040-P at this location

30% Sediment content.

1411 Move to SSREF-S004 for Sed. Sample

Location Site 2 at BCRA Date 10-5-04

Project / Client St Js

1414 Collect [SSREF-SD04-00-04ID] for Sock, Pest/PCB, Metals, CN, Ammonia, AVS/SEM, TOC, cLTOX.

Sandy Silt, dark gray, black, organic matter

pH = 5.2 Cond = 30.2 mS/cm

Turb = 7.2 DO 6.54 mg/L Temp 25.74°C

Sal = 1.84% Orp = 98 mV

1445 Collect [SSREF-SD05-00-04ID] for Pest/PCB, Sock, CN, Ammonia, AVS/SEM, TOC, cLTOX. MS/MSD

pH = 5.2 Cond 28.4 mS/cm Turb: 8.2

DO = 8.43 mg/L Temp = 25.68°C Sal = 1.75%

Orp = 96 mV

Lots Live mussels, organic matter, some oyster shells, sulfur odor, [illegible] sand content, wood chips

1509 Return to Shoreline to meet Bill and M. Elias.

1600 Depart St Js for office to pick coolers.

1648 Collect [SSO2-EBROOS04] for Sock, Pest/PCB, Total metals, Cyanide

Location Site 2 Date 10-6-04

Project / Client St. Js Sediment Sampling

0845 On Site St Johns Creek. Meet for Sediment tracking Sampling. Field Crew: J Butler and D Bolling. Weather: Sunny, high 50s mid 60s

0850 Calibrate Horiba U 22. Error 2 still occurring, however Horiba Cal readings appear OK.

pH = 4.2 Cond = 41.65 mS/cm

Turb: Oasis DO = 7.37 mg/L Orp 261 mV

0900 Will collect Horiba readings at each location and then go back to sample.

0903 Water Quality At SSOA-SD03

pH 6.1 Cond = 6.19 mS/cm Turb = 999 NTU

DO = 4.08 mg/L Temp = 20.23°C Orp 177 mV

0905 Water Quality At SSO2-SD05

pH = 6.6 Cond = 20.3 Turb = Oasis

DO 4.39 Temp = 22.40 Sal = 1.27%

Orp = -247

0907 Water Quality at SSO2-SD06

pH = 6.1 Cond = 8.85 Turb = 139

DO = 5.97 Temp = 20.77 Sal = 0.61

Orp = -1.8 mV

Location Site 2 Date 10-6-04

Project / Client ST. Ss

0910 Northern Sample Collect By Hand
Not a lot of Water. SD26 (X3)
pH=5.8 Cond=0.443 Turb=7.9 DO=5.29
Temp=20.76 Sal=0.00 ORP=-31

0915 Water Quality at 1st Southern-SD25
pH-5.8 Cond=18.0 Turb 14.9
DO=6.88 Temp=22.14 Sal=1.85
ORP=-16

0925 Southern Sample SD24
pH=5.70 Cond=19.1 Turb=15.6
DO=2.80 mg/L Temp Reading Sal=1.14
ORP=-17 mV.

0930 Collect [SS02-SD24-00-040]
For SVOC, Pest/PCB, TOC, Grain Size, Tox, Metals, Ammonia, AVS/SEM, Cyanide.
Approx 20 feet because of chunks of concrete rubble. Organic Sheen in water during sample collection. Believed to be Veos. Field crew has smoke product Petroleum based. Shell Layer present, sheens well at approx 4-6 inches/Salty Shelly Layer

Location Site 2 Date 10-6-04

Project / Client ST. Ss

1000 Collect [SS02-SD25-00-040]
For SVOC, Pest/PCB, TOC, Ammonia, AVS/SEM, Grain Size, Cyanide and Metals and TOX. Shelly Layer was not encountered at this location. much less Sand present. more Plasticity and Silt. Color Orange at approx 4" to more Brown black. Organic odor. Sulfides

1015 Collect [SS02-SD05-00-040] for SVOC, Pest/PCB, TOC, Grain Size, AVS/SEM, Metals, Ammonia and Cyanide and TOX. Sulfide odor, Silty muddy, lots of fragment

1025 Collect [SS02-SD05-00-040]
for SVOC, Pest/PCB, TOC, Grain Size, AVS/SEM, Metals, Ammonia, Cyanide and, TOX. Very Similar to SD03

1040 Collect [SS02-SD04-00-040]
for SVOCs, Pest/PCB, TOC, Grain Size, AVS SEM, Metals, Ammonia, Cyanide and TOX, Black flocculent that dissipated when exposed and produced a petroleum sheen. Aspect and odor similar to Sample location [illegible] Unable to hold.

Location Site 2 Date 10-6-04

Project / Client St. Js

1100 Collect [SS502-SD2600-04D] for SVOC, Pest/PCB, Metals, Cn, Tox, Grain Size, Ammonia, AVS/SEM, Lil Tox Sandy material w/ 3" base Silty, black organic content present [illegible]

1110 Collect [SS502-FB100604] for SVOC, Pest/PCB, Tox, Metals, and Cn.

1125 Collect [SS502-FB100604] for SVOC, Pest/PCB, TAL Metals and Cn.

1130 Blind Sediment Sample [SS502-SD22-00-04D] for exhibits SVOCs, Pest/PCBs, and Metals

1140 Blind SW [illegible] sample [SS502-SW12-04D] for TAL Metals, SVOCs, TCL Pest/PCBs,

1150 Blind SW Spiked Sample [SS502-SW13-04D] for TAL Metals SVOC, Pest/PCBs

10/6/04

Location Blows Creek BERA, Phase II Date 10/25/04

Project / Client St. J.'s

0800 - Arrive @ pass office to get shipyard pass for R. Ives.

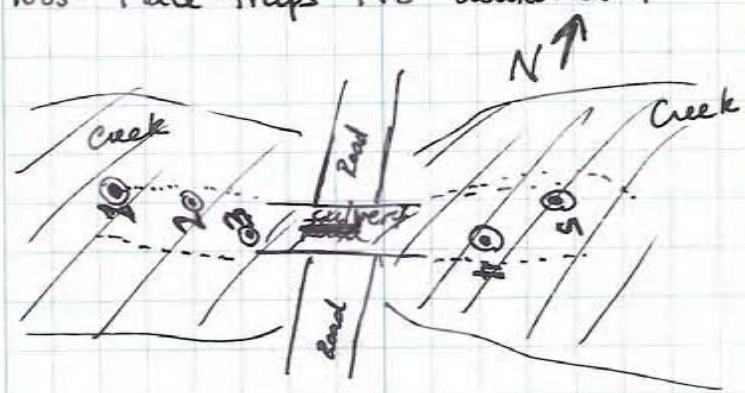
0830 - On site St. J.'s, Blows Creek. F. Crew - R. Ives, D. Ballam, J. Butler. Today's weather - windy, cloudy, high = 63°F Tide - very high Obj. - set mummichaug traps + collect 13 sediment samples.

0900 - Decide to wait to see if tide goes down to collect sediment. Move to upstream locations to set traps.

0905 - Set up traps.

1000 - Place traps 1, 2, + 3 upstream. Noted mummichaug in H_2O @ this location.

1005 - Place traps 4 + 5 downstream.



Location: St. J.'s Blows Creek Date 10/26/04

Project / Client Phase II BERA

1120 Mobilize under bridge to remove stakes + collect cores.

1130 - Collect sediment core @ ~~208~~. 203 (3rd least E)

1140 - Collect sediment core @ 208. ~~Easternmost~~ ~~further~~ Easternmost location.

1150 - Collect sediment core @ (2nd least of Easternmost location)

1300 - Depart site + return to office.

Location St Js' Date 11/8/04

Project / Client Site 2, 19, +21 MIP

0705 - Depart office to pick up rental vehicle.

0730 - Load "fleet vehicle" + depart office

0800 - Arrive @ pass office + meet Columbia technologies.

0845 - On site + meet USA Environmental (UXO).

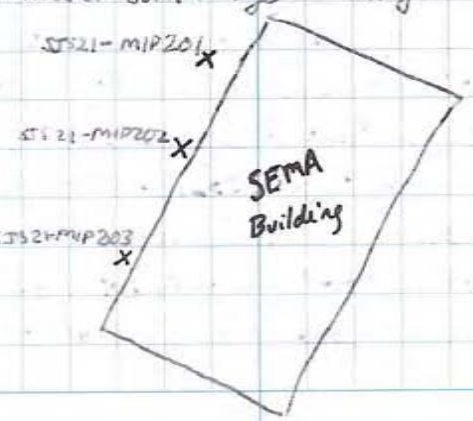
F. Crow - R. Ives, K. Zurich, J. Butler.

Subcontractors - UXO (USA Environmental)

Phil Balvocius + Nelson Figueac;

Columbia Technologies (MIP) - ~~Malcolm~~ Morgan Aycock + Robert Stewart. Weather - Windy, cold, T = 60°F, sunny. Today's obj. - UXO avoidance + MIP locations for well placement. H+S tailgate given by J. Butler + USA Env.

0900 - Set up near SEMA building to begin MIP + "clear" area. Met w/ ~~to~~ Susan Hayes (in lieu of John Wesly) of Navy.



Location St. J.'s Date 11/8/04

Project / Client Site 2, 19, 21 MIP

0935 - Begin drilling for MIP investigation @ SJS21-MIP201 + clear for UXO.

1000 - Begin MIP investigation @ SJS21-MIP201. Punched to 16 feet bgs; estimated depth of confining unit. At ~4 ft. bgs one small peak, probable noise - no hit.

1040 - Withdraw from hole + patch.

1052 - Move to new MIP location + practice UXO avoidance + begin drilling for MIP investigation @ SJS21-MIP202; original location too noisy. Off set ~5 ft. East, closer to building. Second Location is good. Will proceed with MIP.

1115 - Punched to 16 feet bgs; estimated depth of confining unit ~16.09 ft bgs. No peaks @ this location. Withdraw from hole. Patch hole w/ Bentonite chips + pavement.

1145 - Move to new MIP location + practice UXO avoidance + begin drilling for MIP investigation @ SJS21-MIP203. Too much "noise" in initial hole. Move location East ~2 feet, towards building. Second location is good. Will proceed with MIP.

Location St. J.'s Date 11/8/04

Project / Client Site 2, 19, 21 MIP

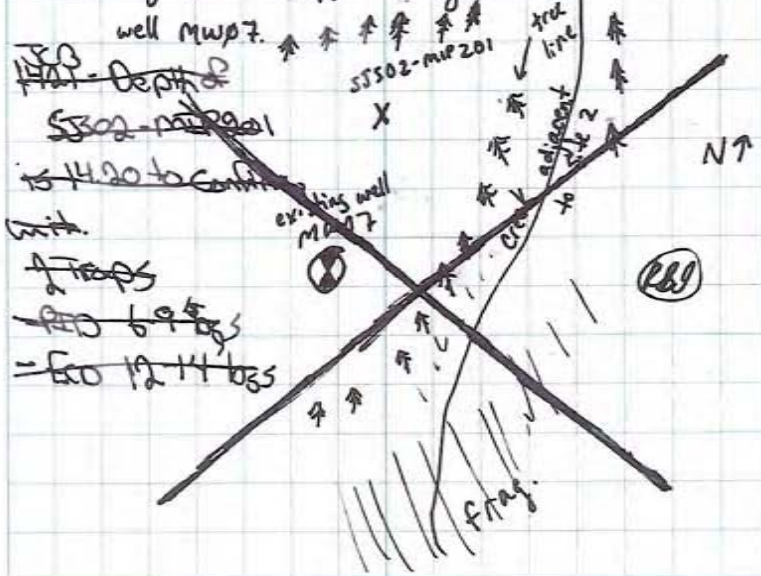
1215 - Pushed to 16 feet; approximate location of confining unit @ 16 feet. No peaks.

1223 - Withdraw from hole + patch. Mobilize to Site 2

1230 - USA clears locations for MIP investigation.

1330 - Calibrate PID. ~~Begin drilling at~~ Calibrated to ambient air 0.0. Calibrated to Isobutylene 100.9

1332 - Begin drilling at SJS02-MIP201 PID reads 0.0 in breathing zone. Too "noisy" relocate to new location ~1½ ft. west of original hole. (Approximately 25 ft. NORTH of well MWP7.



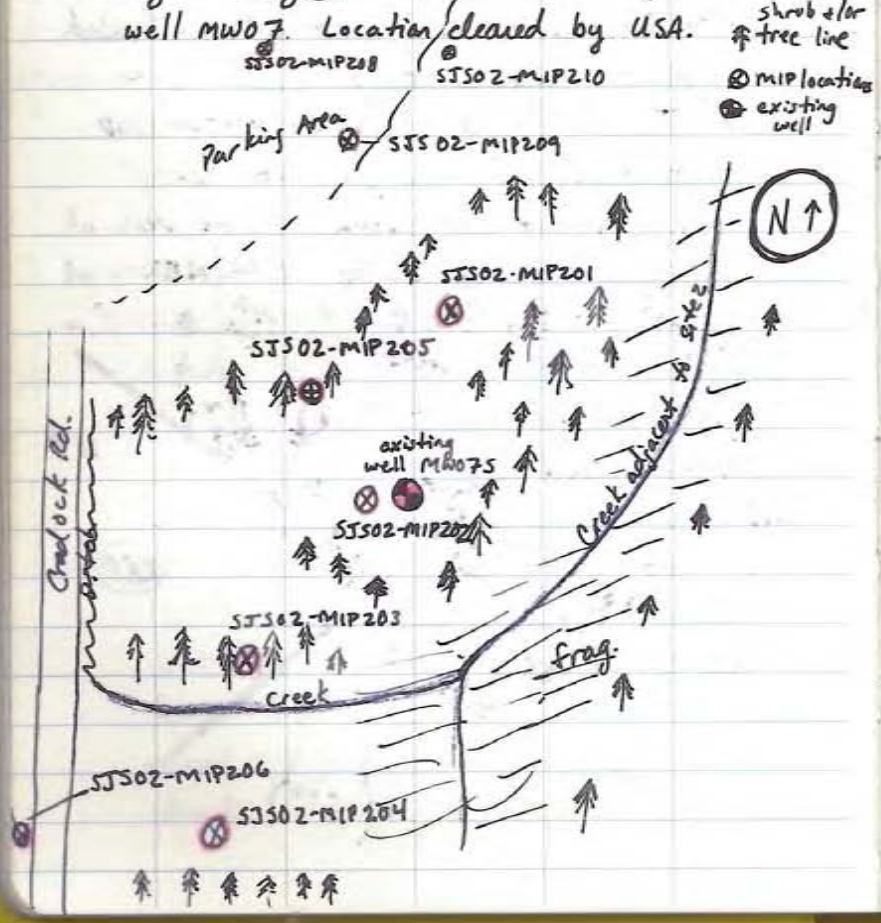
Location St. Js Date 11-8-04

Project / Client Site 2 MIP investigation

1421 - Complete SJS02-MIP201. Total Depth was 14.20 to the confining unit. PID hit occurred from 6-9' bgs. Trap #21. ECD hit occurred from 12-14' bgs Trap #2.

1440 - Withdraw from hole + move to new location.

1452 - Begin drilling @ SJS02-MIP202 adjacent to well MW07. Location cleared by USA.



Location St. J.'s Date 11-8-04

Project / Client Site 2 MIP

1455 - Begin MIP investigation @ SJS02-MIP202. PID reads 0.0 in breathing zone.

1505 - At 6 ft bgs. ECD reaches maximum output

1530 - Confining unit @ 14.09 ft bgs (total depth pushed). Trap #3 (5-14 bgs). PID still reads 0.0 in breathing zone.

1540 - Withdraw from hole + move to new location.

1552 - Begin drilling @ SJS02-MIP203. Location cleared by UXO. Approximately 45 ft. SW of well MW07.

1612 - Begin MIP investigation @ SJS02-MIP203. PID reads 0.0 in breathing zone. Complete SJS02-MIP203. Total depth was 15.06 ~~to the confining unit~~ EOB. ECD hit occurred 8-15' bgs. Trap #4. Confining unit ~13 feet bgs.

1655 - J. Butler gives debriefing. USA off-site. Withdraw from hole + pack up for the day.

1720 - Depart site.

Jebekar Ave

Location St. Juliens Creek Date 11-9-04

Project / Client Site 2 MIP

0730 on Site St. Juliens Creek annex for the Sites 2, 19, 21 MIP.
Field Crew: J. Butler, R. Ives, K. Poppin from CH2M Hill.
Contractors on M. Ackole and R. Stewart from Columbia Technologies
P. Bulsicous and W. Fiscat from USA Environmental. Weather - cold, breezy, sunny, T= 48°F. Today's obj. - collect MIP studies at Site 2 + collect surface soil samples @ Site 19.

0745 - R. Ives conducts H+S tailgate.

0750 - Set up @ SJS02-MIP204 location + beginning drilling. Calibrate PID to ambient air Calibrated to isobutylene 100.3. PID reads 0.0 in breathing zone. UXO cleared location.

0755 - Begin pushing for MIP investigation @ SJS02-MIP 204. Location SW of MW07 ~ 65 feet. PID in breathing zone is 0.0.

0808 ~~0820~~ - At approx. 2.5 feet there was a lot of "noise," possible interferance from "walkie-talkies."

0815 - At approx 10 feet the ECD dropped again, "noise."

0820 - At 12 feet ECD hit + maxed out.

Location St. J.'s Date 11-9-04

Project / Client Site 2 MIP

0836 - PID in breathing zone is 0.0. Trap # 1 occurred from 12-16' bgs. Total depth 16.12' bgs. Confining unit ~ 16' bgs.

0840 - Withdraw from hole + move to new location.
Note: Using walkie-talkies in the MIP van interferes w/ MIP equipment.

0845 - B. Friedmann on site.

0915 - Move to new location + begin pushing + UXO cleared location SJS02-MIP205. Waiting for MIP tool to "cool down."

0925 - Proceed w/ MIP investigation @ SJS02-MIP205 ~ 45 feet NW of MW07, at tree line. PID is ~~0.0~~ 0.1 in breathing zone, probable exhaust from MIP truck.

0945 - PID reads 0.0 - 0.1, probable exhaust.

1014 - ~~No ECD hits~~ Total depth + depth of confining unit 15.10. ECD hit @ 14' Trap # 2 from 14'-15' bgs.

1030 - Withdraw from hole.

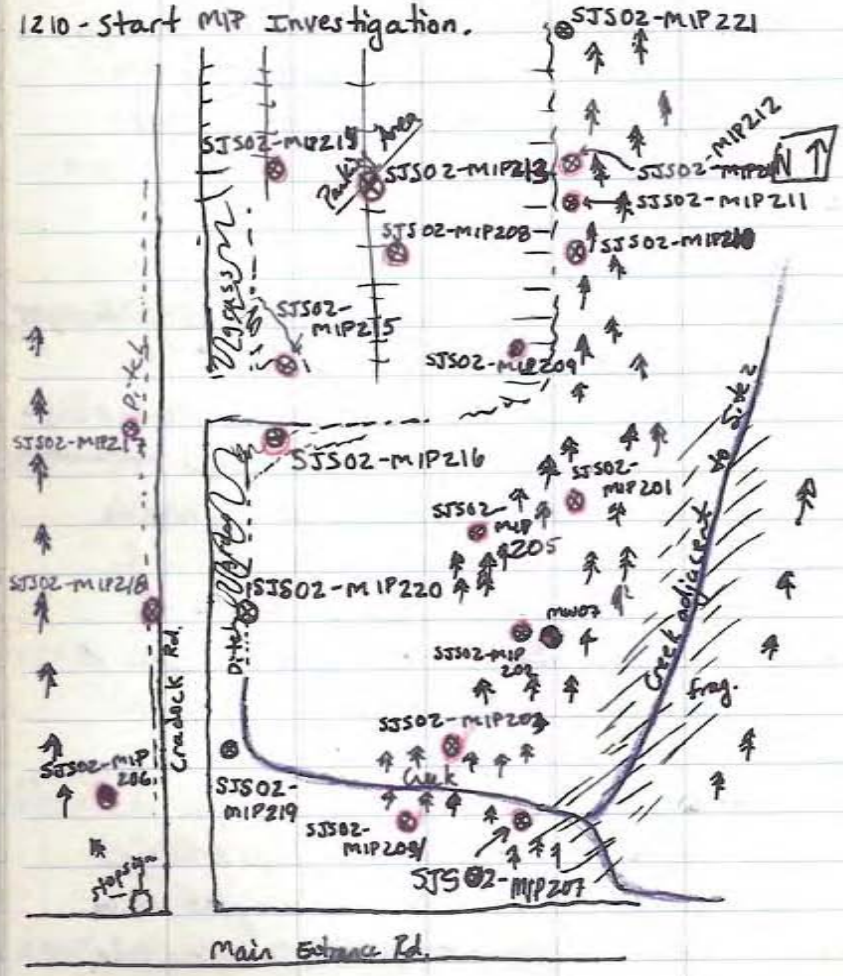
1045 - Move to new location + begin drilling at SJS02-MIP206. Area too "noisy" so move location. New area still too "noisy" in hole, pick new location. Again "noisy." Move new location + clear. Location SJS02-MIP206.

Location St. J.'s Date 11/9/04

Project / Client Site 2 MIP

1207- Begin pushing at new hole SJS02-MIP206, ~ 100 ft. SW of MW07, West of Cradock Road.

1210 - Start MIP Investigation.



#electrical lines

Location St. J.'s Date 11/9/04

Project / Client Site 2 MIP

1225- PID is 0.0 in breathing zone.

1250 - Pushed to 20.08; no ECD hits.

1255 - Withdraw from hole

1300 - Move to new location & begin drilling at SJS02-MIP207

1315- begin pushing at new hole SJS02-MIP207, approx. 75-100 ft south of MW07

1325 - PID reading 0.3 in breathing zone likely due to exhaust from gp probe

1337- PID reading 0.1 ppm

1348- pushed to 16.08

1355- withdraw from hole

1400 - moved to new location SJS02-MIP208 in parking lot b/w light pole & road

1410 - begin pushing at new hole SJS02-MIP208

1411- Check for UXO - ok

Location St. J's Date 11/9/04

Project / Client Site 2 MIP

1420 PID reading 0.1 breathing zone
1445 pushed to 18.00 ft no hits
1446 Withdrawal from hole
1455 move to new location
SJS02-MIP209
1502 begin pushing at SJS02-MIP209
1503 - check for UXO - OK
1505 PID reading 0.1 breathing zone
1519 - ECD hit at 6.5' bgs. Did not catch it in time to trap it. Conductivity also peaked; probable trash.
1533 - Pushed to 17.10' bgs. Confining unit at 16' bgs. No other ECD hits.
1535 - Withdraw from hole + pack up
1605 - USA offsite.
1610 - Depart site to return to office + pack up samples

Mikehart Swer

Location St. J.'s Date 11/10/04

Project / Client Site 2 MIP

0730 - Arrive on site. Weather = cold, sunny, T = 47°F. USA Environmental on-site. N. Figeauc + P. Balvocious UXO subcontractors. Columbia on-site + set up at new location. M. Aycock + R. Stewart MIP subcontractors.
0735 - Calibrate PID. Calibrated to ambient air + Isobutylene (100.1)
0740 - Conduct H + S tailgate. Today's objectives: continue MIP investigation at site 2 delineating TCE + trash boundaries. Collect subsurface soil samples at Site 19.
0750 - Begin drilling @ SJS02-MIP 210. UXO cleared location. Location in grass adjacent to parking.
0755 - Continue drilling + begin MIP investigation. PID reads 0.3, closer to vehicle; probable exhaust from MIP truck.
0805 - PID reads 0.1. Drillers arrive on site Parratt Wolff. Scott Graham + Arnold Chapel are drillers. J. Butler takes them to the staging area + briefs them on the activities going on.
0813 - Conductivity is pretty "jumpy," probable trash.

Location St. J.'s Date 11/10/04

Project / Client Site 2 MIP

0823- Ground gets "soft" at ~13 ft bgs. Small conductivity spike ~ 14 ft bgs. Pushed to 16.12. Confining unit ~14.5' bgs. No ECD hits. Lots of "trash" throughout hole shown on conductivity reading. Location ~125 ft. N of MW07.

0834- Withdraw from hole + move to new location.

0848 - Begin drilling @ new location SJS02-MIP211 UXO cleared.

0853- Begin pushing + MIP investigation @ SJS02-MIP211, ~ 160 ft. N of MW07, ~30 ft. N of MIP 210. Location in grass adjacent to parking lot. PID reads 0.0

0911 - PID reads 0.1 in breathing zone.

0929- Conductivity spike @ ~14' bgs + ground got "soft." Another spike @ ~15' bgs. Total depth is 17.17' bgs. Confining unit @ ~15' bgs. No ECD hits.

0940 - Withdraw from hole + move to new locations.

0950 - Begin drilling at new location SJS02-MIP212. UXO cleared

1000 - Begin pushing + MIP investigation @ SJS02-MIP212, ~185 ft. N of MW07. (~25 ft. N of SJS02-MIP211). Location in grass adjacent to parking lot. PID reads 0.1 in breathing zone.

Location St. J.'s Date 11/10/04

Project / Client Site 2 MIP

1010- Conductivity is pretty "noisy," probable trash.

1030 - Thermometer dropping; probable heater malfunction. Will pull out of hole (at 12' bgs) + test heater.

1040 - Drillers back from setting up. J. Butler gives H+S tailgate to them.

1045- K. Henderson + B. Friedmann onsite. Columbia replaces probe due to malfunctioning heater.

1128- Begin MIP again using new probe @ 12' bgs.

1138- At 14' bgs conductivity peaks + ground gets "soft." Push 2 more feet. Total depth 16.08' bgs. Confining unit ~14' bgs. No ECD hits.

1145- Withdraw from hole + move to new location.

1200 - Begin drilling @ SJS02-MIP213. UXO cleared.

1206 - Begin pushing + MIP investigation @ SJS02-MIP213, ~200 ft. NNW of MW07 Directly west + slightly south of MIP212. Location in parking lot, East of former UST location. PID reads 0.1.

1225- Conductivity spike @ 14' bgs. Ground "soft" @ 14' bgs. Total depth 16.10' bgs.

Location St. J.'s Date 11/10/04

Project / Client Site 2 MIP

1229 - No ECD hits. Conductivity was pretty "clean," not too much "trash."

1235 - Withdraw from hole + move to new location.

1243 - Begin drilling new location SJS02-~~MIP214~~ MIP214 (2). UXO gave clearance.

1253 - Begin pushing + MIP investigation at SJS02-~~MIP214~~ MIP214d (2); supposed location of former UST. Location in parking lot ~ 20 ft. west of MIP213 + ~ 220 ft. NW of MW07.

1300 - PID reads 0.0. No ECD hits.

1313 - Conductivity spike @ 15' bgs + ground gets soft. Total depth 17.09' bgs. B. Friedmann + Kim depart.

1320 - Withdraw from hole. Move to new location.

1340 - Begin drilling at new location SJS02-MIP215. UXO gave clearance.

1353 - Begin pushing + MIP investigation @ location SJS02-MIP215.

1400 - PID reads 0.3 in breathing zone.

1413 - Ground gets "soft" at ~14.5' bgs. Conductivity spike @ ~15 ft. bgs. Total depth 17.08' bgs. Confining unit @ ~15' bgs.

1420 - Withdraw from hole + move to new location.

1432 - Begin drilling new location SJS02-MIP216 UXO cleared location. ~ 65' WNW of MW07.

Location St. J.'s Date 11/10/04

Project / Client Site 2 MIP

1434 - Begin drilling + MIP investigation at SJS02-MIP216.

1445 - ECD hit @ ~3' bgs. Maxed out at ~4.5' bgs.

1450 - Some drops in "ECD plateau," drop at about ~7.5' bgs. ECD max again at 8' bgs. PID hits @ 8' bgs. "Very hot" location. Notified J. Butler, who will notify B. Friedmann. PID reads 0.0 in breathing zone.

1500 - At 16' bgs PID shoots up even hotter. Ground "soft" at 15'. Total depth 17.12' bgs. Conductivity peak @ ~14' bgs. Confining unit @ ~14' bgs. Trap #1 is 3-17.

1508 - Withdraw from hole + clean up for the day. Columbia to start directly west of this location across street tomorrow morning.

1530 - Patch holes in parking lot. UXO + I depart Site 2 + move to Site 21. Reference Field Book #2.

1850 - Depart site. [illegible]

Location St. J.'s Date 11/11/04

Project / Client Site 2 MIP

0655- Arrive on site at St. J.'s. Today's weather - Cold, sunny, T= 45°F am, 60° day. F. Crew - R. Ives, K. Zunich, J. Butler. Columbia - M. Aycock, R. Stewart, Courtney Reynolds, . Parratt Wolff - A. Chapel, S. Graham. USA - P. Balvocious, N. Figeauc Today's obj. - MIP @ Site 2, delineate trash, GPS. See Book #2 for well installation.

0710- J. Butler conducts H+S tailgate + briefing for drillers. R. Ives conducts H+S briefing for MIP.

0715 Calibrate PIDs

#1. calibrated to ambient air 0.0 ppm

calibrated to 100 ppm isobutylene 101.1

#2 lamp out - not working

0730 - Set up at new location SJS02-MIP217 UXO cleared location.

0800 - Begin pushing + MIP investigation at SJS02-MIP217. Location west of Cradock St, just west of ditch. Location approximately WNW of MW07 by 90'. ~35' west of SJS02-MIP216.

Location St. J.'s Date 11/11/04

Project / Client Site 2 MIP

0818- Total depth 16.13' bgs. Conductivity spike + ground "soft" at ~14' Confining unit @ ~14 ft.

0820 - No ECD hits.

0825 - Withdraw from hole + move to new location.

0835 - Drill @ new location SJS02-MIP218. Too noisy... move to new hole. New hole cleared.

0845- Begin pushing + MIP investigation @ SJS02-MIP218. Location ~80 ft. west of MW07. West side of Cradock Rd., just East of ditch.

0857- Conductivity spike @ 9' bgs, probable trash. Robert says this location is "harder."

0903 - "Soft" at 14' bgs. Conductivity spike @ ~14.5' bgs. Total depth @ 16.12' bgs. Confining unit @ ~14.5' bgs.

0906- Withdraw from hole + move to new location.

0915 - Begin drilling new hole @ SJS02-MIP219. UXO cleared location. However it is pretty "noisy" in surrounding area.

Location St. J.'s Date 11/11/04

Project / Client Site 2 MIP

0930 - Begin pushing @ SJS02-MIP219, location Eastside of Cradock, approximately 10 ft. East of street edge. ~65 ft. WSW of MW07, ~50 ft. south of MIP216.

0935 - conductivity is pretty noisy.

0938 - ECD hit @ 8' bgs. "Maxed out" at 10' bgs.

0944 - Conductivity spike @ ~14.08' + ground got "soft." Total depth 16.09' bgs. Confining unit @ ~14' bgs. Trap #1 from 8'-16' bgs.

1000 - Withdraw from hole + move to new location.

1010 - Begin drilling location SJS02-MIP220. UXO gave clearance.

1037 - Begin pushing + MIP investigation @ SJS02-MIP220. Location in ditch, East of Cradock Rd. Location ~55' west of MW07 + ~25' south of MIP216.

1038 - ECD hit @ ~3' bgs

1046 - ECD maxed @ ~9' bgs. Conductivity peak at ~10' bgs. Total depth @ 12.18' bgs. Confining unit ~10' bgs.

Location St. J.'s Date 11/11/04

Project / Client Site 2 MIP

1050 - Trap #2 from 3' - 12' bgs.

1055 - Withdraw from hole + move to new location.

1105 - Begin drilling at new location SJS02 - MIP221. UXO cleared.

1124 - Begin pushing + MIP investigation @ SJS02 - MIP221. Location North of MW07 by ~300 feet. NE section of parking lot, in grass.

1142 - A lot of "noise" on conductivity. Ground has felt "soft" pretty consistently.

1154 - Total depth 16.11' bgs. Confining unit ~14 ft. bgs. No ECD hits. Withdraw from hole.

break for lunch

1300 DPT to delineate trash 1st location NE corner of parking lot

0-2 ft - asphalt 12 in
- brown silty sand w/ gravel 10 in
- black silty sand 2 in
- strong organic odor

2-6 ft

3 ft possible refusal
- UXO check, clear,

Location St. J's Date 11/11/04
Project / Client Site 2 MIP

- Check for clear location
1320 move to new location
location DPT #1 NE corner of pkng lot
2-6 ft water
gray slightly silty ~~gra~~ sand
w/ gravel, saturated
8-12 ft saturated
(10-12) approx 2 ft of fat clay w/
slight wood fibers mixed in
strong petroleum odor
no PID hit
heavy wood fibers mixed in
to 11.5 ft
1400 location DPT #2
approx 30 ft from (W) of DPT #1
0-2' ~~tow~~ 6" asphalt
6-12" - sand w/ some silt (tan)
w/ gravel
12"-18" - tan slightly moist
medium fine sand w/ some silt
18"-22" - brown silty sand
w/ wooden chunks
22"-24" - brownish gray sandy
clay

Location St. J's Date 11/11/04
Project / Client Site 2 MIP

2-6'
4-4.5' medium fine sand (tan)
w/ pea gravel
4.5-5.5' medium ~~fine~~ to coarse
brown sand w/ pea gravel
5.5'-6' gray fine sand w/ some silt
at 5.5", thin layer of black organics
moist w/ gravel
~~saturated~~ at 5.5'
6'-10'
- saturated
6'-6.5 gray medium fine sand w/
some gravel, brick, some silt
6.5/7.5 grayish brown sandy clay
w/ wood fibers
7.5-9' - tan silty clayey sand
to silty sand
9'-10' - light tan fine sand w/
slight silt
10'-14' water
11'-13' - light tan/gray fine sand
w/ silt
13'-14' - same as above w/ increasing
orange w/ depth

Location St. J's Date 11/11/04
Project / Client Site 2 MIP

1450 move to next location
DPT #3
0-2' organic matter,
4-8' saturated from ~5'
5'-6' - gray clayey sand
6'-7' gray silty sand
7'-8' - tan fine sand w/ some silt

510 move to next location
DPT #4
0-2' organic matter, brown sand
4'-8' last 1' black clay w/ wood fibers, roots
6'-8' gravel, glass, wood
8'-12'
8'-9' black/dark brown clay w/ gravel, wood chunks, roots
9'-10' silty sand w/ some wood roots
10'-12' gray saturated medium sand w/ some silt

1550 complete DPT for day
1730 Reference book #2. Off-site.

Location St. J's Date 11/12/04
Project / Client Site 2

0700 arrive onsite
0725 calibrate PID
Calibrate to ambient air - zeroed
Calibrate to 100ppm isobutylene 100.7
0730: Tailgate meeting conducted; Contractors Signed off on H&S.
0745: LWO Clears area at Site 2 for Yorktown well.
Objective for the day is to complete outer Casing for yorktown well at Site 2 in area of TCE contaminated soil
0810 Setup at MIP location 216 to Set yorktown aquifer monitoring well
Drillers will DPT to confirm unit at then drill casing once the depth has been established
- 0-2' 1.5' recovery
0-.5' - fill organics
.5-1.5 - fine sand; sm, loose, no odor. PID=0; 7.5yr 3/2
- 2-4' 1' recovery
3-4' - 6' fine sand, sm, 7.5yr 3/2; Loose, Sat.
PID=0.0 3.5-4' - Stiff clay 7.5yr 3/2; Stiff, CL

Location St Juliens Date 11-12-04

Project / Client

ECD hit on MIP816 showed at approx 4' bgs.
No odor observed in 2-4' core
4-8' core - 3.5' recovery
PID in breathing zone = 0.0 ppm
Down hole = 11.8 ppm
4.5-5 - Silty Clay with some Sand; ML; Soft, moderate, 7.5yr 6/6, moist
5-7 - Silty Sand; SM, Some Clay; Loose Saturated; 7.5yr 6/6.
7-8' - Fine Sand; SM; Saturated; petroleum at sweet TCE odor - PID=0.0 ppm; 2.5yr 7/1
- 8-12 Core - 3.5' recovery
8-11.5 - Fining down gravel; 2.5y 6/8; SM; fine sands, loose; saturated, TCE odor. PID Reading along core were approx 11.9.
11.5-12 - No Recovery; wet loose very small core with PID; 23 ppm. PID=0.00 ppm in breathing zone.
- 12-16' bgs
PID is varying between 0-11 at 23 ppm.
Not steady at is sustaining at 00
Saturated silty sand, SM; loose, 2.5y 6/8.

Location St. Juliens Date 11/12/04

Project / Client Site 2

16-20' bgs - 4' recovery
16-17' - Silty Clay; Grey 2.5y 2.5/1, moderate SC
17-20' - YCL; CH; 2.5y 2.5/1.
20' - fine Silty Clay with some sand.
0930 B. Frickmann on site to assist with outer wall casing for YCL well.
PID readings were continuously collected during emergency activities. There were a few PID hits above 100 ppm but they immediately subsided at were stabilized around 11 ppm for approximately 5-10 seconds. Overall PID remained at 0 ppm in the breathing zone.
1000 Set outer casing from 0-19' bgs. for SJS02-MW
1020 - Columbia sets up @ SJS02-DPT05 for trash delineation. UXO gave clearance
0-2 ft. ~~0-12"~~ 0-12" asphalt
~~1.5 ft. recov.~~ - grey sandy w/ gravel @ 10 in
12-14" ~~12-14"~~ 8"-10" - orange brown sand (fine) w/ small (1/4" black gravel)
14-22" ~~14-22"~~ 10"-14" - orange brown fine/medium sand
22-24" ~~22"-24"~~ 14-18" - light orange brown sand, ~~fine~~ medium

Location St. Juliens Date 11/12/04

Project / Client Site 2

1035 - Push 2-6 ft. bgs. 3 ft. recovery

24"-38" - lt. brown orange fine sands

~~30"-40" - stiff blackish brown sand (fine)~~

~~40"-42"~~ .

38"-42" - lt. grey small pieces of gravel w/ some sand

~~42"-48"~~ - lt. brown orange fine sands

48-52" ~~35"-42"~~ - stiff blackish brown sand (fine)

52"-54" ~~42"-43"~~ - orange brown brick + rock fragments

54"-60" ~~43"-48"~~ - black clayey fine sands w/ silt. pieces of rock debris + glass

1050 - Push 6-10 ft. bgs. 3 ft. recovery

6 ft. -9' : lt. grey fine medium sands; frag stem

9'-10' : lt. greenish grey fine medium sands, very moist

1130 - Set up @ new DPT location. UXO gave clearance

1136 - Begin pushing @ SS502-DPT06. South central location west of ~~MPBOF~~ DPT05.

0-2 ft. 2 ft. recovery

0-8" - asphalt

8"-12" - asphalt frag. + lt. grey gravel w/ some coarse sand

12"-24" - orange brown sand (fine) loose - moderate

Location St. Juliens Date 11/12/04

Project / Client Site 2

1140 - Push 2-6 ft. 4 ft. recovery

24"-32" : lt. tan fine sands, loose

32"-34" : greyish tan fine sands w/ some gravel

34"-38" : tan fine sands

38"-41" : dark greyish brown fine sands, moderate in stiffness w/ rocks

41"-42" : rocks + gravel

42"-43" : orange/brown brick debris + sand

43"-50" : black gravel, glass debris (old parking lot ?)

50"-54" black clayey sands

54"-72" - grey moist sands (fine)

1150 - Mobilize to new location DPT07. UXO gave clearance.

0-2 ft. bgs. 1 ft. recovery

0-2" : asphalt

6"-12" ~~2"-8"~~ - greenish brown sand medium fine w/ rock, plastic, rope debris

(28)

4-6" ~~8"-10"~~ - black silty sand w/ small rock

2-4" ~~10"-12"~~ - gravel + rocks w/ medium fine sands, dark greenish brown

1200 - Push 2-6 ft. bgs. 3 feet of recovery

Location St. Juliens Date 11/12/04

Project / Client Site 2

2-5 ft. 24"-32" - brown medium fine sand w/ some small gravel fragments

32"-36" - medium fine sands w/ wood fibers + debris + rocks

36"-44" - gravel w/ sand (fine), greyish brown, stiff to moderate hardness

44"-46" - lt. grey stiff fine sand

46"-58" - brownish black moist sandy silt w/ small pieces of rock (1/8") glass, ceramic debris

58"-60" - black moist sandy silt w/ rocks, glass, wood fibers

1210 - 6-10 ft. bgs. Hit H_2O ~ 9 ft.
1 foot of recovery

9 ft - 9.5 ft.: black sandy silt w/ rock + glass fragments, wet

9.5 - 10 ft.: lt-grey fine sands, wet

1235 - Mobilize to new location DPT08. West of DPT06.

1240 - Begin drilling 0-2 ft. UXO gives clearance
2 ft. recovery

0"-12": asphalt

12"-13" - brown sand, medium fine

13"-14" - concrete rocks

Location St. Juliens Date 11/12/04

Project / Client Site 2

14"-22": brown medium ~~fine~~ sands fine w/ rocks.

22"-24": black / brown medium silty sands w/ rocks + gravel. @ 22" fiber weave mesh (silt fence) directly above silty layer (same as last sample)

1255 - Push 2-6 ft. bgs

1300 - Rig begins leaking hydraulic fluid. Stop work + turn off machine. Fix leak + clean up.

1330 24" → 6 ft. (4 ft. recovery)
· same as above.

1340 - Withdrawel from hole + pack up equipment to return home.

1345 - Parsutt Wolfe off site meeting on Monday at 10:00 AM at Site 2.

1430 - Depart site.

Note: Reference Book #2 for additional notes.

[signature]

Location St. J.'s Date 11/15/04

Project / Client Site 2

1000 - On site @ Site 2. Drillers on-site; Parratt Wolff: A. Chapel, S. Graham, Steve Smith; UXO on-site; USA Environmental - N. Fijeaue, P. Balvocious F. Crew - R. Ives, J. Butler. Today's weather: sunny, breezy, T = 58°F. Drillers have ~1 hr. of prep work to do. Today's obj. - install monitoring wells @ Sites 2 + 21.

1015 - Calibrate Horiba U-22
pH = 3.96; cond = 4.53; Turb. = 3.0; Sal. = 0.2
ORP = 323; DO: 11.05; T = 9.2°

1130 Drillers arrived at approx 9:30 and began setting up. Currently preparing to begin mud rotary for Yorktown well.

1145 - J. Butler conducts H + S tailgate.

1150 - P. Wolff begins work on Yorktown well.

1205 - B. Friedmann arrives on-site.

1245 - Collect split spoon @ 20'-22' bgs.
2 foot recovery
20'-20.5": gravely clay (possible stuff from drill rig); TCE odor possibly, slightly organic; GC; 5Y 3/1, greenish gray
20.5"-22': medium stiff, moist, clay, CH; color: ~~2.5Y 2.5/1~~ 5Y 3/1, greenish gray

Location St. J.'s Date 11/15/04

Project / Client Site 2

1330 - Collect split spoon 27'-29' bgs.
2 foot recovery
27'-28.5" Gley 1, 2.5/10Y; greenish gray; silty clay; soft (medium stiff 27'-27.5'), soft thereafter, ~~CH~~ CL, moist, high-med. plastic
28.5"-29': sandy clay, SC, loose
Gley 1, 2.5/10Y; greenish gray, ~~non~~ saturated, low plasticity, a lot of fines

1350 - Collect split spoon 29'-31' bgs.
2 foot recovery
~~29'-29'~~
29'-29.6": sandy clay, SC, Gley 1, 2.5/10Y, greenish gray, moist, moderate plasticity
29.6"-29.9": fine silty sand, SM, w/ some clay, loose, saturated, Gley 1, 2.5/10Y, greenish gray
29.9"-30.9": sandy clay, , low-medium plasticity, some fines/silts, Gley 1 2.5/10Y, greenish gray
30.9"-31': fine sand w/a little bit of clay, SM, loose, moist, Gley 1 2.5/10Y, greenish gray

Location St. J.'s Date 11/15/04

Project / Client Site 2

1410 - Collect split spoon @ 34'-36' bgs.
2 foot recovery
34'-34'.6": moderate, silty clay, CL, moist, Gley 1 2.5/10Y, greenish gray, slight organic odor
34'.6"-34'.7": ~~sandy clay~~ silty clay w/ some sand, moist, CL, Gley 1 2.5/10Y, greenish gray
34'.7"-35'.6": moderate, silty clay, CL, moist, Gley 1 2.5/10Y, greenish gray.
35'.6"-36': silty clay, med. plasticity, some sand, CL, Gley 1 2.5/10Y, greenish gray; slightly stiffer than last 11", more silts than last 11"
1442 - Collect split spoon @ 38'-40' bgs.
2 foot recovery
38'-38'.2": sandy silt w/ some clay, CL, moist, Gley 1 2.5/10Y, greenish gray, low-mod. plasticity, soft
38'.2"-39': silty clay, CL, moist, no color change, medium plasticity, medium stiffness.

Location St. J.'s Date 11/15/04

Project / Client Site 2

39'-39'.4": moderate stiffness, silty clay, CL, less silts than previous 10", moist, no color change, medium plasticity
39'.4"-39'.8": soft, silty clay, CL, moist, low-moderate plasticity, no color change
39.8'-40': ~~silty~~ sandy silt w/ some clay, CL, low plasticity, no color change, moist, moderate-stiff stiffness, w/ few shell fragments
1500: Collect split spoon from ~~33-3~~ 43'-45' bgs. 2 feet recovery.
43'-44'.6": silty clay w/ some sand, CL, same color as before, moderate stiffness, moist.
Sand lens ~ 44'-44.1'.
44'.6"-45': clay w/ some silt, CH, stiff, no color change
1530 B. Friedman ~~offsite~~ with R. Ives.
J. Butler remains with Drillers at 1410 to set SS502-MW100.
1600 Steve/Parrettwolf Sets PAO @ SS521-MW075 at begins well development

Location St. Juliens Creek Date 11-15-04

Project / Client Site 2

1610 Begin Purging SS521-MW075.
1615 48-50' - 2' Recovery
CH; Stiff, High Plasticity Clay; No
Color Change fat Clay. Some wood
~~1650~~ fragments.
1650 Collect water Quality @
SS521-MW075 | 55 gal Drum used
pH = 4.45 Cond = 0.319 mS/cm
Turb = 72.7 NTU DO = 9.38 mg/L
Temp = 19.42 Sal = 0.0% Orp = 123
1720 53-55' - 2' Recovery
53-54.5 - Same as above
54.5-55' - Silty Clay; Some Color;
moderate; CL (58-60') - Same
1735 Drillers; UXO, CH2M Hill ~~offsite~~. Will
Continue drilling in the morning at MW100.

11-15-04

Location St. Juliens Creek Date 11-16-04

Project / Client Site 2

0715 J. Butler and R. Ford on site
St. Juliens Creek Annex to continue
monitoring well installation at Sites 2 and
21.
Subcontractors: Parratt Wolf, Steve, Brooke,
Scott. UXO - USA Environmental; Phil and
Nelson.
Weather - Sunny highs in the low 60's.
~~TB 60~~
0725 Split Spoon ~~60-62' bgs~~ 63-65'
1 foot recovery
64'-64'2": clayey sand, CL, Gley 1
2.5/10Y, moist, greenish gray.
low-moderate plasticity
64'2"-64'8": ~~sat~~ fine silty sand w/
some clay, SM, slight plasticity,
Gley 1 2.5/10Y, moist
64'8"-65': fine grain sand, saturated,
SM, loose, no color change
0745 Collect split spoon 65-67' bgs
2 foot recovery
65'-65'2": slag material, no color change
65'2"-67': fine/med sand w/ some silt, SM
saturated, no color change

Location St. J.'s Date 11/16/04

Project / Client Site 2 + 21

0750 Steve / Pardtwolfe is developing MW09 at Site 21. Will Radoin over it transcript for water quality readings.

0800 - Calibrate Horiba U-22
pH = 3.98, Cond. = 4.55, Turb. = 0.0,
DO = 11.94, T = 10.2°C, SAL = 0.2, ORP = 321

0825 - Calibrate minirae
Zero to fresh air at
VOS 0 = Isobutylene

0852 - Check water quality @ MW09 @ Site 21. Slight petroleum odor.
pH = 6.40, Cond. = 0.350, Turb = 87.4,
DO = 9.36, T = 21.7°C, sal = 0.0, ORP = 47
Total volume = 40 gallon. Completed development.

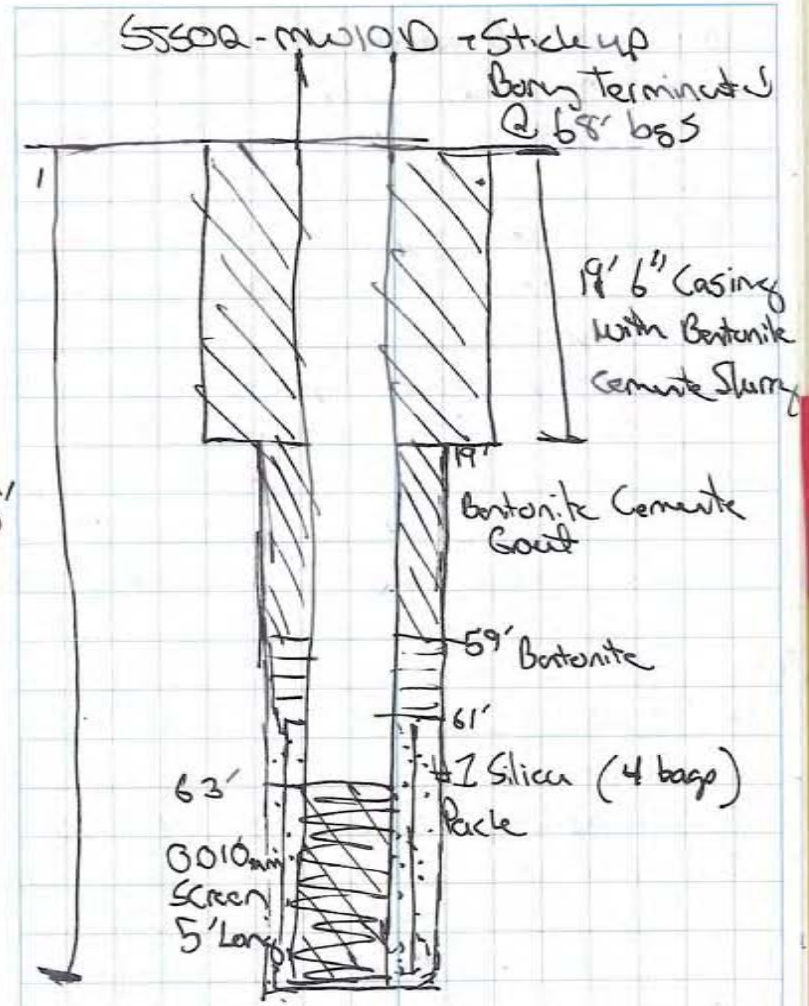
0910 Begin developing SSS21-MW08S

1000 - Check H_2O quality @ MW08S @ Site 21.
pH = 6.22, cond. = 0.470, Turb. = 385,
DO = 8.99, T = 22.3°C, sal. = 0.0, ORP = 65
~~Total~~ Est volume = 30 gallons. Will continue to develop.

1020 - Check H_2O quality @ MW08S
pH = ~~6.16~~ 6.16, cond. = 0.417, Turb. = 66.8,
DO = 9.48, T = 23.1°C, sal. = 0.0, ORP = 87

Location St. Juliens Creek Date 11-16-04

Project / Client Site 2



Location St. Juliens Date 11-16-04

Project / Client Site 21

1710 - UXO offsite. Drillers decon. equipment

1728 - Off-site. Will begin work at 0700 a.m. tomorrow. Note: Reference Book #2 for additional field notes.

Personal Jurs

Location St. Juliens Date 11-16-04

Project / Client Site 2

0700 - Arrive on site. Weather: Sunny, cool a.m. temps., daily high T= 60°F.; Field Crew - R. Ives + J. Butler; UXO subcontractors - USA Env: N. Figeauc, P. Balvacious; Drillers: Parratt Wolff - S. Stewart, A. Chapel, S. Smith. Today's obj. - Install MW @ Site ~~21~~ 2 + develop + pad wells @ site 2 + 21.

0715 - J. Butler conducts H+S tailgate.

0725 - Calibrate Minirae to ambient air (0.0) + Isobutylene (55.8)

0730 - Set up @ MW10S to install shallow well w/ screen from 6'-16' bgs. Set pad for MW10D. USA clears next area.

0745 - UXO gives clearance down to 2 ft. bgs

0800 - MiniRae reads 0.0 ppm in breathing zone + 10.5 directly over hole.

0805 - ~~PID~~ Minirae reads 1.2 ppm @ 10' from hole in breathing zone.

0815 - ~~PID~~ minirae jumping btwn ~7 + 11 ppm in breathing zone. ~~PID odor~~ TCE odor at times.

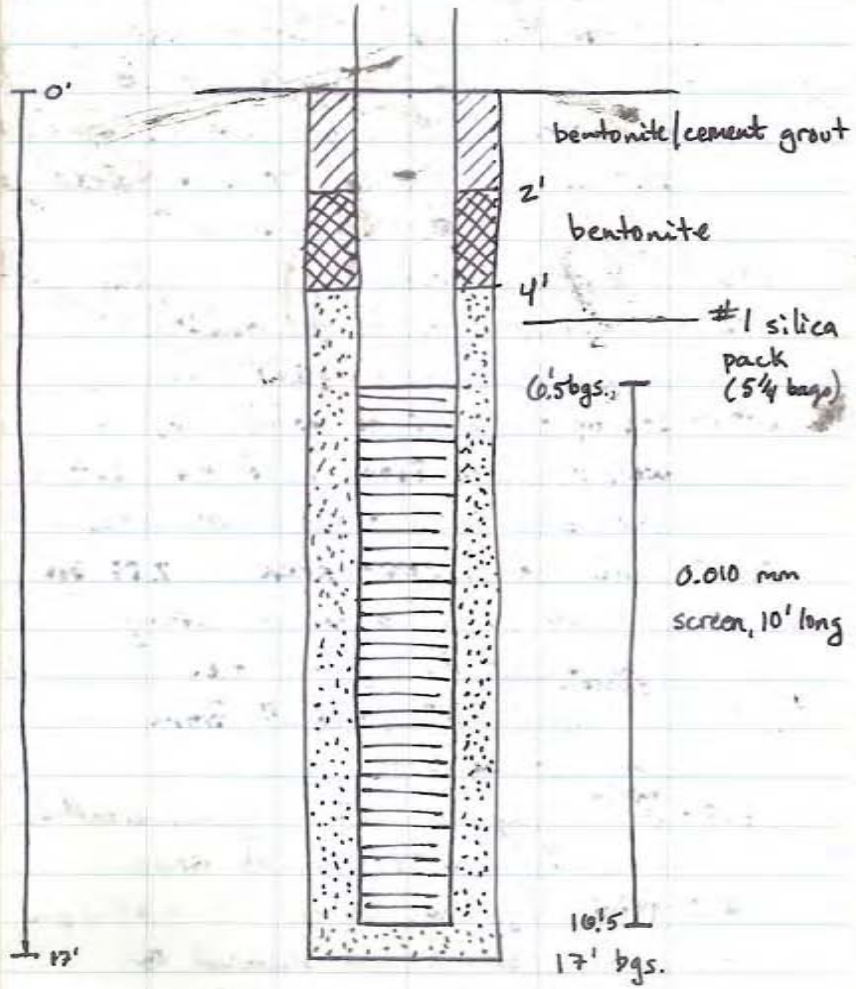
0830 - Minirae jumping. Highest hit ~67 ppm. Nothing over 25 ppm sustained for 1 minute. Strong TCE odor. Average ~9 ppm.

Location St. J.'s Date 11/17/04

Project / Client Site 2

SJS02 -MW10S

Stick-up. Boring terminated @ 17' bgs.



Location St. J.'s Date 11/17/04

Project / Client Site 2

0910 - Complete setting MW10S @ Site 2 + mobilize to next well location. 0915 begin developing MW10D.

0925 - Set up @ SJS02-MW11S.
UXO gives clearance to 2 ft. bgs

0930 - Drillers go to 4 ft. bgs. UXO gives clearance to 4 ft. bgs.

0940 - Collect split from 5'-7' bgs. About 0.5" recovery. Rock debris + organics.

0947 - Collect split spoon from 10'-12' bgs. 2 feet recovery. Minirae reads 0.0 ppm

10'-10'2": Gley 1 3/5GY, dark greenish gray, CH, fat clay, large fragments of brick + rock debris, moist, soft-moderate, high plasticity

10'2"-10'10": same as above, except less brick fragments... fragments are smaller pieces

10'10"-11'2": same as above, no brick fragments

11'2"-12': same as above, except old frag. debris, soft

0948 - Calibrate Horiba U-22.

pH = 3.58 cond. = 4.53

Turb = 1.4 DO = 10.01

T° = 12.3°C Sal. = 0.2

ORP = 347

Location St. Juliens Date 11/17/04

Project / Client Site 2

0950: Collect split spoon 12-14' bgs.
2 feet recovery.
12-14': CH, fatty clay, dark greenish gray, (Gley 1 3/5GY), soft, moist, high plast.
12'-12'3": wet, brick + rock fragments
13'2"-14': wood fibers, probable old frag. stand.

1018: Check H_2O quality during well development @ MW10D. Approx. 30 gallons so far.
pH = 6.37, cond. = 0.447, Turb. = 109
DO = 9.29 T = 16.5°C, Sal. = 0.0, ORP = 120
Continue to Develop.

1030: Collect soil core 4'-8' bgs. 6" recovery.
Debris + organics mixed.

1037: Check H_2O quality during well development @ MW10D.
pH = 7.80, cond. = 0.374, Turb = 16.9,
DO = 9.32, T = 17.1°C, sal. = 0.0, ORP = 80
Total development volume = 55 gallons

1045: Collect macrocore from 14'-18' bgs.
3 feet recovery.
15'-16'5": peat w/ frag. fibers + fragments, PT moist, very dark gray (10YR 3/1), organic odor

Location St. Juliens Date 11/17/04

Project / Client Site 2

16'5'-17'2": silty peat w/ some fine sand, moist, PT, very dark gray (10YR 3/1), organic odor
17'2"-17'10": saturated silty peat w/ some sand, same as above,
17'10"-18': fine sand w/ silt, saturated, SM, black, (10YR 2/1)

1115 - Collect macrocore from 18'-22' bgs.
2 feet recovery. Begin well develop @ MW10S.
18'-19': silty sand, SM, saturated, medium dense, some clay, very dark gray (10YR 3/1)
19'-19'8": fine sand, SW, small amount of silt, saturated, olive brown (2.5Y 4/2), medium dense
19'8"-20': sandy clay, SC, saturated, low-medium plasticity, olive brown (2.5Y 4/2)
20'-21': fat clay, CH, medium stiff, greenish gray (Gley 1. 6/5G)
21'-22': same as above, slightly more stiff, light greenish gray (Gley 1 7/5G), some small amounts of clay colored yellow (2.5Y 6/8)

1130: Will set well screen @ 20'-15' bgs.

Location St. Juliens Creek Date 11/17/04

Project / Client Site 2

1150 - Check H_2O quality @ SJS02-MW10S.
pH = 6.32 cond. = 1.06 Turb. = 87.4
DO = 8.89 T = 18.9°C sal. = 0.0
ORP = 20

1211 - Strong odor: TCE. C. White on-site
H_2O quality @ SJS02-MW10S
pH = 6.35, cond. = 1.07, Turb. = ~~57.2~~ 57.2
DO = 18.67, T = 19.1°C, sal. = 0.0, ORP = 27

1230 - Begin developing ~~SJS0~~ SJS21-11S.

1323 - Drillers go to decon. equipment.

1334 - Check H_2O quality @ SJS21-MW11S.
pH = 6.22, Cond. = 0.352, Turb = 13.9
DO = 8.80, Temp. = 22.6, sal = 0.0, ORP = 59
Development complete total purge volume = 25 gall.
Well goes dry after ~3 minutes w/ whale pump.
Very quick recharge.

1430 - Set up @ SJS02-MW12S. Auger to 2 ft.

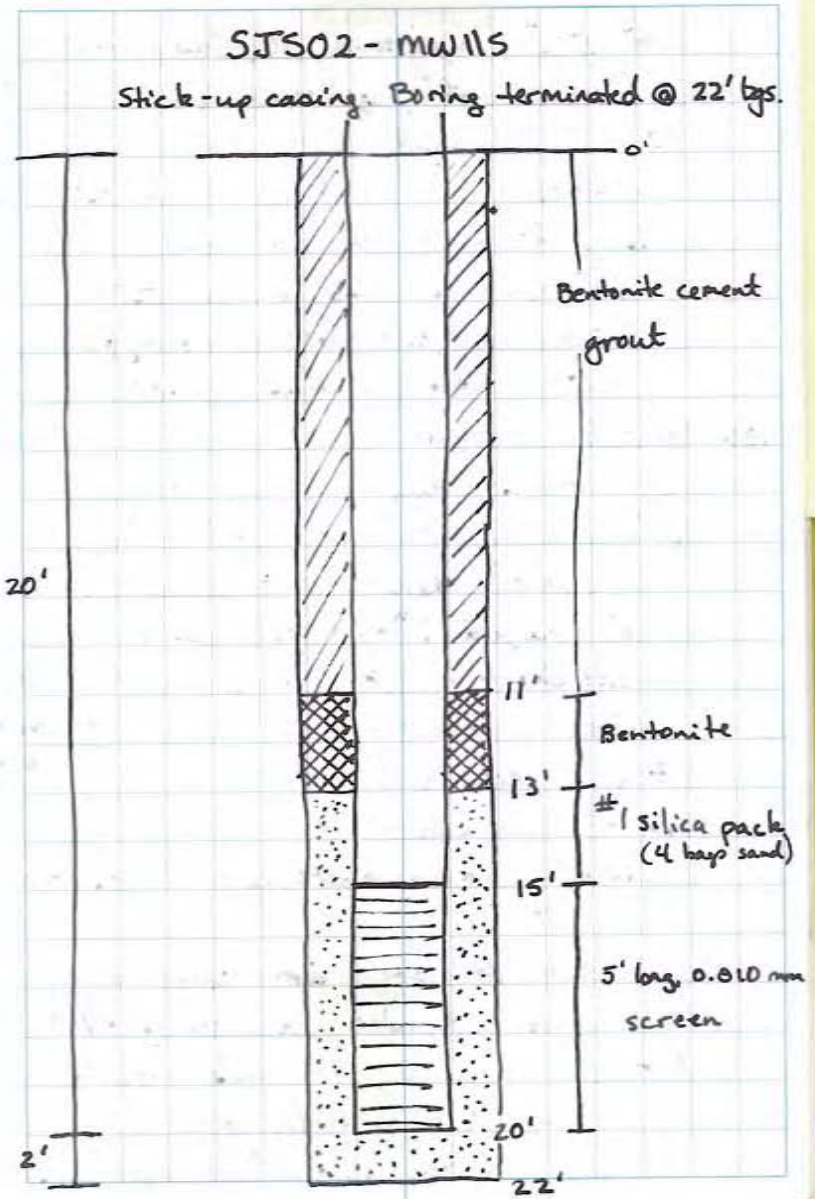
1434 - UXO gives clearance to 2 ft. bgs

1435 - Auger to 4 ft. UXO gives clearance to 4 ft.

1440 - Collect macrocore from 4'-8' bgs.
3.5' recovery
4'6"-4'10": sandy clay, SC, medium stiff, gravel fragments, ~~dark~~ olive brown, (2.5Y 4/6)

Location St. Juliens Date 11/17/04

Project / Client Site 2



Location St. Juliens Date 11/17/04

Project / Client Site 2

4'10" - 5'2": clayey sand, SC, low plasticity medium stiff, yellowish brown (10YR 5/6)

5'2" - 6': fine sand, wet, well-graded, med-loose, SW, light olive brown (2.5Y 5/4)

6' - 7.5': fine sand, SW, well-graded, wet, medium dense sand, light gray (2.5Y 7/1)

7.5' - 8': fine sand, wet, well-graded, medium, SW, light olive brown (2.5Y 5/4)

1450 - Collect macrocore 8' - 12' bgs.

3.5 feet recovery

8.5' - 12': fine sand, SW, well graded, saturated, dense, olive yellow (2.5Y 6/8); color change @ 9' olive yellow (2.5Y 6/6); color change @ 10.8'; olive yellow (2.5Y 6/8)

1500 - Collect macrocore 12' - 16' bgs.; overdrove it beyond 16'.

3.5 ft. recovery.

12'6" - 13': same as above.

13' - 15'6": same as above; color - strong brown (7.5YR 5/8)

15'6" ~~15'10"~~ 16': same as above except sand medium sand, color - olive yellow (2.5Y 6/8)

16' - 16'2": fat clay, CH, dark greenish gray (Gley 1 4/10Y), soft

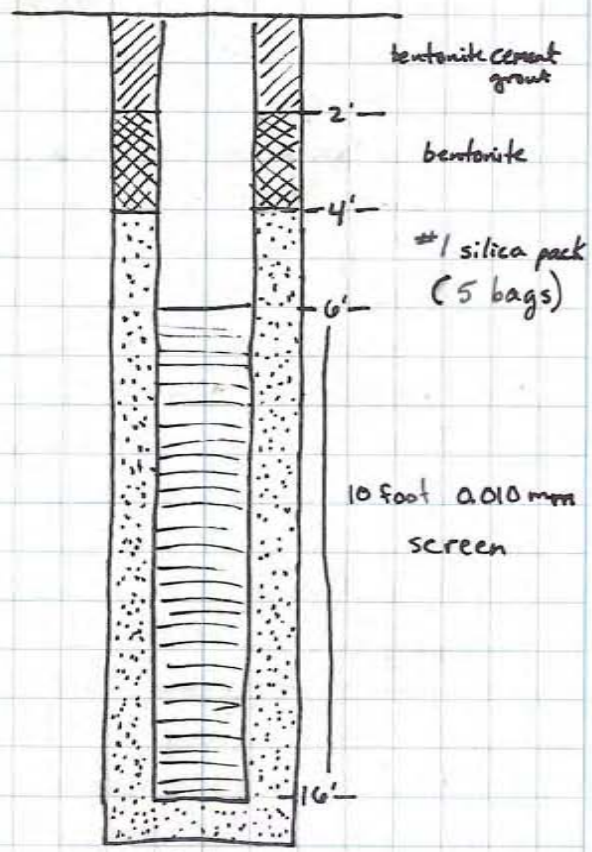
1540 - Set well w/ screen from 6' - 16' bgs.; 2" PVC

Location St. Juliens Date 11/17/04

Project / Client Site 2

SJS02 - MW12S

total boring depth 16, flush mount



Location St. Juliens Date 11/17/04
Project / Client Site 2

1630 - Set up @ SJS02 - MW13S
1640 - Drill to 2 ft. bgs. UXO cleared to 2ft.
1642 - Drill to 4 ft. bgs. UXO cleared to 4ft.
1645 - Take macrocore 4'-8' bgs
1.5 feet recovery
6.5'-7': gravelly sands, SP, coarse, poorly graded, saturated. very dark gray (2.5Y 3/1)
7'-7.5': gravelly sands, SP. coarse, finer sand than last 6", dark black - possibly stained, TCE odor (mild) (5Y 2.5/1)
7.5'-8': same as 6.5'-7'
1650 - Collect macrocore 8'-12' bgs.
2.5 feet recovery
fat clay, CH, soft, organic odor, wood fragments throughout, dark greenish gray (Gley 1 3/5GY)
1655 - Collect macrocore 12'-16' bgs
2.8 ft. recovery
13.2-15' ~~14.2-15'~~: same as above
15'-16.0' ~~15'-15.5'~~: Pt, clayey peat, soft, some organic + frag debris, organic odor, very dark brown, 7.5YR 2.5/1

Location St. Juliens Creek Date 11/17/04
Project / Client Site 2

16' - 16.8'
~~15.5'-15.9'~~
~~16'~~ - 16.8': Pt, peat, frag + organic debris, organic odor, very dark brown (10YR 2/2)
~~15.9'-16'~~
~~16.8'-17'~~ 16.8-17': sandy peat, PT, black, (10YR 2/1)
Note: 1640 Begin developing MW12S.
1705: Collect H_2O quality @ MW12S.
pH = 6.14 cond = 1.08, Turb = 190,
DO = 8.20, T = 19.7°, sal. = 0.0, ORP = 60
1715: Collect macrocore 16'-20' bgs
4' recovery
16'-17.5': same as 15.5'-15.9'
17.5'-17.8': dark gray (2.5Y 4/1) fine silty sand, stiff
17.8'-20': clayey sand w/ silt, soft, same color as previous segment
1718: Drillers stop + turn rig off until resume w/ hole tomorrow. Will take 20'-24'.
1720. H_2O quality parameters.
pH: 5.97, cond: 1.04, Turb: 125
DO = 7.65, T: 21.2°, sal: 0.0, ORP = 64
Total volume 75 gallons.

Location St. Juliens Date 11/17/04

Project / Client Site 2

1736: UXO off-site.

1740: Stage drums + clean up for day.

1750 Depart site. Will return @ 7^00 am to finish well installation, pads, + development.

Location St. Juliens Date 11/18/04

Project / Client Site 2

0715 - Arrive on site. Today's weather: drizzly, clearing later, overcast, T = 40°F. F. Crew - R. Ives + C. White, UXO: USA Env - P. Balvocius + N. Figeave, Drillers: Parratt Wolff - S. Smith, S. Graham, A. Chapel. Today's obj. - Finish well installation, padding, + developing, + sediment samples

0720 - Conduct H+S tailgate.

0730 - S. Smith departs site to buy supplies. C. White arrives on-site.

0735 - Collect 20'-24' macrocore @ SJS02-MW13S. 2.5' recovery

21.5'-21.7': ~~sit~~ sandy silt, SM, saturated, v. loose, black (2.5Y 2.5/1)

21.7'-23': fat clay, CH, soft, high plasticity, dark greenish gray, (Gley 1 4/5Y)

23'-24': fat clay, CH, medium stiffness, high plasticity, dark greenish gray (Gley 1 4/10Y)

0800 - Set well SJS02-MW13S from ~~11'-21' bgs~~ 21' 7'-22' bgs per conversation w/ J. Butler + B. Friedmann.

0945 - USA Env. departs site.

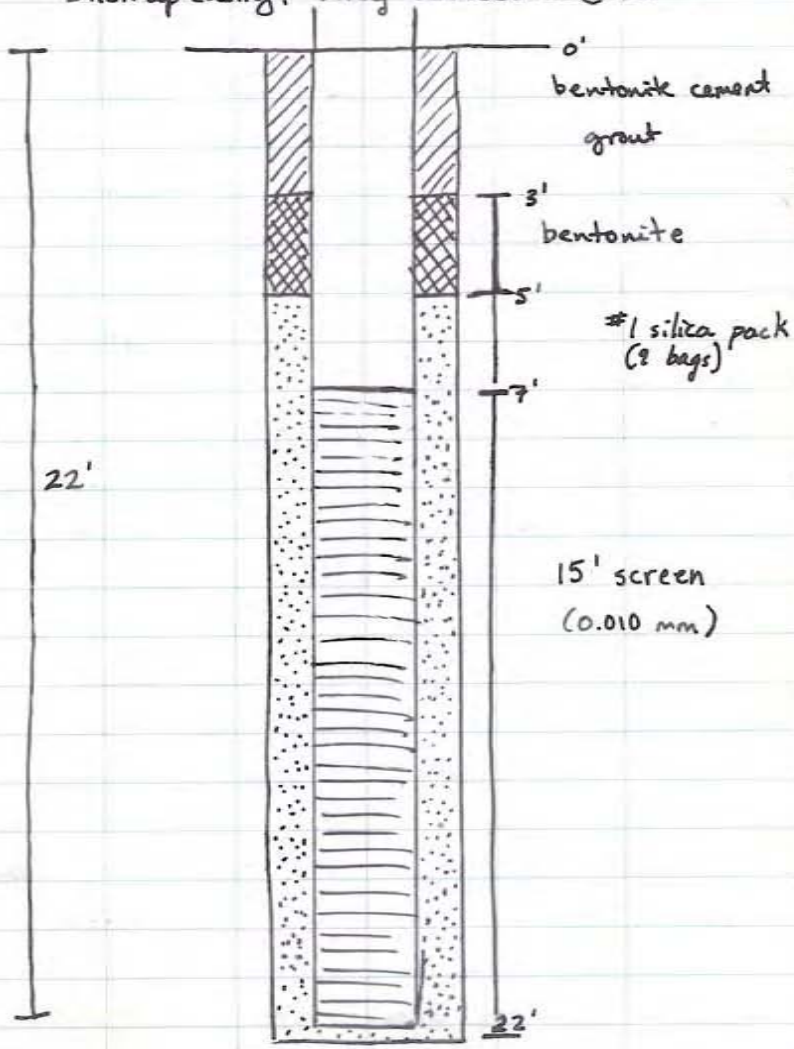
0946 - Calibrate MiniRae to ambient air (0.0) + Isobutylene (101.3)

Location St. Juliens Date 11/18/04

Project / Client Site 2

SJS02-MW13S

stick up casing. boring terminated @ 22'



Location St. Juliens Date 11/18/04

Project / Client Site 2

1020 - Calibrate Horiba U-22
pH = 3.96, Cond. = 4.55, Turb = 0, DO = 9.75
Temp = 15.8°C, sal = 0.2, ORP = 347

1035 - Check H_2O quality @ SJS02-MW11S
(Development began @ 0900)
pH = 6.55 cond. = 3.26, Turb. = 51.3
DO = 9.16, T = 19.3°, sal. = 0.2, ORP = 20
Well has poor yield + takes awhile to recharge. After ~ 1½ hours only 8 gallon of production from well. Drillers clean-up.

1040 ~~1100~~ - Decon. hand auger.

1045 - Collect equipment blank for VOCs.
SJS02-EB111804.

1048 - Collect field blank for VOCs.
SJS02-FB111804.

1115 - Collect sediment sample for VOCs;
SJS02-SD22-00-04D MS/MSD
taken here. MiniRae reads 0.0.

1120 - Decon auger

1130 - Collect sediment sample for VOCs.
SJS02-SD21-00-04D. Duplicate
SJS02-SD21-00-04D-P collected
here. MiniRae reads 0.0.

Location St. Juliens Date 11/18/04

Project / Client Site 2

~~Surface~~

1145 - Surface H_2O quality @ SJS02-SD22.
pH = 6.99 cond. = 6.84 Turb. = 516.0
DO = 9.27, T° = 17.5, sal. = .4, ORP = 60

1150 - Surface H_2O quality @ SJS02-SD21
pH = 7.39 cond. = 8.68 Turb. = 0.0
DO = 9.67 T° = 16.00 sal. = .5 ORP = 76

1155 - Decon auger.

1200 - Surface H_2O quality @ SJS02-SD23.
pH = ~~8.02~~ 7.80 cond. = 1.46 Turb. = 0.0
DO. = 7.76 T° = 17.4 sal. = 0.1 ORP = 98

1205 - Collect sediment sample SJS02-SD23-00-04D for VOCs. MiniRae reads 0.0 ppm.
~~pH = cond. Turb. =~~
~~DO = T° sal = ORP =~~

1220 - Begin developing SJS02-MW13S.

1300 - Check H_2O quality @ SJS02-MW13S.
pH = 7.00 cond. = 2.22 Turb. = 109 DO = 9.21
T° = 17.7 sal. = 0.1 ORP = -11

1317 Check H_2O Quality @ SJS02-MW13S
pH = 7.18 Cond = 1.60 Turb = 204 DO = 9.47
T° = 17.1 Sal = 0.1 ORP = -26

Location St. Juliens Date 11/18/04

Project / Client Site 2

H_2O quality @ SJS02-MW13S
pH = 7.10 cond. = 2.15 DO = 9.62
Turb. = 25.3 T° = 17.0 sal. = 0.1 ORP = 14

1415 drillers offsite

1440 C. White and R. Ives offsite

Leave out

Location St. Juliens Date 11/23/04

Project / Client Site 2 + 21 Slug Tests

0920 - Arrive on site. Today's weather - cool, rainy, overcast, T = 63°F. F. Crew - R. Ives + B. Francisco. Today's obj. - perform slug tests at Site 2 + 21.

0930 - R. Ives gives H+S tailgate.

0935 - Set up @ SJS02-MW05S. Cannot access due to improper key.

0945 - Set up @ SJS02-MW09S. Total depth per Kim is 10' deep. Decon. slug.

1000 - Calibrate MiniRae to fresh air (0.0) + isobutylene (104 ppm).

1005 - Perform slug test @ SJS02-MW09S.
Initial DTW - 4.15' btc, MiniRae = 0.0 ppm
DTW below ground surface ~1.15', approx. 8.5' of H_2O in well. Place transducer @ ~8' bgs
~~New DTW after slug inserted~~ (RE)

1048 - Falling head slug test started. (MW09S)

1052 - DTW = 4.11 ft btc @ end of falling head test

1052 - Stop ~~active~~ falling BR head test.

1100 - Begin rising head slug test MW09SR.
Initial DTW before test = 4.15' btc

1104 - Stop rising head test.
Final DTW after test = 4.20' btc

Location St. Juliens Date 11/23/04

Project / Client Site 2 + 21 Slug Tests

1105 - Clean up @ SJS02-MW09S.

1115 - Mobilize to + set up @ SJS~~02~~ 21 (RE) MW06S.

1118 - Initial DTW = 2.08' btc. (flush)
Total depth of well = 18' bgs.

1125 - Probe placement (transducer) @ 10 ft btc.

1146 - Initial DTW = ~~2.08~~ (RE) 2.08'

1148 - Begin falling head test ~~SJS~~ MW06SF.
Note = slug did not go all the way into well smoothly. (RE) ~~Will perform rising head test.~~ Probe shifted. Will redo test.

1156 - Initial DTW = 2.12' btc.

1157 - Begin Falling head test MW06SF2.

1201 - Stop Falling head test
Final DTW after test = 2.0' btc.

1206 - Begin Rising head slug test MW06SR.
Initial DTW = 2.05' btc.

1210 - Stop Rising head test.
Final DTW = 2.15' btc

1212 - Clean up @ ~~SJS0~~ SJS21-MW06S.

1300 - Set up @ SJS21-MW11S. MiniRae = 0.0 ppm
DTW = 5.76' btc (flushmount)
Total depth of well = 16.5' bgs. Needs lock.

Location St. Juliens Date 11/23/04

Project / Client Site 2+21 slug test

1305 - Place transducer @ 13' btc.
Initial DTW = 5.76' btc
1321 - Begin falling head test 21MW11SF.
1325 - Stop falling head test 21MW11SF.
Final DTW = 5.42' btc.
~~1326 - Clean~~ RI
1330 - Begin Rising head test 21MW11SR.
Initial DTW = 5.61' btc.
1335 - Stop rising head test 21MW11SR.
Final DTW = 5.96' btc.
1338 - Clean up @ SJS21-MW11S.
1355 - Depart site + return to office due to improper computer connector. Will try to get another laptop. Download info.
1505 - Onsite @ St. Juliens.
1515 - Mobilize to + set up @ SJS21-MW01S.
Total depth of well is 18' bgs. Needs lock.
DTW = 3.61, MiniRae = 0.0 ppm
1532 - Place transducer @ 11' btc. Will place slug @ ~6' btc. Will not do falling head, due to no laptop
1537 - Begin rising head slug test 21MW01SR.
Initial DTW = 3.64' btc.
1540 - Stop rising head test 21MW01SR.
Final DTW = 3.78' btc.

Location St. Juliens Date 11/23/04

Project / Client Site 2 + 21 Slug Test

1542 - Clean up @ SJS21-MW01S.
1551 - Set up @ SJS21-MW10S.
Total well depth = 14' bgs.
DTW = 4.08' ~~bgs.~~ btc.
1557 - Place ~~slug~~ RI transducer @ 11' btc.
1600 - Place slug @ 9' btc.
1606 - Initial DTW = 4.02' btc
1608 - Begin rising head test 21MW10SR.
1611 - Stop rising head test 21MW10SR.
Final DTW = 4.11' btc.
1615 - Clean up @ SJS21-MW10S.
1620 - Mobilize to Site 2. SJS02-MW~~055~~ 01D.
MiniRae = 0.0 ppm
Well depth = ~~78'~~ ~~btc~~ TBD bgs.
DTW = 5.52' btc
1630 - Place transducer @ ~~13'~~ ~~bgs.~~ TBD btc.
1635 - Place slug @ ~~8.0~~ ' btc. (~6 ft bgs)
1648 - Initial DTW = 5.52' btc.
1650 - Begin Rising head test 02MW~~055R~~.01DR.
1652 - Stop Rising head test 2MW~~055R~~.01DR.
- Final DTW = 5.48' btc
1655 - Clean up @ SJS02-MW10D. Will not sample MW10S due to wasp nest in well casing. Will leave open overnight + test tomorrow

Location St. Juliens Date 11/23/04

Project / Client Site 2 + 21 Slug Test

1720 - Mobilize to + set up @ SJS02-MW10S

1722 - PID reads ~1462 ppm. Will air out + start w/ SJS02-MWW10D. Abandon area + move to new location.

1740 - Set up @ SJS21 ~~MW04D~~ - MW01D.

Total well depth = 43' bgs

- Calibrate MiniRae due to high hit that "overwhelmed it."

Malfunction { Freshair = 0.0 ppm. Isobutylene = No gas! } Error. will fix tonight.

DTW = 4.95' btc (flush mount)

1753 - Place transducer @ 16' btc.

1756 - Place slug @ 8' btc.

1802 - Initial DTW = 4.87' btc

- ~~Begin rising head test 21MW01SR~~

1810 - Note probe failure. Tried to repair. Unable to. Will try repair in office.

1830 - Depart site.

Location St. Juliens Date 11/24/04

Project / Client Site 2 + 21 Slug tests

0940 - Arrive on site. Today's weather - overcast, drizzly, cool, breezy. F. Crew - R. Ives, B. Francisco. Today's obj. - complete slug tests at Site 2 + Site 21. Note: Tested transducer @ office + MiniRae. Appear to be functioning fine. H+S - wasps + slips/trips + TCE contam.

0945 - At SJS02-MW01S cannot test due to wasps. Tried to kill... will return later.

0958 - Mobilize to + set up @ SJS02-MW05S

1000 - Calibrate MiniRae to Freshair (0.0) + Isobutylene (109 ppm)

1006 - At SJS02-MW05S. MiniRae = 0.0 ppm

DTW = 5.87' btc

Total Depth = 13' bgs

1007 - Place transducer @ 11' bgs

1010 - Place top of slug @ 5' bgs.

1011 - Initial depth to H_2O = 5.75' btc.

1013 - Begin Rising head test 02MW05SR.

~~1018~~ 1019 - Stop Rising head test 02MW05SR.

~~1018~~ 1015 - Final depth to H_2O = 5.84' btc.

1020 - Clean up @ SJS02-MW05S.

Location St. Juliens Date 11/24/04

Project / Client Site 2 + 21 Slug Test

1027 - Mobilize to SJS02-MW05D.
Total well depth = 51' bgs.
1029 - MiniRae reads = 0.0 ppm
~~Initial well depth~~ DTW = 6.15' btc.
1033 - Place transducer @ 15' bgs.
1038 - Place slug @ 7' bgs.
1039 - Initial depth to H_2O = 6.15' btc.
1039 - Begin Rising Head test 02MW05DR.
1042 - Stop test 02MW05DR.
1043 - Final DTW = 6.17' btc.
1045 - Clean up @ ~~0~~ SJS02-MW05D.
1053 - Mobilize to SJS02-MW01S. Kill remaining wasps. Recalibrate MiniRae (acting funny)
Total well depth = 15' bgs.
~~13~~ 1106 - MiniRae = 0.0 ppm
DTW = 5.82' btc.
1113 ~~1313~~ - Place transducer @ ~~12'~~ 11' bgs.
1115 - Place slug @ 6' bgs.
1121 - Initial Depth to H_2O = 5.45' btc.
1122 - Begin Rising head test 02MW01SR.
1123 - Stop Rising head test 02MW01SR. due to ~~Final DTW =~~ slug getting caught up in transducer cord. Test a failure. Will wait for well to recover.

Location St. Juliens Date 11/24/04

Project / Client Site 2 + 21 Slug Tests

1129 - Begin Rising Head test 02MW01SR2.
Initial DTW = 5.69' btc.
1137 - Stop Rising Head test 02MW01SR2.
Final DTW = 6.02' btc.
1138 - Clean up @ SJS02-MW01S.
1146 - Mobilize to SJS02-MW10S + 10D + open wells to "air out."
1230 - Set up @ SJS02-MW10D. MiniRae malfunctioning again. Recalibrate to fresh air + Isobutylene (109 ppm)
At MW10D breathing zone = 0.0 ppm + @ MW10S. In well SJS02-MW10S MiniRae reads 15 ppm. At SJS02-MW07S B.Z. = 0.0 ppm.
1246 At SJS02-MW10D. Note - test 02015R2 stopped
Total well depth = 68' bgs.
DTW = 6.88' btc.
1248 - Place probe @ 15' bgs.
1250 - Place slug @ 7' bgs.
1257 - Initial ~~well depth~~ DTW = 6.81' btc
1258 - Begin Rising Head test 02MW10DR.
1259 - Stop test due to ~~slug~~ probe getting caught up w/ slug. Will wait for well to stabilize again + redo test.

Location St. Juliens Date 11/24/~~05~~ 04

Project / Client Site 2 + 21 Slug Tests

1307 - Begin Rising Head test 02MW10DR2.
1307 - Initial DTW = 6.72' btc.
1312 - Stop Rising head test 02MW10DR2.
1312 - Final DTW = 7.00' btc
1314 - Clean up @ SJS02MW10D.
1316 - Set up @ SJS02 - MW10S.
Total well Depth = 16.5' bgs.
DTW = 7.67' btc
MiniRae = 0.0 ppm in breathing zone
1323 - Place transducer @ 11' bgs.
1325 - Place slug @ 6' bgs.
1330 - Initial DTW - 7.54' btc
1331 - Begin Rising head test 02MW10SR.
1339 Stop Rising head test 02MW10SR.
Final DTW = 7.68' btc
1340 - Clean up @ SJS02-MW10S.
1350 - Mobilize to SJS02-MW07S in woods.
1352 - Set up @ SJS02 - MW07S.
DTW = 5.58' btc
well depth = 15' bgs.
MiniRae = 0.0 ppm in b.z., ~60 in well
1353 - Place probe @ 11' bgs.
1357 Place slug @ 4' bgs.

Location St. Juliens Date 11/24/04

Project / Client Site 2 + 21 Slug Test

1404 - Initial DTW = 5.41' btc
1406 - Begin Rising Head test 02MW07SR
1418 - Stop Rising Head test 02MW07SR.
1418 - Final DTW = 5.62' btc.
1420 - Clean up @ SJS02 - MW07S.
1425 - Mobilize to SJS21 - MW01D.
~~Place transducer @~~ (RS)
1428 - well Depth = 43' bgs
1429 - DTW = 4.96' btc (flush mount)
MiniRae = 0.0 ppm in b.z. + well.
1430 - Place probe @ 15' btc.
1434 - Place slug @ 7' btc
1440 - Initial DTW = 4.92' btc.
1442 - Begin Rising Head test 21MW01DR.
1447 - Stop Rising Head test 21MW01DR.
1447 - Final DTW = 5.00' btc
1448 - Clean up SJS21-MW01D.
1451 - Set up @ SJS21-MW04S.
Well Depth = 18' bgs.
1453 - DTW = 2.37' btc (flush)
MiniRae = 0.0 ppm in bz. + well.
1455 - Place transducer @ 11' btc.
1457 - Place slug @ 4' btc.
Lock missing.

Location St. Juliens Creek Annex Date 12/01/04

Project / Client Site 21

0745 ARRIVE ONSITE. WEATHER: OVERCAST WINDY, & WARM, DAILY HIGH T = 60°
FIELD CREW: RIVES & K HENDERSON
OBJECTIVE: GROUNDWATER SAMPLING AT SITES 21 & 2

0750 CALIBRATE MINIRAE 2000 TO AMBIENT AIR = 0.0 PPM & ISO BUTYLENE = 105PPM

0755 SET UP AT SJS21-MW09S
DTW = 5.57 PID = 0
CALIBRATE HORIBA
PH = 3.97 TURB = 0.5
COND = 4.5 DO = 10.78
TEMP = 14.1 SAL = 0.2
TDS = 2.9 ORP = 299

0830 COLLECT SAMPLES SJS21-MW09S-04D AND SJS21-MW09S-04D-P FOR VOCs, SVOCs, Pest/PCBs, Explosives, TOC, Nitrate, Sulfate, Ferrous Iron, & Alkalinity, Total & Dissolved Metals & Cyanide

0850 SLIGHT PETROLEUM/TCE ODOR. PID=0 SLIGHT SHEEN IN PURGE WATER. GREEN ALGAE-LIKE PARTICLES.

Location St. Juliens Creek Annex Date 12/01/04

Project / Client Site 21

SJS21-MW09S

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	FLOW
0805	6.35	0.339	219	6.63	21.8	0	0.22	-93	6.11	500
0810	6.47	0.331	144	0.42	21.9	0	0.22	-100	5.99	275
0815	6.45	0.331	74.7	0.41	22	0	0.21	701	5.98	275
0820	6.45	0.334	38.3	0.45	21.9	0	0.22	-105	5.96	275
0825	6.44	0.333	26.7	0.51	22.0	0	0.21	-105	5.98	275

TOTAL VOL PURGED = 3 GAL.

SJS21-MW02S

1000	5.83	0.297	259	1.88	22.8	0	0.19	95	5.31	400
1005	5.80	0.299	167	0.00	23	0	0.19	85	5.09	150
1010	5.74	0.303	96.7	0.52	23	0	0.20	78	5.08	150
1015	5.77	0.300	69.8	0.44	23	0	0.20	74	5.08	150
1020	5.75	0.300	76	0.43	23	0	0.20	76	5.08	150

TOTAL VOL PURGED = 3 GAL

Location St. Juliens Creek Annex Date 12/01/02

Project / Client Site 21

0950 Set up at SJS21-MW02S
PID = 0 DTW = 4.83 CAP8
LOCK DOES NOT FIT

1030 COLLECT SAMPLE [SJS21-MW02S-04D]
FOR VOCS, TOC, Nitrate, Sulfate,
Ferrous Iron, & Alkalinity

1035 COLLECT SAMPLE [SJS21-MW02S-04D-P]
FOR SAME PARAMETERS AS DUPLICATE

1050 SET UP AT SJS21-MW08S
DTW = 6.21 PID = 0 IN BREATHING
ZONE 1 ABOVE WELL CASING.
RAINING

1135 COLLECT SAMPLE [SJS21-MW08S-04D]
FOR VOCs, SVOCs, Pest/PCBs,
Explosives, TOC, Total & Dissolved
Metals, Cyanide, Alkalinity,
Ferrous Iron, Nitrate, & Sulfate

1215 DISOPOSED OF PURGE WATER &
LEFT SJCA FOR LUNCH + supplies.

1300 ARRIVE AT SJCA SETUP AT
SJS21-MW01D
PID = 0 DTW = 5.07

1345 COLLECT SAMPLE [SJS21-MW01D-04D]
FOR TOTAL & DISSOLVED METALS
AND CYANIDE

Location St Juliens Creek Annex Date 12/01/04

Project / Client Site 21

SJS21-MW08S

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	FREQ
1100	5.82	0.424	54.3	0.84	22.5	0	0.28	87	6.70	300
1105	5.83	0.431	21.3	0.58	22.7	0	0.28	83	6.41	300
1110	5.81	0.430	17.9	0.52	22.7	0	0.28	84	6.51	300
1115	5.80	0.428	15.1	0.00	22.7	0	0.28	83	6.56	300
1120	5.80	0.430	16.3	0.50	22.7	0	0.28	82	6.58	300
1125	5.79	0.432	17.1	0.47	22.7	0	0.28	81	6.59	BCL
1130	5.79	0.431	5.2	0.42	22.8	0	0.28	83	6.62	300

TOTAL VOL. PURGED = 3 GAL

SJS21-MW01D

1315	8.79	0.363	47.5	0.57	20.6	0	0.23	-153	5.44	375
1320	8.77	0.367	36.7	0.42	20.7	0	0.24	-177	5.38	300
1330	8.74	0.367	30.0	0.41	20.7	0	0.24	-185	5.39	300
1335	0.73	0.368	38.9	0.37	20.5	0	0.24	-196	5.37	300
1340	8.70	0.369	37.7	0.26	20.6	0	0.24	-204	5.28	300

TOTAL VOL. PURGED = 2.5 GAL

Location St. Juliens Creek Annex Date 12/01/04

Project / Client Sites21 + 2

1400 - Set up @ SJS 21-MW04S.
DTW = 2.09 PID = 0

1430 - COLLECT [SJS21-MW04S-04D] FOR VOCs, TOC, Ferrous Iron, Alkalinity, Sulfate, Nitrate, & Explosives

1445 - Clean up @ SJS21-MW04S.

1505 - Set up @ SJS21-MW03S.
DTW = 5.40' btc
Methane = 0.0 ppm

1535 - COLLECT [SJS21-FB120104] FOR VOCs, SVOCs, Pest/PCBs, Explosives, Total Metals, Cyanide, TOC, Sulfate, Nitrate, Alkalinity, Ferrous Iron

1550 - COLLECT [SJS21-MW03S-04D] FOR VOCs, TOC, SULFATE, NITRATE, ALKALINITY, FERROUS IRON

1608 - DISPOSED OF SITE 21 PURGEWATER

1625 - SET UP AT SJS02-MW01D
PID = 0 DTW = 5.80

1730 - COLLECT [SJS02-MW01D-04D] FOR VOCs, TOC, SULFATE, NITRATE, ALKALINITY, & FERROUS IRON

1800 ~~DISPOSE~~ PACKED COOLERS, DISPOSED OF PURGEWATER & LEFT SJCA TO FEDEX

Location St. Juliens Creek Annex Date 12/01/04

Project / Client Site 21

SJS21-MW04S

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	FLOW
1405 ~~1.95~~	5.79	0.278	170.0	0.68	21.9	0	0.18	79	2.63	400
1410	5.53	0.277	89.8	0.37	21.7	0	0.18	75	2.56	300
1415	5.54	0.290	70.0	0.33	21.6	0	0.18	62	2.56	300
1420	5.63	0.283	70.4	0.34	21.6	0	0.18	52	2.56	300
1425	5.69	0.284	39.8	0.32	21.6	0	0.18	46	2.57	300
1430	5.72	0.286	33.2	0.45	21.4	0	0.19	43	2.52	300

TOTAL VOL. PURGED = 2.75 GAL

SJS21-MW03S

1520	6.35	0.364	19.2	0.78	22.4	0	0.24	7	6.16	375
1525	6.32	0.341	3.5	0.33	22.5	0	0.24	3	6.10	300
1530	6.34	0.342	6.4	0.30	22.5	6	0.23	1	6.09	300
1535	6.38	0.359	0.9	0.29	22.5	0	0.23	0	6.04	300
1540	6.39	0.360	1.2	0.24	22.5	0	0.23	0	5.99	300
1545	6.40	0.359	1.2	0.28	22.4	0	0.23	1	6.00	300

TOTAL VOL PURGED = 4.5 GAL

Location ST. JULIENS CREEK ANNEX Date 12/01/04

Project / Client SITE 2

SJ802-MW01D

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	FLOW
1635	7.41	0.270	51.6	4.95	17	0	0.18	87	5.84	400
1640	7.51	0.249	12.8	4.50	17	0	0.17	88	5.86	300
1645	7.64	0.249	3.4	4.41	17	0	0.17	85	5.85	350
1650	7.80	0.270	16.5	4.57	16.9	0	0.18	74	5.84	300
1655	7.90	0.272	17.1	4.54	14.9	0	0.18	73	5.84	300
1700	8.17	0.280	13.3	3.58	16.9	0	0.19	54	5.86	300
1705	8.52	0.313	28.1	2.58	16.4	0	0.20	-24	5.86	300
1710	7.92	0.357	39.2	2.54	14.9	0	0.23	-155	5.88	300
1715	7.79	0.362	37.3	2.80	14.8	0	0.24	-164	5.88	300
1720	7.75	0.362	20.2	2.35	14.8	0	0.23	-148	5.88	300
1725	7.75	0.363	21.1	2.01	14.80	0	0.24	-171	5.88	300

TOTAL VOL. PURGED = 4 GAL

Location ST. JULIENS CREEK ANNEX 12/02/04

Project / Client SITE 2

0850 - ARRIVE ONSITE. WEATHER: CLEAR & COLD AM TEMPS, HIGH T = 50°
FIELD CREW: RIVES & K. HENDERSON
OBJECTIVE: GROUNDWATER SAMPLING AT SITE 2

0855 - UNLOCK & POP CAPS ON SJS02-MW10S & SJS02-MW10D

0900 - SETUP AT SJS02-MW11S TO PURGE DUE TO POOR YIELD
- CALIBRATE MINIRAE 2000
AMBIENT AIR = 0
ISOBUTYLENE = 101

0905 - PID IN BREATHING ZONE = 0
IN MW CASING = 10
- CALIBRATE HORIBA

PH = 3.99	TEMP = 6.3
COND = 4.61	SAL = 0.2
TURB = -10	TDS = 3.0
DO = 11.77	ORP = 341

INITIAL DTW = 3.88 HORIBA READING AT SJS20-MW11S WHILE PURGING

PH = 6.38	TEMP = 16.4
COND = 3.53	SAL = 0.2
TURB = 145	TDS = 2.3
DO = 3.42	ORP = -32

Location ST. JULIENS CREEK ANNEX Date 12/02/04

Project / Client SITE 2

0910 PID IN BREATHING ZONE = 0
IN MW CASING = 0.6

0935 PID IN BREATHING ZONE &
MW CASING = 0

0945 COLLECT SJS02-FB120204
FOR VOCs, SVOCs, Pest PCBs, Metals
Explosives, TOC, Alkalinity, Cyanide
Ferrous Iron, Sulfate, Nitrate

1020 COLLECT SJS02-MW11S-0404
For VOCS, SVOCS, Pest/PCBs,
Explosives, TOC, Alkalinity,
Ferrous Iron, Sulfate,
Nitrate, Total & Dissolved
Metals, & Cyanide

1040 BILL FRIEDMANN ARRIVED ONSITE
TO DROP OFF ADDITIONAL
SUPPLIES FROM THE LAB &
OPEN 1 DW DRUM.

1105 BILL FRIEDMANN OFFSITE

1110 - Clean up @ MW11S. + mobilize to
parking lot.

1115 - Set up @ SJS02-MW12S - NO LOCK
DTW = 4.44
PID = 0.0 ppm in breathing zone, 2.0 in well

Location ST. JULIENS CREEK ANNEX Date 12/02/04

Project / Client SITE 2

SJS02-MW11S

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	FLOW
0915	6.75	3.57	186	0.39	16.8	0.2	2.3	-60	5.72	250
0920	6.77	3.52	173	0.32	16.9	0.2	2.2	-64	8.57	250
0924	6.79	3.49	49.6	0.35	16.9	0.2	2.2	-60	9.64	250
0930	6.78	3.50	36.4	0.34	16.9	0.2	2.2	-60	10.91	250
0935	6.78	3.51	73.0	0.33	16.9	0.2	2.2	-60	11.61	250
0940	STOPPED LOW FLOW PURGING AND ANALYT								RECOVERY	
0955									9.85	
1000									9.20	
1015	6.71	3.68	29.5	0.35	16.8	0.2	2.4	-62	8.50	

~~AFTER~~ ~~PURGING~~

TOTAL VOL. PURGED = 4 GAL

Location St. Juliens Creek Annex Date 12/02/04

Project / Client Site 2

SJS02-MW12S

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	Flow
1135	6.34	0.584	130	0.46	21.8	0	0.37	-9	4.77	300
1140	6.34	0.592	87.5	0.37	21.7	0	0.37	-9	4.74	250
1145	6.34	0.610	62.7	0.39	21.4	0	0.39	-10	4.74	250
1150	6.35	0.597	36.1	0.48	21.5	0	0.38	-11	4.76	250
1155	6.35	0.620	32.9	0.55	21.4	0	0.40	-13	4.75	250

TOTAL VOL. PURGED = 2.75 GAL

SJS02-MW07S

1505	6.55	1.34	177	3.02	18.4	0.1	0.9	-22	6.54	400
1510	6.50	1.36	88.3	0.50	18.4	0.1	0.9	-24	6.51	350
1515	6.52	1.37	38.4	0.48	18.2	0.1	0.9	-27	6.34	325
1520	6.53	1.37	32.1	0.31	18.2	0.1	0.9	-29	6.34	325
1525	6.53	1.37	28.4	0.32	18.2	0.1	0.5	-32	6.34	325

Total vol. purged = 2.5 gal.

Location St. Juliens Creek Annex Date 12/02/04

Project / Client Site 2

1200 COLLECT SJS02-MW12S-04D FOR VOCs, SVOCs, Pest/PCBs, Explosives, Total & Dissolved Metals, Cyanide, TOC, Nitrate, Ferrous Iron, Sulfate, & Alkalinity - TRIPLE VOLUME FOR MS/MSD - GREEN COLOR TO CYANIDE SAMPLE

1305 COLLECT SJS02-EB120204 FOR VOCs, SVOCs, PEST/PCBs, EXPLOSIVES, TOTAL & DISSOLVED METALS, & CYANIDE

1405 LEFT SJCA FOR LUNCH

1450 ARRIVE AT SJCA & DISPOSE OF PURGE WATER

1456 SET UP AT SJS02-MW07S
PID = 0.2 BREATHING ZONE
DTW = 5.53
PID = 10-20 ABOVE WELL CASING

1500 BEGIN PURGING
PID = BREATHING ZONE 0.1-0.5
IN ~~ABOVE~~ PURGE WATER 1-77

1530 - Collect SJS02-MW07S-04D for VOCs, TOC, Alkalinity, Ferrous Iron, Sulfate, + Nitrate. Extra volume collected for high concentration

Location: ST JULIENS CREEK ANNEX Date: 12/02/04

Project / Client: SITE 2

1532 - PID reads ~3.0 - 5.0 in breathing zone during sampling.
DRAGER TEST NEGATIVE FOR VINYL CHLORIDE AT 0-5 PPM

1600 - SET UP AT SJS02-MW13S
PID = 0 IN BREATHING ZONE & IN WELL CASING DTW = 3.94

1610 - BEGIN PURGING - PID = 0.0-0.3 IN BREATHING ZONE - PURGE WATER IS BUBBLY

1645 - COLLECT SJS02-MW13S-04D FOR VOCs, SVOCs, Pest/PCBs, Explosives, TOC, Total & Dissolved Metals, Cyanide, Ferrous Iron, Alkalinity, Nitrate, Sulfate

1700 - COLLECT SJS02-MW13S-04D-D FOR SAME PARAMETERS AS DUPLICATE
NOTE: GREEN COLOR TO CYANIDE SAMPLE

1820 - DISPOSE OF PURGE WATER & LEAVE SJCA FOR FEDEX

Location: ST. JULIENS CREEK ANNEX Date: 12/02/04

Project / Client: SITE 2

SJS02-MW13S

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	FLOW
1615	7.13	1.85	148	1.25	17.3	0.1	1.2	-138	4.99	400
1620	7.16	1.83	109	0.32	17.2	0.1	1.2	-146	4.97	200
1625	7.17	1.83	104	0.32	17.2	0.1	1.2	-140	5.02	200
1630	7.16	1.87	56.3	0.36	17.1	0.1	1.2	-148	5.00	200
1635	7.16	1.86	68.4	0.28	16.9	0.1	1.2	-148	5.02	200
1640	7.16	1.87	100	0.24	16.9	0.1	1.2	-149	5.02	200

TOTAL VOL. PURGED = 2.5 gallons

Location St. Juliens Creek Date 12/3/04

Project / Client Site 2

745 - Arrive onsite. Weather = clear, cold, + sunny. T = 55°F for high. F. Crew = R. Ives + K. Henderson H + S - given by R. Ives + K. Henderson (slips + trips, TCE, safety goggles, MiniRae). Obj. - water levels @ site 2 + 21 + finish GW sampling.

0750 - Set up @ SJS02-MW10D.

DTW = 7.54' btc.

MiniRae = 0.0 ppm in breathing zone + in well. Note: MiniRae calibrated to fresh air (0.0) + Isobutylene (100.0 ppm).

0755 - Calibrate Horiba U-22.

pH = 3.99 Temp = 4.7

Cond. = 4.43 Sal. = 0.2

Turb. = 0 TDS = 3

DO = 13.16 ORP = 332

0758 - Begin purging SJS02-MW10D.

0840 - Collect GW sample SJS02-MW10D-04D for VOCs, SVOCs, Explosives, Pest. /PCBs, TOC, ferrous iron, alkalinity, nitrate, sulfate, total metals, dissolved metals, + cyanide.

0850 - Set up @ SJS02-MW10S.

Location St. Juliens Creek Date 12/3/04

Project / Client Site 2

SJS02-MW10D

TIME	PH	COND	TURB	DO	TEMP	SAL	TDS	ORP	DTW	FLOW
0800	7.14	0.392	151.0	1.01	16.6	0.0	0.25	52	8.02'	250
0805	8.11	0.381	134	0.46	17.4	0.0	0.25	-33	8.11'	375
0810	8.18	0.382	79.3	0.43	17.3	0.0	0.25	-57	8.13'	375
0815	8.35	0.382	43.7	0.43	17.3	0.0	0.25	-92	8.14'	375
0820	8.78	0.483	64.6	0.28	17.0	0.0	0.31	-126	7.89'	375
0825	8.83	0.480	67.0	0.28	17.0	0.0	0.31	-127	7.85'	375
0830	8.84	0.468	61.0	0.32	17.1	0.0	0.31	-128	7.88'	375
0835	8.84	0.458	52.8	0.31	17.2	0.0	0.30	-131	7.88'	375

Total purge volume = ~2.75 gallons

SJS02-MW10S

0900	6.70	0.331	72.1	1.57	18.2	0.0	0.22	-15	8.24'	375
0905	6.17	0.343	37.7	0.57	18.8	0.0	0.22	3	8.23'	300
0910	6.15	0.346	30.3	0.50	19.0	0.0	0.22	5	8.24'	300
0915	6.13	0.342	20.6	0.49	18.6	0.0	0.22	6	8.25'	300
0920	6.13	0.335	15.2	~~[illegible]~~	18.8	0.0	0.22	7	8.26'	300
0925	6.11	0.332	9.1	0.36	18.8	0.0	0.22	7	8.26'	300

TOTAL VOL PURGED = 3.5 GALLONS

Location St. Juliens Creek Date 12/3/04

Project / Client Site 2

0850 - SJS02-MW10S.
DTW = 7.74' btc.
MiniRae = 0.0 ppm in breathing zone + ~ 20 ppm in well. When tubing / WLI etc. are placed in well MiniRae readings in well increase to ~ 100 ppm.

0855 - Begin purging well. MiniRae in bucket reads ~ 68 - 80 ppm. In breathing zone ~ 5 - 15 ppm. H+S - stay away from area except when taking measurements. TCE odor in air. Vinyl chloride negative for 0-5 ppm.

0915 - MiniRae = ~4 ppm in breathing zone + ~26 ppm in bucket + ~ 90 ppm in well.

0930 - Collect GW sample SJS02-MW10S-04D for VOCs, SVOCs, Pest./PCBs, Explosives, TOC, Alkalinity, Nitrate, sulfate, Ferrous Iron, Total metals, Dissolved metals, + cyanide.

0958 - Clean up @ SJS02-MW10S.

Location St. Juliens Creek Date 12/3/04

Project / Client Site 2 + 21

1015 - Collect H_2O levels @ Site 2.

*SJS02-MW01S = 5.74' btc (stick up)
WILL NOT SHUT LID *SJS02-MW02S = 7.09' btc (~~flus~~ stick up)
*SJS02-MW03S = 5.57' btc (stick up)
not locked *SJS02-MW04S = 5.78' btc (stick up
SJS02-MW05S = 5.70' btc (stick up)
SJS02-MW06S = 5.90' btc (stick up)
*SJS02-MW07S = 5.65' btc (~~flu~~ stick)
SJS02-MW08S = 5.00' btc (stick up)
SJS02-MW09S = 4.24' btc (stick up)
SJS02-MW10S = 7.74' btc (stick up)
SJS02-MW11S = 4.14' btc (stick up)
SJS02-MW12S = 4.61' btc (flush)
SJS02-MW13S = 4.02' btc (stick up)
SJS02-MW01D = 5.99' btc (stick up)
SJS02-MW02D = 5.05' btc (stick up)
No 03D or 04D.

SJS02-MW05D = 6.89' btc (stick up)
SJS02-MW10D = 7.54' btc (stick up)

1130 - Finish collecting water levels @ SJS02.

1136 - Dispose of purge H_2O in drums.
* needs new lock.

Location St. Juliens Creek Date 12/3/04

Project / Client Site 21

1140 - Begin checking H_2O levels.

SJS21-MW01S = 3.43' btc (flush mount)

LOCK STUCK TOP LOOSE SJS21-MW02S = 5.02' btc (flush mount)

NO LOCK TOP LOOSE SJS21-MW03S = 5.40' btc (flush mount)

SJS21-MW04S = 2.25' btc (flush)

LOCK STUCK SJS21-MW05S = 2.25' btc (flush mount)

SJS21-MW06S = 1.75' btc (flush mount)

SJS21-MW07S = 2.54' btc (flush mount)

SJS21-MW08S = 6.08' btc (flush mount)

SJS21-MW09S = 5.74' btc (flush mount)

SJS21-MW10S = 3.87' btc (flush mount)

SJS21-MW11S = 5.69' btc (flush)

SJS21-MW01D = 5.45' btc (flush mount)

1240 - Water levels completed @ Site 21.

1300 - Depart site.

Location St. Juliens Date 1/18/05

Project / Client IDW & Site 2

0800 J. Butler & K. Zunich onsite, h&s briefing

0810 mark drums for IDW sampling

0830 - mob to SJS02-MW10D (purge 10 gallons)

DTW = 6.80 ft

0840 purge (begin)

1005 collect sample SJS02-MW10D-05A for TCL VOCs

1015 off site SJCA. Return to office to pack cooler.

J. Butler 1/18/05

Location ST. JULIENS CREEK ANNEX Date 22-FEB 05

Project / Client SITE 4

1135 DECON EQUIPMENT

1145 COLLECT SJSØ4-SDØ4-Ø1Ø2-05A

1150 DECON EQUIPMENT

1200 COLLECT SJCA-TCLP-03, SJCA-TPH/DRO-03, SJCA-EOX-03, SJCA-VOC-03, SJCA-RIC-03

1215 COLLECT SJSØ4-SDØ5-Ø1Ø2-05A

1230 - Return to vehicle + clean up. Mob to drums to dispose of decon. H_2O.

1255 - Depart site.

1400 Packed coolers, included trip blank

Jamie B. Conner

Location St. Juliens Creek Annex Date 3/28/05

Project / Client Site 2 + 21 GW Sampling

9:00 Arrive at Base Pass Office and attain base pass for A. Jones.

9:10 Arrive at St. Juliens. Proceed to Site 4/3 to obtain empty drums for purge water. Don from Agvig assisting with drum transport to staging area.

Weather: Rainy, Mid 60's, thunderstorms scattered & very windy

Field Crew: A. Jones & R. Ives

9:30 Dropped of drum at staging area.

9:37 - Due to lightening calibrating instruments + waiting for storm to pass. Today's obj. = collect gw samples @ 4 wells + take water levels

0940 - Calibrate MiniRae. Due to lack of gas connector... unable to calibrate. MiniRae reads 0.0 ppm in ambient air + reads ~50 ppm w/ sharpie top.

0950 - Check Dräger pump for leaks. No leaks.

0952 - Calibrate Horiba U-22.

PH = 3.96 SC = 4.49 Turb = Ø DO = 9.2

Temp = 19.48 Sal = Ø.23 ORP = 344

10:00 - R. Ives conducts HES briefing

10:10 - Arrive at SJS21 - MWØ7S to take water level

Location St. Juliens Creek Annex Date 3-28-05

Project / Client Site 2 & 21 GW sampling

10:27 Water level = 1.56' BTC. Note - unable to get ~~lock~~ cap off SJS21-MW07S. Had to remove 6" PVC connection & replace. Needs new cap. Mini rae not functioning properly, possibly due to high humidity.

10:33 Water level at SJS02-MW02D = 4.02' BTC mini rae reads 6 initially but climbing, malfunctioning Note: Replaced lock

11:08 Attempted to take water level at SJS02-MW01D but unable to get cap off. Proceeding to MW10D and will try SJS02-MW01D again later. Water level at SJS02-MW10D = 6.62' BTC

11:18 Set up at SJS02-MW07S
Water level = 1.36' BTC

11:29 Begin purging well

11:56 Collect field blank [SJS21-FB032805] for VOCs

12:00 Collect GW sample [SJS21-MW07S-05A] for VOCs. Collected MS/MSD at this location. Note: well needs new cap.

12:20 Set up at SJS02-MW02D
DTW = 4.19'

12:25 Begin purging well

1300 Collect GW sample [SJS02-MW02D-05A] for VOCs

Location St. Juliens Creek Annex

Project / Client

SJS21-MW07S

Time	pH	Cond.	Turb.	DO	Temp.	SAL	TDS	ORP	DTW	Flow
1130	5.46	0.161	70.7	0.0	13.5	0.01	0.10	200	1.83	400
1135	5.08	0.152	54.0	0.0	13.6	0.01	0.10	127	1.78	375
1140	5.73	0.157	32.2	0.0	13.8	0.01	0.10	98	1.78	375
1145	5.75	0.162	31.0	0.0	13.8	0.01	0.11	92	1.75	375
1150	5.75	0.170	31.2	0.0	13.8	0.01	0.11	87	1.74	375
1155	5.77	0.175	21.9	0.0	13.9	0.01	0.11	81	1.74	375

Total vol = 3 gal.

SJS02-MW02D

Time	pH	Cond.	Turb.	DO	Temp.	Sal.	TDS	ORP	DTW	Flow
1230	6.33	0.407	48.9	0.28	17.22	0.02	0.30	-38	4.29	400
1235	6.99	0.465	149.0	0.0	17.37	0.02	0.30	-85	4.3	400
1240	7.19	0.463	170.0	0.0	17.41	0.02	0.30	-97	4.32	400
1245	7.27	0.461	64.9	0.0	17.37	0.02	0.30	-102	4.3	400
1250	7.31	0.460	33.5	0.0	17.39	0.02	0.30	-106	4.32	400
1255	7.34	0.457	24.6	0.0	17.4	0.02	0.30	-108	4.32	400

Total vol = 3 gal

Location St. Juliens Creek Annex Date 3/28/05

Project / Client Site 2 & 21 GW Sampling

1305 Collect Duplicate GW sample [SJS02-MW02D-05A-P] for VOCs

1310 Went back to SJS21-MW01D and was able to get cap off well.

1315 Left St. Js for lunch

1355 Set up at SJS02-MW01D
DTW = 5.17' BTC

1400 Begin purging SJS02-MW01D
Try mini rae again, still not functioning properly.

1440 - Collect gw sample [SJS02-MW01D-05A] for VOCs.

1445 - Set up at SJS02-MW10D
DTW = 6.55' BTC

1450 - Begin purging SJS02-MW10D
note - hail at 1500

1540 - Collect gw sample [SJS02-MW10D-05A2] for VOCs

1545 - Collect Equipment Blank [SJS02-EB032805] for VOCs

1555 - Mob to drums & dispose of purge water

1600 - Leave Site to ship cooler.

Location St. Juliens Creek Annex Date 3/28/05

Project / Client Site 2 & 21 GW Sampling

SJS02-MW01D Gal purged = 2.5

Time	pH	Cond.	Turb	DO	Temp	Sal	TDS	ORP	DTW	Flow
1405	7.5	0.284	10.7	7.4	16.40	0.01	0.18	127	5.22	375
1410	7.01	0.285	9.5	3.44	16.70	0.01	0.19	113	5.21	375
1415	7.6	0.296	11.3	2.02	16.73	0.01	0.20	-51	5.22	375
1420	7.87	0.364	37.1	Ø	16.80	0.01	0.24	-102	5.22	375
1425	7.93	0.370	69.1	0.0	16.80	0.02	0.24	-116	5.22	375
1430	7.95	0.375	103	0.0	16.7	0.02	0.24	-124	5.22	375
1434	7.96	0.374	113	0.0	16.6	0.02	0.24	-126	5.23	375

SJS02-MW10D Gal purged =

Time	pH	Cond.	Turb.	DO	Temp	Sal	TDS	ORP	DTW	Flow
1450	7.64	0.400	1.0	0.0	17.30	0.02	0.26	-183	~~6.18~~ 7.18	400
1455	7.64	0.359	3.9	0.0	17.19	0.02	0.24	-214	7.19	375
1500	7.65	0.401	19.4	0.0	17.08	0.02	0.26	-243	7.19	375
1505	7.87	0.387	25.0	0.0	17.04	0.02	0.25	-250	7.19	375
1510	8.05	0.387	31.9	0.0	17.05	0.02	0.25	-251	7.19	375
1515	8.13	0.387	20.9	0.0	17.24	0.02	0.25	-250	7.19	375

continued on p. 104

Location St. Juliens Creek Annex Date 3/28/05

Project / Client Site 2

SJS02-MW10D (Cont. from p. 103)

Time	pH	Cond.	Turb.	DO	Temp	Sal.	TDS	ORP	DTW	Flow
15:20	8.28	0.387	31.0	0.0	17.19	0.02	0.25	-263	7.20	375
15:25	8.48	0.400	19.1	0.0	17.25	0.02	0.26	-259	7.21	375
15:30	8.47	0.419	19.8	0.0	17.21	0.02	0.27	-250	7.22	375
15:35	8.47	0.416	22.9	0.0	17.15	0.02	0.27	-247	7.22	375

Total Vol. Purged = 4 Gal

J Jones

Location St. Juliens Creek Annex Date 4/18/05

Project / Client Basewide Well Survey

0840 - Arrive @ pass office to obtain vehicle pass.

0900 - At gate, need a difft. pass. Return to pass office + get new pass.

0920 - Deliver soil @ Site 4 + drive base to show J. Conner layout.

0924 - Weather:.. Clear, Sunny, high 78°F
Field crew:.. R. IVES, J. CONNER
Objectives:.. Conduct basewide MW Survey.

0930 - R. IVES conducts Health & Safety brief.

0945 - Begin Survey at MW 1D - BK and site 5

1316 - Completed site 5 survey

1330 - Begin Site 3 MW Survey

1443 - Completed Site 3 MW survey

1445 - Leave SJCA. Returning to Office.

J Conner

Location St. Juliens Creek Annex Date 11/27/06

Project / Client Site 4 Well Redevelopment & GW Sampling & Site 2 GW Sampling

MW05S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1533	7.34	19.50*	45.2	5.54	16.54	1.16	-171	2.85	125
1538	7.36	19.4	50.3	5.21	16.47	1.15	-173	2.86	125
1543	7.36	19.2	46.4	5.02	16.43	1.15	-175	2.86	125
1548	7.39	18.3	63.2	4.86	16.35	1.07	-175	2.86	125
1553	7.44	15.4	84.3	4.88	16.23	0.87	-172	2.86	125
1558	7.48	12.2	90.5	4.87	16.11	0.69	-177	2.86	125
1603	7.48	11.2	91.1	4.86	16.07	0.63	-180	2.86	125
1608	7.48	10.7	103.0	4.81	16.04	0.60	-182	2.86	125
1613	7.47	10.4	114.0	4.79	15.98	0.58	-182	2.86	125
1618	7.47	10.2	123.0	4.78	15.92	0.56	-182	2.86	125

~2 Gal Purged

1625 Collect gw [SJS04-MW05S-0406] for total & dissolved select metals

1645 Tow truck on site to tow truck out.

1715 Truck successfully towed out

1722 off site to pack & ship cooler.

[signature] 11/27/06

Location St. Juliens Creek Annex Date 11/28/06

Project / Client Site 4 GW Sampling

0855 Arrive at Site 4.

Field crew - A. Jones, D. Livingston > HILL

Weather - Sunny, 60°F

Objective - Collect gw samples from select wells at Sites 2 & 4.

0857 Conduct H&S Briefing & sign AHA: ticks, proper lifting.

0900 Calibrate Horiba U-22 (# 100900) w/ Auto Cal Solution (Lot # 5368, Exp. 8/3/07):

pH = 7.99 * DO not calibrating (Error 6)

Cond = 4.54 will use DO test kits

Turb = 0.0

Temp = 10.14

0905 Set up at SJS04-MW01S

DTW = 2.66' btc

1 well vol = 2.34 Gal

0915 Begin purging [MW01S]

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
0916	4.43	.534	36.1	8.04	15.70	0.02	244	3.14	300
0921	4.45	.501	15.5	6.73	15.52	0.02	261	3.39	200
0926	4.46	.499	4.4	6.18	15.62	0.02	257	3.39	150
0931	4.51	.498	4.2	5.92	15.67	0.02	250	3.~~39~~ 42 ft	150
0936	4.57	.494	15.2	5.73	15.62	0.02	236	3.~~39~~ 45 ft	150

af 11/28/06

Location St. Juliens Creek Annex Date 11/28/06
Project / Client Site 4 GW Sampling

MW01S (cont.)

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
0941	4.61	.494	14.6	5.63	15.62	0.02	226	3.48	150
0946	4.71	.493	20.9	5.48	15.67	0.02	208	3.49	150
0951	4.79	.492	20.1	5.42	15.62	0.02	190	3.49	150
0956	4.93	.494	28.3	5.28	15.67	0.02	168	3.51	150
1001	5.01	.494	35.1	5.21	15.74	0.02	156	3.54	150
1006	5.10	.494	43.6	5.14	15.78	0.02	143	3.55	150
1011	5.14	.495	45.9	5.11	15.75	0.02	140	3.55	150

~ 3 Gal purged

1015 Collect groundwater sample SJS04-MW01S-06D for total & diss. Select metals.

1017 Collect DO with Chemets test kit:
DO = 0.4 ppm

1030 Off site on route to office.

1255 Arrive at Site 4 to finish sampling w/ M. Ost.

1256 Set up at SJS04-MW03S
DTW = 4.44' btc
1 well vol = 1.88 Gal

1303 Begin purging MW03S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1307	6.64	3.94	81.8	7.02	18.85	0.20	195	4.60	175
1312	6.72	3.92	65.0	6.00	18.49	0.20	164	4.62	175

AJ 11/28/06

Location St. Juliens Creek Annex Date 11/28/06
Project / Client Site 4 GW Sampling

MW03S (cont.)

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1317	6.74	3.93	59.2	5.62	18.10	0.20	149	4.65	175
1322	6.78	3.91	51.6	5.32	17.94	0.20	125	4.66	175
1327	6.88	3.90	48.3	5.02	17.82	0.20	57	4.67	175
1332	6.93	3.88	47.6	4.73	17.73	0.20	33	4.67	175
1337	6.98	3.87	46.2	4.53	17.65	0.20	10	4.67	175
1342	7.02	3.86	48.1	4.33	17.56	0.20	-7	4.68	175
1347	7.05	3.85	44.7	4.21	17.52	0.20	-15	4.68	175
1352	7.08	3.85	47.2	4.12	17.51	0.20	-25	4.68	175
1357	7.11	3.84	47.2	4.05	17.54	0.20	-28	4.69	175
1402	7.12	3.82	45.8	4.01	17.51	0.20	-32	4.69	

1405 - Collect groundwater sample SJS04-MW03S-06D for total + dissolved metals,
~ 4 gallons purged

1412 Collect DO msmt w/ DO Chemets test kits:
DO = 1.0 ppm

1415 Collect fieldblank at Site 4 SJS04-FB112806 for select total metals.

1430 Dump purge water at staging area within Site 4.

1433 Set up at SJS02-MW10D
DTW = 6.51' btc
1 Well Vol = 10 Gal

AJ 11/28/06

Location St. Juliens Creek Annex Date 11/28/06
Project / Client Site 4 GW Sampling & Site 2 GW Sampling

1439 Begin purging SJS02-MW10D

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1442	8.08	0.379	52.3	7.22	19.35	0.02	-194	6.71	200
1447	8.22	0.358	66.5	4.03	19.01	0.01	-210	6.71	200
1452	8.21	0.354	91.7	3.38	18.82	0.01	-218	6.75	200
1457	8.21	0.353	110.0	3.20	18.74	0.01	-222	6.75	200
1502	8.20	0.352	116.0	2.98	18.69	0.01	-227	6.79	225
1507	8.20	0.351	94.3	2.90	18.66	0.01	-230	6.79	225
1512	8.20	0.351	94.3	2.85	18.62	0.01	-234	6.79	225
1517	8.22	0.351	78.5	2.83	18.57	0.01	-237	6.79	250
1522	8.23	0.351	92.2	2.81	18.52	0.01	-242	6.79	250
1527	8.26	0.350	148.0	2.79	18.43	0.01	-245	6.82	250
1532	8.27	0.349	317.0*	2.79	18.44	0.01	-246	6.80	250
1537	8.29	0.348	332.0*	2.80	18.45	0.01	-249	6.75	250
1542	8.31	0.347	380.0*	2.80	18.44	0.01	-250	6.75	250
1547	8.33	0.345	436.0*	2.81	18.43	0.01	-252	6.76	275
1552	8.24	0.355	14.2	3.39	18.41	0.01	-225	6.76	275
1557	8.30	0.355	22.1	3.10	18.36	0.01	-239	6.76	275
1602	8.32	0.355	25.4	3.05	18.33	~~0.04~~ 0.01	-241	6.79	300
1607	8.37	0.359	32.3	3.04	18.27	0.01	-251	6.81	300
1612	8.41	0.359	39.3	3.04	18.24	0.01	-254	6.82	300
1617	8.43	0.360	46.0	3.09	18.22	0.01	-255	6.84	300
1622	8.43	0.360	133.0*	3.15	18.19	0.01	-255	6.85	300
1627	8.43	0.362	138.0*	3.14	18.15	0.01	-255	6.86	300

DL

Location St. Juliens Creek Annex Date 11/28/06
Project / Client Site 4 & Site 2 GW Sampling

SJS02-MW10D (cont.)

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1632	8.44	0.361	149.0*	3.14	18.14	0.01	-255	6.86	300
1637	8.45	0.360	163.0*	3.17	18.10	0.01	-255	6.86	300
1642	8.45	0.359	180.0*	3.17	18.07	0.01	-256	6.86	300
1647	8.46	0.358	146.0*	3.20	18.03	0.01	-255	6.86	300
1652	8.45	0.356	144.0*	3.21	18.05	0.01	-254	6.86	300
1657	8.44	0.355	151.0*	3.23	17.99	0.01	-254	6.86	300

~ 10 gal purged

*high turb caused by bubbles in flow thru

1700 - Collect sample SJS02-MW10D-06D for TCL LC VOCs

1705 - Collect sample SJS02-MW10D-06DP for TCL LC VOCs

1707 - Collect DO with Chemets test kit
DO = 0.8 ppm

1708 - Collect Site 2 equipment blank SJS02-EB112806 for TCL LC VOCs

1710 - Collect Site 4 equipment blank STS04-EB112806 for select total & diss metals

*1645 - Collected field blank at Site 2 SJS02-EB112806 for TCL LC VOCs

1730 - Dump purge water at Site 4 Staging area

1740 - Off site to pack & ship coolers.

aj 11/28/06

Location SJCA Date 4/17/07

Project / Client Site 2 Triad Investigation

0800 Arrive at NNSY pass office for A. Bogdanski & L. Carr to recieve temporary passes to SJCA.

1015 Arrive at Site 2

Field Crew: A. Jones
L. Carr
A. Bogdanski
T. Dingle
} CH2M HILL

Weather: 52° F, v. windy, overcast

Objective: Install sediment diffusion samplers in tidal inlet of site 2.

1018 H&S Briefing - Sign HASP. misc. conditions, weather, bio. hazards, trips, slips, falls.

1030 Decon hand auger & shovel

1100 Conduct site overview & walk through.

1120 Install sediment diffusion sampler at area closest to culvert, approx. 30' N. Location under 3' of surface water. Sampler inserted with top of protective casing flush with sediment surface. Flagged location of sampler.

1140 Install sediment diffusion sampler approx. 100 ft N. of initial location. Attempt ~~unsuc~~ unsuccessfull due to high tide. Will install other samplers & attempt to install at this location later in day near

Location SJCA Date 4/17/07

Project / Client Site 2 Sediment Diffusion Samplers Installation - Triad Investigation

low tide.

1250 Install sediment sampler (#2) near outlet at Site 2 parking lot & sediment sampler (#3) ~50' South. Surface water above southern installation point, installed ~ 6 in bgs.

1330 Off site for lunch

1400 On site

1410 Install SD sampler (#4) ~45' S. of previous samplers in ditch. Sampler location has overlying surface water. Set flush w/ ground.

1425 Install SD sampler (#5) ~50' Southeast of #4 Location has overlying surface water. Install sampler w/ top of casing flush w/ ground surface.

1430 Install SD sampler locations #6 ~ #15 All locations had overlying surface water, and samplers were pushed flush with ground surface. Additional sampler installed at location #6 to serve as duplicate. Two additional samplers installed at location #14 to serve as MS/MSD.

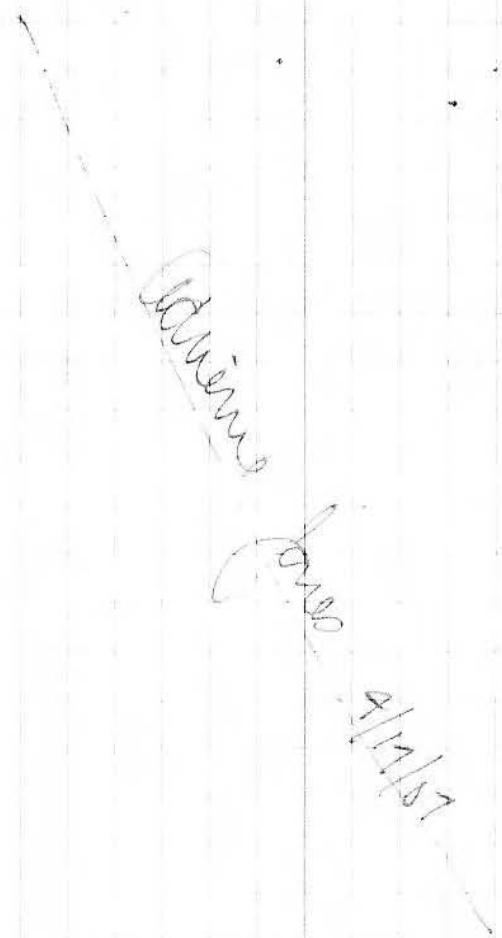
1700 Diffusion sampler installation complete.

1710 Decon equipment & clean up.

Location SJCA Date 4/17/17

Project / Client Site 2 Triad Investigation

1755 Off site.



Location SJCA Date 5/1/07

Project / Client Site 2 Triad Investigation - Vegetation Removal

0710 - Arrive on site.

Field Crew - A. Jones, T. Dingle > HILL
B. Caron, J. Cox > Agvig

Objective - Mark sample locations where vegetation removal needed.

0745 - A. Jones & T. Dingle conduct H&S briefing & MEC briefing. Sign AHA & HASP.

- A. Jones & T. Dingle begin clearing & marking locations. Agvig begins clearing vegetation from areas marked.

1500 - A. Jones & T. Dingle Offsite.

Adrienne Jones 5/1/07

Location SJCA Date 5/7/07

Project / Client Site 2 Triad Investigation - MIP

1100 Arrive at Site 2.

Field Crew - A. Jones, L. Carr, K. Yarberry, T. Dingle > HILL
G. Maples, J. Ketchum > Bear Environ.
D. McGinnis - Columbia Technologies

Weather - Party cloudy, cool 51°F, V. Windy

Objective - Set up to begin MIP investigation at Site 2. Conduct MIP at proposed locations. Practice MEC avoidance.

1115 H&S Briefing:
A. Jones - Site overview, COCs, HASP
T. Dingle - MEC awareness & avoidance
D. McGinnis - MIP: Chemicals, hot rods/MIP
G. Maples - PPE, fire ext. loc., kill switch

1140 A. Jones, T. Dingle, L. Carr, & K. Yarberry conduct site visit & discuss first location for MIP.

1150 D. McGinnis informs A. Jones Gator will be brought on site ~~tr~~ Shortly.

— (cp) —

Location SJCA Date 5/7/07

Project / Client Site 2 Triad Investigation

Drillers & MIP Set up.

1205 Drillers stage 1 55-Gallon drum at staging area to contain decon fluids.

1235 Off Site (HILL) for lunch

1320 Onsite. D. McGinnis informs that Gator had problems with driveshaft & had to be taken back offsite to be fixed. Est. time 3 hrs. D. McGinnis will set up in truck until Gator is fixed.

1325 T. Dingle checks magnometer in field.

1335 Calibrate PID MiniRae
Cal Gas = 100 ppm
Fresh Air = 0 ppm

1337 D. McGinnis conducts response test using benzene, TCE, & butane.

1400 T. Dingle clears area for initial MIP location. Proposed location moved ~ 5' NW to avoid anomolus (subsurface).

1425 D. McGinnis had to replace probe due to damage caused by solution. Ready to start at first MIP location.

1429 Drillers drill hole in order for anomalies to be checked downhole every 1' to water table. Area cleared.

(aj)

Location SJCA Date 5/7/07

Project / Client Site 2 Triad Investigation

1455 Begin MIP 224 @ 8/8/07
* Breathing Zone w/ PID = 0.0 ppm
Depth counter not reading correctly. Stop to adjust.
Had to replace line/wiring for depth counter. It is not wire/chord.
Columbia is replacing counter attached to mast of DPT Rig. Problem does not appear to be cable. Columbia trys new computer. New computer did not help. Columbia will call manufactorer of cable/depth counter to trouble shoot equipment.

1640 Gator dropped off for Columbia.

1650 Columbia can not get equipment to function - microprocessor malfunctioning. A "new" microprocessor will be brought on site in the morning. Drillers & Columbia pack up. Columbia will leave Gator in parking lot overnight.

1730 HILL, Columbia, & Bear offsite.

Location SJCA Date 5/8/07

Project / Client Site 2 Triad Investigation-MIP

0930 Arrive on site.

Field Crew - A. Jones, T. Dingle, K. Yarberry, L. Carr > HILL

D. McGinnis - Columbia Tech.

G. Maples, J. Ketchum > Bear Environ.

Weather - Drizzly, 55°F, breezy

Objective - Continue MIP investigation at Site 2 practicing avoidance.

* Note: D. McGinnis on site enabling replacement microprocessor for MIP to work properly. Columbia informs that the replacement microprocessor will have a high baseline but will not affect MIP data results.

0937 Calibrate PID MiniRae

Fresh Air = 0 ppm

Isobutylene = 101 ppm

0940 K. Yarberry calls J. Staszak to discuss MIP issues. J. Staszak informs team to continue MIP investigation.

0950 A. Jones conducts H&S Briefing: weather, slips, trips, falls, drill rig safety, PPE.

Location SJCA Date 5/8/07

Project / Client Site 2 Triad Investigation-MIP Investigation

0958 Columbia conducts response test

1005 Begin MIP224

* Cond. spike @ 16' bgs, top of confin. unit

1025 Finish MIP224

1030 T. Dingle offsite to purchase water for decon of rods.

* PID malfunctioning, might be due to high humidity in air.

1048 T. Dingle on site with water for decon. Drillers decon rods truckside w/ alconox.

* Note: J. Staszak on site @ 1040

1055 T. Dingle clears area at surface for next MIP location.

1059 Columbia conducts response test.

1111 Set up at MIP222. Bore hole to clear for anomolies subsurface every ft to water table. Location cleared.

1138 Begin MIP222 ~6" beside cleared boring.

* Yorktown tagged @ 17' bgs by cond. spike. High ECD & PID response at bottom of log.

1200 Finish MIP222. Drillers decon rods.

* Will break for lunch while Columbia transfers equipment from truck to Gator.

Location SJCA Date 5/8/07

Project / Client Site 2 Triad Investigation - MIP

1210 HILL personnel offsite for lunch.
1315 HILL personnel onsite.
1325 Drillers set up at MIP 223 & begin boring
~~15~~ 25 for T. Dingle to clear subsurface anomolies every ft. Location cleared.
1355 Begin MIP223
1417 Finish MIP 223.
* Yorktown tagged @ 12' bgs by spike in conductivity reading.
1420 Drillers decon rods "truckside".
1440 Drillers set up near MIP225 location & begin boring for T. Dingle to clear subsurface anomolies every ft. to water table. Location cleared.
* Note: Columbia performed response test after MIP 223 completed.
1448 Columbia begins MIP225 (located ~ 6 in. beside borehole for monitoring anomolies).
1508 MIP 225 completed.
* Yorktown tagged @ 14' bgs by spike in conductivity reading.
1515 T. Dingle clears hole hand augered to measure subsurface anomolies near next MIP, # 226. Area cleared.

Location SJCA Date 5/8/07

Project / Client Site 2 Triad Investigation - MIP

1530 Drillers set up at MIP 226
1535 Begin MIP226
1546 Completed MIP 226
* Yorktown tagged @ 16' bgs by peak in conductivity reading.
1550 Drillers decon rods "truckside"
~~1557~~ 1551 Columbia conducts response test.
1552 T. Dingle clears hand augered borehole for subsurface anomolies at next location, MIP 227.
1608 Drillers set up at MIP 227.
1615 Columbia begins MIP 227
1626 MIP 227 completed
* Yorktown flagged @ 14' bgs by peak in conductivity reading.
1630 Drillers decon rods "truckside".
1640 T. Dingle clears hand augered borehole near next MIP location for subsurface anomolies. Area cleared.
1650 Begin MIP 228
1710 MIP 228 completed
* Yorktown tagged @ 13' bgs by peak in conductivity reading.
1712 Drillers decon rods "truckside".

Location SJCA Date 5/8/07

Project / Client Site 2 Triad Investigation-MIP

1720 Columbia & drillers load up equipment & grout boreholes. Columbia prints ~~bore~~ MIP logs and A. Jones draws MIP locations on drawing for Columbia to reference.

1900 All offsite for day.

Adriene Jones 5/8/07

Location SJCA Date 5/9/07

Project / Client Site 2 Triad Investigation-MIP

0820 Arrive at Site 2.

Field Crew - A. Jones, L. Carr, T. Dingle > CH2M HILL

D. McGinnis - Columbia Tech.

G. Maples, J. Ketchum > Bear Environmental

Weather - foggy in am, humid, chance of tstorms, 65°F

Objective - Continue MIP investigation

0824 Conduct Health & Safety briefing:

A. Jones - Overhead power lines safety, weather, bio. hazards, slips, trips, falls, MEC.

0840 Set up at first MIP location for day.

0855 DPT soil boring completed for clearing area of subsurface anomolies. Discontinue initial boring due to metal anomolies. Move rig over to clear new location. Location cleared.

0910 Begin MIP 229

09 MIP completed

*Yorktown tagged @ 15' by peak in conductivity reading.

0940 Drillers decon rods

A. Jones & L. Carr check paths to proposed

AJ

Location SJCA Date 5/9/07

Project / Client Site 2 Triad Investigation - MIP

MIP locations. A. Jones calls J. Staszak to consult on path forward, due to MIP locations located closer together than planned on figure because of paths diverted around trees. Will proceed with locations as the paths are currently cleared instead of removing one location.

1000 Dingle clears area of subsurface anomolies.

1010 Begin MIP 230

- Hit refusal. T. Dingle clears location 1' back from initial location. Hit refusal again @ 2' bgs.

1020 ~~Begin MIP 230 again.~~ T. Dingle clears area for drillers to bore hole for subsurface anomolies to be checked. Refusal at 3' bgs.

1050 Area cleared for MIP 230, begin MIP. Hit refusal @ 3' bgs. Area cleared to try again.

1057 Attempt MIP 230. Refusal @ 3' bgs.

1104 T. Dingle clears area to check for subsurface anomolies. Refusal. MIP cut on rock. Columbia replacing MIP and performing response test.

1130 Attempt MIP 230 again. Refusal @ 7' bgs.

Location SJCA Date 5/9/07

Project / Client Site 2 Triad Investigation - MIP

1140 T. Dingle clears area to check for subsurface anomolies. Hit refusal @ 5' bgs.

1147 T. Dingle clears area east, near vegetation edge for subsurface anomoly clearance. Hit refusal @ 3.5' bgs

1155 T. Dingle clears area east at grass line for sub. anomoly clearance. Area cleared.

1203 Attempt MIP 230

1216 Complete MIP 230

* Yorktown tagged @ 15' bgs, no response.

1220 HILL personnel offsite for lunch.

1310 HILL personnel onsite.

1319 T. Dingle clears area of subsurface anomolies at MP231 location.

1330 Begin MIP 231

* Yorktown tagged at 8' bgs by peak in conductivity reading

1342 Complete MIP 231

1345 Drillers decon rods

* Note: Columbia performed response test after MIP 231 complete

1357 T. Dingle clears area of subsurface anomolies at MIP 232 location. T. Dingle requests DPT for additional 1' to

Location SJCA Date 5/9/07

Project / Client Site 2 Triad Investigation - MIP

Confirm the location is clear. Move location up 2' from wetland (East) for better Geoprobe access (slope of berm area is posing a problem for rig stability and therefore MIP location move is necessary).

1411 T. Dingle clears area of subsurface anomolies.

1415 Begin MIP 232

- Hit refusal at 3' bgs. Move north 4' to avoid debris pile. T. Dingle clears surface area; use DPT to punch hole and clear 1' bgs. T. Dingle clears; second punch 1' bgs by DP rig. T. Dingle clears. Prep for MIP location 232.

1437 Begin MIP 232.

1455 MIP completed.

* Yorktown tagged @ 15' bgs by peak in conductivity reading.

1500 Drillers decon rods "truckside".

1520 Battery dead on gator, jump battery.

1527 T. Dingle clears area for next MIP location to be bored to check for anomolies. Area cleared.

1600 Begin MIP 233

Location SJCA Date 5/9/07

Project / Client Site 2 Triad Investigation - MIP

1613 MIP completed.

* Yorktown tagged @ 15' bgs. No ECD response.

1618 Drillers decon rods "truckside."

1620 A. Jones draws MIP locations on CAD drawing for Columbia to reference.

1640 Drillers pack up and dump decon fluids into 55 Gallon drum in staging area.

1700 Drillers offsite. Columbia packing up equipment.

1720 A. Jones instructs Columbia to post sign on gator left on site overnight containing contact info & "no smoking" b/c of hydrogen tank.

1733 Columbia & HILL offsite for day.

Adrienne Jones 5/9/07

Location SJCA Date 5/10/07

Project / Client Site 2 Triad Investigation - MIP

0830 Arrive on Site.

Field Crew - A. Jones, L. Carr, T. Dingle } HIL

D. McInnis - Columbia Tech.

G. Maples, J. Ketchum } Bear Environmental

Weather - Cloudy, humid, 70°, chance of tstorms.

Objective - Complete MIP investigation: initial locations & step-out locations. Have underground electrical line re-marked. Practice MEC avoidance. Complete surface debris survey.

0840 A. Jones conducts H&S Briefing: utilities, bio. hazards, inhalation (OVM), slips, trips, falls. Sign PTSP.

0845 Columbia performs response test.

0855 T. Dingle clears area for DPT to drill test boring for subsurface anomolie clearance.

0903 Area cleared for MIP

0911 Begin MIP 234

* Yorktown tagged @ 19' bgs peak in cond reading
16' bgs ECD response

0928 MIP completed

Location SJCA Date 5/10/07

Project / Client Site 2 Triad Investigation - MIP

0930 Drillers decon rods "truckside".

0931 Columbia's subcontractor onsite to replace battery on Gator (using PPE - gloves, hardhat).

0932 A. Jones calls K. Yarberry to explan MIP234 results. K. Yarberry requests additional MIP be collected at proposed DPT sample location, @ 55' S. of MIP 234.

1005 Columbia's subcontractor changes battery. Gator is up and running.

1015 T. Dingle clears location for DPT to drill test boring for subsurface anomolie clearance.

1020 K. Yarberry calls A. Jones to request additional MIP location next to MW11S.

10 Begin MIP 235

10 MIP 235 Completed.

* Yorktown tagged @ 18' bgs by peak in cond. reading

1045 Drillers decon rods "truckside"

1055 Columbia performs response test.

1100 Spectra remarks underground electrical line running along/across Craddock St.

1103 T. Dingle clears location for DPT to drill test boring for subsurface anomolie clearance.

~~Begin MIP 236~~

Location SJCA Date 5/10/07

Project / Client Site 2 Triad Investigation - MIP

1117 Begin MIP 236
- Hit refusal at 0.3' bgs. T. Dingle cleared large area before MIP began. Drillers move over and attempt second MIP hole is cleared area.

1120 Attempt MIP 236

1126 Calibrate OVM Model 580B
Fresh Air = 0.0 ppm
Isobutylene Calibrated successfully

1140 MIP 236 Completed
* Yorktown tagged @ 16' bgs by peak in conductivity reading.

1142 Drillers decon rods "truckside. Monitor breathing zone w/ OVM. No hits with OVM meter, breathing zone clear

1200 T. Dingle clears location for DPT rig to drill test boring for subsurface anomolie clearing. Hit refusal @ 1.5' bgs. Move location and try again. Location cleared.

1208 Drillers attempt to locate lost pull tab. Drillers could not locate pull tab will use instead.

12 Begin MIP 237
Complete MIP 237
* Yorktown tagged @ 14.5' bgs by cond. reading.

Location SJCA Date 5/10/07

Project / Client Site 2 Triad Investigation - MIP

1255 Drillers decon rods "truckside". Monitor breathing zone during decon w/ OVM.

1305 HILL offsite for lunch.

1345 HILL onsite

1400 T. Dingle clears location for DPT rig to drill test boring for subsurface anomolies.

1410 Area cleared to water table.

1415 Begin MIP 238

1428 MIP 238 completed
* Yorktown tagged at @

1430 Drillers decon rods "truckside". Monitor breathing zone w/ OVM during decon. Breathing zone = 0.0 ppm.

1445 T. Dingle clears location for DPT rig to drill test boring for subsurface anomolies. Cleared to water table (v. shallow).

1455 Begin MIP 239

1504 MIP 239 Completed @ 15'

1506 Drillers decon rods "truckside". Monitor breathing zone during decon: PPM = 0.0

1515 Columbia conducts response test. Small leak found in line. Will replace/fix and run another response test. Probe needs to be fixed.

Location SJCA Date 5/10/07

Project / Client Site 2 Triad Investigation-MIP

1535 Drillers grout boreholes.
1552 Probe replaced.
1553 T. Dingle clears next MIP location to 4' bgs from hand augered bore hole. Begin MIP240
1625 MIP240 completed.
1629 Drillers decon rods "truckside". Monitor breathing zone during decon: = 0.0 ppm
1631 Flag MIP locations
1652 T. Dingle clears final MIP location for DPT rig to drill test boring for clearing of subsurface anomolies. ~~Hit refusal @ 2' bgs. Clear location nearby~~ Area cleared.
17 Begin MIP 241
1718 MIP 241 completed.
1721 Drillers decon "truckside". Monitor breathing zone during decon w/ OVM = 0.0 PPM.
1745 Drillers dump decon fluid in IDW drum at staging area and move rig & trailer to IDW staging area. Columbia unloads Gator & packs up equipment.
1750- Conduct surface debris survey at site.
1830- Surface debris survey completed.
1900- All off site.

Location SJCA Date 5/14/07

Project / Client Site 2 Triad Investigation-DPT

0745 At NNSY Pass Office to help New Age Landmark employee attain base pass.
0820 Bear Environmental calls A. Jones to inform that they are having a difficult time finding a steamcleaner to rent.
0957 Arrive at Site 2

Field Crew - A. Jones
A. Bogdanski } CH2M HILL
P. Balvocius
L. Wall - New Age Landmark

Weather - Clear, sunny, warm
Objective - Mobilize and begin DPT gw sampling for horizontal plume delineation.

1020 Generator delivered to site.
1030 Bear Environmental informs A. Jones they have located a steam cleaner & are on the way to pick it up.
1100 Bear Environmental (J. Ketchum) on site. Sets up decon pad. Driller decons rods w/ steam cleaner.
1200 Conduct H&S Briefing: A. Jones discusses driller activities, working near above & below ground utilities, & bio. hazards. P. Bal.

discusses MEC awareness & procedures.
1220 A. Jones & A. Bogdanski offsite for lunch.
1300 Onsite. Diesel tank being dropped off & staged on secondary containment.
1320 Calibrate OVM Model 580B
Fresh Air = 0.0 ppm
Calibration successful
1330 Set up at SJS02-GW01. Screen set ~~13.~~ 12.5 - 13.5' bgs.
1340 Begin purging. No water, will expose add. ft of screen.
1345 Begin purging from 11.5-13.5' bgs.
1352 Collect groundwater sample SJS02-GW01-07B for select VOCs by mobile lab. Water still fairly turbid. Monitor breathing zone with OVM: 0.0 ppm.
1400 Driller decons rods & screens at decon pad.
1405 A. Jones drops off first sample to mobile lab. Asks for MS/MSD to be run on sample.
1410 Begin drilling at SJS02-GW02. Set screen 12-13' bgs.
1423 Begin purging. No water, will expose additional ft of screen.

1433 Begin purging. No water, will expose additional ft of screen.
1440 Begin purging GW02S again, from 10-13' bgs. No water. A. Jones consults K. Yarberry about where to set screen. Screen clogged with possible organic material. Driller decons screen to clear it up. K. Yarberry suggests setting screen from 5.5-6.5' bgs.
1458 Begin purging new DPT hole w/ screen set from 5.5-6.5' bgs.
1509 Collect groundwater sample SJS02-GW02S-07B from 5.5'-6.5' bgs. Monitor breathing zone: OVM = 0.0 ppm.
1520 Driller steam cleans rods & screen.
1533 Drop of samples to mobile lab.
1535 Set up at SJS02-GW03S ~~07B~~. P. Balvocious attempts to clear area of subsurface anomolies for DPT location. Area cleared.
1539 Begin boring, will set screen 13-14' bgs.
1559 Begin purging SJS02-GW03S. Black viscous material appears at bottom of tubing brought up b/c it was clogged. Cut bottom 1/2" off tubing to unclog.
1613 Collect groundwater sample SJS02-GW03S-07B for select VOCs by mobile lab.

Location SJCA Date 5/14/07

Project / Client Site 2 Triad Investigation - DPT

1620 Driller decons rods & screen.

1645 Set up at SJS21-GW04S. P. Balvocious Clears area of subsurface anomolies for borehole.

1652 Begin boring GW04S. Will set screens 17.5-18.5' bgs.

1700 Begin purging SJS02-GW04S. Very minimal (few drops every 30 sec.) water drawing.

1708 Expose additional ft of screen. Begin purging from 16.5-18.5' bgs. Intermittent flow of water, enough to sample.

1725 Collect groundwater sample SJS02-GW04-07B for select VOCs by mobile lab.

1745 Driller decons rods & screen.

1800 Dump purge water in 55 Gallon drum at staging area.

1803 Driller off site.

1822 New Age Landmark & CH2M HILL offsite.

Andrew Jones 5/14/07

Location SJCA Date 5/15/07

Project / Client Site 2 Triad Investigation - DPT

0740 Arrive at Site 2.

Field Crew - A. Jones, A. Bogdanski, P. Balvocius } CH2M HILL

J. Ketchum - Bear Environmental

L. Wall - New Age Landmark

Weather - Mostly sunny, 60°F, warmer in afternoon

Objective - Continue collecting DPT gw samples for horizontal plume delineation and begin collecting DPT soil samples. Oversee IDW pickups for Sites 4 & 21 drums.

0745 Health & Safety Briefing: MEC avoidance, hospital rte. & emergency #, bio. hazards, heat, exhaustion.

0800 Calibrate OVM: Model 580B

Fresh Air = 0.0 ppm ~~580B~~ aj

Calibrated successfully

0805 Begin boring GW05. P. Balvocius cleared area of subsurface anomolies.

0812 Begin purging SJS02-GW05. Screen set 16-17' bgs. No water.

Background OVM = 0.0 ppm

Breathing zone OVM = 0.0 ppm

aj

Location SJCA Date 5/15/07

Project / Client Site 2 Triad Investigation - DPT

0820 Expose additional ft of screen. No water. Expose additional ft of screen: 14-17' bgs, no water. Pull screen up to see if clogged with clay: Looks silty & sandy.

0844 Bore new hole and set screen 16-17' bgs. No water. Expose additional ft of screen: 15-17' bgs: No water. Expose additional ft of screen - 14-17' bgs: No water. Expose remaining 0.5' of screen (3.5' screen) 13.5-17.0' bgs: No water. A. Jones calls K. Yarberry for help determining next step. K. Yarberry requests new borehole with screen set 11-14' bgs.

0905 Pull rods and bore new hole. Set screen from 12-14' bgs.

0913 Begin purging GW05. No water. Expose additional ft of screen.

0918 Begin purging GW05, screen set 11-14' bgs. Slow stream of water, enough to sample.

0925 Collect groundwater sample SJS02-GW05-07B for select VOCs by mobile lab. Breathing zone measured with OVM = 0.0 ppm.

0940 Drillers decon rods & screens. A. Jones delivers sample to mobile lab. Note: All bottles for the day are unpreserved.

Location SJCA Date 5/15/07

Project / Client Site 2 Triad Investigation - DPT

0945 Call Miss Utility to extend dig permit.

0958 P. Balvocius clears area of subsurface anomolies for boring. Area cleared to 8' bgs.

1005 Begin boring SJS02-GW06. Set screen 13'-14' bgs. Background OVM = 0.0 ppm

1014 Begin purging GW06 from 13-14' bgs.

1021 Collect groundwater sample SJS02-GW06-07B for select VOCs by mobile lab. Breathing zone measured during purging/sampling = 0.0 ppm.

1022 P. Balvocius clears area of subsurface anomolies for boring location.

1030 Deliver sample bottles to mobile lab, and the Drillers decon rods & screen.

1043 Begin boring GW07. Screen set 13'-14' bgs. Background OVM = 0.0 ppm

1049 Begin purging SJS02-GW07 from 13-14' bgs

1056 Collect groundwater sample SJS02-GW07-07B for select VOCs by mobile lab. Breathing zone monitored during purging/sampling = 0.0 ppm.

1100 Driller decons screen & used rods.

1115 P. Balvocius clears area of subsurface anomolies for boring location.

Location SJCA Date 5/15/07

Project / Client Site 2 Triad Investigation - DPT

1117 Begin boring at GW08. Screen set from ~~19~~ 17.5' - 19.5' bgs.

1130 Begin purging SJS02- GW08. Very minimal water. Expose additional ft of screen.

1134 Begin purging GW08 from 16.5'-19.5' bgs. Very minimal water.

1138 Bore new hole and set screen from 15.5'-18.5' bgs.

1150 Begin purging GW08. Breathing Zone = 0.0 ppm

1155 Collect groundwater sample SJS02-GW08-07B for select VOCs by mobile lab.

1200 Drillers decon rods & screen.

1205 P. Balvocius clears area of subsurface anomolies for boring location.

1218 Begin boring at GW09. Screen set at 21'-22' OVM Background = 0.0 ppm

1227 Begin purging SJS02- GW09. Not enough ~~Collect groundwater sample~~ water flowing to collect sample. Expose additional ft of screen.

1232 Begin purging from 20'-22' bgs. Very minimal amount of water. Expose additional ft. of screen

1236 Begin purging from 19'-22' bgs. Minimal

Location SJCA Date 5/15/07

Project / Client Site 2 Triad Investigation - DPT

amount of water. Exposed remaining 0.5' of screen.

1241 Begin purging from 18.5'-22' bgs. No water.

1245 Begin boring new hole. Set screen at 16'-18' bgs.

1254 Begin purging GW09. Breathing Zone = 0.0 ppm

1300 Collect groundwater sample SJS02-GW09-07B

1305 and duplicate gw sample SJS02-GW09-07BP for select VOCs by mobile lab.

1315 Drillers decon rods & screen. Deliver samples to mobile lab.

1330 Offsite (HILL) for water & food.

1355 Onsite.

1420 P. Balvocius clears area of subsurface anomolies for boring location. Background = 0.0 ppm

1428 Begin boring GW10. Screen set at 15.5'-18.5' bgs.

1440 Begin purging SJS02- GW10. Breathing Zone = 0.0 ppm

1445 Collect groundwater sample SJS02-GW10-07B for select VOCs by mobile lab.

1503 Drop off groundwater sample at mobile lab. Drillers decon rods & screen

Location SJCA Date 5/15/07

Project / Client Site 2 Triad Investigation - DPT

1510 P. Balvocius clears area of subsurface anomolies for boring location.

1521 Begin boring at SB01. Will collect soil from 14'-19' bgs and only sample 16' interval.

1533 Log sample interval for SJS02-SB01: CLAY (CH), Gley1-N/4, moist, plastic, med soft, Yorktown Confining Unit

1540 Collect soil sample SJS02-SB01-07B from 15-16'. *Note: YCU starts @ 15' bgs.

1550 P. Balvocius clears area of subsurface anomolies for boring location

1600 Begin boring at SB02. Will collect soil soil from 13'-18' bgs and only sample 16' interval

1614 Log sample interval for SJS02-SB02: clay (CH), Gley1 N/4, moist, plastic, med-soft Yorktown Confining Unit

1621 Collect soil sample SJS02-SB02-07B from 15-16'.

1640 Drillers decon rods

1700 P. Balvocius clears area of subsurface anomolies for boring location

1710 Begin boring at SB03. Will collect soil from 4'-9'. Only recovery in sleeve from 8.5-9' bgs.

Location SJCA Date 5/15/07

Project / Client Site 2 Triad Investigation - DPT

1720 A. Jones calls K. Yarberry who informs to skip location.

1730 Drillers decon rods.

1750 Dump purge water & soil borings that wouldn't fit back downhole at IDW staging area, in 55 Gallon drums.

1753 Drillers offsite for day.

1755 New Age finishing up for the day.

1830 New Age & CH2M HILL offsite for day.

Adriene Jones 5/15/07

Location SJCA Date 5/16/07

Project / Client Site 2 Triad Investigation - DPT

0750- Arrive on site.

Field Crew - A. Jones
A. Bogdanski } CH2M HILL
P. Balvocius
G. Maples } Bear Environ.
J. Ketchum
R. Johnson — Aquiq

Weather - Sunny, high 83°F, chance tstorms late

Objective - Clear path through vegetation to collect additional DPT gw sample, continue to collect gw & soil samples.

0753- Conduct H&S Briefing: MEC awareness, bio. hazards, weather, PPE, veg. clearance.

0810 P. Balvocius clears area of subsurface anomolies for boring location.

0812 Begin boring GW11. Screen set at 16.5'-18.5' bgs.

0829 Begin purging. Background OVM = 7.4-9.5 ppm

* Note: Calibrated OVM model 580B at 0810:
- Fresh Air = 0.0 ppm
- Calibrated successfully

~~No water~~ only few drops of water. Will expose additional 1 ft. of screen.

0833 Begin purging from 15.5'-18.5' bgs. No ~~Brea~~ of water. Expose remaining 0.5' of screen.

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Project / Client Site 2 Triad Investigation - DPT

0837 Begin purging from 15.0-18.5' bgs. No water. Will pull rods & screen & bore ~~not~~ new hole and set screen at different depth.

0844 Begin boring new hole for GW11. Set screen at 14'-15' bgs.

0850 Begin purging GW11 from 14.0'-15.0' bgs. Few drops of water. Will expose additional 1' of screen.

0855 Begin purging from 13.0'-15.0' bgs. First few seconds yield steady flow of water changing to drips, with intermittent flow. OVM = 7.4 ppm

0900 Collect groundwater sample SJS02-GW11-07B for select VOCs for analysis by mobile lab.

0910 Drop sample off at mobile lab.

0912 P. Balvocius clears area of subsurface anomolies for boring location SB03.

0930 Begin boring SB03. Will collect sleeve from 15'-20' bgs.

2' Recovery: OVM = 0.0 ppm
15.5'-16.5' No Recovery
18.5'-19.5': Silty sand (SM), 2.5Y 5/1, moist, loose
odor @ 19-19.5' bgs

1000 Collect soil sample SJS02-SB03-19-07B from 19-20' bgs for VOCs by mobile lab & TOC for offsite lab.

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1014 Drillers bore hole to collect 15' interval, if possible for sample collection.

Collect sleeve from 13'-18' bgs. OVM = 0.0 ppm

13'-15' No Recovery

15'-16.5' Silty clay, 5Y 3/1, v. dark gray, moist, soft, plastic, slight odor

16.5'-17.5' Clayey silt w/ organics, 5Y 2.5/1, black, moist, soft, plastic, slight odor

1031 Collect sample SJS02-SB03-16-07B sampled for VOC. Collected from 15.5-16.5' bgs.

1045 Collect sample SJS02-SB03-17-07B from 16.5'-17.5' for VOCs & TOC.

1050 Deliver VOC soil samples to mobile lab

1052 P. Balvocius clears area of subsurface anomolies for boring location SJS02-GW12.

1101 Begin boring GW12. Set screen at 18-19' bgs.

OVM Bkgd = 3.1 ppm

Breathing zone = 3.1ppm

1118 Begin purging GW12

1124 Collect groundwater sample SJS02-GW12-07B for VOCs.

~~1129 Collect duplicate sample SJS02-GW12-07BP for VOCs.~~ Not enough volume to collect duplicate.

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Project / Client Site 2 Triad Investigation - DPT

1203 P. Balvocius clears area of subsurface anomolies for DPT location in same vicinity as samples collected at SB03 to collect 4' interval.

1217 Collect soil sample from 4.5-5.0' bgs: Silt w/ organics ( ), 5Y 2.5/2 black, dry, loose, wood fragments, brick fragments, quartz gravel, roots SJS02-SB03-4-07B for VOCs.

1226 Drop off soil sample at mobile lab. Drillers decon rods & screen.

1230 Offsite for lunch (HILL)

1310 Onsite

1325 P. Balvocius clears areas of subsurface anomolies for DPT location SB04. Will attempt to collect sample from 6' bgs & 12' bgs ~~for s~~ aj

1330 Begin boring SB04

1340 Collect sample from 5.5'-6.5' SJS02-SB04-6-07B sampled for TOC & VOC. Silty clay w/ organics (wood, organic odor), moist, soft, plastic, 2.5Y, 2.5/1, black

1350 Collect sample from 11.5'-12.5' SJS02-SB04-12-07B

1355 Collect duplicate sample SJS02-SB04-12-07BP Med-fine sand (SM), 2.5Y, 5/2 grayish brown saturated, dense.

1405 P. Balvocius clears area of subsurface

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anomolies for DPT boring SB05

1410 Begin boring SB05

1430 Collect sample from 10-10.5' bgs [SJS02-SB05-10-07B] Silty fine sand, 2.5Y 5/1 gray with heavy iron staining (10YR 5/6, yellowish brown), saturated med-dense. OVM = 0.0 ppm

1442 P. Balvocus clears area of subsurface anomolies for DPT location. Begin boring SB06.

1535 Collect ~~groundwater~~ at soil sample from 17.5-18.5' fine sand (SM) with fines, 5Y 7/2 light gray w/ iron staining: 10YR 5/8 yellowish brown, saturated, medium dense. OVM = 0.0 ppm. [SJS02-SB06-18-07B] for VOCs & TOC.

1540 Deliver sample to mobile lab.

1542 P. Balvocus clears area of subsurface anomolies for boring SB07. Background OVM = 1.0 ppm.

1543 Drillers decon rods. Having difficulties with ~~Begin boring SB07.~~ of the steam cleaner.

1635 Drillers have steam cleaner working sufficiently.

1636 Begin boring SB07

1700 Collect soil sample [SJS02-SB07-13-07B]

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from 13'-14.0' bgs: CLAY (CH), Gley 1 4/5G dark greenish gray, ~~soft~~ moist, med soft.

1705 Collect duplicate soil sample from 13-14' bgs [SJS02-SB07-13-07BP] for VOCs.

1720 Dump purge water into 55 Gallon drum at staging area

1730 Drillers grout borehole in parking lot. Offsite.

1745 Mark sampling locations with pinflags & pack up. Wait for New Age to finish up.

1820 New Age & HILL offsite for day.

Williams

Location SJCA Date 5/17/07

Project / Client Site 2 Triad Investigation - DPT

0730 Arrive at Site 2.

Field Crew - A. Jones
A. Bogdanski } CH2M Hill
P. Balvocius
L. Wall - New Age Landmark

Objective - Collect sediment diffusion samplers, Collect vertical delineation DPT gw samples & GPS sample locations.

Weather - Rainy, 62°F

0734 Fill out PTSP & Conduct H&S Briefing: tstorms, bio hazards (snakes), slips, trips, falls, PPE.

0745 Prepare for collection of porewater samples.

0830 Begin collecting porewater samples at PW01. Tide too high, will collect later.

0910 Collect porewater sample [SJS02-PW06-07B]

0915 Collect duplicate porewater sample [SJS02-PW06-07BP] for select VOCs for analysis by mobile lab.

0920 Drop off samples to mobile lab.

0940 Collect porewater sample [SJS02-PW11-07B] for select VOCs. Drop off samples at mobile lab
* Note: Black "sludge" inside sampler. Organic odor.

0950 Collect porewater sample [SJS02-PW02-07B] for select VOCs. Note: brown silty sediment in sampler and on PDB.

Location SJCA Date 5/17/07

Project / Client Site 2 Triad Investigation

0955 Collect porewater sample [SJS02-PW03-07B] for select VOCs. Note:

1000 Collect porewater sample [SJS02-PW04-07B] for select VOCs. Note:

1010 Collect porewater sample [SJS02-PW05-07B] for select VOCs. Note: Black water ~~5~~ & sediment in sampler, has organic odor.

1020 P. Balvocius clears area of subsurface anomolies for DPT boring GW13.

1025 Begin boring GW13

1027 Calibrate OVM
Fresh Air = 0.0 ppm
Calibrated successfully

1038 Begin purging GW13. Screen set 13.0 - 13.5' bgs. Few drops of water. Expose additional .5' of screen.

1041 Begin purging GW13 from 12.5' - 13.5' bgs. Expose additional .5' of screen.

1047 Begin purging GW13 from 12.0' - 13.5' bgs

1054 Collect groundwater sample [SJS02-GW13-13-07B] for select VOCs by mobile lab analysis.
* Note: Purge water cloudy gray, similar color as grout used to fill in adjacent borehole previous afternoon.

Location SJCA Date 5/17/07

Project / Client Site 2 Triad Investigation - DPT

1057 Driller decons screen (extra screen) & water sampler tube.
1109 Begin boring GW13-15
1124 Begin purging GW13-15 from 15-15.5' bgs
Background OVM = 0.0 ppm
Breathing zone OVM = 0.0 ppm
1131 Collect groundwater sample SJS02-GW13-15-07B for select VOCs by mobile lab. *Note - Iron colored purge water.
1140 Deliver samples to mobile lab.
Begin boring GW14
1212 Begin purging GW14-13 from 13'-13.5' bgs
Not enough water to sample. Will pull up to 12' bgs. Screen didn't come out. Will reset screen at 13'-13.5' bgs and try again.
1237 Begin purging GW14-13 from 13'-13.5' bgs.
Not enough water. Will expose additional 1' of screen.
1244 Begin purging GW14-13 from 12'-13.5' bgs.
1251 Collect groundwater sample SJS02-GW14-13-07B for select VOCs
1256 Collect duplicate groundwater sample ~~SJS02-GW14-8~~ SJS02-GW14-13-07BP for select VOCs.
1315 Begin boring GW14-6
1325 Begin purging GW14-6 from 5.5'-6'

Location SJCA Date 5/17/07

Project / Client Site 2 Triad Investigation

1330 Collect sample SJS02-GW14-6-07B
1335 Drillers mobilize to decon area.
1350 Offsite for lunch.
1430 Onsite
1435 Recalibrate OVM:
Fresh Air = 0.0 ppm
Calibrated sucessfully
Sharpie = 85 ppm
Isobutylene = 102 ppm
1445 Begin boring GW15 (sample location cleared of subsurface anomolies prior to boring).
OVM in breathing zone flashing between 0.0-1.6' ppm.
1450 Collect groundwater sample SJS02-GW15-13-07B from 13'-13.5' ~~bls~~ bgs for select VOCs.
1455 Drillers decon sampler tube & screen & rods.
1500 Area cleared of subsurface anomolies at GW16-
1510 Begin boring GW16-14 from 13.5'-14' bgs
1518 Begin purging GW16-14
1520 Collect fieldblank SJS02-FB051707 for select VOCs by mobile lab for SD diffusion samplers.
1523 Collect Equipment Blank SJS02-EB051707 over PDB.

Location SJCA Date 5/17/07

Project / Client Site 2 Triad Investigation - DPT

1525 Begin purging SJS02-GW16-14 from 13-14' bgs b/c not enough water at initial interval.

1530 Collect groundwater sample SJS02-GW16-14-07B for Select VOCs from 13'-14' bgs.

1535 Drillers decon screen, rods, & samplers.

1545 Collect remaining SD diffusion samplers

1640 Begin purging SJS02-GW16-11 ~~-07B~~ @ from 11-11.5' bgs

1647 Collect groundwater sample SJS02-GW16-11-07B for Select VOCs from 11-11.5' bgs. OVM = 0.0 ppm.

1650 Drillers mobilize to decon area.

1700 Collect sample SJS02-PW01-07B

1705 Collect sample SJS02-PW07-07B

1710 Collect sample SJS02-PW08-07B

1715 Collect sample SJS02-PW09-07B

1720 Collect sample SJS02-PW10-07B

1725 Collect sample SJS02-PW12-07B

1730 Collect sample SJS02-PW13-07B

1735 Collect sample SJS02-PW13-07BP

1740 Collect sample SJS02-PW14-07B @45/45D

1750 Collect sample SJS02-PW15-07B

1815 Dump purge water in 55 gallon drum at staging area.

(ag)

Location SJCA Date 5/18/07

Project / Client Site 2 Triad Investigation - DPT

0725 Arrive at Site 2.

Field Crew - A. Jones
A. Bogdanski
P. Balrocius
} CH2M HILL
G. Maples
J. Ketchum
} Bear Environ.
L. Wall — New Age Tech.

Weather - Scattered showers, breezy, 60°F

Objective - Complete groundwater DPT and GPS SD diffusion sample locations.

0733 Conduct H&S Briefing: weather, PPE, lifting, pinch points, slips, trips, falls.

0750 Call Miss Utility concerning dig permit # B713500369 not being cleared by COX Communications because access to the site was restricted. Miss Utility submits a 3-hr Response to Cox. Call Cox Communications directly to find out why there is an access problem when previously the dig permits have stated that the utility is outside the stated work area. Cox checking into issue.

0813 A. Jones receives phone call from Linda Wellington at Cox Communications that there is no conflict, utilities are not in the area.

(ag)

Location SJCA Date 5/18/07

Project / Client Site 2 Triad Investigation - DPT

0815 P. Balvocius clears area of subsurface anomolies for boring GW17.

0820 Begin boring at GW17-21 Screen set 20.5'-21' bgs. No water, will expose additional .5' of screen. No water from 20-21' bgs. Will expose additional .5' of screen

0835 Begin purging from 19.5-21' bgs.

0842 Collect groundwater sample SJS07-GW17-21-07B for select VOCs

0850 Drillers decon rods, screen, gw sampler.

0902 Begin boring at GW17-17

*Note: All gw samples collected in HCl preserved bottles (for the day).

0909 Begin purging GW17-17 from 17.0'-17.5' bgs few drops of water. Will expose additional .5' of screen.

0913 Begin purging from 16.5-17.5' bgs.

0918 Collect gw sample SJS07-GW17-17-07B for select VOCs.

0926 Deliver samples to mobile lab

0927 Drillers decon

0929 P. Balvocius clears area of subsurface anomolies for boring GW18.

0943 Begin boring GW18-

(ay)

Location SJCA Date 5/18/07

Project / Client Site 2 Triad Investigation - DPT

0959 Begin purging GW18-19. Screen set from 18.5'-19.0' bgs.

*Note: OVM battery died, Charging in mobile lab.

1005 Collect gw sample SJS02-GW18-19-07B for select VOCs.

1010 Collect duplicate gw sample SJS02-GW18-19-07BP for select VOCs.

1020 Drillers decon. Samples delivered to mobile lab.

1021 Area cleared by boring GW19.

1035 Begin boring GW19

1047 Begin to purge GW19-13 from 12.5'-13.0' bgs

1052 Collect sample SJS02-GW19-13-07B for select VOCs.

1100 Deliver sample to lab. Drillers decon.

1120 Clear area of subsurface anomolies.

1123 Begin boring GW20

1132 Begin purging GW20. Screent set 13'-14' bgs. OVM = 0.0 ppm

*Note: OVM calibrated in morning:
Fresh Air = 0.0 ppm
Calibrated successfully.

1137 Collect groundwater sample ~~SJS02-GW19-~~ ay SJS02-GW20-14-07B for select VOCs.

1145 Drillers decon & clean-up.

(ay)

Location SJCA Date 5/18/07

Project / Client Site 2 Triad Investigation - DPT

1150 Dump purge water in 55 Gallon drum at staging area.

1155 Deliver sample to mobile lab

1210 Collect equipment blank SJSD2-EB051807-SO for select VOCs. (DI water poured ~~over~~ through acetate sleeve).

1215 Collect equipment blank SJSD2-EB051807-GW for select VOCs. (DI water poured over screen)

1230 Drop off samples to mobile lab. Drillers Grout boreholes.

1300 Offsite.

A. Jones 5/18/07

Location SJCA Date 5/21/07

Project / Client Site 2 Triad Investigation - Piezometers

1020 Arrive at Site 2.

Field Crew - A. Jones, A. Bogdanski, P. Balvocius } CH2M HILL

G. Ellingsworth, J. Sengny } Parratt Wolff

L. Wall — New Age Landmark

Weather - Sunny, breezy,

Objective - Install temporary piezometers.

1035 Conduct H&S Briefing: Bio. hazards, slips, trips, falls, PPE, weather

1100 P. Wolff offsite to purchase waders

1210 Hill offsite for lunch

1300 Hill & P. Wolff onsite.

1310 Site walk-thru. Set up to collect soil sample near area where PZ01 will be installed.

1320 Calibrate OVM (Model 580B);
Fresh Air = 0.0 PPM
Calibrated successfully

0-4': No Recovery
4-8'

8-12': 8-10' - No Recovery

(a)

Location SJCA Date 5/21/07

Project / Client Site 2 Triad Investigation - Piezometer

10-12' - CLAY (CL), GILEY 1 2.5/10Y greenish black, moist, soft, organics PID = 0.0 ppm

12-16': 1.5' Recovery

12-14.5' No Recovery

14.5-15.1' SAA

15.1-16' CLAY (OH) w/ organics, GILEY 1 2.5/10Y greenish black, moist, soft, organics (wood fragments), PID = 0.0 PPM

16-20': 2.5' Recovery

16-17.5': No Recovery

17.5-18'10": ~~Silty CLAY~~ Clayey SILT (ML), 5Y 3/1 very dark gray, moist, slight plasticity, some organics, soft.

18'10"-19'4": Silty fine SAND (SM), 5Y 4/1 dark gray, saturated, med. dense

19'4"-20': Clayey Silt (ML), same as 17.5-18'10"

20'-24': 4' Recovery

20'-24': Clayey SAND (SC), 5Y 4/1 dark gray, saturated, 4" lense of med-coarse sand @ 23'11", some organics

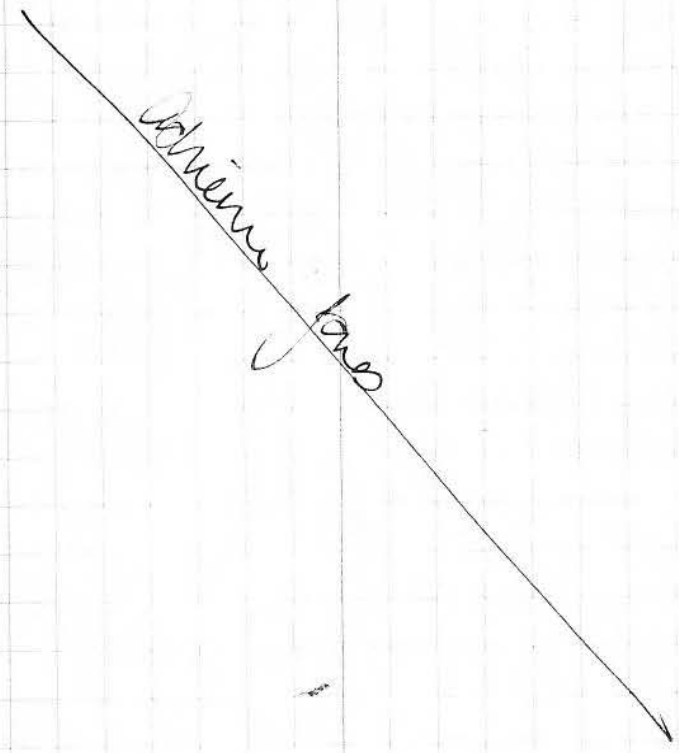
Location SJCA Date 5/21/07

Project / Client Site 2 Triad Investigation - Piezometers

1645 Begin installing PZ01. Outer casing set from 2' above grand surface to 8' bgs. Screen set from ~~2~~ 19'-24' bgs. Annular space filled with filter sand.

1745 Piezometer installation complete.

1820 P. Wolff & Hill offsite.



Location SJCA Date 5/22/07

Project / Client Site 2 Triad Investigation - Piezometers

0720 Arrive at Site 2. Drillers decanning rods.

Field Crew - A. Jones, A. Bogdanski, P. Balvocius } CH2M HILL
L. Wall — New Age Landmark
G. Ellingsworth, J. Sevigny } Parratt Wolff

Weather - Sunny, mid 80's

Objective - Continue installing temporary piezometers in wetland area & sample.

0759 Conduct H&S Briefing: Bio. hazards, slips, trips, falls, PPE.

0825 Set up at PZ02 to install

0930 Begin installing PZ02 with Tripod.

1100 Installation complete. Outer casing set from @ 2.5' above surface to 7.5' bgs. 1in. diameter PVC driven to 24' bgs with 5' screen set from 19'-24' bgs. Annular space filled with filter sand and topped with bentonite

1200 Set up at PZ03 to install

1245 Offsite for lunch.

1330 Onsite. Drillers decon rods w/ steam cleaner.

1340 Calibrate Horiba U-22:

Location SJCA Date 5/22/07

Project / Client Site 2 Triad Investigation - Piezometers

1345 Calibrate OVM (Model 580B):
Fresh Air = 0.0 ppm
Calibrated successfully

1400 Set up at PZ01 to sample

1425 Begin purging at high tide.
DTW = 1.56' btoc / DTSW = 2.42' btoc

Time	pH	Cond	Turb	DO	Temp	ORP	Sal	DTW	FLOW
1428	6.56	2.07	0.0*	0.0	21.4	-131	0.1	—	375
1438	6.67	1.19	-5.0*	0.0	19.4	-139	0.1	—	350
1443	6.69	1.03	588	0.0	18.7	-152	0.0	4.2	300
1448	6.72	0.96	300	0.0	18.7	-159	0.0	4.2	275
1455	6.82	0.95	125	0.0	18.8	-164	0.0	4.08	275
1500	6.79	0.875	168	0.0	19.2	-164	0.0	4.08	275
1505	6.80	0.912	127	0.0	19.0	-164	0.0	4.07	275
1515	6.79	0.92	96.9	0.0	19.1	-165	0.0	4.05	275
1520	6.78	0.93	125	0.0	19.0	-165	0.0	4.05	275

~3 Gal. Purged

1525 Collect groundwater sample SJS02-PZ01-07B for select VOCs.

1530 Collect duplicate sample SJS02-PZ01-07BP for select VOCs.

*Note: Began installing PZ03 @ 1420.

1600 Installation complete. Outer casing set @ to ° ' bgs. 1 in. diameter PVC driven to 15'

Location SJCA Date 5/22/07

Project / Client Site 2 Triad Investigation-

Piezometers

bgs with 5' screen set from 10'-15' bgs. Annular space filled with filter sand + bentonite on top.

1640 Drillers decon rods

1650 Dump 10 L purge water at Staging area.

1700 Offsite

[illegible] 5/22/07

Location SJCA Date 5/23/07

Project / Client SITE 2 TRIAD INVESTIGATION LOGINSOFT

0720 ARRIVE AT SITE

CHEM HILL - A. BOGDANSKI (AB)
T. WEHM (TW)
P. BAYUCCUS (PB)

PARRATT WOLFF - G. ELLINGSWORTH
J. SEWIGNY

NEW AGE LANDMARK - L WALL

0730 A. BOGDANSKI (A.B) CONDUCTS TAILGATE H2S BRIEF: PPE; SLIPS, TRIPS, FALL; BIOLOGICAL HAZARDS, HYDRATION, HEAT STRESS

0735 P.B CLEARS LOCATION FOR PZ04

DRILLERS SET UP AND BEGIN INSTALLATION

0740 CALIBRATE PID/OVM (MODEL 580B):

FRESH AIR = 0.0

CALIBRATION SUCCESSFUL

0742 CALIBRATE HORIBA U-22

pH = 3.18 (Target = 2.0)

COND = 4.49 (Target = 4.49)

Turb = ~~0.1~~ 6.0 (Target = 0.0)

0806 COLLECT EQUIPMENT BLANK FROM TUBING FOR VOCs IN 2x40 mL with NO PRESERVE

SAMPLE ID = SJ502-EB052307

75 Sunny

Location SJCA Date 5/23/07 WEDNESDAY

Project / Client SITE 2 TRIAD INVESTIGATIONS

0805 SET UP AT PZ03 & BEGIN PUMPING

0820 HOOK UP HORIBA TO COLLECT PARAMETERS

TIME	DTW	FLOW (LPM)	pH	COND	TURB	DO	TEMP	SAL	ORP
0825	3.42	0.2	6.19	2.72	999	0.0	17.2	0.1	-77
0830	3.27	0.2	6.29	2.79	110	0.0	17.1	0.1	-86
0835	3.37	0.2	6.29	2.73	104	0.0	17.1	0.1	-90
0840	3.50	0.2	6.30	2.79	119	0.0	17.1	0.1	-92
0845	3.51	0.2	6.30	2.76	118	0.0	17.3	0.1	-94
0850	3.13	0.2	6.33	2.67	117	0.0	17.4	0.1	-93

* Pump shut off numerous times between 0845 & 0850 readings

0855	3.01	0.2	6.44	2.36	121	0.0	17.5	0.1	-116
0900	3.02	0.2	6.46	2.31	118	0.0	17.5	0.1	-117
0905	3.01	0.2	6.47	2.29	117	0.0	17.5	0.1	-119
0910	3.00	0.2	6.46	2.31	120	0.0	17.5	0.1	-112

* PURGED ~3 GAL OF WATER

0835 Drillers complete PZ04. Begin moving to PZ05

0912 Collect sample from PZ03. Sample ID: SJS02 - PZ03 - 0713 in 2 x 40 mL no preservative for select VOCs

0930 Drillers start PZ05

0935 Take purge water to IDW drum

0950 Mob to PZ04 to sample

DTW: 1.15

Location SJCA Date 5-23-07

Project / Client Site 2 Triad Investigation

1005 Begin purging ~~PZ04~~ TFW PZ02

1015 Attach Horiba & begin collecting parameters

Time	DTW	Flow	pH	Cond	Turb	DO	Temp	Sal	ORP
1015	3.45	0.3	6.71	0.557	999	0.0	19.4	0.0	-147
1020	3.62	0.3	6.88	0.536	999	0.0	19.3	0.0	-175
1025	3.35	0.25	6.94	0.534	999	0.0	19.4	0.0	-187
1030	3.35	0.25	6.98	0.546	999	0.0	19.7	0.0	-191
1035	3.35	0.25	6.99	0.563	999	0.0	19.6	0.0	-193
1040	3.35	0.25	7.00	0.603	444	0.0	19.5	0.0	-195
1045	3.35	0.25	7.01	0.664	264	0.0	19.6	0.0	-196

* Tide starting to come back in

1050	3.35	0.25	7.02	0.746	277	0.0	19.6	0.0	-196
1055	3.35	0.25	7.03	0.792	144	0.0	19.5	0.0	-193
1100	3.35	0.25	7.03	0.897	297	0.0	19.6	0.0	-199

* Approx 4.5 gallons purged

1105 Collect sample from PZ04. Sample ID: SJ0S02 - ~~PZ04~~ PZ02 - 0713 in 40 mL x 2 for VOCs

1050 Drillers complete PZ05. Mob to PZ06

1115 Take IDW to drum

1145 Break for lunch

1300 Return from lunch

Location SJCA Date 5-23-07

Project / Client Site 2 Triad Investigation

1300 Set up to sample PZ04. DTW = 2.49

1302 Begin pumping PZ04

	Flow	DTW	pH	Cond	Turb	DO	Temp	Sal	ORP
1320	.15	12.85'	5.81	1.65	>999	.5	.05	.1	-8
1325	.15	12.41	5.84	1.66	950.0	.5	21.6	.1	-5
1330	.15	12.32	5.81	1.69	870.0	0.0	21.7	.1	-4
1335	.15	13.97	5.82	1.72	885.0	0.0	21.2	.1	-4
1340	.15	14.02	5.83	169	890.0	0.0	21.2	.1	-5
1345	.10	13.50	5.81	1.72	904	0.0	21.9	.1	-4
1350	.10	14.08	5.81	1.73	560.0	0.0	22.4	.1	-5
1355	.10	13.10	5.82	1.75	200.0	0.0	22.8	.1	-5
1400	.10	13.12	5.82	1.74	190.0	0.0	22.8	.1	-4
1405	.10	14.13	5.83	1.76	267.0	0.0	21.9	.1	-6

* Approx 5 gal. purged

1410 Collect sample from PZ04 Sample ID SJ08-PZ04-07B 2-40mL no preserve vials for select VOC

1400 Drillers finish PZ06. Mob to decon area

1416 take purge water from PZ04 to DW drum

1430 JE locates PZ07 for drillers. Located across stream channel from PZ04

1500 Mob to PZ06 to collect sample Daw.

Location SJCA Date Wednesday

Project / Client Site 2 Triad Investigation

Time	Flow	DTW	pH	Cond	Turb	DO	Temp	Sal	ORP
1530	0.15	9.78	6.41	4.87	325	0.44	24.6	[illegible]	-79
~~1535~~ DTW	0.15	19.17	Test kit DO > 1.0 mg/L						
1535		21.91'	6.43	4.82	251	0.11	24.9	[illegible]	-84
1540	Piezometer ran dry, allowing to recharge								
1626	Water level 16.75' btoc; resume pumping								
1635	0.1	19.39	6.42	4.87	207		26.1	0.3	-21

Note well dry

1715 DTW = 18.36

* will run pump & immediately collect sample

1720 Collect sample from PZ06. Sample ID: SJ5U2-PZ06-07B for select VOCs in 2x40mL w/o preservative

* APPROX. 1.5 gal purged

1730 Drillers finish installing PZ-08 Second from 10'-15'

1745 Take IDW water to decon area

1800 Wait for E. Wall to finish running samples.

Location SJCA Date 5/24/07

Project / Client Site 2 Triad Investigation - Piezometers

0725 Arrive at Site 2.

Field Crew - A. Jones, A. Bogdanski, P. Balvocius } HILL
G. Ellingsworth, J. Sevigny } P. WOLFF

Weather - Sunny, high of 7

Objective - Install additional "Step-out" piezometer & sample remaining piezometer for onsite analysis.

0740 Drillers decon rods

0745 Calibrate Horiba U-22 w/ Auto Cal Solution:
pH = 3.99
SC = 4.49
Turb = 0.0 NTU
Temp = 17.5 °C

0750 Conduct H&S Briefing: Bio. hazards, PPE, falls

0805 Set up at PZ08 (Switching from H to L tide)
DTW = 3.17' btoc DTSW = 3.49' btoc

0820 Begin purging PZ08

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW (ml/min)
0825	6.35	21.0	-5.0*	0.0	18.3	1.3	-49	10.40	175
0830	6.42	21.4	536	0.0	18.0	1.3	-57	—	175
~~0835~~	Well	Dry	Well	Allow	to	recharge			
~~0840~~									

Location SJCA Date 5/24/07

Project / Client Site 2 Triad Investigation - Piezometers

PZ08

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW (ml/min)
0904	6.60	19.2	975	0.0	19.8	1.1	-76	15.5'	175

Well Dry again. Will allow to recharge.

0927 — 13.5' 175

0930 Collect groundwater sample SJS02-PZ08-07B for select VOCs. ~1.2 Gal Purged

* Note: Drillers installing PZ09

0951 Set up to sample PZ02. Drillers pulled PVC well up 5' so screen set from 14'-19' bgs.
DTW = 0.9' btoc DTSW = (low tide)

0905 Begin purging PZ02

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW (btoc)	FLOW (ml/min)
1015	6.83	.687	-5.0*	0.0	19.9	0.0	-149	14.55	175
1020	6.89	.696	-5.0*	0.0	19.8	0.0	-152	14.62	175
1025	6.89	.754	-5.0*	0.0	19.7	0.0	-157	14.53	175
1030	6.87	.941	-5.0*	0.0	19.8	0.0	-153	—	175
1035	6.83	.847	-5.0*	0.2	20.3	0.0	-122	—	175
1040	6.71	.659	-5.0*	1.79	21.5	0.0	-100	—	175
1045	6.68	.654	876.4	1.81	21.9	0.0	-97	—	175
1050	6.63	.671	-5.0*	1.76	22.1	0.0	-94	—	175
1057	6.52	.878	-5.0*	1.40	20.8	0.0	-89	—	175
1100	6.51	.855	-5.0*	1.25	21.2	0.0	-87	—	175
1105	6.51	.811	-5.0*	1.25	21.6	0.0	-86	21.7	175
1110	6.52	.813	-5.0*	1.39	21.6	0.0	-87	21.7	175

~2.5 Gal Purged

Location SJCA Date 5/24/07

Project / Client Site 2 Triad Investigation - Piezometers

1115 Collect groundwater SJS02-PZ02-19-07B for select VOCs.

DO Chemets test kit = DO 4.0 ppm

1140 Mobilize to PZ-09 for GW sampling

DTW = 2.58' DTSW = 2.78' btc (L → H tide)

1159 Begin purging PZ09

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1225	6.53	2.06	7999	0.0	25.3	.1	-84	9.19	.2
1230	6.57	2.05	7999	0.0	25.5	.1	-124	9.20	.2
1235	6.60	2.06	7999	.07	25.1	.1	-131	9.26	.2
1240	6.61	2.05	842.0	0.0	25.0	.1	-132	9.35	.2
1245	6.61	2.09	624.0	.03	25.2	.1	-133	9.35	.2
1250	6.61	2.08	345.0	0.0	25.3	.1	-135	9.37	.2

DO test kit = 0.05 ppm

1255 ~~Collect Sampl~~ from PZ09 Sample ID: SJS02-PZ09-07B 2 x 40mL vials for select VOC purge vol. ~ 3 gal.

1315 Leave site for lunch

1400 Back on site, setup on PZ-05

DTW = 2.02' btc DTSW = 2.19' btc

SW = 0.5" ags.

*measured during high tide

1423 Begin purging PZ05

aj

Location SJCA Date 5/24/07

Project / Client Site 2 Triad Investigation - Piezometers

PZ05

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1435	6.06	2.02	-5.0*	0.0	19.2	0.1	-25	2.75	175
1440	5.94	1.95	-5.0*	0.0	18.6	0.1	-18	2.76	175
1445	5.92	1.94	-5.0*	0.0	18.3	0.1	-14	2.76	175
1450	5.93	1.93	-5.0*	0.0	18.9	0.1	-12	2.76	175
1455	5.91	1.92	-5.0	0.0	21.5	0.1	-16	2.76	175
1500	5.95	1.99	-5.0	0.0	19.3	0.1	-13	2.76	175

~~1507~~ ~2 Gallons purged

1505 Collect groundwater sample SJS02-PZ05-07B for select VOCs.

* DO Chemets Test Kits = 1.0 ppm. Note: Water was orange & affected color of test kit results.

1518 Set up at PZ07 (High Tide)

DTW = 8.6' btc ~~DTSW =~~ — aj SW = 0.6" ags

1533 Begin purging PZ07

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1537	6.53	7.66	202	0.0	22.6	0.4	-6	—	—

1541 Well dry. Will allow to recharge & sample.

1625 Begin purging well. Battery died. Took geopump up to car battery.

1641 Begin purging PZ07. Minimal water. Well running dry. Will allow to recharge over weekend and will sample 5/29/07.

aj

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Location SJCA Date 5/24/07

Project / Client Site 2 Triad Investigation

1705 Cleanup and dump purge water at IDW Staging area.

1720 offsite.

5/24/07

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PAGE	REFERENCE	DATE

Location SJCA Date 5/29/07

Project / Client Site 2 Triad Investigation

1120 Arrive at Site 2. Meet Spectra Group and show area to mark underground utilities.

Field Crew - A. Jones } CH2M HILL
A. Bogdanski
A. } Spectra Group

Weather - Hot, 86° F, Sunny, breezy

Objective - Begin permanent monitoring well installation, permanent well sampling, Have additional area marked for underground utilities, Have sample locations surveyed, Practice MEC avoidance.

1130 Conduct H&S Briefing: Bio. hazards, inhalation, PPE, MEC avoidance, Sun & heat.

1140 Calibrate Horiba U-22 w/ Auto Cal Solution:
pH = 3.98
Cond = 4.42
Turb = 0.0 *Flashing* Particles in Auto cal sol.

1145 Calibrate OVM ~~PID~~
Fresh Air = 0.0 ppm
Calibrated successfully

1155 Spectra Group offsite.

1159 HILL offsite for lunch.

1240 HILL onsite. P. Balocins onsite.

Location SJCA Date 5/29/07

Project / Client Site 2 Triad Investigation

1245 Set up at MW08S

DTW = 6.46' btc

1308 Begin purging MW08S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW mL/min
1309	5.95	.790	52.4	0.0	19.4	0.0	-80	6.50	200
1314	6.23	.753	33.6	0.0	18.7	0.0	-121	6.73	200
1319	6.37	.711	11.2	0.0	19.3	0.0	-138	6.74	150
1324	6.42	.687	0.0*	0.0	19.1	0.0	143	6.75	150
1329	6.45	.680	0.0*	0.0	19.3	0.0	145	6.75	150
1334	6.46	.670	0.0	0.82	19.3	0.0	147	6.75	150

~2.75 Gal Purged

Chemets DO test Kit = 0.0 ppm

1400 Collect gw sample SJS02-MW08S-07B for Select LC VOCs.

1430 Set up at SJS02-MW06S

DTW = 7.46' btc

1439 Begin purging MW06S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1440	6.26	.428	111	0.0	16.8	0.0	53	7.62	175
1445	6.27	.387	54.8	0.0	16.2	0.0	86	7.67	150
1450	6.24	.383	23.4	0.0	16.3	0.0	99	7.67	150
1455	6.23	.370	0.0	0.0	16.3	0.0	110	7.68	150
1500	6.19	.346	0.0	.11	16.3	0.0	122	7.69	150
1505	6.19	.353	0.0	.17	16.3	0.0	126	7.69	150
1510	6.20	.364	0.0	.17	16.2	0.0	128	7.69	150

Location SJCA Date 5-29-07

Project / Client Site 2 Triad Investigation

~ 2.50 gal purged

Chemets DO test kit = 1.0 ppm

1515 Collect GW Sample SJS02-MW06S-07B for select LC VOCs.

* Note: P. Wolff (G. Ellingsworth, J. Sevigny, K. White) on Site. Conduct H&S Briefing at 1445.

1525 Dump purge water at IDW staging area.

1535 P. Wolff sets up to purge/redevelop SJS02-MW05S

1537 Set up to sample PZ07.

1545 Surge MW05S

1551 Begin pumping MW05S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP
1554	6.61	.323	-5.0*	0.0	17.1	0.0	112
1559	6.07	.312	-5.0*	0.0	16.8	0.0	135
1604	5.91	.276	306	0.0	16.8	0.0	147
1609	5.98	.274	279	0.0	16.9	0.0	155
1614	5.86	.273	418	0.0	17.2	0.0	162
1619	5.78	.282	84.2	0.0	17.0	0.0	160
1624	5.79	.281	0.0*	0.0	17.0	0.0	178
1629	5.68	.277	0.0*	0.0	16.9	0.0	177
1634	5.72	.282	0.0	0.0	16.5	0.0	178

~ 30 Gallons purged

1635 Groundwater sample ~~SJS02-M~~ SJS02-PZ07-07B for Select VOCs.

Location SJCA Date 5/29/07
Project / Client Site 2 Triad Investigation

1642 Begin redeveloping SJS02-MW05D through surging & pumping.

Time	pH	Cond	Turb	DO	Temp	Sal	ORP
1644	5.86	.409	72	0.0	18.2	0.0	94
1649	6.83	.410	0.0	0.0	19.1	0.0	-47
1654	7.00	.416	0.0	0.0	18.2	0.0	-46
1659	7.17	.410	0.0	.14	17.9	0.0	-98
1704	7.27	.403	0.0	.16	18.3	0.0	-112
1709	7.29	.410	0.0	0.0	17.6	0.0	-105
1714	7.31	.408	0.0	0.0	18.3	0.0	-105
1719	7.31	.413	0.0	0.0	17.9	0.0	-113

~35 Gallons Purged

1725 Collect fieldblank SJS02-FB052907 for Select LC VOCs.

1740 Collect equipment blank SJS02-EB052907 for Select LC VOCs.

1755 P. Wolff offsite.

1800 Pack cooler.

1840 Off site

A. Jones 5/29/07

Location SJCA Date 5/30/07 7
Project / Client Site 2 Triad Investigation

0730 Arrive on site.

Field Crew - A. Jones, A. Bogdanski, M. Hilton, P. Balvocius (CH2M HILL); K. White, J. Sevigny, G. Ellingsworth (P. Wolff)

Weather - Sunny, hot

Objective - Begin permanent mw installation, continue gw sampling & well re-development.

0740 Calibrate Horiba U-22 #1 using Auto Cal Sol.:
pH = 3.95
Cond = 4.50
Turb = 0.0

0742 Calibrate Horiba U-22 #2 using Auto Cal Sol:
pH = 4.00
Cond = 4.51
Turb = 1.1

0744 Calibrate OVM:
Fresh Air = 0.0 ppm
Calibrated successfully

0745 Conduct H&S Briefing

Location SJCA Date 5/30/07

Project / Client Site 2 Triad Investigation

~~1to Begin redeveloping SJS02-MW05D through surge & pump.~~ gf

~~Time pH Cond Turb DO Temp Sal ORP~~

0810 P. Balocius clears area of subsurface anomolies ~~0810~~ for well installation.

0813 Precision Msmt on site. Conduct H&S Briefing.

0823 Drillers begin to setup on MW-14S

0-4' 3.5' recovery

0-1 poor recovery, topsoil w/ organics and wood chips

1'-1.5' crushed concrete

1.5-3' fine sand w/ organic clay, stiff, dense, 2.5Y 3/2

3-4' silty clay with fine sand (CL), medium dense plastic, moist, 10 YR 3/2 v. dark grayish brown

4-8' full recovery

4-4.75 sluough

4.75-6.5 clay, moist, medium dense, highly plastic, 10YR 4/1 d. gray

6.5-8 Same as above except dense 2.5Y 3/1 v. dark gray

8-12 .5' recovery

8-11.5 no recovery

af

Location SJCA Date 5-30-07

Project / Client Site 2 Triad Investigation

11.5-12 organic clay soft, moist, 2.5Y 2.5/1 black

12-16 3.5' recovery

~~12.5~~ 12.5 no recovery

12.5-13 Same as 11.5-12

13-15 clay, soft, highly plastic, moist, 5Y 2.5/1 black

15-15.5 silty sand, fine, stiff, moist 10YR 3/2 v. d. grayish brown

15.5-16 fine sand, saturated, stiff, 2.5Y 6/1, gray

16-20 ~~AM3 H3'~~ recovery ~~AM~~

16-17 no recovery *Note: Appears to be SAA.

17-19.5 Silty clay, moist, soft, 2.5Y 3/1 v.d. gray

19.5-20 fine sand, saturated, stiff, 2.5 4/1 d. gray

gf

20-24' 4' Recovery

20-24' CLAY( ), Stiff, high ~~plac~~ plasticity, moist, GLEY 1 6/5G (greenish grey)

0930 Begin installing MW14S. Screen will be set from 7'-17' bgs.

OVM Breathing Zone = 0.0 ppm

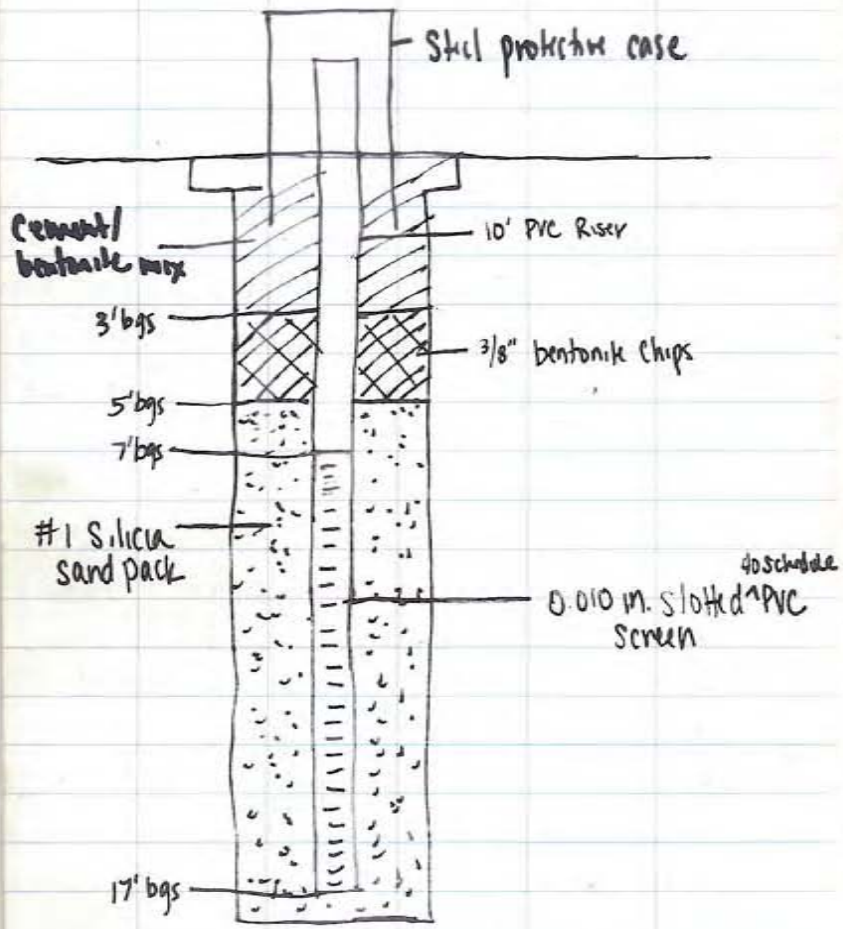
Well installation Complete.

af

Location SJCA Date 5/30/07

Project / Client Site 2 Triad Investigation

MW14S



Location SJCA Date 5/30/07

Project / Client Site 2 Triad Investigation

1115 Begin to setup on MW12S for GW Sampling
DTW - 4.95' bgs
1120 Begin purging MW-12S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	Alk
1125	5.62	1.56	120.0	0.0	21.5	.1	22	200
1130	5.58	1.52	72.3	0.0	21.2	.1	21	200
1135	5.54	1.49	24.1	0.0	21.4	.1	23	200
1140	5.53	1.49	3.7	0.0	21.5	.1	25	200
1145	5.53	1.48	4.6	0.0	21.3	.1	26	200
1150	5.53	1.48	4.7	0.0	21.4	.1	25	200

~2 Gal Purged

1155 Collect gw sample SJS02-MW12S-07B for Select LC VOCs.
1207 Off site for lunch & ice.
1309 On site.
1320 P. Balvocus clears area for soil boring & well installation for MW15S.
1330 Begin soil boring to log lithology at MW15S.
0-4' 1' Recovery
0-.5' Fill
.5'-3.5' No Recovery
3.5-4.8' Silty clay w/ sand (CL) w/ gravel, moist, soft, 5Y 4/2 olive gray

Location SJCA Date 5/30/07

Project / Client Site 2 Triad Investigation

3.8-4.0' CLAY with organics (OH), moist, soft, medium plasticity, GLEY 1 2.5N (black).

4'-8' 3' Recovery

4'-5' No Recovery

5'-6.5' Silty sand (SM) with some clay, saturated, loose, 2.5Y 3/1 very dark gray, wood debris

6.5'-8.0' CLAY with organics (OH), moist, stiff, medium plasticity, GLEY 1 3/10Y very dark greenish gray

8'-12' 2' Recovery

8'-10' No Recovery

10-11' Gravelly ~~st~~ of CLAY (CL), saturated, very soft, GLEY 1 3/10Y very dark greenish gray

11'-12' CLAY with some small organics (OH), moist, very soft, medium plasticity, GLEY 1 3/10Y very dark greenish gray

12'-16' 1.5' Recovery

12'-14.5' No recovery

14.5-16' Silty CLAY (CL), saturated, medium plasticity, very soft, GLEY 1 3/10Y (very dark greenish gray)

16'-20' 2.5' Recovery

16'-17.5' No Recovery

— up —

Location SJCA Date 5/30/07

Project / Client Site 2 Triad Investigation

17.5'-19' Fine SAND with silt (SM), saturated, dense, 2.5Y 4/1 (dark gray), color changes to 2.5Y 5/1 (gray) @

19.0'-20' Silty CLAY (ML), moist, very stiff, GLEY 1 5/5GY (greenish gray)

20'-24' 3.5' Recovery

20'-24' Clayey SAND (SC), saturated, medium dense, ~~GLEY 5/5G g~~ of GLEY 1 6/5GY (greenish gray)

24'-28' 4.0' Recovery

24-27.5' Medium sand (SP), saturated, medium dense, GLEY 1 6/5GY (greenish gray)

27.5'-28' Clayey SAND (SC), saturated, ~~med~~ of loose, GLEY 1 6/5GY (greenish gray).

28-32' ~~St~~ of 3' Recovery

28'-29' - No Recovery

29'-32' - Clayey sand (SC), saturated, loose, GLEY 1 4/N (dark gray).

1700 Attempt to collect Shelby tube from 16.5'-17.5' bgs, but no recovery.

1720 Attempt to collect Shelby tube from 18'-19' bgs, but no recovery.

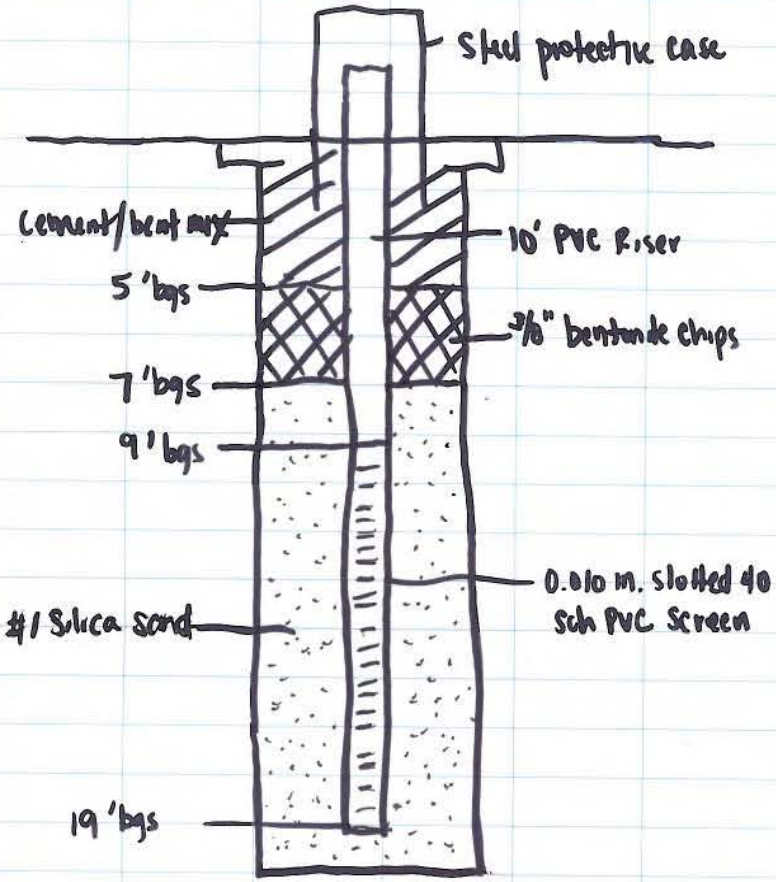
1748 Finish installing SJS02-MW15S in same borehole used to try collecting Shelby tubes.

1847 Well set, bentonite hydrated. Will ~~finish~~ of grout & set pad tommorow.

Location SJCA Date 5/30/07

Project / Client Site 2 Triad Investigation

MW15S



Location SJCA Date 5/30/07

Project / Client Site 2 Triad Investigation

1915 Dump purge water at IDW staging area.
1920 P. Wolff's HIL offsite.

P. Wolff 5/30/07

Location SJCA Date 5/31/07

Project / Client Site 2 Triad Investigation

0730 Arrive onsite.

Field Crew - A. Jones, A. Bogdanski, M. Hilton, P. Balvocius } CH2M HILL

G. Ellingsworth, J. Sevigny, K. White } Parratt Wolff

Weather - Sunny, High 89°F

Objective - Continue permanent MW sampling, redevelopment, & installation. Abandon temporary piezometers.

0740 Health & Safety Briefing: Weather, piezometer abandonment, bio. hazards, exposure.

0750 Collect round of water levels from piezometers during high tide:

PZ01: DTW = DTSW =
PZ02: DTW = DTSW =
PZ03: DTW = DTSW =
PZ04: DTW = DTSW =
PZ05: DTW = DTSW =
PZ06: DTW = DTSW =
PZ07: DTW = DTSW =
PZ08: DTW = DTSW = aj
PZ09: DTW = DTSW =

Location SJCA Date 5/31/07

Project / Client Site 2 Triad Investigation

0820 Tide not high enough, will wait and collect water level when tide is higher.

0857 Collect fieldblank for regular concentrations select VOCs [SJS02-FB053107].

0915 Collect equipment blank for regular concentration select VOCs [SJS02-EB053107]

0930 Collect round of water levels from piezometers during high tide:

PZ01: DTW = 2.15 ft. DTSW = 2.19 ft.
PZ02: DTW = 0.9 ft. DTSW = 1.3 ft.
PZ03: DTW = 1.62 ft. DTSW = 1.62 ft.
PZ04: DTW = 2.6 ft. DTSW = 2.5 ft.
PZ05: DTW = 1.9 ft. DTSW = 1.8 ft.
PZ06: DTW = 2.24 ft. DTSW = 2.6 ft.
PZ07: DTW = 4.45 ft. DTSW = 2.3 ft.
PZ08: DTW = 3.45 ft. DTSW = 2.78 ft.
PZ09: DTW = ~~2.3~~ 1.3 ft. DTSW = ~~1.3~~ 1.6 ft. ~~0.6~~ ft

0945 Drillers begin abandoning piezometers.

1143 Set up at SJS02-MWD5S
DTW = 7.25' btc

1210 Begin purging [SJS02-MWD5S]

(aj)

Location SJCA Date 5/31/07

Project / Client Site 2 Triad Investigation

SJS02-MW05S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1212	5.30	.246	87.2	2.5	16.58	0.0	45	7.40	175
1217	5.32	.242	50.2	1.72	16.68	0.0	36	7.40	150
1222	5.43	.233	26.4	1.29	16.68	0.0	23	7.40	150
1227	5.54	.228	17.7	1.06	16.50	0.0	13	7.40	150
1232	5.57	.226	14.3	.88	16.44	0.0	7	7.40	150
1237	5.60	.223	10.3	.82	16.62	0.0	4	7.40	150
1242	5.61	.221	8.5	.95	16.62	0.0	4	7.40	150
1247	5.58	.219	7.1	.78	16.52	0.0	2	7.40	150

~~1252~~ ~2.5 Gallons purged

1300 Collect gw sample SJS02-MW05S-07B for select LC VOCs.

*DO Chemets test kit = 1.5 ppm

1305 Collect duplicate gw sample SJS02-MW05S-07BP for select LC VOCs.

1315 Offsite for lunch.

1405 Onsite

1435 Collect soil sample SJS02-SB08-07B for geotech analysis: Total Porosity, Grainsize, Moisture content, & bulk density. Sample collected from 10'-12' bgs in a 4" acetate sleeve.

Breathing Zone OVM = 0.0 PPM

1500 Drillers abandon final temp piezometer.

(as)

Location SJCA Date 5/31/07

Project / Client Site 2 Triad Investigation

1600 A. Jones & M. Hilton offsite to drop off soil samples to ETC.

* Note: SJS02-SB08-17-07B and SJS02-SB08-19-07B collected at 9:30, ~~SB08-17 collected from~~ at in a 4' acetate sleeve.

1730 A. Jones & M. Hilton on site.

1830 Pack cooler & finish developing MW05S (recorded in additional fieldbook).

1915 Dump purge water

1920 P. Wolff & HILL offsite.

Adrienne Jones 5/31/07

Location SJCA Date 6/1/07

Project / Client Site 2 Triad Investigation

0730 Arrive at Site 2.

Field Crew - A. Jones, A. Bogdanski, P. Balvocius, M. Hilton — CH2M HILL

G. Ellingsworth, J. Sengny, K. White — Parratt Wolff

Weather - Sunny, hot

Objective - Attempt to install 1 permanent mw, Continue sampling permanent mws.

0740 Conduct H&S Briefing: PPE, Bio. hazards

0821 Precision Measurements on Site to Survey MW15S. Conduct H&S Briefing.

*Note: Purging SJS02-MW09S, information recorded in additional logbook

0823 Drillers steam cleaning temp. casings used for piezometers & augers.

*Note: Purging SJS02-MW04S, info recorded in additional logbook.

1000 Alyn Christopher on Site (NAVFAC). A. Jones shows Alyn location for proposed MW16S. Alyn informs a sewer line runs in the area but thinks it is the white line painted

Location SJCA Date 6/1/07

Project / Client Site 2 Triad Investigation

by Spectra Group running along St. Julians Rd.

1025 K. Henderson calls to inform A. Christopher spoke with Mr. Lang from NAVFAC Midlant Utilities. Mr. Lang informs he will call MWS Utility to respond that utilities are marked in the area & boring can proceed.

1035 K. Henders informs A. Jones dig permit has been obtained.

1045 Set up to install SJS02-MW16S. Will log soils to determine depth to install well.

1100 Begin soil boring.

Breathing Zone with OVM = 0.0 ppm

0-4' 3.5' Recovery

0-4' Fill material w/ organics (roots)

~~1-3' Silty SAND ( ) with clay nodules, moist, medium dense, 5Y 5/4 (Olive),~~

~~3-4' Clayey SAND with silt ( ), moist, dense, 5Y 3/1 (very dark gray).~~ af

4-8' 3.5' Recovery

4-4.5' No Recovery

4.5'-5.0' Fill Material

5.0'-5.3' Silt w/ Phragmites/grass ( ), dry, 5Y 5/3 (Olive)

Location SJCA Date 6/1/07

Project / Client Site 2 Triad Investigation

6'3"-6'6" Clayey SILT (ML), Slight moisture, dense, 5Y 4/1 (dark gray)

6'6"-6'8" Silty SAND (SM), Slight moisture, dense, 2.5Y 5/2 (grayish brown)

6'8" ~~Clayey SAND w/ silt ( ), moist,~~ Silty CLAY w/ sand (CL), moist, Slight plasticity, 5Y 4/1 (dark gray), Stiff

8-12', 3' Recovery

8'-9' No Recovery

9'-9'6" Silty ~~CLAY~~ SAND w/ some clay ( ), Slight moisture, loose, possible fill, Phrag/grass roots in last 2", 2.5Y 3/1 (very dark gray).

9'6"-10'6" Sandy CLAY w/ silt (ML), moist, Slight plasticity, Soft, GLEY 1 5/10Y (greenish gray). Silty fill layer from 9'8" to 9'10", 2.5Y 4/3 (Olive brown).

10'6"-11'9" Silty sand w/ CLAY, medium dense, moist, GLEY 1 5/10Y (greenish gray)

11'9"-11'10" brick/terracotta fill, 10R 4/6 (red)

11'10"-11'12" Silty fine sand (SM), medium dense, moist, 5Y 6/2 (light olive gray)

Location SJCA Date 6/1/07

Project / Client Site 2 Triad Investigation

12-16' 4' Recovery

12'-15' Sandy CLAY w/ silt (CL), moist, very soft, 2.5Y 4/1 (dark gray)

15'-16' CLAY (CH), moist, medium plasticity, Stiff, 5Y 3/1 (very dark gray)

16'-20' 4' Recovery

16'-18' Clayey SILT w/ sand (ML), v. moist, loose, 2.5Y 4/1 (dark gray)

18'-20' CLAY (CH), moist, med. plasticity, stiff, GLEY 1 3/10Y (very dark greenish gray)

20-24' 4' Recovery

20'-22'6" Clayey SAND (SC), v. moist, loose/soft, 5Y 4/1 (dark gray)

22'6"-23'10" Sandy CLAY (CL), moist, organics, med. soft, ~~2.5Y 4/1~~ GLEY 1 3/10Y

23'10"-24' Clayed SAND (SC), saturated, loose/very soft, 2.5Y 4/1 (dark gray)

13 MW1LES installed. Screen set 14'-24' bgs.

1327 Begin developing MW1LES

~~13 * Development info in additional logbook.~~

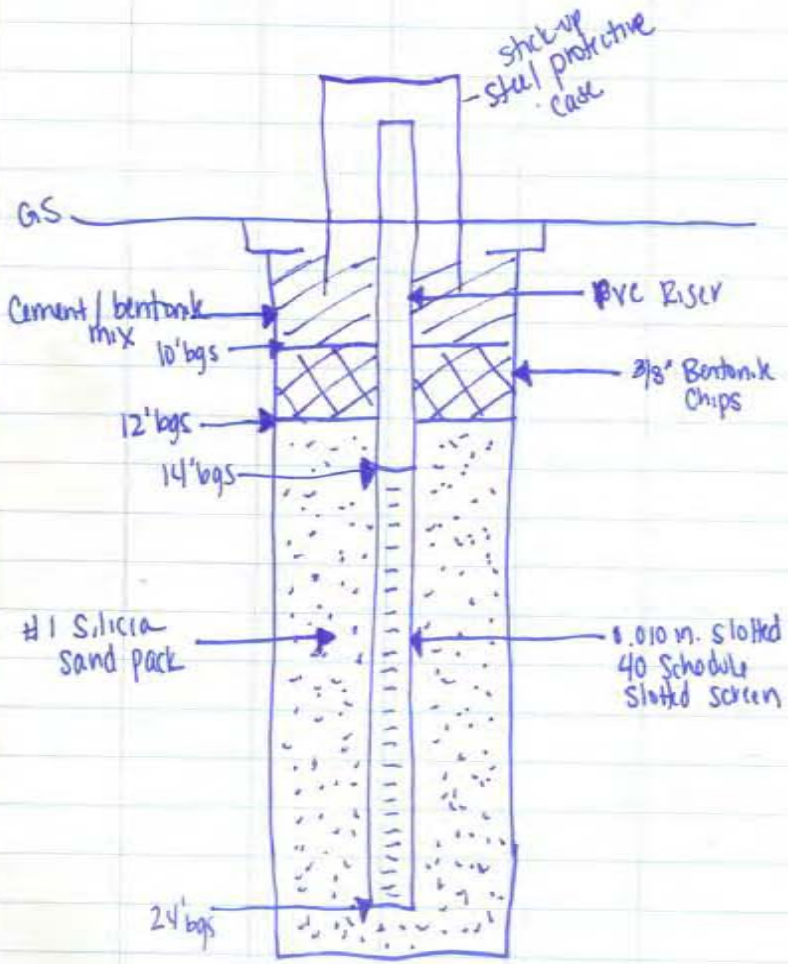
1343 Well dry. Will allow to recover.

1402 Begin purging MW1LES

Location SJCA Date 6/1/07

Project / Client Site 2 Triad Investigation

MW16S



Location SJCA Date 6/1/07

Project / Client Site 2 Triad Investigation

Time	pH	Cond	Turb	DO	Temp	Sal	ORP
1409	Well dry. Will allow to recharge.						
1430	Begin purging.						
1435	5.23	.651	-5	5.72	23.	.4	41
1450	6.28	.662	590	7.03	25.4	.4	18
1451	well dry. Will allow to recharge.						
1503	Begin purging.						
1505	6.21	.615	736	6.29	22.9	.3	18
1506	well dry. Will allow to recharge.						
1524	Begin purging.						
1525	6.15	.606	736	6.06	23.9	.3	19
1530	~~6.14 .519~~						
	MH well dry. Will allow to recharge						
1548	6.61	.532	600	5.66	22.8	.3	22
1549	Well dry.						
1612	Begin purging						
1614	Well dry						
1624	Begin purging:						
	6.34	.54	709	6.53	21.5	.3	18
1625	Well development complete. ~12 Gal Purged						
1700	Drillers decon augers & rods.						
1740	Dump purge water at IDW staging area.						
1750	Offsite to pack & ship cooler.						

(aj)

Location SJCA Date 6/4/07

Project / Client Site 2 Triad Investigation - Groundwater Sampling

0755 Arrive at Site 2.

Field Crew - A. Jones, M. Hilton > CH2M HILL

Weather - Mostly sunny. High 80°F, humid
*Note: Heavy rain day before

Objective - Complete gw sampling at Site 2.

0756 Conduct H&S Briefing: weather, Bio. hazards, Chemicals, inhalation, PPE

0805 Calibrate Horiba (#1), which will be used for samples purged & recorded in this book:
pH = 4.00
Cond = .452 s/m
Turb = 0.0 NTU

0810 Set up at SJS02-MW01D. Tubing will not go down well. Will attempt later w/ large tubing.

0845 Set up at SJS02-MW11S*
DTW = 5.1' btc

~~0800~~ 0815* Begin purging MW11S*

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow*
0916	6.34	.352	23.6	3.65	17.8	0.2	-49	6.3	250
0921	6.30	.334	9.3	0.40	17.3	0.2	-62	6.6	250
0926	6.20	.335	20.0	0.31	17.2	0.2	-65	8.1	250
0931	6.19	.339	21.2	0.30	17.5	0.2	-69	8.44	200
0936	6.21	.338	27.1	0.30	17.6	0.2	-74	9.17	200
0941	6.25	.342	32.8	0.30	17.9	0.2	-80	9.42	175

Location SJCA Date 6/4/07

Project / Client Site 2 Triad Investigation - Groundwater Sampling

MW11S (Cont.)

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow*
0946	6.27	0.354	12.8	0.48	17.6	0.2	-71	9.86	175
0951	6.31	0.353	10.6	0.27	17.5	0.2	-86	10.00	175
0956	6.33	0.354	5.6	0.25	17.7	0.2	-90	10.03	175
1001	6.36	0.356	6.0	0.25	17.4	0.2	-96	10.37	175

Chemets DO Test Kit = 0.2 ppm

1015 Collect groundwater sample SJS02-MW11S-078 for Select VOCs.
~3 Gal Purged.

*Note: Sampled SJS02-MW07S. Info recorded in add. logbook.

1040 Dump purge water at IDW staging area.

1145 Offsite for lunch & supplies.

1230 Onsite

1235 Set up at SJS02-MW01D
DTW = 5.8' btc

1400 Begin purging SJS02-MW01D

Time	pH	Cond	Turb*	DO	Temp	Sal	ORP	DTW	Flow
1410	7.90	39.1	-5.0	8.51	19.6	0.0	-48	5.81	150
1415	7.08	37.9	45	1.71	19.1	0.0	-136	5.81	150
1420	7.08	37.8	14.3	0.61	19.1	0.0	-145	5.81	150
1425	7.05	37.5	26.2	0.39	19.0	0.0	-147	5.83	175
1430	7.03	37.5	48.8	0.31	18.9	0.0	-149	5.83	225
1435	7.04	37.6	46.9	0.30	19.0	0.0	-149	5.83	225

Location SJCA Date 6/4/07

Project / Client Site 2 Triad Investigation - Groundwater sampling

SJS02-MW01D

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1445	7.06	37.5	26.2	0.31	19.6	0.0	-152	5.84	225
1455	7.19	37.5	20.1	0.30	20.4	0.0	-159	5.84	225
1505	7.20	36.6	13.6	0.21	18.5	0.0	-159	5.88	350
1515	7.24	36.7	13.5	0.19	18.2	0.0	-164	5.88	350
1525	7.52	37.1	14.4	0.23	19.2	0.0	-179	5.88	350
1535	7.56	36.7	15.1	0.25	20.7	0.0	-182	5.88	350
1545	7.63	37.1	14.5	0.28	21.4	0.0	-183	5.89	350
1555	7.62	37.6	15.2	0.29	20.4	0.0	-180	5.92	175
1605	7.57	37.2	14.9	0.27	21.1	0.0	-179	5.94	200
1615	7.39	37.6	1.8	1.19	19.2	0.0	-152	5.94	200
1625	7.23	37.2	0.1	0.30	19.3	0.0	-157	5.96	200
1635	7.26	37.2	2.2	0.25	19.2	0.0	-159	5.96	200
1645	7.39	37.2	2.4	0.22	18.6	0.0	-168	5.97	200
1655	7.46	37.2	3.3	0.22	18.6	0.0	-173	5.97	200
1700	7.51	37.3	3.9	0.23	18.4	0.0	-176	5.97	200
1705	7.51	37.2	4.8	0.20	18.4	0.0	-176	5.97	200
1710	7.53	37.2	1.7	0.20	18.3	0.0	-177	6.02	200
1715	7.54	37.3	2.0	0.19	18.1	0.0	-177	6.02	200
1720	7.54	37.3	2.3	0.20	18.3	0.0	-178	6.02	200
1725	7.57	37.3	2.6	0.21	18.2	0.0	-179	6.02	200

~10 Gal purged

1735 Collect gw sample SJS02-MW01D-07B for Select LC VOCs.

Location SJCA Date 6/4/07

Project / Client Site 2 Triad Investigation - Groundwater sampling

*Note: Rain downpouring during sample collection.

DO Chemets = 1.0 ppm

1745 Pack up

1810 Dump purge water

0815 Offsite to pack & Ship coolers.

A. Jones 6/4/07

Location SJCA Date 6/5/07

Project / Client Site 2 Triad Investigation- Groundwater Sampling.

0740 Arrive on site.

Field Crew - A. Jones, M. Ost } CH2M HILL

Objective - Finish sampling permanent gw mws. Conduct round of gw levels.

Weather - Sunny, hot, humid, chance of afternoon showers.

0745 Conduct H+S Briefing: Concentrations, Bio. hazards, Sunscreen, heat.

0805 Calibrate Horiba (#1), which will be used for samples recorded in this book:

pH = 3.99

Cond = 4.47 ms/cm

Turb = 0.0 NTU

0815 Set up to sample SJS02-MW02D. Data recorded in additional fieldbook.

0925 Begin collecting round of water levels from all Site 2 MWs:

Time	Well ID	DTW
0930	SJS02-MW02S	7.43' btc
0931	SJS02-MW02D	5.05' btc
0937	SJS02-MW16S	12.50' btc
0952	SJS02-MW04S	6.67' btc
0957	SJS02-MW05S	7.22' btc
1003	SJS02-MW06S	7.30' btc

Location SJCA Date 6/5/07

Project / Client Site 2 Triad Investigation- Groundwater Sampling

Time	Well ID	DTW
1010	SJS02-MW09S	4.50' btc
1016	SJS02-MW08S	6.23' btc
1023	SJS02-MW01D	5.90' btc
1026	SJS02-MW01S	6.17' btc
1035	SJS02-MW03S	6.23' btc
1050	SJS02-MW05D	6.70' btc
1058	SJS02-MW13S	4.58' btc
1124	SJS02-MW14S	5.70' btc
1121	SJS02-MW15S	4.52' btc
1103	SJS02-MW12S	4.46' ~~btc~~ bgs
1107	SJS02-MW11S	6.76' btc
1111	SJS02-MW07S	5.92' btc
1115	SJS02-MW10D	7.20' btc
1118	SJS02-MW10S	7.22' btc

1210 Collect ~~fieldbook for~~ field blank for select LC VOCs [SJS02-FB050607-2].

1217 Collect fieldblank for select VOCs (OLM04) [SJS02-FB060507]

1410 Set up at SJS02-MW15S

DTW = 4.4' btc

1420 Begin purging [SJS02-MW15S]

6/5/07

Location SJCA Date 6/5/07

Project / Client Site 2 Triad Investigation - Groundwater Sampling

SJS02-MW15S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow ml/min
1434	6.09	3.71	52.8	2.92	22.23	0.2	13	4.90	225
1439	6.26	3.59	11.2	1.10	23.60	0.2	-16	5.22	150
1444	6.30	3.67	0.0	0.85	24.63	0.2	-28	5.50	125
1449	6.31	3.68	0.2	0.76	25.65	0.2	-37	5.75	125
1454	6.32	3.69	0.0	0.73	24.23	0.2	-41	5.98	125
1459	6.30	3.66	0.0	0.59	24.74	0.2	-47	6.15	125
1504	6.31	3.69	11.2	0.60	24.65	0.2	-51	6.25	125
1509	6.33	3.66	0.0	0.54	25.09	0.2	-53	6.34	125
1514	6.33	3.70	2.6	0.54	25.31	0.2	-58	6.44	125
1519	6.33	3.68	0.0	0.55	24.99	0.2	-61	6.46	125

~2.5 Gal Purged

Chemets DO Test kit = 4.0 ppm

1530 Collect groundwater sample SJS02-MW15S-07 for select VOCs, TOC, MEE, Hydrogen, CO_2, Alkalinity, Nitrate, Nitrite, Sulfate, ~~Manganese~~, Sulfide (Flow = 300 ml/min)

~~1540 Collect duplicate groundwater sample SJS02-MW15S-07BP for select VOCs.~~

Note: Could not collect duplicate because water effervesing in bottles. A. Jones calls Compuchem to discuss. Compuchem suggests rinsing bottles for VOAs w/ DI water & collecting unpreserved. Samples still effervesce.

Location SJCA Date 6/5/07

Project / Client Site 2 Triad Investigation - Groundwater Sampling

Was able to collect 2 VOA vials for parent sample but do not know for sure if bottles are still preserved. Will inform lab that bottles may not be preserved so they are analyzed within holding time.

1720 Dump purge water at staging area.

1740 Offsite to pack & ship coolers.

A. Jones 6/5/07

Location SJCA Date 6/6/07

Project / Client Site 2 Triad Investigation - Groundwater Sampling

0755 Arrive on Site.

Field Crew - A. Jones
M. Ost

Weather - Sunny, high 81° F, Passing Clouds

Objective - Complete gw sampling at Site 2.

0758 Conduct H&S Briefing: Heat, Bio. hazards, inhalation, sun, pinch points

0805 Calibrate Horiba U-22 (#1), used for measurements recorded in this logbook.

pH = 4.0
Cond = 4.47 ms/cm
Turb = 0.0 NTU

0840 Set up at SJS02-MW10S
DTW = 7.6' btc

053 Begin purging MW10S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
0854	6.35	.531	-5.0*	2.51	18.52	0.0	-76	7.82	225
0859	6.01	.425	828	1.09	18.55	0.0	-67	7.92	200
0904	5.85	.287	345	0.82	18.86	0.0	-58	7.90	200
0909	5.84	.253	136	0.62	19.11	0.0	-58	7.89	200
0914	6.01	.231	39.6	1.46	20.51	0.0	-71	7.80	200
0919	6.22	.227	15.4	1.26	22.21	0.0	-80	7.65	200
0924	6.21	.219	40.5	0.98	21.57	0.0	-81	7.80	200

* Pump had stopped

(ay)

Location SJCA Date 6/6/07

Project / Client Site 2 Triad Investigation - Groundwater Sampling

SJS02-MW10S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
0929	6.13	.213	24.1	0.59	19.07	0.0	-79	7.89	200
0934	5.93	.212	38.1	0.52	19.39	0.0	-75	7.89	200

~2 Gal Purged

0945 Collect gw sample SJS02-MW10S-07B for select VOCs (OLM04), TOC, MEE, Hydrogen, Ferrous Iron, CO_2, Nitrate, Nitrite, Sulfide, Alkalinity.

* DO Chemets Test Kit = 1.5 ppm
* Flow rate while using Gas Stripping Sampler = 300 ml/min

1050 Clean up & finish sampling/purging SJS02-MW10D (recorded in additional logbook).

1151 Set up at SJS02-MW14S. Data recorded in additional fieldbook.

1343 Dump purge water at IDW staging area. 9 total aqueous drums & 4* solid drums (1 AQ drum from Site 4).

1415 Off site to pack & ship coolers.

ay

Location SJCA Date 6/27/07

Project / Client Site 2 IDW Sampling

0830 Arrive at NNSY Pass office to meet up with subcontractor Sampling IDW drums. A. Jones calls Capitol Environmental for contact phone # of employee responsible for sampling, no response from Capitol, will wait for a call back or for phone call from employee conducting fieldwork.

0925 A. Jones receives Scott Wood's cell # from LCM office & speaks w/ Woods, who is in the pass office.

0930 S. Wood calls A. Jones to inform that the pass office claims they do not have to required paperwork. A. Jones calls J. Staszak to have paperwork re-sent.

0947 J. Staszak calls A. Jones to inform paperwork (pass letter) has been resent. A. Jones calls S. Wood to inform. S. Wood informs that although the pass office did have paperwork, he does not have an I-9 Form. S. Wood's company (LCM) will fax an I-9 Form over.

0955 S. Wood informs A. Jones that pass office says the letter is missing a needed signature

Location SJCA Date 6/27/07

Project / Client Site 2 IDW Sampling

and that LCM had to re-fax his I-9 Form because a needed signature was also missing from that form. A. Jones calls J. Staszak to ask about missing signature on access letter. J. Staszak thinks correct letter should have been received by pass office and to check with them again.

1003 S. Wood attempts to attain base pass again.

1040 S. Wood receives temp. base pass.

1050 Arrive at Site 2 IDW staging area.

Field Crew - A. Jones - CH2M HILL
S. Woods - LCM Corporation

Objective - Sample IDW drums from Site 2 Triad Investigation.

Weather - Sunny, humid, hot

1059 Conduct H&S Briefing: exposure, slips, trips, & falls, heat, PPE, COCs.

1105 S. Wood sets up to sample and calls Capitol for sampling instructions: how many samples & how many ~~drs~~ drums to composite per sample.

1136 Begin collecting composite sample from all 4 soil drums [SJS02-IDW-SO-07B] for full TCLP. Sample time 1145.

1230 ~~Begin~~ of collecting composite sample from 4 of

Location SJCA Date 6/27/07

Project / Client Site 2 IDW Sampling

the 8 aqueous drums, drums labeled #1-#4 SJSD2-IDW1-AQ-07B for full TCLP.

1245 ~~Begin~~ sampling remaining 4 drums for full TCLP SJSD2-IDW2-AQ-07B.

1255 Sampling complete. Clean up.

1305 Off site.

Adrienne Jones

Location Date

Project / Client

Location SJCA Date 5-30-07

Project / Client Site 2 Triad Investigation

1610 Begin to develop MW 02S

Time	pH	cond	turb	DO	temp	Sal	ORP
1615	6.25	4.65	94.2	0.0	21.6	.2	-115
1620	6.39	3.16	25.2	0.0	20.4	.2	-119
1625	6.38	3.09	13.6	0.0	22.2	.2	-120
1630	6.33	3.11	14.3	0.0	23.4	.2	-119
1635	6.32	3.38	14.0	0.0	24.0	.2	-119
1640	6.31	3.72	16.2	0.0	24.4	.2	-119
1645	6.31	3.98	18.6	0.0	24.7	.2	-120
1650	6.29	4.19	3.5	0.0	25.1	.2	-119
1655	6.27	4.50	1.3	0.0	25.6	.2	-117
1700	6.47	3.39	5.1	0.0	20.8	.2	-124
1705	6.49	3.36	4.5	0.0	20.9	.2	-124
1710	6.46	3.97	5.8	0.0	20.5	.2	-127
17[illegible]	6.47	4.14	5.7	0.0	20.3	.2	-129
1720	6.48	4.33	6.1	0.0	20.2	.2	-131
1725	6.48	4.37	6.2	0.0	20.2	.2	-131
1730	6.49	4.42	6.4	0.0	20.4	.2	-132
1735	6.48	4.58	7.0	0.0	20.1	.2	-131
1740	6.47	4.73	11.0	0.0	19.9	.2	-130
1745	6.46	4.88	9.0	0.0	20.2	.3	-129
1750	6.43	5.16	9.5	0.0	20.1	.3	-127
1755	6.36	5.81	15.5	0.0	20.2	.3	-122
1800	6.17	7.39	42.6	0.0	20.0	.4	-110

Location SJCA Date 5-30-07

Project / Client Site 2 Triad Investigation

1800 Finish developing MW-2S. Purge approx 36 gal.

1805 Mobilize to MW-01S

1820 Begin to purge MW01S.

Time	pH	cond	turb	DO	Temp	Sal	ORP
1825	6.53	1.24	541.3	0.0	18.0	.1	-71
1830	6.50	1.24	47.9	0.0	20.3	.1	-71
1835	6.50	1.27	43.1	0.0	22.8	.1	-74
1840	6.51	1.30	41.6	0.0	24.1	.1	-75
1845	6.51	1.34	43.6	0.0	25.2	.1	-75
1850	6.50	1.37	57.4	0.07	22.3	.1	-74
1855	6.47	1.45	21.0	0.0	18.9	.1	-74
1900	6.47	1.47	17.2	0.0	19.1	.1	-74

1905 Finish purging the well for today. Will continue to purge tomorrow.

Location SJCA Date 5-31-07

Project / Client Site 2 Tried Investigation

0730 Arrive onsite
0740 H&S meeting held
0750 Calibrate Horiba
pH 3.91 3.97 temp 20.9 22.49
cond 4.79 4.51 Sal .2 .2
turb 0.0 orp 266 213
DO 8.53
0810 Begin to setup on MW015
0815 Begin to purge well

Time	pH	cond	turb	DO	temp	sal	ORP
0820	6.52	.94	81.2	.65	19.8	0.0	-30
0825	6.76	.93	81.2	.91	22.08	0.0	-34
0830	6.74	.93	144.0	1.63	19.10	0.0	-22
0835	6.77	.93	101.0	2.15	19.45	0.0	-20
0840	6.81	.93	51.8	2.22	20.15	0.0	-30
0845	6.83	.93	16.4	1.98	21.20	0.0	-38
0850	6.83	.93	14.3	1.71	22.27	0.0	-44
0855	6.84	.93	14.5	1.61	22.64	0.0	-45
0900	6.86	.94	23.7	1.63	22.36	0.0	-45

0900 Finish purging well. MW015 redeveloped completely. Purge approx 35 gal. Mobilize to decon the pump.

Location SJCA Date 5-31-07

Project / Client Site 2 Tried Investigation

0915 Begin to setup on MW035 to redevelop the well by pump + surge method.
0925 Begin to pump the well.

Time	pH	cond	turb	DO	temp	Sal	ORP
0930	7.02	3.31	17.0	.89	17.46	.2	-20
0935	6.94	3.26	59.9	.34	20.21	.2	-27
0940	7.00	3.31	6.4	.44	21.35	.2	-29
0945	7.05	3.49	11.0	0.0	17.06	.2	-28
0950	6.98	3.32	8.8	0.0	18.73	.2	-28
0955	7.00	3.34	11.0	0.0	19.47	.2	-31
1000	7.01	3.34	4.8	0.0	20.10	.2	-31
1005	7.02	3.35	6.9	.02	20.71	.2	-31

1010 Well MW035 redevelopment complete. Purge approx 15 gal.

1020 Mobilize to MW045
1025 Begin to decon the pump.
1030 Begin to setup on MW045 to redevelop the well by pump + surge method.
1035 Begin to purge well MW045

Location: SJCA Date: 5-31-07

Project / Client: Site 2 Trial Investigation

Time	pH	Cond	turb	DO	temp	Sal	ORP
1040	5.01	.346	297.0	2.38	16.36	0.0	162
1045	5.01	.347	152.0	2.11	17.48	0.0	160
1050	5.02	.332	75.6	1.01	20.42	0.0	161
1055	5.01	.310	0.0	.63	23.63	0.0	121
1100	4.81	.325	2.2	.70	20.02	0.0	96
1105	4.82	.327	3.2	.93	20.21	0.0	93
1110	4.84	.326	3.0	.93	20.76	0.0	90
1115	4.88	.327	3.0	.94	21.26	0.0	84
1120	4.89	.327	2.3	1.06	21.85	0.0	82
1125	4.90	.325	2.4	1.14	22.48	0.0	78
1130	4.91	.325	1.9	1.14	22.82	0.0	74

1130 Redevelopment of well MW045 complete. Approx 18 gal purged.

1135 Begin to decon the pump.

1210 Leave site for lunch

1310 Back on site

1315 Begin to pull peizometers from wetland area.

1515 Begin to pump & surge well MW14 for well development

Location: SJCA Date: 5-31-07

Project / Client: Site 2 Trial Investigation

Time	pH	Cond	Turb	DO	Temp	Sal	ORP
1535	6.01	4.05	791.1	.79	16.39	.2	-71
1540	6.17	3.54	381.0	.26	16.86	.2	-66
1545	6.26	2.84	87.4	.02	18.66	.1	-64
1550	6.26	2.86	83.6	0.0	18.84	.1	-69
1555	6.26	3.15	58.8	0.0	19.08	.2	-85
1600	6.26	3.50	72.6	0.0	19.42	.2	-91
1605	6.27	4.04	51.3	0.0	19.34	.2	-101
1610	6.27	4.25	58.4	0.0	19.54	.2	-104
1615	6.27	4.34	54.3	0.0	19.74	.2	-107
1620	6.28	4.33	55.7	0.0	20.36	.2	-109
1625	6.29	4.34	23.0	0.0	20.50	.2	-110

1625 Well stabalized. Development of MW14 complete. Purge approx 45 gal.

1630 Begin to decon pump.

1635 Begin to mobilize to MW

1645 Begin to develop MW by pump & surge method.

1715 Begin to take horiba readings. Drillers install pad and bollards at MW

Location SJCA Date 5-31-07

Project / Client Site 2 Triad Investigation

Time	pH	Cond	Turb	DO	Temp	Sal	ORP
1720	6.50	3.33	319.0	4.01	20.15	.2	-57
1725	6.51	3.36	321.0	3.40	19.72	.2	-60
1730	6.51	3.37	236.0	3.13	20.11	.2	-61
1735	6.49	3.37	189.0	2.66	19.63	.2	-55
1740	6.53	3.38	185.0	4.38	22.22	.2	-55
1745	6.44	3.45	697.0	1.21	19.55	.2	-59
1750	6.43	3.49	235.0	1.12	19.25	.2	-66
1755	6.49	3.43	123.0	3.82	20.22	.2	-59
1800	6.48	3.45	85.9	2.59	20.12	.2	-58
1805	6.46	3.44	80.2	2.41	19.54	.2	-58
1810	6.47	3.43	61.1	2.78	19.98	.2	-51
1815	6.49	3.40	73.4	2.35	20.06	.2	-57
1820	6.43	3.45	94.0	1.62	19.18	.2	-60
1825	6.46	3.42	58.0	3.07	20.07	.2	-53
1830	6.46	3.44	52.0	2.87	20.12	.2	-54
1835	6.45	3.42	48.2	2.63	20.31	.2	-54
1840	6.45	3.43	49.8	2.36	20.30	.2	-55
1845	6.44	3.44	46.5	1.96	20.30	.2	-56
1850	6.43	3.47	52.3	1.60	20.28	.2	-57
1855	6.41	3.46	69.1	1.11	20.34	.2	-60
1900	6.41	3.42	57.0	.68	20.26	.2	-65

1905 well MW development complete

Location SJCA Date 6-1-07

Project / Client Site 2 Triad Investigation

0815 Setup on well MW09S. DTW-4.95'

0825 Begin to purge well MW09S.

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow
0835	6.45	.313	71.00	1.77	16.87	0.0	-50	5.26	150
0840	6.13	.363	949.0	.31	16.47	0.0	-51	5.26	150
0845	6.14	.367	71.00	.12	16.51	0.0	-59	5.24	150
0850	6.35	.363	864.0	0.0	16.59	0.0	-66	5.24	150
0855	6.40	.359	672.0	0.0	16.56	0.0	-77	5.24	150
0900	6.55	.362	210.0	0.0	16.49	0.0	-88	5.23	150
0905	6.62	.355	214.0	0.0	16.58	0.0	-52	5.23	150
0910	6.63	.354	210.0	0.0	16.60	0.0	-93	5.23	150

Chemetrics DO test kit = .1 ~2.5 Gal Purged

0915 Collect sample (SJS02-MW09S-0713) for VOC (3x 40ml vial's)

0925 Move to the decon pad

0938 Set up at SJS02-MW04S

DTW = 7.62' btoc

0945 Begin purging SJS02-MW04S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
0950	4.34	.366	161.0	5.80	16.64	0.0	156		100
0955	4.31	.368	56.9	6.10	16.62	0.0	136		100
1000	4.37	.368	21.6	5.73	16.65	0.0	121		100
1005	4.50	.365	10.2	5.09	16.72	0.0	104		100
1010	4.61	.365	48.9	4.89	16.18	0.0	93		1

Location SJCA Date 6-1-07

Project / Client Site 2 Triad Investigation

Time	pH	Cond	turb	DO	Temp	Sal	ORP	DTW	Flow
1015	4.64	.356	21.9	4.16	16.21	0.0	87		100
1020	4.71	.352	8.6	3.79	16.23	0.0	80		100
1025	4.78	.351	16.8	3.80	16.57	0.0	81		100

1030 Collect sample SJS02-MW04S-0713 for VOC (3 x 40mL vials). Purged approx 2.5gal

1100 Mobilize to MW02D. Attempt to set tubing down well but unable to reach screened area.

1145 Mobilize to MW02S. DTW 10.36'

1150 Begin to purge MW02S

Time	pH	cond	Turb	DO	Temp	Sal	ORP	DTW	Flow
1155	5.98	12.1	13.6	1.86	18.47	.7	-76	10.56	150
1200	5.97	11.7	3.8	2.34	18.62	.7	-73	10.68	150
1205	6.13	11.6	3.8	4.08	18.70	.7	-79	10.71	125
1210	6.33	10.1	10.6	2.95	19.02	.6	-90	10.98	125
1215	6.47	6.70	15.5	2.02	19.74	.4	-102	11.10	125
1220	6.50	6.43	13.1	1.72	20.14	.3	-104	11.23	125
1225	6.50	6.00	7.3	1.69	20.22	.3	-64	11.31	125
1230	6.50	5.82	4.6	1.66	20.59	.3	-65	11.37	125
1235	6.50	5.81	3.9	1.59	20.48	.3	-106		125

Chemets DO test kit = 4.0

1240 Collect sample SJS02-MW02S-0713 for VOC (3 x 40 mL vial). Approx 2.5 gal purged.

Location SJCA Date 6/1/07

Project / Client Site 2 Triad Investigation

1327 Begin developing MW16S

~~Time pH Cond Turb DO Temp Sal ORP~~ of

~~1328~~ of

~~1343 Well dry, stop purging and allow to recover.~~ of

*Development info in additional logbook

1400 Begin to drop on MW03S

DTW - 6.67

1405 Begin to purge MW03S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow
1410	6.86	3.57	61.3	3.72	18.21	.2	-25	6.77	125
1415	6.90	3.42	27.1	.67	17.68	.2	-27	6.83	125
1420	6.92	3.40	34.6	.38	17.62	.2	-27	6.83	125
1425	6.94	3.37	54.6	.21	17.73	.2	-28	6.84	125
1430	6.95	3.36	37.8	.15	17.75	.2	-29	6.86	125
1435	6.95	3.36	35.7	.11	17.61	.2	-30		125
1440	6.97	3.36	31.4	.06	17.52	.2	-31		125
1445	6.97	3.34	25.8	.05	17.71	.2	-32		125

1450 Collect sample SJS02-MW03S-0713 for VOC (3 x 40mL vial), Chemets test kit for DO = 2.5. Purge approx 2 gal.

1503 Begin to mobilize to MW13S

1511 Begin to drop at MW13S

DTW - 5.43'

Location SJCA Date 6-1-07

Project / Client Site 2 Triad Investigation

1520 Begin to purge MW 13S

Time	pH	Cond	turb	DO	temp	sal	orp	DTW	Flow
1525	6.80	1.46	24.9	.93	17.53	.1	-153	5.49	200
1530	6.99	1.45	5.7	.62	17.53	.1	-166	5.54	200
1535	7.02	1.47	4.7	.50	17.65	.1	-168	5.54	200
1540	7.02	1.47	.4	.36	17.45	.1	-166	5.54	200
1545	7.02	1.47	0.0	.33	17.66	.1	-165	5.54	200
1550	7.02	1.47	0.0	.30	17.64	.1	-164	5.55	200
1555	7.03	1.47	4.9	.25	17.61	.1	-164	5.55	200
1600	7.02	1.46	13.0	.22	17.73	.1	-163	5.56	200
1605	7.02	1.47	5.5	.23	17.71	.1	-163	5.56	200
1610	7.03	1.47	5.1	.22	17.75	.1	-163	5.56	200

Chemets DO test kit = 2.5

1615 Collect Sample SJ502-MW13S-07B for VOC (3 x 40mL vial). Purge approx 3.25 gal.

Location SJCA Date 6-4-07

Project / Client Site 2 Triad Investigation

0755 Arrive at Site 2
Additional information in primary field book

0810 Calibrate Horiba U-22 #2 which will be used for samples purged in this notebook.
AutoCal Sol'n Lot#5350 Exp 7-14-07
pH= 3.96 Cond=4.48 Turb= 0.0

0855 Set up at location
SJS02-MW07S-07B
DTW = 5.90' btoc

MW07S

MH Time 0905 Begin purging MW07S

Time	pH	Cond	Turb	DO	Temp	sal	ORP	DTW	Flow
0910	5.06	.001	189	9.7	21.08	0.0	53	6.22	125
0915	4.82	.001	191	9.94	20.18	0.0	49	6.10	125
0920	4.71	.001	193	10.07	19.58	0	44	6.10	150
0925 (*)	6.11	1.5	44.1	4.72	18.39	0.1	-34	6.10	150
0930	6.07	1.5	44.6	1.50	19.00	0.1	-38	6.30	150
0935	6.10	1.49	31.7	.58	17.96	0.1	-44	6.29	150
0940	6.11	1.48	31.5	.55	17.96	0.1	-45	6.29	150
0945	6.15	1.48	27.5	.47	17.97	0.1	-47	6.29	150
0950	6.17	1.48	31.9	.35	18.02	0.1	-47	6.29	150

(*) - Cap was still on up until now.

Location SJCH Date 6/4/07

Project / Client Site 2 Triad Investigation

Purge ~ 4 gallons
DO w/Chemets = 3.5 ppm

0955 Collect Sample [SJS02-MW07S-07B]
for select VOCs (normal concentration), ~~Fe~~, Nitrate, Nitrite, Sulfate, ~~MEE~~, CO_2, ~~Hydrogen~~, Alkalinity, Ferrous Iron pulled

* Note: Flow rate during sampling = 150 ml/min
Began equilibralizing MEE gas stripping sampling at 10:29.

1054 Equilibration complete. Collect ~~sample [SJS02-MW07S-07B]~~ ~~for Hydrogen~~.

~~1055~~ 1140 Pack up at MW07S
1145 offsite for lunch, store
1234 Back onsite
1245 Set up at location MW01S
1323 Begin purging at MW01S
DTW = 6.19' btoc

MW01S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	flow
1323	6.15	.92	46.8	2.42	17.34	0	-7	6.19	225
1328	6.50	.831	35.7	1.35	19.62	0	-46	6.65	200
1333	6.54	.823	27.2	.94	18.96	0	-57	6.78	200
1338	6.55	.816	14.1	.88	18.74	0	-63	6.97	175
1343	6.59	.812	18.9	.76	19.07	0	-70	7.05	175
1348	6.61	.810	7.3	.70	19.44	0	-74	7.05	175

Location SJCH Date 6/4/07

Project / Client Site 2 Triad Investigation

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow
1353	6.61	.809	3.3	.67	19.41	0	-79	7.1	175
1358	6.60	.807	2.3	.64	18.97	0	-81	7.1	175

Purged ~2.5 gallons
1403 - Collect sample [SJS02-MW01S-07B]
for select LC VOCs.
DO w/Chemets = 1.5 ppm
1625 Set up at SJS02-~~MW02D~~ MW14S
DTW = 5.72' btc
1632 Begin purging SJS02-~~MW02D~~ MW14S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow
1633	6.64	2.47	707	6.04	19.48	0.1	-41	5.93'	

1638 Battery dead. Will attempt to sample tomorrow.

Location SJCA Date 6/5/07

Project / Client Site 2 TriAD investigation

0806 Arrived onsite

Weather: Clear Sunny 72°

obj: Collect Water Samples from monitoring wells.

Personnel: M. Ost

A Jones

0809 Calibrate Horiba # 0612634

PH	Cond	Turb	Do
3.98	0.448 s/m	0.9 NTU	8.78

STD: PH 4.0 Cond 0.449 s/cm

0817 Mob to MW02D to collect Sample

5.09 DTW btoc 69' Sf Depth 9.6 gal Vol

0927 Commenced Purge MW02D

Time	PH	Cond	Turb	Do	Temp	Sal	orp	DTW	Flow
0930	7.45	54.5	999	0.31	19.0	0.0	-127	5.04	200
0940	6.92	49.6	178	0.25	18.6	0.0	-125	5.04	200
0950	6.88	47.1	85.5	0.24	18.5	0.0	-128	5.04	200
1000	6.89	44.3	57.9	0.23	18.5	0.0	-132	5.04	200
1010	6.95	43.6	57.6	0.22	18.5	0.0	-136	5.04	200
1020	7.09	42.6	34.7	0.21	18.5	0.0	-145	5.04	200
1030	7.23	42.5	22.2	0.20	18.6	0.0	-154	5.00	200
1040	7.31	41.8	17.4	0.19	18.5	0.0	-159	5.00	200
1050	7.35	41.5	15.0	0.19	18.7	0.0	-162	5.00	200
1100	7.36	40.9	33.7	0.19	18.7	0.0	-162	5.0	200

Location SJCA Date 6/5/07

Project / Client Site 2 Triad investigation

Time	Ph	ms/cm³ Cond	Turb	DO	Temp	Sal	orp	DTW	Flow
1110	7.37	40.6	59.3	0.18	18.9	0.0	-162	5.0	200

1118 Total Volume Purged 10 GAL

1119 DO Reading By CHemetx = 1.0

1125 Collect Sample SJS02-MW02D-07B

for VOC ulco 3.2

~~1109~~ 1135 Commenced Purge MW16S

DTW 9.96' BTC 2.29 GAL Vol

~~1130~~ No Entry

Time	PH	ms/cm Cond	Turb	DO	Temp	Sal	orp	DTW	Flow
1140	~~1140~~ 14.90	0.001	166.0	5.98	13.09	0.0	+199	0.26	220
1145	4.93	0.001	153.0	5.81	14.49	0.0	+29	10.00	175
1150	4.83								

Disregard this line

Time	pH	S/m Cond	Turb	DO	Temp	Sal	orp	DTW	Flow
1155	6.07	0.457	286	0.87	20.2	0.2	-33	10.1	175
1200	6.07	0.461	253	0.92	19.9	0.2	-37	10.1	175
1205	6.07	0.457	247	0.92	20.1	0.2	-37	12.5	175
1210	6.07	0.451	236	0.90	20.1	0.2	-37	12.7	150

Location SJCA Date 6/5/07

Project / Client Site 2 Triad Investigation

Time	Ph	S/M Cond	Turb	DO	Temp	Sal	orp	DTW	Flow
1215	6.05	0.457	154.0	0.86	20.1	0.2	-36	12.7	150
1220	6.03	0.452	152.0	0.83	20.3	0.2	-34	12.5	150
1225	6.02	0.454	159	0.82	20.3	0.2	-34	12.7	150

1226 2.5 gallons Purged.

DO By Chemets 0.8

1230 Collect Sample SJS02-MW16S-07B

~~Sor~~ VOC, Sulfide, TOC, Alk, MEE

Hydrogen

1413 Mob to MW05D DTW: 6.54' btc

1414 Commenced Purge MW05D ≈ 7.5 GAL.

Time	ph	mS/m Cond	Turb	DO	Temp	Sal	orp	DTW	Flow
1420	7.02	40.2	15.7	0.42	17.7	0.0	-127	6.5'	200
1430	6.93	39.1	27.0	0.25	17.7	0.0	-132	6.5'	200
1440	6.93	39.0	41.2	0.23	18.3	0.0	-133	6.5'	200
1450	7.0	38.8	48.9	0.22	18.1	0.0	-138	6.5'	200
1500 ~~1460~~	7.16	38.8	49.3	0.19	17.8	0.0	-148	6.5'	200
1510 ~~1470~~	7.49	38.6	55.0	0.18	18.1	0.0	-170	6.5'	200
1520 ~~1480~~	7.60	38.6	19.3	0.18	17.8	0.0	-172	6.5	200
1530	7.55	37.9	19.3	0.17	18.3	0.0	-170	6.5'	200
1538 ~~1540~~	7.51	37.9	18.6	0.17	18.4	0.0	-168	6.5'	200
1550									

1545 DO by Chemets = ~~1.2~~ 1

Purged 7.5 Gallons

Location SJCA Date 6/5/07

Project / Client Site 2 Triad Investigation

1550 Collect SJS02-MW05D-07B

for VOC.

MA

Location SJCA Date 6/6/07

Project / Client Site 2 Triad Inv

0806 Arrived at Site 2
Weather: clr 75°
obj: Collect Water Samples
Personnel: M. OST CHZM
A Jones

0807 Calibrate Horiba # 612034

pH	Cond s/m	Turb	DO
3.99	0.449	0.0	8.77

0815 Mob to MW10D to collect Sample
DTW 7.41 Total Volume 10.5 Gal

0850 Commenced Purge MW10D

Time	Ph	mS/m Cond	Turb	DO	Temp	Sal	Orp	DTW	Flo
0850	7.24	40.0	3.1	0.50	19.2	0.0	-166	7.60	175
0900	7.25	39.7	7.0	0.45	19.1	0.0	-168	7.60	175
0910	7.24	39.3	3.0	0.30	18.9	0.0	-170	7.77	175
0920	7.30	39.2	0.0	0.27	18.9	0.0	-176	7.77	175
0930	7.46	38.8	1.0	0.24	18.9	0.0	-185	7.76	175
0940	7.58	38.5	1.9	0.24	19.0	0.0	-191	7.76	175
0950	7.65	38.8	2.9	0.23	19.1	0.0	-193	7.76	175
1000	7.65	38.7	0.0	0.22	19.2	0.0	-194	7.76	175
1010	7.60	38.5	4.1	0.21	19.2	0.0	-190	7.76	175
1020	7.73	38.2	0.0	0.21	19.2	0.0	-196	7.76	175
1030	7.68	37.9	0.5	0.20	19.0	0.0	-193	7.76	175
1040	7.65	37.9	0.0	0.20	18.7	0.0	-191	7.76	175

Location SJCA Date 6/6/07

Project / Client Site 2 Triad Investigation

Time	Ph	mS/m Cond	Turb	DO	Temp	Sal	ORP	DTW	Flow
1050	7.64	38.2	1.1	0.19	18.9	0.0	-191	7.76	175
1100	7.64	37.6	0.0	0.19	19.1	0.0	-189	7.76	175
1105 1110	7.63	38.0	1.9	0.18	19.2	0.0	-189	7.76	175
1110	7.61	38.2	0.0	0.18	19.0	0.0	-187	7.76	175
1115	7.62	37.2	0.0	0.18	19.1	0.0	-187	7.76	175
1120	7.61	38.0	0.0	0.18	19.1	0.0	-186	7.76	175
1125	7.60	37.7	4.5	0.18	18.9	0.0	-187	7.76	175
1130	7.59	38.0	4.0	0.18	18.8	0.0	-186	7.76	175

1135 Purged 11 Gallons from MW10D
1140 Collect SJS02-MW10D-078 for VOC
1149 Collect Duplicate Sample at MW10D SJS02-MW10D-078P for VOC
1151 Mob to MW14S to collect Sample DTW = 5.53' bTL Vol = 1.9 Gal

Begin purging SJS02-MW14S

Time	pH	Cond	Turb	DO	Temp	Sal	ORP	DTW	FLOW
1203	6.16	.264	8.1	3.04	17.6	0.1	-19	5.90	150
1208	6.05	.253	13.7	0.44	17.0	0.1	-14	5.85	150
1213	6.05	.248	14.7	0.35	17.2	0.1	-14	5.85	150
1218	6.05	.246	10.4	0.36	17.1	0.1	-13	5.85	150
1223	6.04	.246	10.2	0.29	16.9	0.1	-12	5.85	150

Location SJCA Date 6/6/07

Project / Client Site 2 Triad Investigation

Time	Ph	SI CONO	Turb	DO	Temp	SAL	ORP	DW FL
1228	6.04	.249	11.4	0.25	16.9	0.1	-12	5.85	150
1233	6.04	.247	12.5	0.24	16.9	0.1	-12	5.85	150
1238	6.05	.249	12.6	0.23	17.1	0.1	-11	5.85	150
1243	6.04	.245	14.1	0.22	16.8	0.1	-11	5.85	150
1248	6.04	.247	14.3	0.22	16.8	0.1	-11	5.85	150
1253	6.04	.247	16.0	0.22	16.8	0.1	-11	5.85	150

1254 Complete Purge MW145 2 Gallons.

1255 Collect SJS02-MW145-07B

for Sulfide, VOC, TOC, ALK, MEE

Hydrogen

1256 DO by Chemets 1.0 mg/L

1323 Hydrogen Sampling Flow Rate 275 ml/min

Location SJC4 Date 7/13/07

Project / Client Site 2

08 30 - Arrive at pass office

Field team: D. Livingston > CHHZ
L. Salamone

Weather: warm, overcast 79°F

Obj: Coordinate IDW pick up and sample groundwater at Site 2

08 50 - IDW sub arrives at pass office

0855 - Computer system at pass office goes down → passes cannot be issued, return to truck

0915 - Loading truck does not have lift gate and sub does not have drum dolly → will not be able to load drums without additional equipment

1030 - Computers back on line → pass issued to sub, mobilize to SJC4

Location SJCA Date 7/13/07

Project / Client Site 2

1115 - Arrive at staging area

1130 - Communicate with rental company to get fork lift on site

1145 - Return to staging are, pick up sub and go off site for lunch

1215 - Return to staging area → Navy contact is supposed to be on site at 1330 and forklift should be on site at 1400

1235 - D. Livingston conducts H+S meeting (heat stress, lifting technique)

1240 - Calibrate Horiba U-22 with auto cal solution Lot #5612 Exp:

pH: 4.02 Cond: 4.51 mS/cm

Turb: 1.7 NTU DO: 7.17 mg/L

Location SJCA Date 7/13/07

Project / Client Site 2

1250 - Set up at monitoring well MW16S

DTW: 7.85' ~~bfoc~~

1 well volume ≈ 2.7 gallons

1255 - Begin purging MW16S

MW16S

Time	pH	Cond S/m	Turb NTU	DO mg/L	Temp °C	Sal %	ORP mV	DTW ft	Flow mL/min
1300	6.35	0.357	34.7	1.76	32.4	0.2	-129	8.69	150
1305	6.41	0.349	8.5	0.51	30.8	0.2	-130	8.83	150
1310	6.36	0.358	12.4	0.38	29.5	0.2	-129	9.16	150
1315	6.36	0.375	14.7	0.23	27.8	0.2	-131	9.31	120
1320	6.38	0.378	17.6	0.21	27.5	0.2	-133	9.61	120
1325	6.47	0.388	24.1	0.17	27.2	0.2	-135	10.33	100
1330	6.48	0.374	28.6	0.08	26.3	0.2	-137	10.77	100
1335	6.47	0.385	36.7	0.05	25.7	0.2	-136	11.14	100
1340	6.48	0.387	30.8	0.03	25.3	0.2	-137	11.48	100
1345	6.49	0.390	36.9	0.01	25.0	0.2	-137	11.74	100
1350	6.49	0.391	36.4	0.000	24.7	0.2	-137	11.98	100
1355	6.49	0.397	42.8	0.00	24.4	0.2	-138	12.26	100
1400	6.50	0.395	42.0	0.00	24.2	0.2	-137	12.55	100
1405	6.50	0.399	43.4	0.00	24.0	0.2	-137	12.77	100
1410	6.50	0.400	52.9	0.00	23.8	0.2	-137	12.97	100

Location SJCA Date 7-13-07

Project / Client Site 2

MW16S - (cont)

Time	pH	Cond S/m	Turb NTU	DO mg/L	Temp °C	Sal %	ORP mV	DTW ft.	Flow (mL/min)
1415	6.49	0.403	47.2	0.00	23.7	0.2	-136	13.19	100
1420	6.50	0.407	44.1	0.00	23.7	0.2	-136	13.43	100
1425	6.49	0.411	44.3	0.00	23.8	0.2	-136	13.52	100
1430	6.49	0.408	44.0	0.00	24.0	0.2	-136	13.64	100
1435	6.50	0.413	44.6	0.00	23.6	0.2	-135	13.79	100
1440	6.50	0.409	45.1	0.00	23.9	0.2	-134	13.96	100

~ 3 gallons purged

1445 - Collect sample SJ502-MW16S-07B2 for CVOCs
* MS/MSD collected

1450 - Collect sample SJ502-MW16SP-07B2 for CVOCs

1455 - Collect equipment blank SJ502-EB071307 for CVOCs

1500 - Collect field blank SJ502-FB071307 for CVOCs

1505 - Collect trip blank SJ502-TB071307 for CVOCs

Location SJCA Date 7/13/07

Project / Client Site 2

1515 - Pack up at site, return to staging area to pack IDW in truck and dump purge water

1350 - Navy rep (Dr. Josh) on site to sign manifest

1355 - Forklift on site

1420 - Load drums on pallets on to truck

1435 - Wait for direction on how to move drums inside truck

1528 - Given permission to roll drums according to SOPs

1530 - Finish packing and loading IDW

1545 - Off site to ship samples

Appendix B
Munitions and Explosives of Concern Summary Reports

January 8, 2004

CH2MHILL
Attn: Ms. Jamie Butler
5700 Thurston Ave, Suite 120
Virginia Beach, Virginia 23455

RE: After Action Report (AAR), for Ordnance and Explosives (OE) Avoidance Services at St. Juliens Creek Annex (SJCA), Sites 2 & 5, Chesapeake, Virginia

Dear Ms. Butler,

USA Environmental, Inc. (USA) completed the Ordnance and Explosives (OE) Avoidance/Construction Support Services at St. Juliens Creek Annex (SJCA), Sites 2 & 5, Chesapeake, Virginia. All operations were completed safely, on time, and within budgeted funding. No OE was encountered during operations

USA mobilized two UXO qualified personnel to SJCA on December 7, 2003. Both USA UXO personnel working at this site completed Naval Explosive Ordnance Disposal (USNAVSCLEOD) training which details procedures for evaluation and disposal of OE. The USA employees at this job site had completed a training program, prior to beginning work on site, which complies with OSHA Regulations 29 CFR 1910.120e(9). All USA employees who work on hazardous sites receive training, which includes an equivalent of 40 hours of training off-site and actual field experience under the direct supervision of a trained, experienced Supervisor. Management and Supervisors receive an additional 8 hours training on program supervision. Each employee receives 8 hours of OSHA refresher training annually.

On December 8, 2003 USA's UXO Technician III, Mr. George Edwards, coordinated with the CH2MHill on-site Field Team Leader/Site Safety Coordinator (FTL/SSC), assessed the site, assembled, and tested the equipment. USA personnel received the Installation briefing and security passes and operations. The entire USA/CH2MHILL team received a safety briefing from Mr. Edwards to include an initial OE safety briefing for all team members. Daily, prior to the day's operations (see Attachment 1), Mr. Edwards provided a tailgate safety briefing to re-emphasize UXO precautions and other site-specific safety issues.

Site 2-Groundwater Monitoring Wells: OE Avoidance operations for drilling four (4) monitoring wells began on Monday the 8th and completed on Tuesday the 9th. Prior to drilling or sampling crews going on site, the OE team conducted a reconnaissance of the approach route to work sites. The reconnaissance included locating a clear path for the crews, vehicles and equipment. The approach paths, at a minimum, were twice the width of the widest vehicle. The boundaries of the approach path were clearly marked to prevent personnel from straying into un-cleared areas. Personnel were instructed to remain within the marked boundary limits. A magnetometer was used to search for near surface anomalies within the approach path.

Prior to drilling equipment being moved to the proposed well location, the OE team located a subsurface anomaly free site. During drilling the OE Team checked the bore every 2-feet with a downhole magnetometer to depth.

Site 5 – Soil Borings: OE Avoidance operations for twenty-eight (28) sampling locations began on Tuesday the 9th and completed on Wednesday the 10th. Non-UXO personnel remained out of the immediate area during opening of holes for soil sampling. Once the hole was opened and cleared by the OE Team the collection personnel performed soil sampling. The OE Team remained on-site during all digging operations for sampling.

No OE or OE-related material was encountered during operations at SJCA. USA completed all operations in accordance with the approved Work Plan and contract requirements. All site operations were completed safely and efficiently and in accordance with the Technical Scope of Work.

Sincerely;

George R. Spencer
Operations Manager

Encl: Attachment 1, Daily Site Summaries and Daily Safety Briefings

5802 Benjamin Center Drive, Suite 101, Tampa, FL 33634 Tel.: (813) 884-5722 Fax: (813) 884-1876

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 08/12/03 **TIME:** 10:30 (AM) PM

LOCATION/SITE: St. Julien's Creek, Va

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
✓	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
✓	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Edwards, George	[illegible]	USAE
Paul, Danny P.	[illegible]	USAE
Jamie S. Culbreth	[illegible]	CH2M Hill
David J Blitzer	[illegible]	CH2M HILL
Lewis LeFever	[illegible]	Parratt, Wolff Inc
William T. Friedmann Jr	[illegible]	CH2M HILL
Steve R Smith	[illegible]	Parratt Wolff Inc.

Page 1 of 2 Pages

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description		Emergency Response Plan
✓	Site Characterization		Hazard Communition
✓	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
✓	Physical Hazard(s)	✓	Evacuation Procedures
	Heat Stress		Rally Point(s)
✓	Cold Stress		Emergency Communication
✓	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
✓	Air monitoring		Specific Task Training
✓	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8 Dec 03

Page 2 of 2 Pages

File

Monday

DAILY OPERATIONS SUMMARY

DATE: 8/12/03 PAGE 1 OF 3 PAGES

SITE / LOCATION: ST. Julin's Creek, VA

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag Proposed well SITE's	2	2
(4) Geophysical		
(5) Intrusive 20 FT. sample wells	2	2
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: _____

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE: _____

OPS-1 Form

Daily Operations Summary Con't. **PAGE 2 of 3 PAGES**

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Supervisor		10	30	75 %	
UXO Specialist		10	30	75 %	
UXO Assistant					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

OPS-1 Form

Daily Operations Summary Con't. **PAGE 3 of 3 PAGES**

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt		5			
Geophysical					
Truck (Heavy)					
Truck (Light)					
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car		10			
GPS					
Weedeater					
Chainsaw					
Chipper					
Mk 26		5			

5. Operational Remarks:
Performed MAINT on Tools & equipment, Received INSTALLation Briefing and Security Passes, Survey Two WELL locations Perform on Site SAfety Briefing with CH2MHILL & Contractors Performed Mk 26 Checks during drilling operations.

NO Hazards OR OE were Encountered

6. Signature / Date:

[signature]
SUXO / Project Manager

Date: 8 / 12 / 03

OPS-1 Form

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 9 Dec 2003 TIME: 0730 AM PM

LOCATION/SITE: ST. Julin's Creek, VA

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Edwards, George	[illegible]	USAE
Paul, Jenny	[illegible]	USAE
Louis LeFever	[illegible]	Parratt Wolff
Steve K Smith	[illegible]	Parratt Wolff
Sonnie Culbreath	[illegible]	CH2M Hill
DAVID Blitzer	[illegible]	CH2M HILL

Page 1 of 2 Pages

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
✓	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
✓	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
✓	Air monitoring PID		Specific Task Training
✓	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks: Drill operations, slip, trips, & falls.

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/1/04 03

Page 2 of 2 Pages

File

Tuesday

DAILY OPERATIONS SUMMARY

DATE: 9/12/03 PAGE 1 OF 3 PAGES

SITE / LOCATION: ST. Julian's Creek, VA

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag 2 well Areas	2	0
(4) Geophysical		
(5) Intrusive 20 Ft. wells	2	0
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: _____

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE: _____

OPS-1 Form

Daily Operations Summary Con't. **PAGE 2 of 3 PAGES**

4. **Utilization**

   a. **Daily Man-hours:**

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Supervisor		10	20	50%	
UXO Specialist		10	20	50%	
UXO Assistant					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

OPS-1 Form

Daily Operations Summary Con't. **PAGE 3 of 3 PAGES**

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt		5			
Geophysical					
Truck (Heavy)					
Truck (Light)					
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental ~~Car~~ Truck		10			
GPS					
Weedeater					
Chainsaw					
Chipper					
mk 26		5			

5. Operational Remarks:
Tailgate & SAfety brief, Assisted in Brush removal around ~~areas~~ well ~~Areas~~, Survey Two well locations, monitored with mk 26 during drilling ops. ~~Survey areas for~~

6. Signature / Date:

SUXO / Project Manager

Date: 9 / 12 / 03

OPS-1 Form

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 10 /Dec/ 2003 **TIME:** 0730 AM PM

LOCATION/SITE: ST. Julian's Creek, VA

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Edwards, George W	[illegible]	USAE
Paul, Danny P.	[illegible]	USAE
Scott S. Cuthbertson	[illegible]	CH2M Hill
DAVID Bitzer	[illegible]	CH2M HILL

Page 1 of 2 Pages

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
✓	Physical Hazard(s)		Evacuation Procedures
	Heat Stress	✓	Rally Point(s)
✓	Cold Stress		Emergency Communication
✓	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
✓	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks: Begin digging in Area 5 To Take Soil Samples from Known open burning area. Non-EOD/ON Personnel will be out of area when hole is opened for sampling once cleared collectors will move in and Take Samples as required.
Rally Point Bldg # Next To Area
Emerg # 396-3333

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 10 / 08 / 03

Page 2 of 2 Pages

File

WEN

DAILY OPERATIONS SUMMARY

DATE: 10/12/03 **PAGE** 1 **OF** 3 **PAGES**

SITE / LOCATION: ST. Julian's Creek, VA

1. WORK SUMMARY

a. Work Accomplished:	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical		
(5) Intrusive Soil Sample Locations	28	0
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies:

c. Inspection Results:	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
To Assist in Soil Sampling. They wanted us on site during there digging.

OPS-1 Form

Daily Operations Summary Con't. **PAGE 2 of 3 PAGES**

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Supervisor		6	14		
UXO Specialist		6	14		
UXO Assistant					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

OPS-1 Form

Daily Operations Summary Con't. **PAGE 3 of 3 PAGES**

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt		6			
Geophysical					
Truck (Heavy)					
Truck (Light)					
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car		6			
GPS					
Weedeater					
Chainsaw					
Chipper					

5. Operational Remarks:
Surveyed with Schonstedt 28 locations for soil sampling by CH2MHill.

Secured site, completed Time Cards & Travel and returned to Hotel.

6. Signature / Date:

SUXO / Project Manager

Date: 10 / 12 / 03

OPS-1 Form

November 22, 2004

CH2MHILL
Attn: Mr. William Friedmann
5700 Thurston Ave, Suite 120
Virginia Beach, Virginia 23455

RE: After Action Report (AAR), for Ordnance and Explosives (OE) Avoidance Services at St. Juliens Creek Annex (SJCA), Sites 2, 19 and 21, Chesapeake, Virginia

Dear Mr. Friedmann,

USA Environmental, Inc. (USA) completed the Ordnance and Explosives (OE) Avoidance/Construction Support Services at St. Juliens Creek Annex (SJCA), Sites 2, 19 and 21, Chesapeake, Virginia. All operations were completed safely, on time, and within budgeted funding. No OE/UXO was encountered during operations.

USA began mobilization of two UXO qualified personnel to SJCA on site on 8 November 2004. Both USA UXO personnel working at this site completed Naval Explosive Ordnance Disposal (USNAVSCLEOD) training which details procedures for evaluation and disposal of OE. The USA employees at this job site had completed a training program, prior to beginning work on site, which complies with OSHA Regulations 29 CFR 1910.120e(9). All USA employees who work on hazardous sites receive training, which includes an equivalent of 40 hours of training off-site and actual field experience under the direct supervision of a trained, experienced Supervisor. Management and Supervisors receive an additional 8 hours training on program supervision. Each employee receives 8 hours of OSHA refresher training annually.

On 8 November 2004, USA's UXO Technician III, Mr. Nelson Figeac, coordinated with the CH2MHill on-site Field Team Leader/Site Safety Coordinator (FTL/SSC), assessed the site, assembled, and tested the equipment. USA personnel arrived at the NNSY pass office at 0730 received the installation briefing and security passes. The entire USA/CH2MHILL team received a safety briefing from Mr. Figeac to include an initial OE safety briefing for all team members. Daily, prior to the day's operations (see Attachment 1), Mr. Figeac provided a tailgate safety briefing to re-emphasize UXO precautions and other site-specific safety issues. The following describe the activities performed during the performance of this effort:

Sites 2, 19 and 21 -Groundwater Monitoring Wells and DPT Soil Sampling:

OE Avoidance operations for drilling monitoring wells and DPT soil sampling began on 8 November 2004 and completed on 18 November 2004. Prior to drilling or sampling crews going on site, the OE team conducted a reconnaissance of the approach route to work sites. The reconnaissance included locating a clear path for the crews, vehicles and equipment. The approach paths, at a minimum, were twice the width of the widest vehicle. The boundaries of the approach path were clearly marked to prevent personnel from straying into un-cleared areas. Personnel were instructed to remain within the marked boundary limits. Magnetometers were used to search for near surface anomalies within the approach path.

Prior to drilling equipment being moved to the proposed well location, the OE team located a subsurface anomaly free site. During drilling the OE Team checked the bore every 2-feet with a downhole magnetometer to depth. The following Table-1 depicts the daily OE avoidance operations performed by the OE Team.

Table-1: Daily OE Avoidance Operations

Date	Description	Quantity	Site Area
8-Nov-04	16' to 18' DPT Soil Sampling	3	2
8-Nov-04	16' to 18' DPT Soil Sampling	3	21
9-Nov-04	16' to 18' DPT Soil Sampling	5	2
10-Nov-04	16' to 18' DPT Soil Sampling	6	2
10-Nov-04	Monitoring Well	1	2
11-Nov-04	16' to 18' DPT Soil Sampling	5	2
11-Nov-04	Monitoring Well	3	21
12-Nov-04	16' to 18' DPT Soil Sampling	7	21
12-Nov-04	65' Deep Monitoring Well - Begin	-	21
15-Nov-04	65' Deep Monitoring Well - Continue	-	21
16-Nov-04	65' Deep Monitoring Well - Complete	1	21
16-Nov-04	16' Deep Monitoring Well	1	21
17-Nov-04	Monitoring Well	3	2
18-Nov-04	Monitoring Well	1	2

No OE or OE-related material was encountered during operations at SJCA. USA completed all operations in accordance with the approved Work Plan, the Site Safety and Health Plan and contract requirements. All site operations were completed safely and efficiently and in accordance with the Technical Scope of Work. USA demobilized the OE Team and equipment on 18 November 2004.

Sincerely;

Manok Synakorn
Project Manager

Encl: Attachment 1: Daily Site Summaries and Daily Safety Briefings

CC: Ms. Jamie Butler

ATTACHMENT 1

Daily Operations Summary

And

Safety/Meeting/Training Records

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 09 / 04 TIME: 0730 (AM) PM

LOCATION/SITE: ST. Juliens Creek Annex, Va

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
✓	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Nelson Figueroa	[illegible]	USAE
Robert Stewart	[illegible]	Columbia Tech
Morgan Aycock	[illegible]	Columbia Tech
Phil Balvocius	[illegible]	USAE
Katie Zurich	Katie Z	CH2M Hill
Rebekah Ives	Rebekah Ives	CH2M HILL
WILLIAM J. FRIEDMANN JR.	William J Friedmann Jr	CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 10 / 04 TIME: 7:30 AM PM

LOCATION/SITE: ST. Juliens Creek annex, VA

1. Reason for Meeting/Training: (Check all that apply)

✓	Daily Safety Meeting/Training
✓	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Nelson Figueroa	[signature]	USAE
Phil Balvocius	[signature]	USAE
Robert Stewart	[signature]	Columbia Tech
Rebekah Ives	[signature]	CH2M HILL
[illegible]	[illegible]	CH2M HILL
Morgan Aycock	[illegible]	Columbia Tech
WILLIAM J. FRIEDMANN JR.	William J. Friedmann Jr.	CH2M HILL
KIM HENDERSON	[signature]	CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 11 / 04 TIME: 0700 (AM) PM

LOCATION/SITE: ST. Juliens Creek

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
N. Figueroa	[illegible]	USA
Phil Balvocchi	[illegible]	USA
J. Butler	[illegible]	CH2M HILL
A. Chapel	[illegible]	P. Wolff
R. Stewart	[illegible]	Columbia Tech
Scott Graham	[illegible]	P. Wolff Inc.
Kourtney S. Reynolds	[illegible]	Columbia Tech
Rebekah Ives	[illegible]	CH2M HILL
Morgan Aycock	[illegible]	Columbia Tech

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 12 / 04 TIME: 0700 AM PM

LOCATION/SITE: ST. Juliens Creek Annex Chesapeake, VA

1. Reason for Meeting/Training: (Check all that apply)

✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
N. Figueroa	[illegible]	USAE
P. Balvocky	[illegible]	USAE
W. Butler	[illegible]	CH2M Hill
R. Ives	[illegible]	CH2M HILL
Robert Stewart	[illegible]	Columbia Tech
Morgan Aycock	[illegible]	Columbia Tech
Arnold Chase	[illegible]	P.W. IWG
Scott Graham	[illegible]	PV.I.
Katie Zynich	[illegible]	CH2M Hill
William T. Friedmann Jr.	[illegible]	CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 15 / 04 TIME: 0900 AM PM

LOCATION/SITE: St. Juliens Creek annex Ches., Va

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
N. Figenc	[illegible]	USAE
P. Balvocias	[illegible]	USAE
R. Ives	Rebekah Ives	CH2M HILL
J. Butler	[illegible]	CH2M Hill
[illegible]	[illegible]	Parsatt ADEP
A. Chapel	[illegible]	" "
Scott Graham	[illegible]	IWI
William J. Friedmann Jr.	William J Friedmann Jr.	CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 16 / 04 TIME: 0700 (AM) PM

LOCATION/SITE: St. Juliens Creek Annex Ches. VA.

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Nelson Figueroa	[illegible]	USAE
Paul Balsocci	[illegible]	USAE
Steve R Smith	[illegible]	Parsons Wolff
Rebekah Ives	[illegible]	CH2M HILL
Jamie Butler	[illegible]	CH2M Hill
Arnold Chavez	[illegible]	P.W.
Scott Graham	[illegible]	P.W.

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 17 / 04 TIME: 0700 AM PM

LOCATION/SITE: St. Juliens Creek Annex Ches. Va

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Nelson Figueroa	Nelson Figueroa	USAE
Phil Balvocius	Phil Balvocius	USAE
Rebekah Ives	Rebekah Ives	CH2M HILL
S. Butler	[illegible]	CH2M HILL
A. Chase	[illegible]	P.W.
Steve R Smith	[illegible]	R-W
Scott Graham	[illegible]	R-W
Cecilia White	Cecilia White	CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 18 / 04 TIME: 0700 AM PM

LOCATION/SITE: _____

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
N. Figueroa	[illegible]	USAE
P. BALVOCIUS	[illegible]	USAE
Steve R. SMITH	Steve R. Smith	PARSAH WOLFD
SCOTT Graham	[illegible]	P WJ
ARNOLD CHAPEL	[illegible]	P.V&E
Cecilia White	[illegible]	CH2M HILL
Rebekah Ives	Rebekah Ives	CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

DAILY OPERATIONS SUMMARY

DATE: 11 / 8 / 04 PAGE ___ OF ___ PAGES

SITE / LOCATION: ST. Julien Creek Annex Ches. VA

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical DOWN hole	6	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: NONE

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

clearing AREA for 6 Direct Push Technology soil sampling, 3 will be done in AREA 21 AND 3 will be in AREA 2.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	10			
UXO Tech. II	2018-316	10			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)		10			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26		10			

5. Operational Remarks:

USED MK-26 To clear clean areas/down hole at 3 different locations at site 21 and 3 different locations at site 2. Depth of sampling was 16'–18' depths.

6. Signature / Date:

SUXO / Project Manager

Date: 11/8/04

DAILY OPERATIONS SUMMARY

DATE: 11/9/04 PAGE ___ OF ___ PAGES

SITE / LOCATION: ST. Juliens Creek Annex Ches VA.

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	5	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: NONE

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

set up for 5 sampling areas at site 2 using The (DPT) Direct Push Technology.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	7			
UXO Tech. II	2018-316	9.5			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. **Daily Equipment:**

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)					
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26		9.5			

5. **Operational Remarks:**

DID 2 DPT sampling holes down to 16'-18' depth. Geophisical personel decon their equipment. Nelson had a medical appointment at lunch time. OK w/CH2m HILL did it during decon time. Returned and completed 3 more DPT samples at site 2.

6. **Signature / Date:**

Nelson Figueroa
SUXO / Project Manager

Date: 11 / 9 / 04

DAILY OPERATIONS SUMMARY

DATE: 11/10/04 PAGE ___ OF ___ PAGES

SITE / LOCATION: St. Juliens Creek Annex Ches. Va

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	1 m.w. 6 DPT samples	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: None

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Monitor wells Drillers would be on site along with DPT sampling Team. Clear areas + check Down holes.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	10			
UXO Tech. II	2018-316	11			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)		10			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26		10			

5. Operational Remarks:

Phil was in early (1hr) To [redacted] LET - help Geoprobe Team set up Their Track machine close To The Edge OF The woods. completed [redacted] monitoring wells w/ Drillers and 6 DPT samples.

6. Signature / Date:

SUXO / Project Manager

Date: 11/10/09

DAILY OPERATIONS SUMMARY

DATE: 11/11/04 PAGE ___ OF ___ PAGES

SITE / LOCATION: ST. Juliens Creek Ches. Va

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	3 mw 5 DPT samples	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: NONE

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
set up for Drilling Monitoring Wells + DPT samples.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	10			
UXO Tech. II	2018-316	10			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)	2018-316	10			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK 26	2018-316	10			

5. Operational Remarks:
completed 3 monitoring wells w/drillers to a depth of 16'-18' and 5 DPT samples at site 2. The M.W. are in site 21.

6. Signature / Date:

SUXO / Project Manager

Date: 11/11/04

DAILY OPERATIONS SUMMARY

DATE: 11 / 12 / 04 PAGE ___ OF ___ PAGES

SITE / LOCATION: ST. Julien Creek Annex Ches. Va.

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	7 DPT samples	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: none

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
set up Equipment for M.W. Drilling + DPT samples.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	7			
UXO Tech. II	2018-316	7			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. **Daily Equipment:**

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)	2018-316	7			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26	2018-316	7			

5. **Operational Remarks:**

The DPT sample Team Finished all sampling AT 2Pm AND DRILLERS WORKED ON The 65' Deep monitoring well Till 1Pm before ReTurning back To North Carolina. Completed 7 DPT samples.

6. **Signature / Date:**

[signature]
SUXO / Project Manager

Date: 11/12/04

DAILY OPERATIONS SUMMARY

DATE: 11 / 15 / 04 PAGE ___ OF ___ PAGES

SITE / LOCATION: St. Juliens Creek Annex Ches. Va.

1. WORK SUMMARY

a. Work Accomplished:	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	0	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: None

c. Inspection Results:	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Continue To Drill Down To 65' Deep on The Deep monitoring well.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	9			
UXO Tech. II	2018-316	9			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. **Daily Equipment:**

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)	2018-316	9			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26	2018-316	9			

5. **Operational Remarks:**

Still working on 65' deep monitoring well. Probably will not finish till Tuesday 1PM. Started work at 0900 due to well drillers drove back from North Carolina this morning.

6. **Signature / Date:**

Nelson Figueroa
SUXO / Project Manager

Date: 11/15/04

DAILY OPERATIONS SUMMARY

DATE: 11/16/04 PAGE ___ OF ___ PAGES

SITE / LOCATION: St. Juliens Creek Annex Ches VA

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	2 mw	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: none

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Complete 65' Deep Monitoring Well a Try To do one more at site 21.

4. **Utilization**

a. **Daily Man-hours:**

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	10			
UXO Tech. II	2018-316	10			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. **PAGE ___ of ___ PAGES**

b. **Daily Equipment:**

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)	2018-316	10			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26	2018-316	10			

5. **Operational Remarks:**
Completed 65' monitoring well at site 2 and one 16' monitoring well at site 21.

6. **Signature / Date:**

Nelson Engine
SUXO / Project Manager

Date: 11/16/04

DAILY OPERATIONS SUMMARY

DATE: 11/17/04 PAGE ___ OF ___ PAGES

SITE / LOCATION: ST. Juliens Creek Annex Ches. Va.

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	3 mw	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: MK 26 was starting to have an intermitten problem at the connector on the control unit. Was able to make it work & still use it.

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
Try to complete 4 monitoring wells at site 2.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	11			
UXO Tech. II	2018-316	11			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)	2018-316	11			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26	2018-316	11			

5. Operational Remarks:

was only able To complete 3 monitoring Wells + start The Last one. Will Return Tomorrow + Finish it in The morning.

6. Signature / Date:

Nelson Tejada
SUXO / Project Manager

Date: 11 / 17 / 04

DAILY OPERATIONS SUMMARY

DATE: 11 / 14 / 04 PAGE ___ OF ___ PAGES

SITE / LOCATION: ST. Juliens Creek Annex Ches. Va.

1. WORK SUMMARY

a. Work Accomplished:

	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical Down hole	1 mw	
(5) Intrusive		
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: NONE

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:

Finish Last well AT site 2.

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Tech. III	2018-316	3			
UXO Tech. II	2018-316	3			
UXO Tech. I					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

Daily Operations Summary Con't. PAGE ___ of ___ PAGES

b. **Daily Equipment:**

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt					
Geophysical					
Truck (Heavy)					
Truck (Light)	2018-316	3			
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car					
GPS					
Weedeater					
Chainsaw					
Chipper					
MK-26	2018-316	3			

5. **Operational Remarks:**

Completed last monitoring well at site 2. CH2MHill thanked us for job well done. Phil will return home. I will package equipment for shipment back to USAE & De mob 11/18/04.

6. **Signature / Date:**

Nelson Figueroa
SUXO / Project Manager

Date: 11/18/04

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 11 / 08 / 04 TIME: 0700 (AM) PM

LOCATION/SITE: St. Juliens Creek Annex, VA

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
✓	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Nelson Figenc	Nelson Figenc	USAE
Rebekah IVES	Rebekah Ives	CH2M HILL
Katie Lynch	Katie L	CH2M Hill
Phil Bavocius	Phil Bavocius	USAE
Robert Stewart	Robert Stewart	Columbia Tech
Morgan Aycock	Morgan Aycock	Columbia Tech
Sonnie Butler	Sonnie Butler	CH2M Hill

Appendix C
Analytical Results

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	02SS01	02SS02	17SS01	SJS02-SS01	SJS02-SS02	SJS02-SS03	SJS02-SS04	SJS02-SS05		SJS02-SS06	SJS02-SS07	SJS02-SS08	SJS02-SS09	SJS02-SS10	SJS02-SS11	SJS02-SS12
Sample ID	02SS01	02SS02	17SS01	SJS02-SS01-000	SJS02-SS02-000	SJS02-SS03-000	SJS02-SS04-000	SJS02-SS05-000	SJS02-SS05-000P*	SJS02-SS06-000	SJS02-SS07-000	SJS02-SS08-000	SJS02-SS09-000	SJS02-SS10-000	SJS02-SS11-000	SJS02-SS12-000
Sample Date	04/03/96	04/03/96	04/04/96	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99
Chemical Name																
Volatile Organic Compounds (µg/kg)																
1,1,1-Trichloroethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
1,1,2,2-Tetrachloroethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
1,1-Dichloroethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
1,1-Dichloroethene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
1,2-Dichloroethene (total)	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
1,2-Dichloropropane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	200	12 U
2-Hexanone	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
4-Methyl-2-pentanone	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
Acetone	12 U	3 BJ	5 BJ	11 U	11 B	3 B	9 B	11 U	9 B	12 B	10 U	7 B	7 J	35	23	12 U
Benzene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Bromodichloromethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Bromoform	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Bromomethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Carbon disulfide	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Carbon tetrachloride	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Chlorobenzene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
Chloroethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Chloroform	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Chloromethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	7 BJ	5 BJ	12 B	5 B	26 B	17 B	25 B	24 B	5 B	23 B	39 B	65 B	33 B	20 B	8 B	5 B
Styrene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
Tetrachloroethene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
Toluene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	1 J	10 U	2 J	11 U	10 U	10 U	12 U
Trichloroethene	12 U	4 J	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Xylene, total	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 UJ	11 U	10 U	10 U	12 U
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	12 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 UJ	10 U	10 U	11 U	11 U	10 U	10 U	12 U
Semi-volatile Organic Compounds (µg/kg)																
1,2,4-Trichlorobenzene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SS13	SJS02-SS14	SJS02-SS15	SJS02-SS16		SJS02-SS17	SJS02-SS18	SJS02-SS19	SJS02-SS20	SJS17-SO01	SJS17-SO02		SJS17-SO03	SJS17-SO04
Sample ID	SJS02-SS13-000	SJS02-SS14-000	SJS02-SS15-000	SJS02-SS16-000	SJS02-SS16-000P*	SJS02-SS17-000	SJS02-SS18-000	SJS02-SS19-000	SJS02-SS20-000	SJS17-SS01-000	SJS17-SS02-000	SJS17-SS02-000P*	SJS17-SS03-000	SJS17-SS04-000
Sample Date	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	02/14/01	02/14/01	02/14/01	02/14/01	02/14/01
Chemical Name														
Volatile Organic Compounds (µg/kg)														
1,1,1-Trichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
1,1,2,2-Tetrachloroethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
1,1,2-Trichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
1,1-Dichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
1,1-Dichloroethene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
1,2-Dichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
1,2-Dichloroethene (total)	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	NA	NA	NA	NA	NA
1,2-Dichloropropane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
2-Butanone	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
2-Hexanone	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
4-Methyl-2-pentanone	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Acetone	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	7 B	5.5 B	6.8 B	8 B	7.9 B
Benzene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Bromodichloromethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Bromoform	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Bromomethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Carbon disulfide	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Carbon tetrachloride	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Chlorobenzene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Chloroethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Chloroform	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Chloromethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
Dibromochloromethane	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
Ethylbenzene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
Methylene chloride	8 B	7 B	2 B	7 B	11 B	8 B	7 B	6 B	5 B	1.6 J	2.8 J	3.9 B	3.6 B	3.3 B
Styrene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Tetrachloroethene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Toluene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Trichloroethene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
Vinyl chloride	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Xylene, total	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
cis-1,3-Dichloropropene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	12 U	13 U	13 U	14 U	15 U
trans-1,3-Dichloropropene	11 U	12 U	12 U	12 U	12 U	12 U	11 U	11 U	10 U	12 U	13 U	13 U	14 U	15 U
Semi-volatile Organic Compounds (µg/kg)														
1,2,4-Trichlorobenzene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	02SS01	02SS02	17SS01	SJS02-SS01	SJS02-SS02	SJS02-SS03	SJS02-SS04	SJS02-SS05		SJS02-SS06	SJS02-SS07	SJS02-SS08	SJS02-SS09	SJS02-SS10	SJS02-SS11	SJS02-SS12
Sample ID	02SS01	02SS02	17SS01	SJS02-SS01-000	SJS02-SS02-000	SJS02-SS03-000	SJS02-SS04-000	SJS02-SS05-000	SJS02-SS05-000P*	SJS02-SS06-000	SJS02-SS07-000	SJS02-SS08-000	SJS02-SS09-000	SJS02-SS10-000	SJS02-SS11-000	SJS02-SS12-000
Sample Date	04/03/96	04/03/96	04/04/96	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99
Chemical Name																
1,2-Dichlorobenzene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
1,3-Dichlorobenzene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
1,4-Dichlorobenzene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2,2'-Oxybis(1-chloropropane)	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2,4,5-Trichlorophenol	9,700 U	830 U	8,900 U	920 U	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
2,4,6-Trichlorophenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2,4-Dichlorophenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2,4-Dimethylphenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2,4-Dinitrophenol	9,700 U	830 U	8,900 U	920 U	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
2,4-Dinitrotoluene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2,6-Dichlorophenol	4,000 U	340 U	NA													
2,6-Dinitrotoluene	NA	NA	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2-Chloronaphthalene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2-Chlorophenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2-Methylnaphthalene	4,000 U	340 U	3,700 U	370 U	350 U	310 J	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2-Methylphenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
2-Nitroaniline	4,000 U	830 U	8,900 U	920 U	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
2-Nitrophenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
3,3'-Dichlorobenzidine	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
3-Nitroaniline	9,700 U	830 U	8,900 U	920 UJ	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
4,6-Dinitro-2-methylphenol	9,700 U	830 U	8,900 U	920 U	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
4-Bromophenyl-phenylether	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
4-Chloro-3-methylphenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
4-Chloroaniline	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
4-Chlorophenyl-phenylether	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
4-Methylphenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
4-Nitroaniline	9,700 U	830 U	8,900 U	920 U	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
4-Nitrophenol	9,700 U	830 U	8,900 U	920 U	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
Acenaphthene	4,000 U	340 U	3,700 U	370 U	100 J	170 J	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Acenaphthylene	4,000 U	340 U	3,700 U	370 U	350 U	820 J	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	37 J	89 J	350 UJ	76 J
Anthracene	4,000 U	340 U	3,700 U	370 U	150 J	590 J	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Benzo(a)anthracene	4,000 U	340 U	520 J	370 U	430	2,300	290 J	180 J	220 J	1,600 U	390 J	1,700 U	140 J	120 J	350 UJ	160 J
Benzo(a)pyrene	4,000 U	340 U	470 J	370 U	360	1,400 J	370 J	160 J	190 J	1,600 U	340 J	1,700 U	130 J	130 J	350 UJ	270 J
Benzo(b)fluoranthene	4,000 U	55 J	740 J	370 U	580	1,700 J	660 J	220 J	270 J	1,600 U	440 J	1,700 U	280 J	240 J	350 UJ	310 J
Benzo(g,h,i)perylene	4,000 U	40 J	3,700 U	370 U	160 J	890 J	280 J	78 J	1,700 U	1,600 U	1,600 U	1,700 U	76 J	160 J	350 UJ	250 J
Benzo(k)fluoranthene	4,000 U	340 U	3,700 U	370 U	290 J	1,100 J	320 J	150 J	1,700 U	1,600 U	270 J	1,700 U	87 J	120 J	350 UJ	89 J
Butylbenzylphthalate	4,000 U	250 J	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	280 J	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Carbazole	4,000 U	340 U	3,700 U	370 U	120 J	300 J	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Chrysene	4,000 U	340 U	430 J	370 U	470	2,700	400 J	160 J	210 J	1,600 U	370 J	1,700 U	150 J	150 J	350 UJ	170 J
Di-n-butylphthalate	4,000 U	340 U	3,700 U	370 U	350 U	210 J	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	120 J	47 J
Di-n-octylphthalate	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 UJ	350 UJ	410 UJ
Dibenz(a,h)anthracene	4,000 U	340 U	3,700 U	370 U	54 J	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 UJ	350 UJ	410 UJ
Dibenzofuran	4,000 U	340 U	3,700 U	370 U	70 J	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Diethylphthalate	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Dimethyl phthalate	4,000 U	340 U	NA	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Fluoranthene	4,000 U	53 J	1,200 J	370 U	910	5,000	460 J	250 J	340 J	1,600 U	650 J	1,700 U	200 J	140 J	350 UJ	130 J
Fluorene	4,000 U	340 U	3,700 U	370 U	110 J	380 J	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Hexachlorobenzene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Hexachlorobutadiene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Hexachlorocyclopentadiene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Hexachloroethane	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Indeno(1,2,3-cd)pyrene	4,000 U	340 U	3,700 U	370 U	180 J	800 J	310 J	86 J	1,700 U	1,600 U	210 J	1,700 U	88 J	110 J	350 UJ	200 J
Isophorone	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Naphthalene	4,000 U	340 U	3,700 U	370 U	52 J	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SS13	SJS02-SS14	SJS02-SS15	SJS02-SS16		SJS02-SS17	SJS02-SS18	SJS02-SS19	SJS02-SS20	SJS17-SO01	SJS17-SO02		SJS17-SO03	SJS17-SO04
Sample ID	SJS02-SS13-000	SJS02-SS14-000	SJS02-SS15-000	SJS02-SS16-000	SJS02-SS16-000P*	SJS02-SS17-000	SJS02-SS18-000	SJS02-SS19-000	SJS02-SS20-000	SJS17-SS01-000	SJS17-SS02-000	SJS17-SS02-000P*	SJS17-SS03-000	SJS17-SS04-000
Sample Date	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	02/14/01	02/14/01	02/14/01	02/14/01	02/14/01
Chemical Name														
1,2-Dichlorobenzene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
1,3-Dichlorobenzene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
1,4-Dichlorobenzene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2,2'-Oxybis(1-chloropropane)	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2,4,5-Trichlorophenol	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	400 U	440 U	420 U	460 U	510 U
2,4,6-Trichlorophenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2,4-Dichlorophenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2,4-Dimethylphenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2,4-Dinitrophenol	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
2,4-Dinitrotoluene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2,6-Dichlorophenol														
2,6-Dinitrotoluene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2-Chloronaphthalene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2-Chlorophenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2-Methylnaphthalene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	35 J	35 J	37 J	210 J
2-Methylphenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
2-Nitroaniline	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
2-Nitrophenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
3,3'-Dichlorobenzidine	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	1,900 U	2,100 U	2,000 U	2,200 UJ	2,500 UJ
3-Nitroaniline	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
4,6-Dinitro-2-methylphenol	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
4-Bromophenyl-phenylether	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
4-Chloro-3-methylphenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
4-Chloroaniline	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
4-Chlorophenyl-phenylether	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
4-Methylphenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
4-Nitroaniline	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
4-Nitrophenol	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
Acenaphthene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	63 J	17 J	85 J	64 J	370
Acenaphthylene	130 J	390 UJ	110 J	420 UJ	410 UJ	390 UJ	78 J	380 UJ	74 J	140	120	110 J	600	110
Anthracene	92 J	390 UJ	43 J	420 UJ	410 UJ	65 J	360 UJ	380 UJ	52 J	160	98	190	320	790
Benzo(a)anthracene	440 J	390 UJ	200 J	140 J	91 J	530 J	220 J	380 UJ	360 J	690	630	720	1,500	2,000
Benzo(a)pyrene	450 J	390 UJ	270 J	140 J	99 J	500 J	280 J	380 UJ	380 J	680	600	640	1,600	2,100
Benzo(b)fluoranthene	670 J	390 UJ	350 J	210 J	150 J	570 J	400 J	57 J	590 J	710	590	550	2,000	1,400
Benzo(g,h,i)perylene	400 J	390 UJ	250 J	120 J	91 J	330 J	270 J	380 UJ	340 J	650	530	590	1,600	1,500
Benzo(k)fluoranthene	220 J	390 UJ	110 J	62 J	45 J	170 J	140 J	380 UJ	200 J	620	440	490	1,600	1,300
Butylbenzylphthalate	380 UJ	390 UJ	400 UJ	55 J	57 J	390 UJ	360 UJ	380 UJ	410 UJ	65 J	24 J	33 J	430 J	510 UJ
Carbazole	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	79 J	50 J	63 J	130 J	350 J
Chrysene	420 J	390 UJ	220 J	130 J	93 J	550 J	210 J	380 UJ	390 J	770	700	840	1,900	2,200
Di-n-butylphthalate	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	510 J	41 J	440 U	420 U	70 J	84 J
Di-n-octylphthalate	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 UJ	440 UJ	420 UJ	460 UJ	510 U
Dibenz(a,h)anthracene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	190	180	170	400	440
Dibenzofuran	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	25 J	26 J	33 J	44 J	220 J
Diethylphthalate	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Dimethyl phthalate	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Fluoranthene	530 J	390 UJ	250 J	160 J	90 J	920 J	230 J	45 J	510 J	1,400	1,300	1,700	2,700	4,400
Fluorene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	48 J	21 J	72 J	62 J	380 L
Hexachlorobenzene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Hexachlorobutadiene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Hexachlorocyclopentadiene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
Hexachloroethane	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Indeno(1,2,3-cd)pyrene	320 J	390 UJ	200 J	96 J	67 J	250 J	210 J	380 UJ	290 J	540	440	460	1,500	1,300
Isophorone	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Naphthalene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	14 J	42 J	36 J	53 J	250

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	02SS01	02SS02	17SS01	SJS02-SS01	SJS02-SS02	SJS02-SS03	SJS02-SS04	SJS02-SS05		SJS02-SS06	SJS02-SS07	SJS02-SS08	SJS02-SS09	SJS02-SS10	SJS02-SS11	SJS02-SS12
Sample ID	02SS01	02SS02	17SS01	SJS02-SS01-000	SJS02-SS02-000	SJS02-SS03-000	SJS02-SS04-000	SJS02-SS05-000	SJS02-SS05-000P*	SJS02-SS06-000	SJS02-SS07-000	SJS02-SS08-000	SJS02-SS09-000	SJS02-SS10-000	SJS02-SS11-000	SJS02-SS12-000
Sample Date	04/03/96	04/03/96	04/04/96	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99
Chemical Name																
Nitrobenzene	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Pentachlorophenol	9,700 U	830 U	8,900 U	920 U	890 U	4,300 U	4,300 U	1,800 U	4,400 U	4,100 U	4,200 U	4,300 U	900 U	830 U	870 UJ	1,000 UJ
Phenanthrene	4,000 U	340 U	430 J	370 U	850	4,400	1,700 U	94 J	1,700 U	1,600 U	310 J	1,700 U	53 J	41 J	350 UJ	56 J
Phenol	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Pyrene	4,000 U	43 J	710 J	370 U	350 U	7,200	550 J	260 J	320 J	1,600 U	590 J	220 J	240 J	230 J	350 UJ	210 J
bis(2-Chloroethoxy)methane	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
bis(2-Chloroethyl)ether	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
bis(2-Ethylhexyl)phthalate	4,000 U	560	620 J	49 B	140 B	1,700 U	1,700 U	72 B	1,700 U	570 B	1,600 U	1,700 U	54 J	35	350 UJ	410 UJ
n-Nitroso-di-n-propylamine	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
n-Nitrosodiphenylamine	4,000 U	340 U	3,700 U	370 U	350 U	1,700 U	1,700 U	700 U	1,700 U	1,600 U	1,600 U	1,700 U	360 U	330 U	350 UJ	410 UJ
Pesticide/Polychlorinated Biphenyls (µg/kg)																
4,4'-DDD	55	9.5 P	84 PD	19	2.8 J	84 J	30 J	13 J	10	8.9 J	24	5.7 J	4,200	7 J	1.60 J	4.10 UJ
4,4'-DDE	59	20	210 PD	82 J	19	260 J	210	110	94	3.3 U	120	25	460	37	1.60 J	1,400 J
4,4'-DDT	95 E	26 P	290 PD	54	9.2 J	NA	170 J	30	27	12 J	23	13 J	900	79	3 J	2,100 J
Aldrin	2.1 U	1.8 U	1.9 U	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2 UJ
Aroclor-1016	41 U	35 U	37 U	74 U	36 U	170 U	170 U	170 U	70 U	33 U	160 U	35 U	350 U	33 U	35 UJ	41 UJ
Aroclor-1221	82 U	71 U	73 U	150 U	72 U	350 U	350 U	350 U	140 U	66 U	330 U	71 U	720 U	67 U	69 UJ	82 UJ
Aroclor-1232	41 U	35 U	37 U	74 U	36 U	170 U	170 U	170 U	70 U	33 U	160 U	35 U	350 U	33 U	35 UJ	41 UJ
Aroclor-1242	41 U	35 U	37 U	74 U	36 U	170 U	170 U	170 U	70 U	33 U	160 U	35 U	350 U	33 U	35 UJ	41 UJ
Aroclor-1248	41 U	35 U	580 PD	74 U	36 U	170 U	170 U	170 U	70 U	33 U	160 U	35 U	350 U	33 U	35 UJ	41 UJ
Aroclor-1254	41	71 P	37 U	74 U	36 U	170 U	170 U	170 U	70 U	33 U	160 U	35 U	350 U	33 U	35 UJ	41 UJ
Aroclor-1260	41 U	35 U	1.9 U	74 U	15 J	110 J	110 J	170 U	70 U	54 J	160 U	17 J	350 U	33 U	35 UJ	41 UJ
Dieldrin	4.1 U	3.5 U	1.9 U	7.4 U	3.8 J	17 U	17 U	17 U	7 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ
Endosulfan I	2.1 U	1.8 U	3.7 U	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2 UJ
Endosulfan II	4.1 U	3.5 U	3.7 U	7.4 U	3.6 U	17 U	17 U	17 U	7 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ
Endosulfan sulfate	4.1 U	3.5 U	3.7 U	7.4 U	3.6 U	17 U	17 U	17 U	7 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ
Endrin	4.1 U	3.6 P	3.7 U	7.4 U	3.6 U	17 U	17 U	17 U	7 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ
Endrin aldehyde	4.1 U	3.5 U	3.7 U	7.4 U	3.6 U	17 U	17 U	17 U	7 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ
Endrin ketone	4.1 U	3.5 U	3.7 U	7.4 U	3.6 U	17 U	17 U	17 U	7 U	3.3 U	16 U	3.5 U	35 U	3.3 U	3.5 UJ	4.10 UJ
Heptachlor	2.1 U	1.8 U	1.9 U	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2.20 J
Heptachlor epoxide	2.1 U	1.8 U	1.9 U	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2 UJ
Methoxychlor	21 U	18 U	19 U	38 U	18 U	89 U	88 U	89 U	36 U	17 U	84 U	18 U	180 U	17 U	17 UJ	20 UJ
Toxaphene	210 U	180 U	190 U	380 U	180 U	890 U	880 U	890 U	360 U	170 U	840 U	180 U	1,800 U	170 U	170 UJ	200 UJ
alpha-BHC	2.1 U	1.8 U	1.9 U	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2 UJ
alpha-Chlordane	4.3 PE	2.8 P	4.1 P	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	50 J
beta-BHC	2.1 U	1.8 U	1.9 U	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2 UJ
delta-BHC	2.1 U	1.8 U	27	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2 UJ
gamma-BHC (Lindane)	2.1 U	1.8 U	1.9 U	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	2 UJ
gamma-Chlordane	3.4 P	4.1 P	4.7 P	3.8 U	1.8 U	8.9 U	8.8 U	8.9 U	3.6 U	1.7 U	8.4 U	1.8 U	18 U	1.7 U	1.70 UJ	29 J
Explosives (µg/kg)																
1,3,5-Trinitrobenzene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	250 U	250 U
1,3-Dinitrobenzene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	250 U	250 U
2,4,6-Trinitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	250 U	250 U
2,4-Dinitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U
2,6-Dinitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U
2-Amino-4,6-dinitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	250 U	250 U
2-Nitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U
3-Nitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U
4-Amino-2,6-dinitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	250 U	250 U
4-Nitrotoluene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U
HMX	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U
Nitrobenzene	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SS13	SJS02-SS14	SJS02-SS15	SJS02-SS16		SJS02-SS17	SJS02-SS18	SJS02-SS19	SJS02-SS20	SJS17-SO01	SJS17-SO02		SJS17-SO03	SJS17-SO04
Sample ID	SJS02-SS13-000	SJS02-SS14-000	SJS02-SS15-000	SJS02-SS16-000	SJS02-SS16-000P*	SJS02-SS17-000	SJS02-SS18-000	SJS02-SS19-000	SJS02-SS20-000	SJS17-SS01-000	SJS17-SS02-000	SJS17-SS02-000P*	SJS17-SS03-000	SJS17-SS04-000
Sample Date	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	02/14/01	02/14/01	02/14/01	02/14/01	02/14/01
Chemical Name														
Nitrobenzene	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Pentachlorophenol	950 UJ	970 UJ	1,000 UJ	1,000 UJ	1,000 UJ	980 UJ	900 UJ	950 UJ	1,000 UJ	1,900 U	2,100 U	2,000 U	2,200 U	2,500 U
Phenanthrene	160 J	390 UJ	110 J	87 J	410 UJ	610 J	45 J	380 UJ	180 J	650	340	1,100	620	4,000
Phenol	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Pyrene	100 J	390 UJ	420 J	170 J	120 J	1,200 J	460 J	48 J	740 J	1,300	1,200	1,700	2,900	4,600
bis(2-Chloroethoxy)methane	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
bis(2-Chloroethyl)ether	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
bis(2-Ethylhexyl)phthalate	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	39 J	380 UJ	70 J	120 J	42 J	56 J	1,700 J	55 J
n-Nitroso-di-n-propylamine	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
n-Nitrosodiphenylamine	380 UJ	390 UJ	400 UJ	420 UJ	410 UJ	390 UJ	360 UJ	380 UJ	410 UJ	400 U	440 U	420 U	460 U	510 U
Pesticide/Polychlorinated Biphenyls (µg/kg)														
4,4'-DDD	230 J	3.90 UJ	5.5 J	4.10 UJ	3.20 J	20 J	30 J	3.80 UJ	4.10 UJ	61 J	120	110	710	140
4,4'-DDE	1,200 J	12 J	120 J	42 J	37 J	110 J	510 J	560 J	7,200 J	1,300	160	86	210	1,100
4,4'-DDT	2,100 J	4.90 J	110 J	34 J	22 J	49 J	150 J	230 J	12,000 J	1,300	320	180	300	1,200
Aldrin	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
Aroclor-1016	38 UJ	39 UJ	40 UJ	41 UJ	41 UJ	39 UJ	36 UJ	38 UJ	41 UJ	120 U	44 U	42 U	230 U	100 U
Aroclor-1221	75 UJ	77 UJ	80 UJ	83 UJ	82 UJ	79 UJ	71 UJ	76 UJ	82 UJ	240 U	89 U	85 U	470 U	210 U
Aroclor-1232	38 UJ	39 UJ	40 UJ	41 UJ	41 UJ	39 UJ	36 UJ	38 UJ	41 UJ	120 U	44 U	42 U	230 U	100 U
Aroclor-1242	38 UJ	39 UJ	40 UJ	41 UJ	41 UJ	39 UJ	36 UJ	38 UJ	41 UJ	120 U	44 U	42 U	230 U	100 U
Aroclor-1248	38 UJ	39 UJ	40 UJ	41 UJ	41 UJ	39 UJ	36 UJ	38 UJ	41 UJ	120 U	44 U	42 U	230 U	100 U
Aroclor-1254	38 UJ	39 UJ	40 UJ	41 UJ	41 UJ	39 UJ	36 UJ	38 UJ	41 UJ	120 U	44 U	42 U	230 U	100 U
Aroclor-1260	38 UJ	39 UJ	40 UJ	41 UJ	41 UJ	39 UJ	36 UJ	38 UJ	41 UJ	150	44 U	42 U	2,700 C	110
Dieldrin	3.80 UJ	3.90 UJ	4 UJ	4.10 UJ	4.10 UJ	0.790 J	1.10 J	3.80 UJ	4.10 UJ	12 U	4.4 U	4.2 U	23 U	10 U
Endosulfan I	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
Endosulfan II	3.80 UJ	3.90 UJ	4 UJ	4.10 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	8 J	4.4 U	4.2 U	53 J	7.9 J
Endosulfan sulfate	3.80 UJ	3.90 UJ	4 UJ	4.10 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	12 U	4.4 U	4.2 U	23 U	10 U
Endrin	3.80 UJ	3.90 UJ	4 UJ	4.10 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	12 U	4.4 U	4.2 U	24 J	10 U
Endrin aldehyde	3.80 UJ	3.90 UJ	4 UJ	4.10 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	14	2.2 J	2.2 J	73 J	10 U
Endrin ketone	3.80 UJ	3.90 UJ	4 UJ	4.10 UJ	4.10 UJ	3.90 UJ	3.60 UJ	3.80 UJ	4.10 UJ	12 U	4.4 U	4.2 U	23 U	10 U
Heptachlor	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
Heptachlor epoxide	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
Methoxychlor	19 UJ	19 UJ	20 UJ	21 UJ	20 UJ	20 UJ	18 UJ	19 UJ	20 UJ	61 U	22 U	21 U	120 U	52 U
Toxaphene	190 UJ	190 UJ	200 UJ	210 UJ	200 UJ	200 UJ	180 UJ	190 UJ	200 UJ	610 U	220 U	210 U	1,200 U	520 U
alpha-BHC	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
alpha-Chlordane	5 J	1.90 UJ	0.810 J	1.80 J	1.60 J	2.40 J	6.60 J	1.90 UJ	13 J	6.1 U	2.2 U	1.1 J	12 U	5.2 U
beta-BHC	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
delta-BHC	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
gamma-BHC (Lindane)	1.90 UJ	1.90 UJ	2 UJ	2.10 UJ	2 UJ	2 UJ	1.80 UJ	1.90 UJ	2 UJ	6.1 U	2.2 U	2.1 U	12 U	5.2 U
gamma-Chlordane	1.90 UJ	1.90 UJ	2 UJ	2 J	1.80 J	2.80 J	7.90 J	1.90 UJ	8.90 J	6.1 U	2.2 U	2.1 U	6.3 J	5.2 U
Explosives (µg/kg)														
1,3,5-Trinitrobenzene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA
2-Nitrotoluene	477 U	500 U	500 U	500 U	477 U	500 U	500 U	477 U	500 U	NA	NA	NA	NA	NA
3-Nitrotoluene	477 U	500 U	500 U	500 U	477 U	500 U	500 U	477 U	500 U	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA
4-Nitrotoluene	477 U	500 U	500 U	500 U	477 U	500 U	500 U	477 U	500 U	NA	NA	NA	NA	NA
HMX	477 U	500 U	500 U	500 U	477 U	500 U	500 U	477 U	500 U	NA	NA	NA	NA	NA
Nitrobenzene	238 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U	250 U	NA	NA	NA	NA	NA

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	02SS01	02SS02	17SS01	SJS02-SS01	SJS02-SS02	SJS02-SS03	SJS02-SS04	SJS02-SS05		SJS02-SS06	SJS02-SS07	SJS02-SS08	SJS02-SS09	SJS02-SS10	SJS02-SS11	SJS02-SS12
Sample ID	02SS01	02SS02	17SS01	SJS02-SS01-000	SJS02-SS02-000	SJS02-SS03-000	SJS02-SS04-000	SJS02-SS05-000	SJS02-SS05-000P*	SJS02-SS06-000	SJS02-SS07-000	SJS02-SS08-000	SJS02-SS09-000	SJS02-SS10-000	SJS02-SS11-000	SJS02-SS12-000
Sample Date	04/03/96	04/03/96	04/04/96	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99
Chemical Name																
RDX	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U
Tetryl	48 U	40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U
Total Metals (mg/kg)																
Aluminum	5,860	20,700	2,910	5,120	8,810	6,590	3,470	3,080	3,110	18,600	4,350	4,920	6,160	2,680	1,960	4,400
Antimony	9 U	12.8	8.4 U	0.38 U	0.35 U	7 J	0.41 B	0.48 B	0.5 B	4.1 B	0.9 B	0.4 U	NA	NA	0.540 U	0.520 U
Arsenic	3.8	3.6	2.4	3.4	2.2	12	7.7	1.9 J	2.3	0.52 U	3.6	5.1	5.3 K	2.5 K	1.40 J	3
Barium	84.8	241	58.1	14.6 J	59.6	306	37.4	26.4 J	27.2 J	245	47.3	40.8	35.9 J	22.5 J	9.80 J	83.6
Beryllium	0.2 U	11.5	0.23 B	0.19 U	0.23 J	2.5	0.17 U	0.18 U	0.2 U	13.4	0.19 U	0.2 U	0.34 J	0.34 J	0.170 J	0.200 J
Cadmium	0.4 B	2.1	7.3	0.1 U	0.25 J	0.1 U	0.68 J	0.23 J	0.27 J	0.65 J	0.29 J	0.33 J	0.09 U	0.15 B	0.200 J	0.680 J
Calcium	8,650	7,620	2,340	541 J	1,060	2,450	1,800	1,220	1,310	8,980	4,730	3,670	646 J	702 J	2,270	479 J
Chromium	10.6	225	29.9	10.4	10.7	232	12.1	13.5	11.4	246	10.8	12.8	23.2	9.1	2.5	13.7
Cobalt	1.8 B	49	2.9 B	1.7 J	1.41 U	20.4	1.35 U	1.43 U	2.1 J	62.6	1.52 U	2.3 J	1.5 J	2.3 J	0.570 J	1.5 J
Copper	40.8	3,450	72.3	5.1	8.4	421	30.4	27.4	27.9	4,260	46.9	64.9	25.6	54.6	5.70	28.5
Cyanide	0.61 U	0.51 U	0.55 U	0.53 U	0.51 U	0.85 J	0.52 U	0.53 U	0.53 U	0.5 U	0.51 U	0.52 U	0.53 U	0.5 U	0.176 U	0.208 U
Iron	5,430	101,000	10,000	6,120	2,560	106,000	5,460	5,690	5,850	106,000	6,170	7,630	7,280	6,060	2,600	4,000
Lead	137	1,830	211	8.8	23.8	450	82.6	96	96.3	2,370	97.8	87.1	49.3	84.6	17.9	305
Magnesium	706 B	2,300	962	496 J	478 J	869 J	433 J	459 J	520 J	2,570	719 J	841 J	734 J	470 J	331 J	229 J
Manganese	48.8	417	138	18.1	27.2	688	49.8	54.6	59.6	470	50.3	77.9	61.8 K	42.6 K	53.4	36.3
Mercury	2.7	0.05 B	0.11	0.07 J	0.23	0.24	0.17	0.42	0.37	0.11	0.56	0.4	0.19 L	0.36 L	0.01000 U	0.0800
Nickel	5.1 B	201	27.4	3.4 J	3.6 J	158	5.6 J	8.4	11.7	246	4.5 J	9	3.5 J	5 J	0.890 J	10.6
Potassium	411 B	2,370	852 B	398 J	562 J	426 J	367 J	360 J	407 J	1,900	417 J	539 J	901 J	391 J	265 J	216 J
Selenium	0.78 U	0.57 U	0.73 U	0.58 U	1	0.58 U	0.51 U	0.54 U	0.59 U	0.52 U	0.57 U	0.6 U	0.55 U	0.55 U	0.520 UL	0.760 L
Silver	0.98 U	0.71 U	0.92 U	0.9 B	0.71 B	2.1 B	0.74 B	0.69 B	0.99 B	2.9 B	0.98 B	1.5 B	0.97 B	0.64 B	0.180 U	0.170 U
Sodium	59.8 B	494 B	57.1 B	42.4 B	76.1 B	166 B	37.9 B	34 B	46.5 B	533 J	82.2 B	54.6 B	82.3 B	59.8 B	29.4 U	28.3 U
Thallium	0.78 U	0.57 U	0.73 U	0.38 U	0.35 U	6.2	0.34 U	0.36 U	0.39 U	5.5	0.38 U	0.4 U	0.76 J	0.94 J	0.640 U	0.610 U
Vanadium	13	38.3	103	15.6	12.5	66.1	20.9	21.1	22.2	40.2	12.9	23.9	19.7	19.9	3.80 J	57.4
Zinc	212	5,940	272	13.2 B	54.6	2,020	127	110	118	7,560	185	147	41.5	164	36.3	273
Wet Chemistry (mg/kg)																
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	1.5	2.3	26.5	11.7	3.7	10.3	153	7	3.1	32	18.6	3.36 UL	2.99 UL
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.35	5.40

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
C - Presence confirmed by GC/MS
K - Reported value may be biased high
L - Reported value may be biased low
P - Difference between the concentration on the two columns is greater than 20%

Table C-1
Surface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SS13	SJS02-SS14	SJS02-SS15	SJS02-SS16		SJS02-SS17	SJS02-SS18	SJS02-SS19	SJS02-SS20	SJS17-SO01	SJS17-SO02		SJS17-SO03	SJS17-SO04
Sample ID	SJS02-SS13-000	SJS02-SS14-000	SJS02-SS15-000	SJS02-SS16-000	SJS02-SS16-000P*	SJS02-SS17-000	SJS02-SS18-000	SJS02-SS19-000	SJS02-SS20-000	SJS17-SS01-000	SJS17-SS02-000	SJS17-SS02-000P*	SJS17-SS03-000	SJS17-SS04-000
Sample Date	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	02/14/01	02/14/01	02/14/01	02/14/01	02/14/01
Chemical Name														
RDX	477 U	500 U	500 U	500 U	477 U	500 U	500 U	477 U	500 U	NA	NA	NA	NA	NA
Tetryl	477 U	500 U	500 U	500 U	477 U	500 U	500 U	477 U	500 U	NA	NA	NA	NA	NA
Total Metals (mg/kg)														
Aluminum	5,960	2,750	6,400	7,500	6,600	4,530	2,300	4,620	8,710	6,210	2,690	3,600	5,320	5,350
Antimony	1.5 J	0.570 U	0.570 U	1.10 J	1.40 J	0.530 J	2 J	0.580 U	2.40 J	1.1 J	0.53 UL	0.51 UL	3.5 J	6.3 J
Arsenic	18	1.30 J	2.40	6.40	5.90	3.10	4.60	2.90	9.70	8.7	9	7.8	10.6	15.5
Barium	101	12 J	50.6	104	109	146	49.8	27.6 J	469	63.1	116	54.4	122	404
Beryllium	0.690 J	0.240 J	0.220 J	0.5 J	0.320 J	0.230 J	0.420 J	0.150 J	0.480 J	0.27 B	0.2 B	0.16 B	0.32 B	0.04 U
Cadmium	0.920 J	0.100 J	0.380 J	0.740 J	0.590 J	1.30	0.630 J	0.180 J	3.10	3.7 B	1.7 B	1.5 B	9.3 K	5.3 K
Calcium	1,880	15,900	1,560	6,090	5,270	2,410	886 J	808 J	1,430	2,460	4,730	2,550	9,630	4,730
Chromium	48.8	6.10	9.20	20.2	17	11.3	28.9	6	139	20.6 K	10.9 K	11.1 K	105 K	45.4 K
Cobalt	4.5 J	2.60 J	0.990 J	5.70 J	3.30 J	1.30 J	2.80 J	0.550 J	9 J	2.8 B	2.4 B	2.7 B	10.2 J	10.2 J
Copper	99.4	5.90	17.4	113	70	56.5	90.7	7.10	87.2	102 J	183 J	96.7 J	569 J	5,030 J
Cyanide	0.203	0.265 U	0.344	0.232 U	0.201 U	0.184 U	0.213 U	0.186 U	0.25 U	NA	NA	NA	NA	NA
Iron	16,200	5,740	3,750	11,700	10,000	5,580	8,910	2,800	15,000	8,850 K	8,210 K	8,980 K	45,200 K	24,800 K
Lead	203	13.1	60.2	282	239	87.9	159	24.4	793	144 K	294 K	331 K	1,270 K	3,130 K
Magnesium	1,040	751 J	563 J	1,630	1,440	980	498 J	274 J	606 J	890 J	376 J	442 J	1,480	1,140 J
Manganese	157	353	45.8	126	107	83.7	91.1	34.8	274	93.3 J	106 J	144 J	307 J	451 J
Mercury	0.110	0.0400	0.0800	0.700	0.710	0.130	0.0800	0.0500	0.240	0.4 L	0.97 L	0.94 L	1.8 L	0.78 L
Nickel	32.6	5 J	7 J	32.7	11	7.20	16.3	3.60 J	31.2	17.1 K	8.3 J	12 K	40.3 K	193 K
Potassium	488 J	498 J	370 J	855 J	831 J	506 J	333 J	236 J	360 J	542 J	196 J	263 J	554 J	362 J
Selenium	0.540 L	0.550 UL	0.900 L	0.580 UL	0.720 L	0.590 L	0.560 UL	0.560 UL	0.75 L	0.65 UL	0.71 UL	0.68 UL	1.2 J	1.7 L
Silver	0.180 U	0.190 U	0.190 U	2.5	3.5	0.150 U	0.190 U	0.190 U	0.200 J	0.51 UL	0.56 UL	0.53 UL	0.59 UL	1.3 J
Sodium	126 J	83.3 J	31.5 U	157 J	92.3 J	54.7 J	58.6 J	31.9 U	147 J	5 J	3.3 U	3.2 U	52.1 J	141 J
Thallium	0.640 U	0.670 U	0.680 U	0.710 U	0.700 U	0.540 U	0.690 U	0.690 U	0.690 U	1.4 U	1.6 U	1.5 U	1.7 U	1.8 U
Vanadium	25.7	7.80 J	23.3	27.5	25.5	18.7	24.7	16.9	138	76.7	19.9	20.7	75.3	1,410
Zinc	626	31.7	76.1	508	257	126	445	45.9	1,020	221 K	389 K	404 K	1,570 K	2,150 K
Wet Chemistry (mg/kg)														
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.6 U	0.66 U	0.63 U	0.7 U	0.77 U
Phosphorus	2.26 UL	3.88 UL	2.73 UL	2.26 UL	3.60 UL	2.40 UL	2.62 UL	2.60 UL	2.39 UL	NA	NA	NA	NA	NA
pH	6.67	7.91	5.74	7.99	7.98	6.49	6.38	6.37	6.03	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
C - Presence confirmed by GC/MS
K - Reported value may be biased high
L - Reported value may be biased low
P - Difference between the concentration on the two columns is greater than 20%

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SB01	SJS02-SB02	SJS02-SB03	SJS02-SB04		SJS02-SB05	SJS02-SB06	SJS02-SB07	SJS02-SB08	SJS02-SB09	SJS02-SB10	SJS02-SB11		SJS02-SB12	SJS02-SB13	SJS02-SB14	SJS02-SB15	SJS02-SB17	SJS02-SB18
Sample ID	SJS02-SB01-003	SJS02-SB02-002	SJS02-SB03-000	SJS02-SB04-004	SJS02-SB04-004P*	SJS02-SB05-002	SJS02-SB06-001	SJS02-SB07-001	SJS02-SB08-001	SJS02-SB09-001	SJS02-SB10-001	SJS02-SB11-001	SJS02-SB11-001P*	SJS02-SB12-001	SJS02-SB13-001	SJS02-SB14-001	SJS02-SB15-001	SJS02-SB17-001	SJS02-SB18-00
Sample Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	06/28/01	06/29/01	06/30/01	06/30/01	07/02/01	07/02/01
Chemical Name																			
Volatile Organic Compounds (µg/kg)																			
1,1,1-Trichloroethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	14 U	11 U	11 U	43 J	31 J	11 U	14	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
2-Hexanone	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Acetone	28 B	11 U	6 J	210	160	6 B	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Benzene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Bromodichloromethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Bromoform	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Bromomethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Carbon disulfide	14 U	11 U	11 U	16 U	12 U	11 U	11 U	33	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Chlorobenzene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Chloroethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Chloroform	14 U	11 U	11 U	16 U	12 U	11 U	1 B	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Chloromethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Methylene chloride	43 B	10 B	7 B	12 B	6 B	4 B	18 B	10 B	9 B	10 B	11 B	6 B	6 B	NA	NA	NA	NA	NA	NA
Styrene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Tetrachloroethene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Toluene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Trichloroethene	14 U	11 U	11 U	16 U	12 U	11 U	12	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Xylene, total	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	14 U	11 U	11 U	16 U	12 U	11 U	11 U	12 UJ	11 UJ	12 U	11 U	12 U	12 U	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)																			
1,2,4-Trichlorobenzene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	1,100 U	900 U	870 U	930 U	920 U	880 U	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	1,100 U	900 U	870 U	930 U	920 U	880 U	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2-Chlorophenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
2-Methylphenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SB19	SJS02-SB20	SJS02-SB201	SJS02-SB202	SJS02-SB203				SJS02-SB204			SJS02-SB205	SJS02-SB206	SJS02-SB207	
Sample ID	SJS02-SB19-001	SJS02-SB20-001	SJS02-SB201-07B	SJS02-SB202-07B	SJS02-SB203-16-07B	SJS02-SB203-17-07B	SJS02-SB203-19-07B	SJS02-SB203-4-07B	SJS02-SB204-12-07B	SJS02-SB204-12-07BP*	SJS02-SB204-6-07B	SJS02-SB205-10-07B	SJS02-SB206-18-07B	SJS02-SB207-13-07B	SJS02-SB207-13-07BP*
Sample Date	07/03/01	07/06/01	05/15/07	05/15/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07
Chemical Name															
Volatile Organic Compounds (µg/kg)															
1,1,1-Trichloroethane	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
1,1,2,2-Tetrachloroethane	NA	NA	28,000 U	267,000 U	806,000 U	2,027,000 U	1,194,000 U	6,100 U	1,213,000 U	1,204,000 U	8,045,000 U	121,591,000 U	2,000 U	3,000 U	16,000 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
1,1,2-Trichloroethane	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
1,1-Dichloroethane	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
1,1-Dichloroethene	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
1,2,4-Trichlorobenzene	NA	NA	71,000 U	667,000 U	2,014,000 U	5,068,000 U	2,986,000 U	15,100 U	3,033,000 U	3,011,000 U	20,114,000 U	303,977,000 U	6,000 U	8,000 U	41,000 U
1,2-Dibromo-3-chloropropane	NA	NA	71,000 U	667,000 U	2,014,000 U	5,068,000 U	2,986,000 U	15,100 U	3,033,000 U	3,011,000 U	20,114,000 U	303,977,000 U	6,000 U	8,000 U	41,000 U
1,2-Dichlorobenzene	NA	NA	28,000 U	267,000 U	806,000 U	2,027,000 U	1,194,000 U	6,100 U	1,213,000 U	1,204,000 U	8,045,000 U	121,591,000 U	2,000 U	3,000 U	16,000 U
1,2-Dichloroethane	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
1,3-Dichlorobenzene	NA	NA	28,000 U	267,000 U	806,000 U	2,027,000 U	1,194,000 U	6,100 U	1,213,000 U	1,204,000 U	8,045,000 U	121,591,000 U	2,000 U	3,000 U	16,000 U
1,4-Dichlorobenzene	NA	NA	28,000 U	267,000 U	806,000 U	2,027,000 U	1,194,000 U	6,100 U	1,213,000 U	1,204,000 U	8,045,000 U	121,591,000 U	2,000 U	3,000 U	16,000 U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	28,000 U	267,000 U	806,000 U	2,027,000 U	1,194,000 U	6,100 U	1,213,000 U	1,204,000 U	8,045,000 U	121,591,000 U	2,000 U	3,000 U	16,000 U
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
Chlorobenzene	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
Chloroethane	NA	NA	71,000 U	667,000 U	2,014,000 U	5,068,000 U	2,986,000 U	15,100 U	3,033,000 U	3,011,000 U	20,114,000 U	303,977,000 U	6,000 U	8,000 U	41,000 U
Chloroform	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
Chloromethane	NA	NA	71,000 U	667,000 U	2,014,000 U	5,068,000 U	2,986,000 U	15,100 U	3,033,000 U	3,011,000 U	20,114,000 U	303,977,000 U	6,000 U	8,000 U	41,000 U
Dibenzofuran	NA	NA	28,000 U	267,000 U	806,000 U	2,027,000 U	1,194,000 U	6,100 U	1,213,000 U	1,204,000 U	8,045,000 U	121,591,000 U	2,000 U	3,000 U	16,000 U
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	NA	NA	71,000 U	667,000 U	2,014,000 U	5,068,000 U	2,986,000 U	15,100 U	3,033,000 U	3,011,000 U	20,114,000 U	303,977,000 U	6,000 U	8,000 U	41,000 U
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	71,000 U	667,000 U	2,014,000 U	5,068,000 U	2,986,000 U	15,100 U	3,033,000 U	3,011,000 U	20,114,000 U	303,977,000 U	6,000 U	8,000 U	41,000 U
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	1,600,000	7,900,000	403,000 U	13,000,000	65,000,000	5,700	29,000,000 J	19,000,000 J	500,000,000	14,000,000,000	98,000	350,000	310,000
Trichlorofluoromethane(Freon-11)	NA	NA	71,000 U	667,000 U	2,014,000 U	5,068,000 U	2,986,000 U	15,100 U	3,033,000 U	3,011,000 U	20,114,000 U	303,977,000 U	6,000 U	8,000 U	41,000 U
Vinyl chloride	NA	NA	4,800 J	267,000 U	12,000,000	9,000,000	410,000 J	6,100 U	1,700,000 J	690,000 J	28,000,000	121,591,000 U	620 J	2,500 J	2,800 J
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	1,200,000	2,500,000	30,000,000	150,000,000	10,000,000	3,000 U	22,000,000 J	9,300,000 J	320,000,000	21,000,000 J	28,000	170,000	160,000
cis-1,3-Dichloropropene	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
trans-1,2-Dichloroethene	NA	NA	14,000 U	133,000 U	340,000 J	870,000 J	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	3,600	8,000 U
trans-1,3-Dichloropropene	NA	NA	14,000 U	133,000 U	403,000 U	1,014,000 U	597,000 U	3,000 U	607,000 U	602,000 U	4,023,000 U	60,795,000 U	1,000 U	2,000 U	8,000 U
Semi-volatile Organic Compounds (µg/kg)															
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SB01	SJS02-SB02	SJS02-SB03	SJS02-SB04		SJS02-SB05	SJS02-SB06	SJS02-SB07	SJS02-SB08	SJS02-SB09	SJS02-SB10	SJS02-SB11		SJS02-SB12	SJS02-SB13	SJS02-SB14	SJS02-SB15	SJS02-SB17	SJS02-SB18
Sample ID	SJS02-SB01-003	SJS02-SB02-002	SJS02-SB03-000	SJS02-SB04-004	SJS02-SB04-004P*	SJS02-SB05-002	SJS02-SB06-001	SJS02-SB07-001	SJS02-SB08-001	SJS02-SB09-001	SJS02-SB10-001	SJS02-SB11-001	SJS02-SB11-001P*	SJS02-SB12-001	SJS02-SB13-001	SJS02-SB14-001	SJS02-SB15-001	SJS02-SB17-001	SJS02-SB18-00
Sample Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	06/28/01	06/29/01	06/30/01	06/30/01	07/02/01	07/02/01
Chemical Name																			
2-Nitroaniline	1,100 U	900 U	870 U	930 U	920 U	880 U	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
2-Nitrophenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
3-Nitroaniline	1,100 U	900 U	870 U	930 UJ	920 U	880 UJ	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	1,100 U	900 U	870 U	930 U	920 U	880 U	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
4-Chloroaniline	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
4-Methylphenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
4-Nitroaniline	1,100 U	900 U	870 U	930 U	920 U	880 U	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
4-Nitrophenol	1,100 U	900 U	870 U	930 U	920 U	880 U	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
Acenaphthene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Acenaphthylene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	150 J	130 J	NA	NA	NA	NA	NA	NA
Anthracene	460 U	360 U	45 J	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	62 J	48 J	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	460 U	360 U	290 J	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	370 J	410 J	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	460 U	360 U	290 J	370 U	370 U	350 U	380 UJ	48 J	380 UJ	390 UJ	380 UJ	220 J	270 J	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	460 U	360 U	530	370 U	370 U	350 U	380 UJ	88 J	380 UJ	390 UJ	48 J	1,100 J	900 J	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	460 U	360 U	170 J	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	580 J	560 J	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	460 U	360 U	210 J	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	280 J	290 J	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Carbazole	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Chrysene	460 U	360 U	360	370 U	370 U	350 U	380 UJ	65 J	380 UJ	390 UJ	380 UJ	450 J	470 J	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	460 U	360 U	55 J	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	120 J	130 J	NA	NA	NA	NA	NA	NA
Dibenzofuran	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Diethylphthalate	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Fluoranthene	460 U	360 U	640	370 U	51 J	350 U	380 UJ	390 UJ	380 UJ	390 UJ	52 J	570 J	580 J	NA	NA	NA	NA	NA	NA
Fluorene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Hexachloroethane	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	460 U	360 U	200 J	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	440 J	430 J	NA	NA	NA	NA	NA	NA
Isophorone	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Naphthalene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Nitrobenzene	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Pentachlorophenol	1,100 U	900 U	870 U	930 U	920 U	880 U	950 UJ	980 UJ	950 UJ	970 UJ	960 UJ	1,000 UJ	1,000 UJ	NA	NA	NA	NA	NA	NA
Phenanthrene	460 U	360 U	410	370 U	38 J	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	150 J	170 J	NA	NA	NA	NA	NA	NA
Phenol	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Pyrene	460 U	360 U	590	370 U	67 J	350 U	380 UJ	390 UJ	380 UJ	390 UJ	63 J	720 J	760 J	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	94 B	39	49 J	91 B	53 B	39 B	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	460 U	360 U	350 U	370 U	370 U	350 U	380 UJ	390 UJ	380 UJ	390 UJ	380 UJ	410 UJ	410 UJ	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/kg)																			
4,4'-DDD	3 J	22	5.6	83	62	3.5 U	3.80 UJ	3.90 UJ	2,100 J	1 J	7.10 J	38 J	21 J	NA	NA	NA	NA	NA	NA
4,4'-DDE	32	40	110	33 J	26	31	0.440 J	6.90 J	4,600 J	26 J	46 J	4 UJ	6.20 J	NA	NA	NA	NA	NA	NA
4,4'-DDT	4.4 J	6.3	20 J	6.9 J	4.8 J	36 J	0.690 J	5.5 J	290,000 J	48 J	27 J	18 J	17 J	NA	NA	NA	NA	NA	NA
Aldrin	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
Aroclor-1016	46 U	36 U	35 U	75 U	73 U	35 U	38 UJ	39 UJ	38 UJ	39 UJ	39 UJ	40 UJ	40 UJ	NA	NA	NA	NA	NA	NA
Aroclor-1221	92 U	74 U	71 U	150 U	150 U	71 U	75 UJ	78 UJ	75 UJ	77 UJ	77 UJ	81 UJ	80 UJ	NA	NA	NA	NA	NA	NA
Aroclor-1232	46 U	36 U	35 U	75 U	73 U	35 U	38 UJ	39 UJ	38 UJ	39 UJ	39 UJ	40 UJ	40 UJ	NA	NA	NA	NA	NA	NA
Aroclor-1242	46 U	36 U	35 U	75 U	73 U	35 U	38 UJ	39 UJ	38 UJ	39 UJ	39 UJ	40 UJ	40 UJ	NA	NA	NA	NA	NA	NA
Aroclor-1248	46 U	36 U	35 U	75 U	73 U	35 U	38 UJ	39 UJ	38 UJ	39 UJ	39 UJ	40 UJ	40 UJ	NA	NA	NA	NA	NA	NA
Aroclor-1254	46 U	36 U	35 U	75 U	73 U	35 U	38 UJ	39 UJ	38 UJ	39 UJ	39 UJ	40 UJ	40 UJ	NA	NA	NA	NA	NA	NA
Aroclor-1260	46 U	36 U	21 J	75 U	73 U	35 U	38 UJ	39 UJ	38 UJ	39 UJ	39 UJ	40 UJ	40 UJ	NA	NA	NA	NA	NA	NA
Dieldrin	4.6 U	3.6 U	3.5 U	7.5 U	7.3 U	3.5 U	0.840 J	3.90 UJ	3.80 UJ	3.90 UJ	3.90 UJ	4 UJ	4 UJ	NA	NA	NA	NA	NA	NA
Endosulfan I	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
Endosulfan II	4.6 U	3.6 U	3.5 U	7.5 U	7.3 U	3.5 U	3.80 UJ	3.90 UJ	3.80 UJ	3.90 UJ	3.90 UJ	4 UJ	4 UJ	NA	NA	NA	NA	NA	NA

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SB19	SJS02-SB20	SJS02-SB201	SJS02-SB202	SJS02-SB203				SJS02-SB204			SJS02-SB205	SJS02-SB206	SJS02-SB207	
Sample ID	SJS02-SB19-001	SJS02-SB20-001	SJS02-SB201-07B	SJS02-SB202-07B	SJS02-SB203-16-07B	SJS02-SB203-17-07B	SJS02-SB203-19-07B	SJS02-SB203-4-07B	SJS02-SB204-12-07B	SJS02-SB204-12-07BP*	SJS02-SB204-6-07B	SJS02-SB205-10-07B	SJS02-SB206-18-07B	SJS02-SB207-13-07B	SJS02-SB207-13-07BP*
Sample Date	07/03/01	07/06/01	05/15/07	05/15/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07
Chemical Name															
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/kg)															
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SB01	SJS02-SB02	SJS02-SB03	SJS02-SB04		SJS02-SB05	SJS02-SB06	SJS02-SB07	SJS02-SB08	SJS02-SB09	SJS02-SB10	SJS02-SB11		SJS02-SB12	SJS02-SB13	SJS02-SB14	SJS02-SB15	SJS02-SB17	SJS02-SB18
Sample ID	SJS02-SB01-003	SJS02-SB02-002	SJS02-SB03-000	SJS02-SB04-004	SJS02-SB04-004P*	SJS02-SB05-002	SJS02-SB06-001	SJS02-SB07-001	SJS02-SB08-001	SJS02-SB09-001	SJS02-SB10-001	SJS02-SB11-001	SJS02-SB11-001P*	SJS02-SB12-001	SJS02-SB13-001	SJS02-SB14-001	SJS02-SB15-001	SJS02-SB17-001	SJS02-SB18-00
Sample Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	06/28/01	06/29/01	06/30/01	06/30/01	07/02/01	07/02/01
Chemical Name																			
Endosulfan sulfate	4.6 U	3.6 U	3.5 U	7.5 U	7.3 U	3.5 U	3.80 UJ	3.90 UJ	3.80 UJ	3.90 UJ	3.90 UJ	4 UJ	4 UJ	NA	NA	NA	NA	NA	NA
Endrin	4.6 U	3.6 U	3.5 U	7.5 U	7.3 U	3.5 U	3.80 UJ	3.90 UJ	3.80 UJ	3.90 UJ	3.90 UJ	4 UJ	4 UJ	NA	NA	NA	NA	NA	NA
Endrin aldehyde	4.6 U	3.6 U	3.5 U	7.5 U	7.3 U	3.5 U	3.80 UJ	3.90 UJ	3.80 UJ	3.90 UJ	3.90 UJ	4 UJ	4 UJ	NA	NA	NA	NA	NA	NA
Endrin ketone	4.6 U	3.6 U	3.5 U	7.5 U	7.3 U	3.5 U	3.80 UJ	3.90 UJ	3.80 UJ	3.90 UJ	3.90 UJ	4 UJ	4 UJ	NA	NA	NA	NA	NA	NA
Heptachlor	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
Methoxychlor	23 U	19 U	18 U	39 U	38 U	18 U	19 UJ	19 UJ	19 UJ	19 UJ	19 UJ	20 UJ	20 UJ	NA	NA	NA	NA	NA	NA
Toxaphene	230 U	190 U	180 U	390 U	380 U	180 U	190 UJ	190 UJ	190 UJ	190 UJ	190 UJ	200 UJ	200 UJ	NA	NA	NA	NA	NA	NA
alpha-BHC	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
alpha-Chlordane	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
beta-BHC	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
delta-BHC	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
gamma-Chlordane	2.3 U	1.9 U	1.8 U	3.9 U	3.8 U	1.8 U	1.90 UJ	1.90 UJ	38 J	1.90 UJ	1.90 UJ	2 UJ	2 UJ	NA	NA	NA	NA	NA	NA
Dioxin/Furans (µg/kg)																			
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00795 J	NA	NA	0.118 J	0.0359 J	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.02E-04 UJ	NA	NA	0.0435 J	0.00806 J	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.50E-04 UJ	NA	NA	0.00322 J	2.00E-04 UJ	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.46E-04 UJ	NA	NA	0.00202 J	6.06E-04 J	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.19E-04 UJ	NA	NA	0.0087 J	0.00127 J	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.27E-04 UJ	NA	NA	0.00449 J	0.00299 J	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.15E-04 UJ	NA	NA	0.00388 NJ	0.00161 I	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.23E-04 J	NA	NA	0.00534 J	0.00274 J	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.60E-04 UJ	NA	NA	0.00221 UJ	2.39E-04 UJ	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.04E-04 UJ	NA	NA	0.00146 J	1.02E-04 UJ	NA
1,2,3,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.29E-04 UJ	NA	NA	0.00440 J	1.56E-04 UJ	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.28E-04 U	NA	NA	0.00370 J	5.06E-04 J	NA
2,3,4,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.24E-04 UJ	NA	NA	0.00435 J	4.77E-04 J	NA
2,3,7,8-TCDD (dioxin)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.80E-05 UJ	NA	NA	3.28E-04 NJ	8.70E-05 UJ	NA
2,3,7,8-Tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.06E-04 UJ	NA	NA	0.00636 J	8.48E-04 NJ	NA
Octachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.219 J	NA	NA	1.40 J	0.261 J	NA
Octachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.16E-04 B	NA	NA	0.0794 J	0.00505 J	NA
Total heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0211 J	NA	NA	0.281 J	0.0772 J	NA
Total heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.02E-04 UJ	NA	NA	0.0467 J	0.00806 J	NA
Total hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00476 J	NA	NA	0.0392 J	0.0221 J	NA
Total hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.15E-04 UJ	NA	NA	0.0745 J	0.00938 J	NA
Total pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.04E-04 UJ	NA	NA	0.00315 J	5.36E-04 J	NA
Total pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.24E-04 UJ	NA	NA	0.0290 J	0.00271 J	NA
Total tetrachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.80E-05 UJ	NA	NA	0.00328 J	2.99E-04 J	NA
Total tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.06E-04 UJ	NA	NA	0.0306 J	0.00383 J	NA
Explosives (µg/kg)																			
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U	500 U	500 U	500 U	476 U	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U	500 U	500 U	500 U	476 U	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U	500 U	500 U	500 U	476 U	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U	500 U	500 U	500 U	476 U	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U	250 U	250 U	238 U	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U	500 U	500 U	500 U	476 U	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	500 U	500 U	500 U	500 U	500 U	500 U	476 U	NA	NA	NA	NA	NA	NA
Total Metals (mg/kg)																			
Aluminum	7,220	2,260	5,510	11,900	11,800	2,000	2,670	21,700	16,400	10,700	21,000	10,700	14,100	8,990	10,100	NA	10,900	NA	NA
Antimony	0.37 U	NA	NA	0.63 J	0.43 J	0.33 U	0.600 UL	0.540 UL	0.450 UL	0.580 UL	0.560 UL	0.530 L	0.680 L	77.7	53.1	NA	2.2	NA	NA
Arsenic	2.4	1.2 K	4.5 K	6.3	3.9	1.2 J	2 J	2.90	5.60	2.20	3	4.80	6.10	41.7	25.2	NA	6.9	NA	NA
Barium	41.3	8.7 J	291	44.4 J	55.3	8.4 J	12.3 J	41.4	36	38.7 J	49.7	60.4	88.4	459	335	NA	134	NA	NA
Beryllium	0.24 J	0.18 U	0.35 J	0.32 J	0.34 J	0.17 U	0.100 J	0.180 J	0.170 J	0.220 J	0.270 J	0.5 J	0.630 J	1.1	8	NA	4.6	NA	NA

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SB19	SJS02-SB20	SJS02-SB201	SJS02-SB202	SJS02-SB203				SJS02-SB204			SJS02-SB205	SJS02-SB206	SJS02-SB207	
Sample ID	SJS02-SB19-001	SJS02-SB20-001	SJS02-SB201-07B	SJS02-SB202-07B	SJS02-SB203-16-07B	SJS02-SB203-17-07B	SJS02-SB203-19-07B	SJS02-SB203-4-07B	SJS02-SB204-12-07B	SJS02-SB204-12-07BP*	SJS02-SB204-6-07B	SJS02-SB205-10-07B	SJS02-SB206-18-07B	SJS02-SB207-13-07B	SJS02-SB207-13-07BP*
Sample Date	07/03/01	07/06/01	05/15/07	05/15/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07
Chemical Name															
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxin/Furans (µg/kg)															
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.0250 J	0.03 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.00251 J	3.00E-04 NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.45E-04 UJ	6.40E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	2.35E-04 UJ	4.00E-04 NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	0.00112 J	5.30E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	7.11E-04 J	5.60E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	2.91E-04 UJ	5.10E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.00148 J	1.00E-03 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	4.07E-04 UJ	7.10E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.92E-04 UJ	9.40E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	2.68E-04 UJ	7.10E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	3.25E-04 UJ	5.70E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	5.37E-04 NJ	6.80E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	1.58E-04 UJ	8.00E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	7.75E-04 NJ	8.60E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	1.5 J	0.98 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	0.00313 J	6.80E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	0.0752 J	0.065 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	0.00460 J	4.30E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	0.0244 J	0.011 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	0.00279 J	5.10E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	1.92E-04 UJ	9.40E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	0.00408 J	6.80E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	1.58E-04 UJ	8.00E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	0.00194 J	8.60E-05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/kg)															
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (mg/kg)															
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SB01	SJS02-SB02	SJS02-SB03	SJS02-SB04		SJS02-SB05	SJS02-SB06	SJS02-SB07	SJS02-SB08	SJS02-SB09	SJS02-SB10	SJS02-SB11		SJS02-SB12	SJS02-SB13	SJS02-SB14	SJS02-SB15	SJS02-SB17	SJS02-SB18
Sample ID	SJS02-SB01-003	SJS02-SB02-002	SJS02-SB03-000	SJS02-SB04-004	SJS02-SB04-004P*	SJS02-SB05-002	SJS02-SB06-001	SJS02-SB07-001	SJS02-SB08-001	SJS02-SB09-001	SJS02-SB10-001	SJS02-SB11-001	SJS02-SB11-001P*	SJS02-SB12-001	SJS02-SB13-001	SJS02-SB14-001	SJS02-SB15-001	SJS02-SB17-001	SJS02-SB18-00
Sample Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	04/21/99	06/28/01	06/29/01	06/30/01	06/30/01	07/02/01	07/02/01
Chemical Name																			
Cadmium	0.09 U	0.09 U	4.4	0.47 B	0.11 U	0.43 J	0.0700 U	0.0600 U	0.170 J	0.0600 U	0.0600 U	0.190 J	0.180 J	11.2	2.5	NA	3	NA	NA
Calcium	2,540	569 J	1,720 J	2,970	2,050	346 B	269 J	332 J	1,100	2,270	1,720	4,500	6,010	15,900	4,880	NA	4,730	NA	NA
Chromium	16.7	5.3	30.8	21.6	19.3	4.6	3.70	21.3	17.6	12	24.2	23.6	29.9	110	335	NA	95.2	NA	NA
Cobalt	2.9 J	1.43 U	3.6 J	4 J	2.6 J	1.32 U	0.5 J	1.60 J	1.60 J	1.30 J	6.5 J	4.5 J	7.90 J	27.6	95.3	NA	27.2	NA	NA
Copper	33.7	3.8 J	433	60.5	9.7	7.1	2.5 J	5.10	7.20	8.70	46.5	173	153	926	3,100	NA	1,470	NA	NA
Cyanide	0.6 U	0.55 U	0.52 U	0.68 U	0.59 U	0.54 U	0.238 U	0.180 U	0.230 U	0.25 U	0.220 U	0.290	0.360	NA	NA	NA	NA	NA	NA
Iron	15,000	2,360	16,700	11,700	7,190	1,850	2,230	8,950	7,890	7,030	10,100	14,600	21,000	210,000	66,400	NA	48,700	NA	NA
Lead	74.3	10.3	885	55.8	20.5	5.3	3.10	13	31.7	23.8	50.1	185	144	8,850	1,670	NA	1,210	NA	NA
Magnesium	876 J	243 B	711 J	1,610	800 J	250 J	126 J	772 J	638 J	751 J	1,050	2,120	3,220	12,300	1,930	NA	2,330	NA	NA
Manganese	114	11.9 K	134 K	70.7	28	8.2	5.90	13.1 L	22.1 L	67.9 L	39.8 L	129 L	203 L	1,260	409	NA	368	NA	NA
Mercury	0.28	0.06 L	0.55 L	0.24	0.19	0.08 J	0.0200 U	0.0700	0.0400	0.0300 J	0.270	0.860	1	0.7	6.3	NA	0.75	NA	NA
Nickel	20.9	1.25 U	31.8	9 J	8 J	1.9 J	1 J	5.90 J	6.70	5.40 J	9.30	12.8	13.9	106	243	NA	107	NA	NA
Potassium	479 J	196 J	289 J	968 J	565 J	229 J	149 J	582 J	502 J	526 J	648 J	1,510	2,020	1,660	988	NA	2,270	NA	NA
Selenium	0.55 U	0.54 U	0.57 U	0.75 U	0.63 U	0.5 U	0.580 U	0.520 U	0.530 J	0.560 U	0.640 J	0.440 U	0.440 U	1.7 U	0.53 U	NA	0.34 U	NA	NA
Silver	1.1 B	0.18 U	0.9 B	1.5 B	1 B	0.87 B	0.200 U	0.180 U	0.150 U	0.190 U	0.190 U	0.150 U	0.150 U	1.7	1.5	NA	0.36 U	NA	NA
Sodium	77.2 B	27.9 B	48.5 B	657 J	373 J	95 B	32.8 U	49.2 J	77.8 J	129 J	107 J	134 J	216 J	1,780	1,770	NA	451	NA	NA
Thallium	0.5 J	0.36 U	1.1 J	0.5 U	0.42 U	0.33 U	0.710 U	0.640 U	0.530 U	0.690 U	0.660 U	0.540 U	0.550 U	1.9 U	1.4 U	NA	0.91 U	NA	NA
Vanadium	24	6.5 J	27.5	20.5	21.5	5.3 J	6 J	29.5	26.6	17.8	29.8	31.3	38.6	21.8	73	NA	34.2	NA	NA
Zinc	136	14.7 B	2,420	95.7	23.9 B	44.9	4.20 J	27.7 L	140 L	29.4 L	157 L	158 L	208 L	2,410	9,070	NA	2,940	NA	NA
Wet Chemistry (mg/kg)																			
Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	4.5	19.9	11.6	7.6	2.8	4.1	3.23 UL	25.7	18.4	39	48.8	62.3	63.6	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	7.71	5.34	6.80	7.94	7.72	8.15	7.83	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (mg/kg)																			
TPH-diesel range	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	275	NA	NA	28
TPH-gas range	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8	NA	NA	0.11

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
K - Reported value may be biased high
L - Reported value may be biased low

Table C-2
Subsurface Soil Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID		SJS02-SB19	SJS02-SB20	SJS02-SB201	SJS02-SB202	SJS02-SB203				SJS02-SB204			SJS02-SB205	SJS02-SB206	SJS02-SB207	
Sample ID	1	SJS02-SB19-001	SJS02-SB20-001	SJS02-SB201-07B	SJS02-SB202-07B	SJS02-SB203-16-07B	SJS02-SB203-17-07B	SJS02-SB203-19-07B	SJS02-SB203-4-07B	SJS02-SB204-12-07B	SJS02-SB204-12-07BP*	SJS02-SB204-6-07B	SJS02-SB205-10-07B	SJS02-SB206-18-07B	SJS02-SB207-13-07B	SJS02-SB207-13-07BP*
Sample Date		07/03/01	07/06/01	05/15/07	05/15/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07	05/16/07
Chemical Name																
Cadmium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg/kg)																
Carbon		NA	NA	NA	NA	NA	73,500	998 J	NA	NA	NA	17,500	NA	1,600 U	NA	NA
Phosphorus		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (mg/kg)																
TPH-diesel range	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-gas range		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
K - Reported value may be biased high
L - Reported value may be biased low

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	02GW01	02GW02	17GW01	SJS02-GW01	SJS02-GW02	SJS02-GW03	SJS02-GW04	SJS02-GW05	SJS02-GW06	SJS02-GW07	SJS02-GW08	SJS02-GW09		SJS02-GW10	SJS02-GW11	SJS02-GW12	SJS02-GW13	
Sample ID	02GW01	02GW02	17GW01	SJS02-GW01-07B	SJS02-GW02-07B	SJS02-GW03-07B	SJS02-GW04-07B	SJS02-GW05-07B	SJS02-GW06-07B	SJS02-GW07-07B	SJS02-GW08-07B	SJS02-GW09-07B	SJS02-GW09-07BP*	SJS02-GW10-07B	SJS02-GW11-07B	SJS02-GW12-07B	SJS02-GW13-13-07B	SJS02-GW13-15-07B
Sample Date	04/03/96	04/03/96	04/04/96	05/14/07	05/14/07	05/14/07	05/14/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/16/07	05/16/07	05/17/07	05/17/07
Chemical Name																		
Volatile Organic Compounds (µg/L)																		
1,1,1-Trichloroethane	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
1,1,2-Trichloroethane	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
1,1-Dichloroethane	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
1,1-Dichloroethene	10 U	10 U	10 U	1 U	1 U	1 U	110	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U
1,2-Dibromo-3-chloropropane	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U
1,2-Dichloroethane	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
1,2-Dichloropropane	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
1,3-Dichlorobenzene	NA	NA	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U
1,4-Dichlorobenzene	NA	NA	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U
2-Butanone	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	24	8 J	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U
Bromoform	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	2 BJ	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
Chlorobenzene	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
Chloroethane	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U
Chloroform	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
Chloromethane	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U
Cyclohexane	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	10,000 U
Dibromochloromethane	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydrogen (NMOLE/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	3 BJ	4 BJ	8 BJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U
Styrene	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
Toluene	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	10 U	10 U	10 U	0.42 J	1 U	1 U	3,900	1 U	1 U	0.78 J	1 U	1 U	0.46 J	0.59 J	0.44 J	0.57 J	3,600	950 J
Trichlorofluoromethane(Freon-11)	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	100 U	25,000 U
Vinyl chloride	10 U	10 U	10 U	2 U	2 U	1.3 J	160	2 U	2 U	2 U	3.2	0.6 J	0.31 J	17	2 U	7.3	280	10,000 U
Xylene, total	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	1 U	1 U	5	5,300	1 U	1 U	1.1	6.5	1.8	1.7	2.2	1 U	4.4	940	12,000
cis-1,3-Dichloropropene	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
trans-1,2-Dichloroethene	NA	NA	NA	1 U	1 U	1 U	42	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	19 J	5,000 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	5,000 U
Semi-volatile Organic Compounds (µg/L)																		
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	25 U	25 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	25 U	25 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-GW14			SJS02-GW15	SJS02-GW16		SJS02-GW17		SJS02-GW18		SJS02-GW19	SJS02-GW20	SJS02-MW01S			
Sample ID	SJS02-GW14-13-07B	SJS02-GW14-13-07BP*	SJS02-GW14-6-07B	SJS02-GW15-13-07B	SJS02-GW16-11-07B	SJS02-GW16-14-07B	SJS02-GW17-17-07B	SJS02-GW17-21-07B	SJS02-GW18-19-07B	SJS02-GW18-19-07BP*	SJS02-GW19-13-07B	SJS02-GW20-14-07B	SJS02-GW1S-001	SJS02-GW1S-002	SJS02-GW1S-003	SJS02-MW01S-07B
Sample Date	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	07/16/97	11/06/97	05/18/99	06/04/07
Chemical Name																
Volatile Organic Compounds (µg/L)																
1,1,1-Trichloroethane	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
1,1,2,2-Tetrachloroethane	5,000 U	5,000 U	1,000 U	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	4,000 U	10 U	2 U	1 U	1 U	1 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	NA	NA	NA	0.5 U
1,1,2-Trichloroethane	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,400 J	1,100 J	5 U	1 U	1 U	1 U	1 U	0.5 U
1,1-Dichloroethane	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
1,1-Dichloroethene	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	200	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	12,500 U	12,500 U	2,500 U	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	10,000 U	25 U	5 U	1 U	1 U	1 U	0.5 U
1,2-Dibromo-3-chloropropane	12,500 U	12,500 U	2,500 U	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	10,000 U	25 U	5 U	1 U	1 U	1 U	0.5 U
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
1,2-Dichlorobenzene	5,000 U	5,000 U	1,000 U	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	4,000 U	10 U	2 U	1 U	1 U	1 U	0.5 U
1,2-Dichloroethane	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
1,2-Dichloropropane	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
1,3-Dichlorobenzene	5,000 U	5,000 U	1,000 U	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	4,000 U	10 U	2 U	1 U	1 U	1 U	0.5 U
1,4-Dichlorobenzene	5,000 U	5,000 U	1,000 U	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	4,000 U	10 U	2 U	1 U	1 U	1 U	0.5 U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7 B	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	0.5 U
Bromodichloromethane	5,000 U	5,000 U	1,000 U	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	4,000 U	10 U	2 U	1 U	1 U	1 U	0.5 U
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Carbon tetrachloride	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
Chlorobenzene	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
Chloroethane	12,500 U	12,500 U	2,500 U	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	10,000 U	25 U	5 U	1 U	1 U	1 U	0.5 U
Chloroform	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
Chloromethane	12,500 U	12,500 U	2,500 U	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	10,000 U	25 U	5 U	1 U	1 U	1 U	0.25 B
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	5,000 U	5,000 U	1,000 U	1,000 U	5,000 U	40,000 U	10 U	100 U	2,000 U	4,000 U	10 U	2 U	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Dichlorodifluoromethane (Freon-12)	12,500 U	12,500 U	2,500 U	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	10,000 U	25 U	5 U	NA	NA	NA	0.5 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Hydrogen (NMOLE/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	12,500 U	12,500 U	2,500 U	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	10,000 U	25 U	5 U	2 B	2 B	2 U	0.17 B
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Tetrachloroethene	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
Trichloroethene	110,000 J	530,000 J	28,000	89,000	64,000	370,000	1.7 J	2,000	200,000	210,000	540	1.2	1 U	1 U	1 U	0.5 U
Trichlorofluoromethane(Freon-11)	12,500 U	12,500 U	2,500 U	2,500 U	12,500 U	100,000 U	25 U	250 U	5,000 U	10,000 U	25 U	5 U	NA	NA	NA	0.5 U
Vinyl chloride	5,000 U	2,200 J	310 J	2,100	5,000 U	40,000 U	1,000	1,900	7,200	6,300	11	2 U	1 U	1 U	1 U	0.5 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	NA
cis-1,2-Dichloroethene	10,000 J	75,000 J	24,000	36,000	5,000	6,900 J	68	7,100	87,000	83,000	410	1.7	1 U	1 U	1 U	0.5 U
cis-1,3-Dichloropropene	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
trans-1,2-Dichloroethene	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	0.74 J	92	850 J	1,200 J	5 U	1 U	1 U	1 U	1 U	0.5 U
trans-1,3-Dichloropropene	2,500 U	2,500 U	500 U	500 U	2,500 U	20,000 U	5 U	50 U	1,000 U	2,000 U	5 U	1 U	1 U	1 U	1 U	0.5 U
Semi-volatile Organic Compounds (µg/L)																
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW02S				SJS02-MW03S					SJS02-MW04S			SJS02-MW05S		
Sample ID	SJS02-GW2S-001	SJS02-GW2S-002	SJS02-GW2S-003	SJS02-MW02S-07B	SJS02-GW3S-001	SJS02-GW3S-001P*	SJS02-GW3S-002	SJS02-GW3S-003	SJS02-MW03S-07B	SJS02-GW4S-001	SJS02-GW4S-001P*	SJS02-MW04S-07B	SJS02-GW5S-001	SJS02-MW05S-07B	SJS02-MW05S-07BP*
Sample Date	07/23/97	11/06/97	05/18/99	06/01/07	07/17/97	07/31/97	11/06/97	05/19/99	06/01/07	05/19/99	05/19/99	06/01/07	05/18/99	05/31/07	05/31/07
Chemical Name															
Volatile Organic Compounds (µg/L)															
1,1,1-Trichloroethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	0.5 U	NA	NA	NA	NA	0.5 U	NA	NA	0.5 U	NA	0.5 U	0.5 U
1,1,2-Trichloroethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,1-Dichloroethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,1-Dichloroethene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,2-Dibromoethane	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
1,2-Dichlorobenzene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	0.300 J	0.300 J	0.5 U	7.80	5.6	4.7
1,2-Dichloroethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,2-Dichloropropane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,3-Dichlorobenzene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
1,4-Dichlorobenzene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	0.800 J	0.5 U	0.5 U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	5 U	5 U	5 U	NA	5 U	NA	5 U	5 U	NA	5 U	5 U	NA	5 U	NA	NA
4-Methyl-2-pentanone	5 U	5 U	5 U	NA	5 U	NA	5 U	5 U	NA	5 U	5 U	NA	5 U	NA	NA
Acetone	10 B	6 B	NA	NA	5 B	NA	22 B	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
Bromochloromethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Bromodichloromethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Bromoform	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
Bromomethane	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	1 U	1 U	1 U	NA	1 U	NA	1 U	4.10	NA	3.40	2.80	NA	1 U	NA	NA
Carbon tetrachloride	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Chlorobenzene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	2.40	1.8	1.6
Chloroethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Chloroform	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	0.200 B	1 U	0.5 U	0.600 B	0.5 U	0.5 U
Chloromethane	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.12 B	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	0.5 U	NA	NA	NA	NA	0.5 U	NA	NA	0.5 U	NA	0.5 U	0.5 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
Hydrogen (NMOLE/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	1 B	2 B	2 U	0.35 B	2 B	NA	2 B	0.5 B	0.31 B	0.700 B	0.700 B	0.17 B	2 U	0.18 B	0.16 B
Styrene	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
Tetrachloroethene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Toluene	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
Trichloroethene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	0.600 J	0.800 J	0.5 U	0.800 J	0.67	0.56
Trichlorofluoromethane(Freon-11)	NA	NA	NA	0.5 U	NA	NA	NA	NA	0.5 U	NA	NA	0.5 U	NA	0.5 U	0.5 U
Vinyl chloride	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylene, total	1 U	1 U	1 U	NA	1 U	NA	1 U	1 U	NA	1 U	1 U	NA	1 U	NA	NA
cis-1,2-Dichloroethene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	0.300 J	0.300 J	0.5 U	1 U	0.33 J	0.34 J
cis-1,3-Dichloropropene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	0.5 U	1 U	NA	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (µg/L)															
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	10 U	NA	NA	NA	NA	11 U	NA	12 U	11 U	NA	11 U	NA	NA
1,2-Dichlorobenzene	NA	NA	10 U	NA	NA	NA	NA	11 U	NA	12 U	11 U	NA	6 J	NA	NA
1,3-Dichlorobenzene	NA	NA	10 U	NA	NA	NA	NA	11 U	NA	12 U	11 U	NA	11 U	NA	NA
1,4-Dichlorobenzene	NA	NA	10 U	NA	NA	NA	NA	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2,2'-Oxybis(1-chloropropane)	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2,4,5-Trichlorophenol	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
2,4,6-Trichlorophenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2,4-Dichlorophenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2,4-Dimethylphenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2,4-Dinitrophenol	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
2,4-Dinitrotoluene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2,6-Dinitrotoluene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW06S	SJS02-MW07S	SJS02-MW08S		SJS02-MW09S		SJS02-MW10S		SJS02-MW11S	
Sample ID	SJS02-MW06S-03D	SJS02-MW07S-03D	SJS02-MW08S-03D	SJS02-MW08S-03D-P*	SJS02-MW09S-03D	SJS02-MW09S-07B	SJS02-MW10S-04D	SJS02-MW10S-07B	SJS02-MW11S-04D	SJS02-MW11S-07B
Sample Date	12/11/03	12/12/03	12/12/03	12/12/03	12/11/03	06/01/07	12/03/04	06/06/07	12/02/04	06/04/07
Chemical Name										
Volatile Organic Compounds (µg/L)										
1,1,1-Trichloroethane	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,1,2-Trichloroethane	0.5 U	10	0.5 U	0.5 U	0.5 U	0.5 U	170 L	63	0.5 U	10 U
1,1-Dichloroethane	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,1-Dichloroethene	0.5 U	200 J	0.5 U	0.5 U	0.5 U	0.5 U	280 L	47	0.5 U	10 U
1,2,3-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	0.5 U	NA
1,2-Dichlorobenzene	0.44 J	0.5 U	0.5 U	0.5 U	0.5 U	0.62	500 UL	10 U	0.5 U	10 U
1,2-Dichloroethane	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
2-Butanone	5 U	25,000 R	5 U	5 U	5 U	NA	5,000 UL	NA	10 R	NA
2-Hexanone	5 U	5 U	5 U	5 U	5 U	NA	5,000 UL	NA	5 U	NA
4-Methyl-2-pentanone	5 U	5 U	5 U	5 U	5 U	NA	5,000 UL	NA	5 U	NA
Acetone	5 U	25,000 R	17	9.1 B	5 U	NA	5,000 UL	NA	10 R	NA
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	0.5 U	NA
Bromochloromethane	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	0.5 U	NA
Bromomethane	0.5 U	0.5 UL	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	0.5 U	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	75,000	NA	NA
Carbon disulfide	0.5 U	0.5 UL	0.5 U	0.5 U	0.5 U	NA	9.7 L	NA	2.1 B	NA
Carbon tetrachloride	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	500 UL	10 U	0.5 U	10 U
Chloroethane	0.5 U	0.5 UL	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
Chloroform	1.1	2,500 R	0.71	0.71	0.5 U	0.5 U	130 L	6 J	0.5 U	10 U
Chloromethane	0.46 B	0.5 UL	0.55 B	0.5 B	0.65 B	0.1 B	500 UL	10 U	0.5 U	10 U
Cyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	0.5 U	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	44 L	10 U	0.5 U	10 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 UL	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
Ethane	NA	NA	NA	NA	NA	NA	NA	0.12 B	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	43	NA	NA
Ethylbenzene	0.5 U	2	0.5 U	0.5 U	0.5 U	NA	22 L	NA	0.5 U	NA
Hydrogen (NMOLE/L)	NA	NA	NA	NA	NA	NA	NA	-1	NA	NA
Isopropylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	2.5 L	NA	0.5 U	NA
Methane	NA	NA	NA	NA	NA	NA	NA	840	NA	NA
Methyl acetate	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	1 R	NA
Methyl-tert-butyl ether (MTBE)	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	0.5 U	NA
Methylcyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	500 UL	NA	0.5 U	NA
Methylene chloride	0.67 B	1.5 B	0.75 B	0.61 B	0.87 B	0.2 B	4.1 L	3 B	0.5 U	10 U
Styrene	0.5 U	0.35 J	0.5 U	0.5 U	0.5 U	NA	3.9 L	NA	0.5 U	NA
Tetrachloroethene	0.5 U	21	0.5 U	0.5 U	0.5 U	0.5 U	39 L	22	0.5 U	10 U
Toluene	0.5 U	4.9	0.5 U	0.5 U	0.5 U	NA	67 L	NA	0.5 U	NA
Trichloroethene	0.5 U	82,000	0.5 U	0.32 J	0.5 U	0.5 U	330,000 J	77,000	50	10 U
Trichlorofluoromethane(Freon-11)	0.5 U	2,500 R	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
Vinyl chloride	0.5 U	3,600	0.5 U	0.5 U	0.5 U	0.5 U	960 L	1,900 J	0.5 U	10 U
Xylene, total	0.5 U	11	0.5 U	0.5 U	0.5 U	NA	49 L	NA	0.5 U	NA
cis-1,2-Dichloroethene	0.5 U	34,000	0.59	0.57	0.5 U	0.5 U	23,000 L	21,000	0.5 J	10 U
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.3 L	10 U	0.5 U	10 U
trans-1,2-Dichloroethene	0.5 U	160 J	0.5 U	0.5 U	0.5 U	0.5 U	720 L	240 J	0.5 U	10 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500 UL	10 U	0.5 U	10 U
Semi-volatile Organic Compounds (µg/L)										
1,1-Biphenyl	5 U	2 J	5 U	5 U	5 U	NA	16	NA	11 U	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
2,4,5-Trichlorophenol	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
2,4,6-Trichlorophenol	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
2,4-Dichlorophenol	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
2,4-Dimethylphenol	5 U	2 J	5 U	5 U	5 U	NA	2.6 J	NA	11 U	NA
2,4-Dinitrophenol	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
2,4-Dinitrotoluene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
2,6-Dinitrotoluene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW12S		SJS02-MW13S			SJS02-MW14S	SJS02-MW15S	SJS02-MW16S			SJS02-PZ01		SJS02-PZ02	
Sample ID	SJS02-MW12S-04D	SJS02-MW12S-07B	SJS02-MW13S-04D	SJS02-MW13S-04D-P*	SJS02-MW13S-07B	SJS02-MW14S-07B	SJS02-MW15S-07B	SJS02-MW16S-07B	SJS02-MW16S-07C	SJS02-MW16S-07CP*	SJS02-PZ01-07B	SJS02-PZ01-07BP*	SJS02-PZ02-07B	SJS02-PZ02-19-07B
Sample Date	12/02/04	05/30/07	12/02/04	12/02/04	06/01/07	06/06/07	06/05/07	06/05/07	07/13/07	07/13/07	05/22/07	05/22/07	05/23/07	05/24/07
Chemical Name														
Volatile Organic Compounds (µg/L)														
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
1,2-Dichloroethane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
2-Butanone	5 R	NA	5 R	5 R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	5 U	NA	5 UJ	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	5 U	NA	5 UJ	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	5.5 J	NA	6.7 J	6.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.5 U	NA	0.5 UJ	0.5 R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	0.5 U	NA	NA	0.5 U	NA	NA	NA	0.5 U	0.5 U	NA	NA	NA	NA
Bromodichloromethane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
Bromoform	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide	NA	NA	NA	NA	NA	110,000	130,000	280,000	NA	NA	NA	NA	NA	NA
Carbon disulfide	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
Chlorobenzene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
Chloroethane	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U
Chloroform	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
Chloromethane	0.57 J	0.5 U	0.5 UJ	0.5 U	0.17 B	13,000 U	25,000 U	10 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U
Cyclohexane	0.5 U	NA	1.2 J	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Dibromochloromethane	0.5 U	NA	0.5 UJ	0.5 U	NA	13,000 U	25,000 U	10 U	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U
Ethane	NA	NA	NA	NA	NA	11	66	0.01 U	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	76	660	0.047	NA	NA	NA	NA	NA	NA
Ethylbenzene	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydrogen (NMOLE/L)	NA	NA	NA	NA	NA	-1	-1	-1	NA	NA	NA	NA	NA	NA
Isopropylbenzene	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	2,800	8,500	6,800	NA	NA	NA	NA	NA	NA
Methyl acetate	0.5 R	NA	0.5 R	0.5 R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	0.5 U	NA	0.8 J	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.5 U	0.16 B	0.5 UJ	0.5 U	0.34 B	1,300 B	3,700 B	10 U	0.15 B	0.31 B	5 U	5 U	5 U	5 U
Styrene	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
Toluene	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1.6 B	0.49 J	1.2 B	0.63 B	0.5 U	84,000	240,000	62	11	12	1 U	1 U	1 U	1 U
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U
Vinyl chloride	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	32,000	0.7 J	0.3 J	0.35 J	2 U	2 U	2 U	2 U
Xylene, total	0.5 U	NA	0.5 UJ	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	1.2	3.1	0.5 UJ	0.5 U	0.5 U	30,000	130,000	9 J	6	6.2	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	13,000 U	25,000 U	10 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U
Semi-volatile Organic Compounds (µg/L)														
1,1-Biphenyl	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
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Station ID	SJS02-PZ03	SJS02-PZ04	SJS02-PZ05	SJS02-PZ06	SJS02-PZ07	SJS02-PZ08	SJS02-PZ09
Sample ID	SJS02-PZ03-07B	SJS02-PZ04-07B	SJS02-PZ05-07B	SJS02-PZ06-07B	SJS02-PZ07-07B	SJS02-PZ08-07B	SJS02-PZ09-07B
Sample Date	05/23/07	05/23/07	05/24/07	05/23/07	05/29/07	05/24/07	05/24/07
Chemical Name							
Volatile Organic Compounds (µg/L)							
1,1,1-Trichloroethane	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
1,1,2,2-Tetrachloroethane	100 U	1,000 U	2,000 U	2 U	0.5 U	2 U	2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
1,1,2-Trichloroethane	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
1,1-Dichloroethane	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
1,1-Dichloroethene	200	620	1,000 U	1 U	0.5 U	1 U	1 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	250 U	2,500 U	5,000 U	5 U	0.5 U	5 U	5 U
1,2-Dibromo-3-chloropropane	250 U	2,500 U	5,000 U	5 U	0.5 U	5 U	5 U
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	100 U	1,000 U	2,000 U	2 U	0.5 U	2 U	2 U
1,2-Dichloroethane	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
1,2-Dichloropropane	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
1,3-Dichlorobenzene	100 U	1,000 U	2,000 U	2 U	0.5 U	2 U	2 U
1,4-Dichlorobenzene	100 U	1,000 U	2,000 U	2 U	0.5 U	2 U	2 U
2-Butanone	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	0.5 U	NA	NA
Bromodichloromethane	100 U	1,000 U	2,000 U	2 U	0.5 U	2 U	2 U
Bromoform	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
Chlorobenzene	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
Chloroethane	250 U	2,500 U	5,000 U	5 U	0.5 U	5 U	5 U
Chloroform	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
Chloromethane	250 U	2,500 U	5,000 U	5 U	0.5 U	5 U	5 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	100 U	1,000 U	2,000 U	2 U	NA	2 U	2 U
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	250 U	2,500 U	5,000 U	5 U	0.5 U	5 U	5 U
Ethane	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA
Hydrogen (NMOLE/L)	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	250 U	2,500 U	5,000 U	5 U	0.18 B	5 U	5 U
Styrene	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
Toluene	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1,600	45,000	100,000	1.3	0.5 U	0.8 J	1 U
Trichlorofluoromethane(Freon-11)	250 U	2,500 U	5,000 U	5 U	0.5 U	5 U	5 U
Vinyl chloride	3,500	6,100	1,000 J	7.9	22	0.52 J	3.4
Xylene, total	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	7,700	48,000	17,000	1.1	0.5 U	1 U	1 U
cis-1,3-Dichloropropene	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
trans-1,2-Dichloroethene	58	1,100	1,000 U	1 U	0.5 U	1 U	1 U
trans-1,3-Dichloropropene	50 U	500 U	1,000 U	1 U	0.5 U	1 U	1 U
Semi-volatile Organic Compounds (µg/L)							
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
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Chesapeake, Virginia

Station ID	02GW01	02GW02	17GW01	SJS02-GW01	SJS02-GW02	SJS02-GW03	SJS02-GW04	SJS02-GW05	SJS02-GW06	SJS02-GW07	SJS02-GW08	SJS02-GW09		SJS02-GW10	SJS02-GW11	SJS02-GW12	SJS02-GW13	
Sample ID	02GW01	02GW02	17GW01	SJS02-GW01-07B	SJS02-GW02-07B	SJS02-GW03-07B	SJS02-GW04-07B	SJS02-GW05-07B	SJS02-GW06-07B	SJS02-GW07-07B	SJS02-GW08-07B	SJS02-GW09-07B	SJS02-GW09-07BP*	SJS02-GW10-07B	SJS02-GW11-07B	SJS02-GW12-07B	SJS02-GW13-13-07B	SJS02-GW13-15-07B
Sample Date	04/03/96	04/03/96	04/04/96	05/14/07	05/14/07	05/14/07	05/14/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/16/07	05/16/07	05/17/07	05/17/07
Chemical Name																		
2-Chloronaphthalene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	25 U	25 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	25 U	25 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	25 U	25 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	25 U	25 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	25 U	25 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	25 U	25 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	10 U	10 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)																		
4,4'-DDD	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	2 U	2 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	4 U	4 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	2 U	2 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	2 U	2 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	2 U	2 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	2 U	2 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	2 U	2 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
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Station ID	SJS02-GW14			SJS02-GW15	SJS02-GW16		SJS02-GW17		SJS02-GW18		SJS02-GW19	SJS02-GW20	SJS02-MW01S			
Sample ID	SJS02-GW14-13-07B	SJS02-GW14-13-07BP*	SJS02-GW14-6-07B	SJS02-GW15-13-07B	SJS02-GW16-11-07B	SJS02-GW16-14-07B	SJS02-GW17-17-07B	SJS02-GW17-21-07B	SJS02-GW18-19-07B	SJS02-GW18-19-07BP*	SJS02-GW19-13-07B	SJS02-GW20-14-07B	SJS02-GW1S-001	SJS02-GW1S-002	SJS02-GW1S-003	SJS02-MW01S-07B
Sample Date	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	07/16/97	11/06/97	05/18/99	06/04/07
Chemical Name																
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	1 B	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U	25 U	27 U	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	2 B	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	11 U	NA
Pesticide/Polychlorinated Biphenyls (µg/L)																
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.00510 J	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1.20 U	NA
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2 U	2.30 U	NA
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1.20 U	NA
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1.20 U	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1.20 U	NA
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1.20 U	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1.20 U	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW02S				SJS02-MW03S					SJS02-MW04S			SJS02-MW05S		
Sample ID	SJS02-GW2S-001	SJS02-GW2S-002	SJS02-GW2S-003	SJS02-MW02S-07B	SJS02-GW3S-001	SJS02-GW3S-001P*	SJS02-GW3S-002	SJS02-GW3S-003	SJS02-MW03S-07B	SJS02-GW4S-001	SJS02-GW4S-001P*	SJS02-MW04S-07B	SJS02-GW5S-001	SJS02-MW05S-07B	SJS02-MW05S-07BP*
Sample Date	07/23/97	11/06/97	05/18/99	06/01/07	07/17/97	07/31/97	11/06/97	05/19/99	06/01/07	05/19/99	05/19/99	06/01/07	05/18/99	05/31/07	05/31/07
Chemical Name															
2-Chloronaphthalene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2-Chlorophenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2-Methylnaphthalene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2-Methylphenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
2-Nitroaniline	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
2-Nitrophenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
3,3'-Dichlorobenzidine	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
3-Nitroaniline	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
4,6-Dinitro-2-methylphenol	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
4-Bromophenyl-phenylether	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
4-Chloro-3-methylphenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
4-Chloroaniline	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
4-Chlorophenyl-phenylether	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
4-Methylphenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
4-Nitroaniline	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
4-Nitrophenol	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
Acenaphthene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Acenaphthylene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Benzo(a)pyrene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Benzo(b)fluoranthene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Benzo(g,h,i)perylene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Benzo(k)fluoranthene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Butylbenzylphthalate	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Chrysene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Di-n-butylphthalate	10 U	10 U	1 B	NA	10 U	NA	10 U	11 U	NA	12 U	4 J	NA	1 B	NA	NA
Di-n-octylphthalate	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Dibenz(a,h)anthracene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Dibenzofuran	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Diethylphthalate	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Dimethyl phthalate	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Fluoranthene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Fluorene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Hexachlorobenzene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Hexachlorobutadiene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Hexachlorocyclopentadiene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Hexachloroethane	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Isophorone	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Naphthalene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Nitrobenzene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Pentachlorophenol	25 U	25 U	26 U	NA	25 U	NA	25 U	29 U	NA	29 U	28 U	NA	27 U	NA	NA
Phenanthrene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Phenol	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Pyrene	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
bis(2-Chloroethoxy)methane	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
bis(2-Chloroethyl)ether	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
bis(2-Ethylhexyl)phthalate	10 U	10 U	2 B	NA	10 U	NA	10 U	11 U	NA	12 U	1 J	NA	2 B	NA	NA
n-Nitroso-di-n-propylamine	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
n-Nitrosodiphenylamine	10 U	10 U	10 U	NA	10 U	NA	10 U	11 U	NA	12 U	11 U	NA	11 U	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)															
4,4'-DDD	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
4,4'-DDE	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
4,4'-DDT	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
Aldrin	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
Aroclor-1016	1 U	1 U	1.30 U	NA	1 U	NA	1 U	1.10 U	NA	1.20 U	1.20 U	NA	1.10 U	NA	NA
Aroclor-1221	2 U	2 U	2.60 U	NA	2 U	NA	2 U	2.30 U	NA	2.40 U	2.30 U	NA	2.20 U	NA	NA
Aroclor-1232	1 U	1 U	1.30 U	NA	1 U	NA	1 U	1.10 U	NA	1.20 U	1.20 U	NA	1.10 U	NA	NA
Aroclor-1242	1 U	1 U	1.30 U	NA	1 U	NA	1 U	1.10 U	NA	1.20 U	1.20 U	NA	1.10 U	NA	NA
Aroclor-1248	1 U	1 U	1.30 U	NA	1 U	NA	1 U	1.10 U	NA	1.20 U	1.20 U	NA	1.10 U	NA	NA
Aroclor-1254	1 U	1 U	1.30 U	NA	1 U	NA	1 U	1.10 U	NA	1.20 U	1.20 U	NA	1.10 U	NA	NA
Aroclor-1260	1 U	1 U	1.30 U	NA	1 U	NA	1 U	1.10 U	NA	1.20 U	1.20 U	NA	1.10 U	NA	NA
Dieldrin	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
Endosulfan I	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
Endosulfan II	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
Endosulfan sulfate	0.1 U	0.1 U	0.0110 J	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.00860 J	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW06S	SJS02-MW07S	SJS02-MW08S		SJS02-MW09S		SJS02-MW10S		SJS02-MW11S	
Sample ID	SJS02-MW06S-03D	SJS02-MW07S-03D	SJS02-MW08S-03D	SJS02-MW08S-03D-P*	SJS02-MW09S-03D	SJS02-MW09S-07B	SJS02-MW10S-04D	SJS02-MW10S-07B	SJS02-MW11S-04D	SJS02-MW11S-07B
Sample Date	12/11/03	12/12/03	12/12/03	12/12/03	12/11/03	06/01/07	12/03/04	06/06/07	12/02/04	06/04/07
Chemical Name										
2-Chloronaphthalene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
2-Chlorophenol	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
2-Methylnaphthalene	5 U	8	5 U	5 U	5 U	NA	75	NA	11 U	NA
2-Methylphenol	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
2-Nitroaniline	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
2-Nitrophenol	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
3,3'-Dichlorobenzidine	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
3-Nitroaniline	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
4,6-Dinitro-2-methylphenol	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
4-Bromophenyl-phenylether	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
4-Chloro-3-methylphenol	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
4-Chloroaniline	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
4-Chlorophenyl-phenylether	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
4-Methylphenol	5 U	5 U	5 U	5 U	5 U	NA	2.1 J	NA	11 U	NA
4-Nitroaniline	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
4-Nitrophenol	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
Acenaphthene	5 U	8	5 U	5 U	2 J	NA	85	NA	11 U	NA
Acenaphthylene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Acetophenone	5 U	5 U	5 U	5 U	5 U	NA	1.7 J	NA	11 U	NA
Anthracene	5 U	0.8 J	5 U	5 U	5 U	NA	11	NA	11 U	NA
Atrazine	5 U	5 U	5 U	5 U	5 U	NA	220 R	NA	11 R	NA
Benzaldehyde	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Benzo(a)anthracene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Benzo(a)pyrene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Benzo(b)fluoranthene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Benzo(g,h,i)perylene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Benzo(k)fluoranthene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Butylbenzylphthalate	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Caprolactam	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Carbazole	5 U	6	5 U	5 U	5 U	NA	240	NA	11 U	NA
Chrysene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Di-n-butylphthalate	5 U	5 U	0.7 J	0.7 J	5 U	NA	11 U	NA	11 U	NA
Di-n-octylphthalate	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Dibenz(a,h)anthracene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Dibenzofuran	5 U	5	5 U	5 U	5 U	NA	54	NA	11 U	NA
Diethylphthalate	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Dimethyl phthalate	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Fluoranthene	5 U	5 U	5 U	5 U	5 U	NA	5.9 J	NA	11 U	NA
Fluorene	5 U	5	5 U	5 U	5 U	NA	62	NA	11 U	NA
Hexachlorobenzene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Hexachlorobutadiene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Hexachlorocyclopentadiene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Hexachloroethane	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Indeno(1,2,3-cd)pyrene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Isophorone	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Naphthalene	5 U	120	5 U	5 U	5 U	NA	1,300	NA	11 U	NA
Nitrobenzene	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Pentachlorophenol	13 U	13 U	13 U	13 U	13 U	NA	27 U	NA	28 U	NA
Phenanthrene	5 U	4 J	5 U	5 U	5 U	NA	56	NA	11 U	NA
Phenol	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Pyrene	5 U	5 U	5 U	5 U	5 U	NA	4.1 J	NA	11 U	NA
bis(2-Chloroethoxy)methane	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
bis(2-Chloroethyl)ether	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
bis(2-Ethylhexyl)phthalate	5 U	0.6 J	0.5 J	5 U	5 U	NA	1.1 J	NA	11 U	NA
n-Nitroso-di-n-propylamine	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
n-Nitrosodiphenylamine	5 U	5 U	5 U	5 U	5 U	NA	11 U	NA	11 U	NA
Pesticide/Polychlorinated Biphenyls (µg/L)										
4,4'-DDD	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
4,4'-DDE	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
4,4'-DDT	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
Aldrin	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
Aroclor-1016	1 U	1 U	1 U	1 U	1 U	NA	1.1 UJ	NA	1.2 UJ	NA
Aroclor-1221	2 U	2 U	2 U	2 U	2 U	NA	2.2 UJ	NA	2.5 UJ	NA
Aroclor-1232	1 U	1 U	1 U	1 U	1 U	NA	1.1 UJ	NA	1.2 UJ	NA
Aroclor-1242	1 U	1 U	1 U	1 U	1 U	NA	1.1 UJ	NA	1.2 UJ	NA
Aroclor-1248	1 U	1 U	1 U	1 U	1 U	NA	1.1 UJ	NA	1.2 UJ	NA
Aroclor-1254	1 U	1 U	1 U	1 U	1 U	NA	1.1 UJ	NA	1.2 UJ	NA
Aroclor-1260	1 U	1 U	1 U	1 U	1 U	NA	1.1 UJ	NA	1.2 UJ	NA
Dieldrin	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
Endosulfan I	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
Endosulfan II	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
Endosulfan sulfate	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA

Table C-3
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Station ID	SJS02-MW12S		SJS02-MW13S			SJS02-MW14S	SJS02-MW15S	SJS02-MW16S			SJS02-PZ01		SJS02-PZ02	
Sample ID	SJS02-MW12S-04D	SJS02-MW12S-07B	SJS02-MW13S-04D	SJS02-MW13S-04D-P*	SJS02-MW13S-07B	SJS02-MW14S-07B	SJS02-MW15S-07B	SJS02-MW16S-07B	SJS02-MW16S-07C	SJS02-MW16S-07CP*	SJS02-PZ01-07B	SJS02-PZ01-07BP*	SJS02-PZ02-07B	SJS02-PZ02-19-07B
Sample Date	12/02/04	05/30/07	12/02/04	12/02/04	06/01/07	06/06/07	06/05/07	06/05/07	07/13/07	07/13/07	05/22/07	05/22/07	05/23/07	05/24/07
Chemical Name														
2-Chloronaphthalene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	11 R	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	3.4 J	NA	11 U	2.7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	28 U	NA	28 U	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	11 U	NA	3 J	2.6 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	2.2 B	NA	1.6 B	3.4 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	11 U	NA	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)														
4,4'-DDD	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	1.1 UJ	NA	1 U	1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	2.2 UJ	NA	2.1 U	2 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	1.1 UJ	NA	1 U	1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	1.1 UJ	NA	1 U	1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	1.1 UJ	NA	1 U	1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	1.1 UJ	NA	1 U	1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	1.1 UJ	NA	1 U	1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Station ID	SJS02-PZ03	SJS02-PZ04	SJS02-PZ05	SJS02-PZ06	SJS02-PZ07	SJS02-PZ08	SJS02-PZ09
Sample ID	SJS02-PZ03-07B	SJS02-PZ04-07B	SJS02-PZ05-07B	SJS02-PZ06-07B	SJS02-PZ07-07B	SJS02-PZ08-07B	SJS02-PZ09-07B
Sample Date	05/23/07	05/23/07	05/24/07	05/23/07	05/29/07	05/24/07	05/24/07
Chemical Name							
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)							
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA

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Station ID	02GW01	02GW02	17GW01	SJS02-GW01	SJS02-GW02	SJS02-GW03	SJS02-GW04	SJS02-GW05	SJS02-GW06	SJS02-GW07	SJS02-GW08	SJS02-GW09		SJS02-GW10	SJS02-GW11	SJS02-GW12	SJS02-GW13	
Sample ID	02GW01	02GW02	17GW01	SJS02-GW01-07B	SJS02-GW02-07B	SJS02-GW03-07B	SJS02-GW04-07B	SJS02-GW05-07B	SJS02-GW06-07B	SJS02-GW07-07B	SJS02-GW08-07B	SJS02-GW09-07B	SJS02-GW09-07BP*	SJS02-GW10-07B	SJS02-GW11-07B	SJS02-GW12-07B	SJS02-GW13-13-07B	SJS02-GW13-15-07B
Sample Date	04/03/96	04/03/96	04/04/96	05/14/07	05/14/07	05/14/07	05/14/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/16/07	05/16/07	05/17/07	05/17/07
Chemical Name																		
Endrin	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	0.2 U	0.2 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	1 U	1 U	0.62 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	10 U	10 U	6.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	0.1 U	0.1 U	0.062 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)																		
1,3,5-Trinitrobenzene	0.5 U	0.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	0.5 U	0.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (µg/L)																		
Aluminum	535	34.2 B	547	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	46 U	46 U	46 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	5.8 B	2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	60.3 B	72.7 B	24.8 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	1 U	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	2 U	2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	141,000	28,000	13,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	3.1 B	2 U	12.3 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	4 U	4 U	6.1 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	6,120	18,900	1,320	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	2 U	2 U	3.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	47,700	44,400	10,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	657	726	2,550	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.13 U	0.13 U	0.13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	12 B	11.6 B	10.6 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	19,900	9,680	2,030 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	4 U	4 U	4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	94,500	215,000	72,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	4 U	4 U	4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	3.1 B	2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	29.1	29.4	23.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)																		
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-GW14			SJS02-GW15	SJS02-GW16		SJS02-GW17		SJS02-GW18		SJS02-GW19	SJS02-GW20	SJS02-MW01S			
Sample ID	SJS02-GW14-13-07B	SJS02-GW14-13-07BP*	SJS02-GW14-6-07B	SJS02-GW15-13-07B	SJS02-GW16-11-07B	SJS02-GW16-14-07B	SJS02-GW17-17-07B	SJS02-GW17-21-07B	SJS02-GW18-19-07B	SJS02-GW18-19-07BP*	SJS02-GW19-13-07B	SJS02-GW20-14-07B	SJS02-GW1S-001	SJS02-GW1S-002	SJS02-GW1S-003	SJS02-MW01S-07B
Sample Date	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	07/16/97	11/06/97	05/18/99	06/04/07
Chemical Name																
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.120 U	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.580 U	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	5.80 U	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.0580 U	NA
Explosives (µg/L)																
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.60 U	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.60 U	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.60 U	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.60 U	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20 U	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.60 U	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.60 U	NA
Total Metals (µg/L)																
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,400	365	1,370 K	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.7 U	2.70 U	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 J	5.1 B	3.20 B	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	54.5 J	39.6 J	35 J	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	0.58 J	0.100 U	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.4 U	0.300 U	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	75,600	149,000	162,000	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.2 K	23	7.10 J	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.2 J	12.4 J	1.40 B	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U	5.8 U	5.5 B	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,870	5,990	5,510	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6	1.9 J	2.70 J	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21,400	16,200	14,000	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	988	405	442	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.13 U	0.13 U	0.100 U	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14.8 K	16.5 J	4.90 J	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,720 J	3,880 J	3,550 J	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 UL	3.3 U	2.60 U	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.7 B	1.1 U	0.900 U	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	44,600	20,900	18,800	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2.6 B	2 UL	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14.1 J	6.8 U	3.90 J	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28 B	18 B	11.8 B	NA
Dissolved Metals (µg/L)																
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	44 U	38.1 U	38.2 U	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.7 U	2.70 U	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 U	3.4 B	6.40 B	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	42.1 J	40.2 J	36.4 J	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	0.58 J	0.100 U	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.4 U	0.300 U	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	67,700	152,000	148,000	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7 U	4.8 J	1.30 J	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.1 J	48 J	0.770 B	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U	5.8 U	3.80 B	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,530	5,460	5,360	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1.3 U	1 U	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21,000	16,600	11,600	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW02S				SJS02-MW03S					SJS02-MW04S			SJS02-MW05S		
Sample ID	SJS02-GW2S-001	SJS02-GW2S-002	SJS02-GW2S-003	SJS02-MW02S-07B	SJS02-GW3S-001	SJS02-GW3S-001P*	SJS02-GW3S-002	SJS02-GW3S-003	SJS02-MW03S-07B	SJS02-GW4S-001	SJS02-GW4S-001P*	SJS02-MW04S-07B	SJS02-GW5S-001	SJS02-MW05S-07B	SJS02-MW05S-07BP*
Sample Date	07/23/97	11/06/97	05/18/99	06/01/07	07/17/97	07/31/97	11/06/97	05/19/99	06/01/07	05/19/99	05/19/99	06/01/07	05/18/99	05/31/07	05/31/07
Chemical Name															
Endrin	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
Endrin aldehyde	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
Endrin ketone	0.1 U	0.1 U	0.130 U	NA	0.1 U	NA	0.1 U	0.110 U	NA	0.120 U	0.120 U	NA	0.110 U	NA	NA
Heptachlor	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0900	0.0920	NA	0.0550 U	NA	NA
Heptachlor epoxide	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
Methoxychlor	0.5 U	0.5 U	0.660 U	NA	0.5 U	NA	0.5 U	0.570 U	NA	0.590 U	0.580 U	NA	0.550 U	NA	NA
Toxaphene	5 U	5 U	6.60 U	NA	5 U	NA	5 U	5.70 U	NA	5.90 U	5.80 U	NA	5.5 U	NA	NA
alpha-BHC	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
alpha-Chlordane	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
beta-BHC	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
delta-BHC	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
gamma-BHC (Lindane)	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
gamma-Chlordane	0.05 U	0.05 U	0.0660 U	NA	0.05 U	NA	0.05 U	0.0570 U	NA	0.0590 U	0.0580 U	NA	0.0550 U	NA	NA
Explosives (µg/L)															
1,3,5-Trinitrobenzene	NA	NA	1.20 U	NA	25 U	25 U	25 U	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
1,3-Dinitrobenzene	NA	NA	1.20 U	NA	25 U	25 U	25 U	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
2,4,6-Trinitrotoluene	NA	NA	1.20 U	NA	25 U	25 U	25 U	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
2,4-Dinitrotoluene	NA	NA	1.20 U	NA	NA	25 U	NA	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
2,6-Dinitrotoluene	NA	NA	1.20 U	NA	NA	25 U	NA	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	1.20 U	NA	25 U	25 U	25 U	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
2-Nitrotoluene	NA	NA	2.60 U	NA	25 U	25 U	25 U	2.60 U	NA	2.60 U	2.60 U	NA	2.60 U	NA	NA
3-Nitrotoluene	NA	NA	2.60 U	NA	25 U	25 U	25 U	2.60 U	NA	2.60 U	2.60 U	NA	2.60 U	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	1.20 U	NA	25 U	25 U	25 U	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
4-Nitrotoluene	NA	NA	2.60 U	NA	25 U	25 U	25 U	2.60 U	NA	2.60 U	2.60 U	NA	2.60 U	NA	NA
HMX	NA	NA	2.60 U	NA	25 U	25 U	25 U	2.60 U	NA	2.60 U	0.400 J	NA	2.60 U	NA	NA
Nitrobenzene	NA	NA	1.20 U	NA	NA	25 U	NA	1.20 U	NA	1.20 U	1.20 U	NA	1.20 U	NA	NA
RDX	NA	NA	2.60 U	NA	25 U	25 U	25 U	2.60 U	NA	2.60 U	2.70	NA	2.60 U	NA	NA
Tetryl	NA	NA	2.60 U	NA	25 U	25 U	25 U	2.60 U	NA	2.60 U	2.60 U	NA	2.60 U	NA	NA
Total Metals (µg/L)															
Aluminum	35,500 J	1,170	211 K	NA	6,890	NA	130 J	38.2 U	NA	303	227	NA	304	NA	NA
Antimony	NA	1.7 U	2.70 U	NA	2 U	NA	1.7 U	2.70 U	NA	2.70 U	2.70 U	NA	2.70 U	NA	NA
Arsenic	3 U	3.2 U	12.2 B	NA	10.5 B	NA	6.2 J	8.10 B	NA	2.20 B	2.60 B	NA	2.80 B	NA	NA
Barium	726	575	568	NA	127 B	NA	55.1 J	75.5 J	NA	63.7 J	62.7 J	NA	56.5 J	NA	NA
Beryllium	1.4 B	0.77 J	0.100 U	NA	1 U	NA	0.58 J	0.100 U	NA	0.190 J	0.200 J	NA	0.100 U	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.5 UL	2 U	0.440 B	NA	0.5 U	NA	0.4 U	0.870 B	NA	1 B	1.10 B	NA	0.440 B	NA	NA
Calcium	110,000 J	169,000	225,000	NA	86,300	NA	217,000	207,000	NA	20,900	20,500	NA	25,100	NA	NA
Chromium	56.3 J	14.3	3.20 J	NA	12 K	NA	4.6 U	1.10 U	NA	1.10 U	1.70 J	NA	1.10 U	NA	NA
Cobalt	8 U	15.4 J	0.5 U	NA	8 U	NA	6 U	3.20 J	NA	34.1 J	35.9 J	NA	13.6 J	NA	NA
Copper	21.4 B	5.8 U	5.10 B	NA	6 U	NA	6.3 J	35.9	NA	10.3 B	5.60 B	NA	4.30 B	NA	NA
Cyanide	5 U	5 U	5 U	NA	5 UL	NA	5 U	5 U	NA	5 U	5 U	NA	5 U	NA	NA
Iron	377,000 J	203,000	115,000	NA	26,700	NA	1,240	1,290	NA	55.4 J	54.9 J	NA	314	NA	NA
Lead	36.7 L	8.2	1 U	NA	4.8 B	NA	1.3 U	17.1	NA	1 U	1 U	NA	1 U	NA	NA
Magnesium	123,000 J	125,000	126,000	NA	67,600	NA	25,300	19,300	NA	8,890	9,110	NA	9,360	NA	NA
Manganese	797 L	843	978	NA	1,380	NA	197	272	NA	593	625	NA	723	NA	NA
Mercury	0.64 B	0.12 U	0.100 U	NA	0.14 B	NA	0.13 U	0.100 U	NA	0.100 U	0.100 U	NA	0.100 U	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	9.3 J	8.2 J	1.5 B	NA	7 U	NA	11.2 J	29.8 J	NA	8.10 B	7.80 B	NA	3.80 B	NA	NA
Potassium	14,100	18,500	23,600	NA	21,900	NA	6,970	8,400	NA	4,750 J	4,880 J	NA	2,790 J	NA	NA
Selenium	NA	16.5 U	2.60 U	NA	3 UL	NA	3.3 U	2.60 U	NA	2.60 U	2.60 U	NA	2.60 U	NA	NA
Silver	1.5 J	2.5 B	0.900 U	NA	4.6 B	NA	1.2 B	0.900 U	NA	0.900 U	0.900 U	NA	0.900 U	NA	NA
Sodium	883,000 J	691,000	619,000	NA	295,000	NA	23,800	37,800	NA	35,200	36,500	NA	34,400	NA	NA
Thallium	6.9 J	5.8 B	10 UL	NA	2 U	NA	4.3 B	2 U	NA	2 U	2 U	NA	2 UL	NA	NA
Vanadium	79.6	12.3 J	0.600 U	NA	19.4 J	NA	6.8 U	0.920 J	NA	0.600 U	0.600 U	NA	0.600 U	NA	NA
Zinc	74.9 B	15.3 J	14.2 B	NA	23.4 B	NA	319	638	NA	207	222	NA	52.1	NA	NA
Dissolved Metals (µg/L)															
Aluminum	44 U	38.1 U	114 J	NA	44 U	NA	38.1 U	50.4 J	NA	132 J	202	NA	52.4 J	NA	NA
Antimony	2 UL	1.7 U	2.70 U	NA	2 U	NA	1.7 U	2.70 U	NA	2.70 U	2.70 U	NA	2.70 U	NA	NA
Arsenic	3 UL	32 U	9.90 B	NA	5.6 J	NA	6 J	4.5 B	NA	3.10 B	2.30 B	NA	2.70 B	NA	NA
Barium	495	697	519	NA	110 B	NA	54.8 J	74.3 J	NA	64.9 J	60.9 J	NA	52.7 J	NA	NA
Beryllium	1 U	0.58 J	0.100 U	NA	1 U	NA	0.58 U	0.100 U	NA	0.210 J	0.160 J	NA	0.100 U	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.5 UL	4 U	0.310 B	NA	0.5 U	NA	0.4 U	0.770 B	NA	0.990 J	0.850 B	NA	0.320 B	NA	NA
Calcium	90,200 J	135,000	242,000	NA	90,800	NA	211,000	204,000	NA	20,000	19,100	NA	20,000	NA	NA
Chromium	7 U	9.9 J	1.40 J	NA	7 U	NA	4.6 U	1.10 U	NA	1.10 U	1.10 U	NA	2.40 J	NA	NA
Cobalt	8 U	67.9	0.5 U	NA	9.1 J	NA	11.3 J	3.30 J	NA	38.3 J	35.8 J	NA	13.7 J	NA	NA
Copper	6 U	5.8 U	7.5 B	NA	6 U	NA	5.8 U	29.7	NA	5.5 J	6.90 B	NA	8 B	NA	NA
Iron	267,000 J	367,000	64,600	NA	32,000	NA	689	736	NA	36 J	38.6 J	NA	944	NA	NA
Lead	1 U	15.5	1 U	NA	1 U	NA	1.3 U	2.10 J	NA	1 U	1 U	NA	1 U	NA	NA
Magnesium	99,800 J	128,000	127,000	NA	83,100	NA	23,700	18,900	NA	9,350	8,820	NA	9,280	NA	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW06S	SJS02-MW07S	SJS02-MW08S		SJS02-MW09S		SJS02-MW10S		SJS02-MW11S	
Sample ID	SJS02-MW06S-03D	SJS02-MW07S-03D	SJS02-MW08S-03D	SJS02-MW08S-03D-P*	SJS02-MW09S-03D	SJS02-MW09S-07B	SJS02-MW10S-04D	SJS02-MW10S-07B	SJS02-MW11S-04D	SJS02-MW11S-07B
Sample Date	12/11/03	12/12/03	12/12/03	12/12/03	12/11/03	06/01/07	12/03/04	06/06/07	12/02/04	06/04/07
Chemical Name										
Endrin	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
Endrin aldehyde	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
Endrin ketone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.11 UJ	NA	0.12 UJ	NA
Heptachlor	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
Heptachlor epoxide	0.05 U	0.05 U	1.06	1.11	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
Methoxychlor	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.56 UJ	NA	0.62 UJ	NA
Toxaphene	5 U	5 U	5 U	5 U	5 U	NA	5.6 UJ	NA	6.2 UJ	NA
alpha-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
alpha-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
beta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
delta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
gamma-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.06 UJ	NA	0.06 UJ	NA
Explosives (µg/L)										
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	0.26 U	NA	0.26 U	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	0.26 U	NA	0.26 U	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	0.26 U	NA	0.26 U	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	0.26 U	NA	0.26 U	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	20	NA	0.26 U	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	0.26 U	NA	0.26 U	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	0.52 U	NA	0.52 U	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	0.52 U	NA	0.52 U	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	0.26 U	NA	0.26 U	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	0.52 U	NA	0.52 U	NA
HMX	NA	NA	NA	NA	NA	NA	0.52 U	NA	0.52 U	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	0.26 U	NA	0.26 U	NA
RDX	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	0.79	NA	0.52 U	NA
Tetryl	NA	NA	NA	NA	NA	NA	0.52 U	NA	0.52 U	NA
Total Metals (µg/L)										
Aluminum	286	102 J	48.3 J	67.8 J	91.2 J	NA	134 B	NA	81.4 B	NA
Antimony	2 U	2 U	2 U	2 U	2 U	NA	6.4 U	NA	4.7 UL	NA
Arsenic	2 U	9.2 J	2.8 J	2 U	31	NA	5.3 U	NA	3.8 UJ	NA
Barium	30.1 J	124 J	78.9 J	81.1 J	66 J	NA	33.1 J	NA	121 J	NA
Beryllium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	0.4 U	NA	0.26 L	NA
Boron	NA	NA	NA	NA	NA	NA	50	NA	126 J	NA
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	0.3 U	NA	0.33 B	NA
Calcium	41,800	34,400	65,700	66,300	22,700	NA	18,100	NA	152,000	NA
Chromium	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	NA	1.5 U	NA	2.3 L	NA
Cobalt	4.3 J	18.7 J	5.9 J	6 J	5 J	NA	1.9 J	NA	1.1 UL	NA
Copper	3.4 B	1.8 B	15.2 J	15.6 J	3.8 B	NA	1.1 U	NA	3.3 B	NA
Cyanide	13.2 L	4.7 L	3 UL	3 UL	3 UL	NA	5 U	NA	5 U	NA
Iron	427	20,700	7,620	7,870	41,900	NA	12,500 L	NA	8,090	NA
Lead	0.7 U	0.7 U	0.7 U	0.7 U	4.8	NA	1.6 U	NA	2 UL	NA
Magnesium	4,960 J	44,200	37,500	37,900	11,000	NA	6,180	NA	43,600	NA
Manganese	125	1,340	1,830	1,850	1,210	NA	306	NA	883	NA
Mercury	0.13 U	0.13 U	0.14 U	0.14 U	0.13 U	NA	0.1 U	NA	0.1 U	NA
Molybdenum	NA	NA	NA	NA	NA	NA	1.6 U	NA	2.5 B	NA
Nickel	3 J	0.6 U	0.84 B	0.91 J	3.4 J	NA	1.1 U	NA	1.4 B	NA
Potassium	2,340 J	11,900	12,300	12,700	3,410 J	NA	2,790 J	NA	27,900	NA
Selenium	3 UL	3 UL	3 UL	3 UL	3 UL	NA	3.9 U	NA	3.7 UL	NA
Silver	0.4 U	1.5 J	0.4 U	0.4 U	5.9 J	NA	1.2 U	NA	1.3 UL	NA
Sodium	14,900	256,000	116,000	116,000	43,700	NA	28,200	NA	470,000	NA
Thallium	2 U	2 U	2 U	2 U	2 U	NA	6.5 U	NA	5.6 U	NA
Vanadium	1.1 J	0.4 U	0.4 U	0.4 U	0.4 U	NA	1.7 U	NA	1.2 L	NA
Zinc	48.8	7.9 B	69.7	69.5	158	NA	26.8	NA	3.9 B	NA
Dissolved Metals (µg/L)										
Aluminum	69.5 J	26.1 J	28.7 J	30.2 J	26 U	NA	17.9 U	NA	30.3 B	NA
Antimony	2 U	2 U	2 U	2 U	2 U	NA	6.4 U	NA	4.7 UL	NA
Arsenic	2 U	7.7 J	2 U	2 U	28.8	NA	5.3 U	NA	3.8 U	NA
Barium	28.8 J	118 J	77.2 J	77.6 J	62.6 J	NA	30.5 J	NA	120 J	NA
Beryllium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	0.4 U	NA	0.2 UL	NA
Boron	NA	NA	NA	NA	NA	NA	46.9	NA	122 J	NA
Cadmium	0.22 J	0.2 U	0.2 U	0.2 U	0.2 U	NA	0.3 U	NA	0.3 U	NA
Calcium	43,900	34,900	68,700	67,600	23,100	NA	16,800	NA	149,000	NA
Chromium	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	NA	1.5 U	NA	0.94 L	NA
Cobalt	4.1 J	18.8 J	5.8 J	5.8 J	4.9 J	NA	2 J	NA	1.1 UL	NA
Copper	2.4 B	0.7 U	11.9 J	11.6 J	0.91 B	NA	1.1 U	NA	1.3 U	NA
Iron	84.3 J	20,700 J	8,160 J	8,740 J	41,600 J	NA	11,400	NA	7,220	NA
Lead	1.7 B	1.3 J	1.6 J	2.1 J	3.4 B	NA	1.6 U	NA	2 UL	NA
Magnesium	5,050 J	43,400 J	38,800 J	38,100 J	11,000 J	NA	5,780	NA	41,500	NA

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW12S		SJS02-MW13S			SJS02-MW14S	SJS02-MW15S	SJS02-MW16S			SJS02-PZ01		SJS02-PZ02	
Sample ID	SJS02-MW12S-04D	SJS02-MW12S-07B	SJS02-MW13S-04D	SJS02-MW13S-04D-P*	SJS02-MW13S-07B	SJS02-MW14S-07B	SJS02-MW15S-07B	SJS02-MW16S-07B	SJS02-MW16S-07C	SJS02-MW16S-07CP*	SJS02-PZ01-07B	SJS02-PZ01-07BP*	SJS02-PZ02-07B	SJS02-PZ02-19-07B
Sample Date	12/02/04	05/30/07	12/02/04	12/02/04	06/01/07	06/06/07	06/05/07	06/05/07	07/13/07	07/13/07	05/22/07	05/22/07	05/23/07	05/24/07
Chemical Name														
Endrin	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	0.11 UJ	NA	0.1 U	0.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.02 UJ	NA	0.07 J	0.06 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	0.56 UJ	NA	0.52 U	0.51 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	5.6 UJ	NA	5.2 UJ	5.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	0.06 UJ	NA	0.05 U	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)														
1,3,5-Trinitrobenzene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	0.52 U	NA	0.52 U	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	0.52 U	NA	0.52 U	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	0.52 U	NA	0.52 U	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	0.52 U	NA	0.52 U	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	0.26 U	NA	0.26 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	0.52 U	NA	0.52 U	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	0.52 U	NA	0.52 U	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (µg/L)														
Aluminum	45.6 B	NA	47.4 B	32.2 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	4.7 UL	NA	4.7 UL	4.7 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	14.3 B	NA	3.8 UJ	5.2 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	42.3 J	NA	163 J	166 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.21 L	NA	0.2 UL	0.2 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	90.8 J	NA	170 J	169 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.3 U	NA	0.3 U	0.53 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	38,400	NA	162,000	161,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.9 UL	NA	1.3 L	1.3 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	10.7 J	NA	1.1 UL	1.1 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.3 U	NA	1.9 B	2.1 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	5 U	NA	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	25,600	NA	36,600	36,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	2 UL	NA	2 UL	2 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	13,300	NA	48,300	48,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	760	NA	947	953	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1 U	NA	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	1.9 U	NA	2.9 B	2.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	1.6 B	NA	3 B	3.6 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	4,290 J	NA	18,300	18,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.7 UL	NA	4.5 B	3.7 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.3 UL	NA	1.3 UL	1.3 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	55,000 J	NA	171,000	170,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	5.6 U	NA	5.6 U	5.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	1.1 UL	NA	1.6 L	2.5 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	8.4 B	NA	4.8 B	4.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)														
Aluminum	21.4 U	NA	21.4 U	27 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	4.7 UL	NA	4.7 UL	4.7 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	12 B	NA	3.8 U	4.1 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	50.4 J	NA	161 J	158 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.28 L	NA	0.24 L	0.24 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	88.5 J	NA	168 J	166 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.31 B	NA	0.42 B	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	40,000	NA	160,000	159,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.9 UL	NA	1.2 L	1.5 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	20.6 J	NA	1.1 UL	1.1 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.3 U	NA	1.3 U	1.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	25,700	NA	35,600	35,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	2 UL	NA	2 UL	2 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	14,500	NA	47,200	47,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Station ID	SJS02-PZ03	SJS02-PZ04	SJS02-PZ05	SJS02-PZ06	SJS02-PZ07	SJS02-PZ08	SJS02-PZ09
Sample ID	SJS02-PZ03-07B	SJS02-PZ04-07B	SJS02-PZ05-07B	SJS02-PZ06-07B	SJS02-PZ07-07B	SJS02-PZ08-07B	SJS02-PZ09-07B
Sample Date	05/23/07	05/23/07	05/24/07	05/23/07	05/29/07	05/24/07	05/24/07
Chemical Name							
Endrin	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)							
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA
Total Metals (µg/L)							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA

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Shallow Groundwater Raw Analytical Results
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Chesapeake, Virginia

Station ID	02GW01	02GW02	17GW01	SJS02-GW01	SJS02-GW02	SJS02-GW03	SJS02-GW04	SJS02-GW05	SJS02-GW06	SJS02-GW07	SJS02-GW08	SJS02-GW09		SJS02-GW10	SJS02-GW11	SJS02-GW12	SJS02-GW13	
Sample ID	02GW01	02GW02	17GW01	SJS02-GW01-07B	SJS02-GW02-07B	SJS02-GW03-07B	SJS02-GW04-07B	SJS02-GW05-07B	SJS02-GW06-07B	SJS02-GW07-07B	SJS02-GW08-07B	SJS02-GW09-07B	SJS02-GW09-07BP*	SJS02-GW10-07B	SJS02-GW11-07B	SJS02-GW12-07B	SJS02-GW13-13-07B	SJS02-GW13-15-07B
Sample Date	04/03/96	04/03/96	04/04/96	05/14/07	05/14/07	05/14/07	05/14/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/15/07	05/16/07	05/16/07	05/17/07	05/17/07
Chemical Name																		
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg/L)																		
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
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Station ID	SJS02-GW14			SJS02-GW15	SJS02-GW16		SJS02-GW17		SJS02-GW18		SJS02-GW19	SJS02-GW20	SJS02-MW01S			
Sample ID	SJS02-GW14-13-07B	SJS02-GW14-13-07BP*	SJS02-GW14-6-07B	SJS02-GW15-13-07B	SJS02-GW16-11-07B	SJS02-GW16-14-07B	SJS02-GW17-17-07B	SJS02-GW17-21-07B	SJS02-GW18-19-07B	SJS02-GW18-19-07BP*	SJS02-GW19-13-07B	SJS02-GW20-14-07B	SJS02-GW1S-001	SJS02-GW1S-002	SJS02-GW1S-003	SJS02-MW01S-07B
Sample Date	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	05/18/07	07/16/97	11/06/97	05/18/99	06/04/07
Chemical Name																
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,020	416	509	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.12 U	0.12 U	0.100 U	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16.8 K	11.2 J	2 J	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,170 J	3,980 J	2,930 J	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 U	3.3 U	2.60 U	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.8 J	1.8 B	0.900 U	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	43,900	21,600	29,700	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2.5 B	2 UL	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9 U	6.8 U	1 J	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	17.8 B	21.9 B	5.60 B	NA
Wet Chemistry (mg/L)																
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.146	0.073	0.0320	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW02S				SJS02-MW03S					SJS02-MW04S			SJS02-MW05S		
Sample ID	SJS02-GW2S-001	SJS02-GW2S-002	SJS02-GW2S-003	SJS02-MW02S-07B	SJS02-GW3S-001	SJS02-GW3S-001P*	SJS02-GW3S-002	SJS02-GW3S-003	SJS02-MW03S-07B	SJS02-GW4S-001	SJS02-GW4S-001P*	SJS02-MW04S-07B	SJS02-GW5S-001	SJS02-MW05S-07B	SJS02-MW05S-07BP*
Sample Date	07/23/97	11/06/97	05/18/99	06/01/07	07/17/97	07/31/97	11/06/97	05/19/99	06/01/07	05/19/99	05/19/99	06/01/07	05/18/99	05/31/07	05/31/07
Chemical Name															
Manganese	612 J	807	1,010	NA	1,720	NA	174	247	NA	697	645	NA	751	NA	NA
Mercury	0.38 B	0.13 U	0.100 U	NA	0.13 B	NA	0.13 U	0.100 U	NA	0.100 U	0.100 U	NA	0.100 U	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7 U	7.1 J	0.900 U	NA	7 U	NA	11.6 J	30 J	NA	8.70 J	8.20 B	NA	6.60 J	NA	NA
Potassium	9,980	14,500	25,100 J	NA	25,400	NA	6,330	8,190	NA	4,730 J	4,570 J	NA	2,630 J	NA	NA
Selenium	NA	33 U	2.60 U	NA	3 U	NA	3.3 U	2.60 U	NA	2.60 U	2.60 U	NA	2.60 U	NA	NA
Silver	2 J	4.3 B	0.900 U	NA	3.1 B	NA	1.1 U	1 J	NA	0.900 U	0.900 U	NA	0.900 U	NA	NA
Sodium	720,000 J	876,000	556,000	NA	375,000	NA	22,200	37,400	NA	37,600	35,800	NA	33,400	NA	NA
Thallium	9.6 J	1.5 U	10 UL	NA	2 U	NA	3.2 B	2 U	NA	2 U	2 U	NA	2 UL	NA	NA
Vanadium	9 U	14.2 J	0.600 U	NA	9 U	NA	6.8 U	0.600 U	NA	0.600 U	0.600 U	NA	0.600 U	NA	NA
Zinc	33.8 B	33.5 B	4.20 B	NA	8.7 B	NA	330	642	NA	213	208	NA	64.9	NA	NA
Wet Chemistry (mg/L)															
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	0.338	0.082	0.0200 U	NA	0.105	NA	0.05 U	0.0200 U	NA	0.0200 U	0.0200 U	NA	0.0200 U	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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Chesapeake, Virginia

Station ID	SJS02-MW06S	SJS02-MW07S	SJS02-MW08S		SJS02-MW09S		SJS02-MW10S		SJS02-MW11S	
Sample ID	SJS02-MW06S-03D	SJS02-MW07S-03D	SJS02-MW08S-03D	SJS02-MW08S-03D-P*	SJS02-MW09S-03D	SJS02-MW09S-07B	SJS02-MW10S-04D	SJS02-MW10S-07B	SJS02-MW11S-04D	SJS02-MW11S-07B
Sample Date	12/11/03	12/12/03	12/12/03	12/12/03	12/11/03	06/01/07	12/03/04	06/06/07	12/02/04	06/04/07
Chemical Name										
Manganese	121 J	1,330 J	1,880 J	1,860 J	1,210 J	NA	285	NA	845	NA
Mercury	0.14 U	0.14 U	0.13 U	0.14 U	0.13 U	NA	0.1 U	NA	0.1 U	NA
Molybdenum	NA	NA	NA	NA	NA	NA	1.6 U	NA	2 B	NA
Nickel	2.7 J	0.6 U	0.6 U	0.6 U	3.4 J	NA	1.1 U	NA	0.95 B	NA
Potassium	2,020 J	11,900 J	12,500 J	12,800 J	3,100 J	NA	2,620 J	NA	28,000	NA
Selenium	3 U	3 U	3 U	3 U	3 U	NA	3.9 U	NA	3.7 UL	NA
Silver	0.4 U	1.5 J	0.4 U	0.4 U	5.6 J	NA	1.2 U	NA	1.3 UL	NA
Sodium	14,700	252,000	124,000	120,000	44,000	NA	26,500	NA	469,000	NA
Thallium	2.3 J	2 U	2 U	2 U	2 U	NA	6.5 U	NA	5.6 U	NA
Vanadium	0.97 J	0.4 U	0.4 U	0.4 U	0.4 U	NA	1.7 U	NA	1.2 L	NA
Zinc	52.2	6.5 B	67.3	66.7	157	NA	9.6 J	NA	2.1 B	NA
Wet Chemistry (mg/L)										
Alkalinity	NA	NA	NA	NA	NA	NA	47	56.8	250	NA
Carbon	NA	NA	NA	NA	NA	NA	NA	3.8 K	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	12	2.6 J	3.1	NA
Nitrate/Nitrite	NA	NA	NA	NA	NA	NA	0.05 U	0.75 UJ	0.05 U	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA	0.03	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	33	5.1	4.8	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	2.2	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	4.8	NA	4.7	NA

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Table C-3
Shallow Groundwater Raw Analytical Results
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Station ID	SJS02-MW12S		SJS02-MW13S			SJS02-MW14S	SJS02-MW15S	SJS02-MW16S			SJS02-PZ01		SJS02-PZ02	
Sample ID	SJS02-MW12S-04D	SJS02-MW12S-07B	SJS02-MW13S-04D	SJS02-MW13S-04D-P*	SJS02-MW13S-07B	SJS02-MW14S-07B	SJS02-MW15S-07B	SJS02-MW16S-07B	SJS02-MW16S-07C	SJS02-MW16S-07CP*	SJS02-PZ01-07B	SJS02-PZ01-07BP*	SJS02-PZ02-07B	SJS02-PZ02-19-07B
Sample Date	12/02/04	05/30/07	12/02/04	12/02/04	06/01/07	06/06/07	06/05/07	06/05/07	07/13/07	07/13/07	05/22/07	05/22/07	05/23/07	05/24/07
Chemical Name														
Manganese	1,050	NA	952	944	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1 U	NA	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	1.9 U	NA	4 B	3.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	3.6 B	NA	2.1 B	3.2 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	4,470 J	NA	18,400	17,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.7 UL	NA	3.7 UL	3.7 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.3 UL	NA	1.3 UL	1.3 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	69,800	NA	167,000	164,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	5.6 U	NA	5.6 U	5.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	1.1 UL	NA	1.7 L	2 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	10.4 B	NA	4.7 B	5.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg/L)														
Alkalinity	96	NA	500	470	NA	102	190	281	NA	NA	NA	NA	NA	NA
Carbon	NA	NA	NA	NA	NA	4.8 K	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	33	NA	10 U	10 U	NA	12.2 J	9 J	26.6 J	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	0.05 U	NA	0.05 U	0.05 U	NA	0.75 UJ	0.75 U	0.75 U	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	0.03	0.03 U	0.03 U	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	38	NA	91	130	NA	13	4.4	28.2	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	2.3	2.4 U	2.3 U	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	1 U	NA	13	12	NA	NA	6.3 K	6.4 K	NA	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table C-3
Shallow Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-PZ03	SJS02-PZ04	SJS02-PZ05	SJS02-PZ06	SJS02-PZ07	SJS02-PZ08	SJS02-PZ09
Sample ID	SJS02-PZ03-07B	SJS02-PZ04-07B	SJS02-PZ05-07B	SJS02-PZ06-07B	SJS02-PZ07-07B	SJS02-PZ08-07B	SJS02-PZ09-07B
Sample Date	05/23/07	05/23/07	05/24/07	05/23/07	05/29/07	05/24/07	05/24/07
Chemical Name							
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg/L)							
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Carbon	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	NA	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW01D						SJS02-MW02D							SJS02-MW05D	
Sample ID	SJS02-GW1D-001	SJS02-GW1D-002	SJS02-GW1D-003	SJS02-MW01D-04D	SJS02-MW01D-05A	SJS02-MW01D-07B	SJS02-GW2D-001	SJS02-GW2D-002	SJS02-GW2D-002P*	SJS02-GW2D-003	SJS02-MW02D-05A	SJS02-MW02D-05A-P*	SJS02-MW02D-07B	SJS02-GW5D-001	SJS02-MW05D-07B
Sample Date	07/31/97	11/06/97	05/18/99	12/01/04	03/28/05	06/04/07	07/17/97	11/06/97	11/06/97	05/18/99	03/28/05	03/28/05	06/05/07	05/18/99	06/05/07
Chemical Name															
Volatile Organic Compounds (µg/L)															
1,1,1-Trichloroethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	0.5 UL	10 U	0.5 U	NA	NA	NA	NA	10 U	10 U	0.5 U	NA	0.5 U
1,1,2-Trichloroethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,1-Dichloroethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,1-Dichloroethene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,2-Dibromoethane	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
1,2-Dichlorobenzene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,2-Dichloroethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,2-Dichloropropane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,3-Dichlorobenzene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
1,4-Dichlorobenzene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
2-Butanone	NA	NA	NA	5 R	10 U	NA	NA	NA	NA	NA	10 U	10 U	NA	NA	NA
2-Hexanone	5 U	5 U	5 U	5 UL	10 U	NA	5 U	5 U	5 U	5 U	10 U	10 U	NA	5 U	NA
4-Methyl-2-pentanone	5 U	5 U	5 U	5 UL	10 U	NA	5 U	5 U	5 U	5 U	10 U	10 U	NA	5 U	NA
Acetone	5 U	7 B	NA	5 R	10 U	NA	NA	NA	NA	NA	10 U	10 U	NA	NA	NA
Benzene	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
Bromochloromethane	1 U	1 U	1 U	NA	NA	0.5 U	1 U	1 U	1 U	1 U	NA	NA	0.5 U	1 U	0.5 U
Bromodichloromethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Bromoform	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
Bromomethane	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
Carbon disulfide	1 U	0.2 J	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 J	NA
Carbon tetrachloride	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Chlorobenzene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Chloroethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Chloroform	0.6 J	1 U	1 U	0.5 UL	10 U	0.5 U	6	1 U	1 U	1 U	10 U	10 U	0.5 U	2.40 B	0.5 U
Chloromethane	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.32 B
Cyclohexane	NA	NA	NA	0.5 UL	10 U	NA	NA	NA	NA	NA	10 U	10 U	NA	NA	NA
Dibromochloromethane	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	0.5 UL	10 U	0.5 U	NA	NA	NA	NA	10 U	10 U	0.5 U	NA	0.5 U
Ethylbenzene	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
Isopropylbenzene	NA	NA	NA	0.5 UL	10 U	NA	NA	NA	NA	NA	10 U	10 U	NA	NA	NA
Methyl acetate	NA	NA	NA	0.5 R	10 U	NA	NA	NA	NA	NA	10 U	10 U	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	0.5 UL	10 U	NA	NA	NA	NA	NA	10 U	10 U	NA	NA	NA
Methylcyclohexane	NA	NA	NA	0.5 UL	10 U	NA	NA	NA	NA	NA	10 U	10 U	NA	NA	NA
Methylene chloride	3 B	2 B	2 U	0.5 UL	10 U	0.16 B	3 B	2 B	2 B	2 U	10 U	10 U	0.24 B	2 U	0.33 B
Styrene	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
Tetrachloroethene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Toluene	0.3 J	0.7 B	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
Trichloroethene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Trichlorofluoromethane(Freon-11)	NA	NA	NA	0.5 UL	10 U	0.5 U	NA	NA	NA	NA	10 U	10 U	0.5 U	NA	0.5 U
Vinyl chloride	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Xylene, total	1 U	1 U	1 U	0.5 UL	10 U	NA	1 U	1 U	1 U	1 U	10 U	10 U	NA	1 U	NA
cis-1,2-Dichloroethene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	0.5 UL	10 U	0.5 U	1 U	1 U	1 U	1 U	10 U	10 U	0.5 U	1 U	0.5 U
Semi-volatile Organic Compounds (µg/L)															
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	11 U	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	11 U	NA
1,2-Dichlorobenzene	NA	NA	11 U	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	11 U	NA
1,3-Dichlorobenzene	NA	NA	11 U	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	11 U	NA
1,4-Dichlorobenzene	NA	NA	11 U	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	11 U	NA
2,2'-Oxybis(1-chloropropane)	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2,4,5-Trichlorophenol	25 U	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
2,4,6-Trichlorophenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2,4-Dichlorophenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW01D						SJS02-MW02D							SJS02-MW05D	
Sample ID	SJS02-GW1D-001	SJS02-GW1D-002	SJS02-GW1D-003	SJS02-MW01D-04D	SJS02-MW01D-05A	SJS02-MW01D-07B	SJS02-GW2D-001	SJS02-GW2D-002	SJS02-GW2D-002P*	SJS02-GW2D-003	SJS02-MW02D-05A	SJS02-MW02D-05A-P*	SJS02-MW02D-07B	SJS02-GW5D-001	SJS02-MW05D-07B
Sample Date	07/31/97	11/06/97	05/18/99	12/01/04	03/28/05	06/04/07	07/17/97	11/06/97	11/06/97	05/18/99	03/28/05	03/28/05	06/05/07	05/18/99	06/05/07
Chemical Name															
2,4-Dimethylphenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2,4-Dinitrophenol	25 UJ	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
2,4-Dinitrotoluene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2,6-Dinitrotoluene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2-Chloronaphthalene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2-Chlorophenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2-Methylnaphthalene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2-Methylphenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
2-Nitroaniline	25 U	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
2-Nitrophenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
3,3'-Dichlorobenzidine	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
3-Nitroaniline	25 U	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
4,6-Dinitro-2-methylphenol	25 U	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
4-Bromophenyl-phenylether	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
4-Chloro-3-methylphenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
4-Chloroaniline	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
4-Chlorophenyl-phenylether	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
4-Methylphenol	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
4-Nitroaniline	25 U	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
4-Nitrophenol	25 U	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
Acenaphthene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Acenaphthylene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Benzo(a)pyrene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Benzo(b)fluoranthene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Benzo(g,h,i)perylene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Benzo(k)fluoranthene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Butylbenzylphthalate	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Chrysene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Di-n-butylphthalate	10 U	10 U	1 B	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	2 B	NA
Di-n-octylphthalate	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Dibenz(a,h)anthracene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Dibenzofuran	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Diethylphthalate	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Dimethyl phthalate	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Fluoranthene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Fluorene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Hexachlorobenzene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Hexachlorobutadiene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Hexachlorocyclopentadiene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Hexachloroethane	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Indeno(1,2,3-cd)pyrene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Isophorone	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Naphthalene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Nitrobenzene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Pentachlorophenol	25 U	25 U	27 U	NA	NA	NA	25 U	25 U	25 U	28 U	NA	NA	NA	28 U	NA
Phenanthrene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Phenol	10 U	5 J	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Pyrene	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
bis(2-Chloroethoxy)methane	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
bis(2-Chloroethyl)ether	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
bis(2-Ethylhexyl)phthalate	10 U	10 U	2 B	NA	NA	NA	10 U	5 B	10 U	2 B	NA	NA	NA	1 B	NA
n-Nitroso-di-n-propylamine	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
n-Nitrosodiphenylamine	10 U	10 U	11 U	NA	NA	NA	10 U	10 U	10 U	11 U	NA	NA	NA	11 U	NA
Pesticide/Polychlorinated Biphenyls (µg/L)															
4,4'-DDD	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW01D						SJS02-MW02D							SJS02-MW05D	
Sample ID	SJS02-GW1D-001	SJS02-GW1D-002	SJS02-GW1D-003	SJS02-MW01D-04D	SJS02-MW01D-05A	SJS02-MW01D-07B	SJS02-GW2D-001	SJS02-GW2D-002	SJS02-GW2D-002P*	SJS02-GW2D-003	SJS02-MW02D-05A	SJS02-MW02D-05A-P*	SJS02-MW02D-07B	SJS02-GW5D-001	SJS02-MW05D-07B
Sample Date	07/31/97	11/06/97	05/18/99	12/01/04	03/28/05	06/04/07	07/17/97	11/06/97	11/06/97	05/18/99	03/28/05	03/28/05	06/05/07	05/18/99	06/05/07
Chemical Name															
4,4'-DDE	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA
4,4'-DDT	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA
Aldrin	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
Aroclor-1016	1 U	1 U	1.10 U	NA	NA	NA	1 U	1 U	1 U	1.20 U	NA	NA	NA	1.10 U	NA
Aroclor-1221	2 U	2 U	2.10 U	NA	NA	NA	2 U	2 U	2 U	2.40 U	NA	NA	NA	2.20 U	NA
Aroclor-1232	1 U	1 U	1.10 U	NA	NA	NA	1 U	1 U	1 U	1.20 U	NA	NA	NA	1.10 U	NA
Aroclor-1242	1 U	1 U	1.10 U	NA	NA	NA	1 U	1 U	1 U	1.20 U	NA	NA	NA	1.10 U	NA
Aroclor-1248	1 U	1 U	1.10 U	NA	NA	NA	1 U	1 U	1 U	1.20 U	NA	NA	NA	1.10 U	NA
Aroclor-1254	1 U	1 U	1.10 U	NA	NA	NA	1 U	1 U	1 U	1.20 U	NA	NA	NA	1.10 U	NA
Aroclor-1260	1 U	1 U	1.10 U	NA	NA	NA	1 U	1 U	1 U	1.20 U	NA	NA	NA	1.10 U	NA
Dieldrin	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA
Endosulfan I	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
Endosulfan II	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA
Endosulfan sulfate	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.00960 J	NA	NA	NA	0.00980 J	NA
Endrin	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA
Endrin aldehyde	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA
Endrin ketone	0.1 U	0.1 U	0.110 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.120 U	NA	NA	NA	0.110 U	NA
Heptachlor	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
Heptachlor epoxide	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
Methoxychlor	0.5 U	0.5 U	0.530 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.590 U	NA	NA	NA	0.540 U	NA
Toxaphene	5 U	5 U	5.30 U	NA	NA	NA	5 U	5 U	5 U	5.90 U	NA	NA	NA	5.40 U	NA
alpha-BHC	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
alpha-Chlordane	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
beta-BHC	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
delta-BHC	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
gamma-BHC (Lindane)	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
gamma-Chlordane	0.05 U	0.05 U	0.0530 U	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.0590 U	NA	NA	NA	0.0540 U	NA
Explosives (µg/L)															
1,3,5-Trinitrobenzene	25 U	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
1,3-Dinitrobenzene	25 U	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
2,4,6-Trinitrotoluene	25 U	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
2,4-Dinitrotoluene	NA	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
2,6-Dinitrotoluene	NA	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
2-Amino-4,6-dinitrotoluene	25 U	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
2-Nitrotoluene	25 U	NA	2.60 U	NA	NA	NA	NA	NA	NA	2.60 U	NA	NA	NA	2.60 U	NA
3-Nitrotoluene	25 U	NA	2.60 U	NA	NA	NA	NA	NA	NA	2.60 U	NA	NA	NA	2.60 U	NA
4-Amino-2,6-dinitrotoluene	25 U	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
4-Nitrotoluene	25 U	NA	2.60 U	NA	NA	NA	NA	NA	NA	2.60 U	NA	NA	NA	2.60 U	NA
HMX	25 U	NA	2.60 U	NA	NA	NA	NA	NA	NA	2.60 U	NA	NA	NA	2.60 U	NA
Nitrobenzene	NA	NA	1.20 U	NA	NA	NA	NA	NA	NA	1.20 U	NA	NA	NA	1.20 U	NA
RDX	25 U	NA	2.60 U	NA	NA	NA	NA	NA	NA	2.60 U	NA	NA	NA	2.60 U	NA
Tetryl	25 U	NA	2.60 U	NA	NA	NA	NA	NA	NA	2.60 U	NA	NA	NA	2.60 U	NA
Total Metals (µg/L)															
Aluminum	2,000	42.4 J	200 K	NA	NA	NA	45.8 B	38.1 U	38.1 U	304 K	NA	NA	NA	321 K	NA
Antimony	2 U	1.7 U	2.70 U	NA	NA	NA	2 U	1.7 U	1.7 U	2.70 U	NA	NA	NA	2.70 U	NA
Arsenic	3.7 J	3.2 U	2.40 B	NA	NA	NA	4.5 B	3.2 U	3.2 U	2 U	NA	NA	NA	9.20 B	NA
Barium	18.2 B	9.3 B	14.4 J	NA	NA	NA	18.3 B	22.7 B	23 B	16.4 J	NA	NA	NA	39.8 J	NA
Beryllium	1 U	0.58 U	0.100 U	NA	NA	NA	1 U	0.58 U	0.58 U	0.100 U	NA	NA	NA	0.100 U	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.5 U	0.4 U	0.300 U	NA	NA	NA	0.5 U	0.4 U	0.4 U	0.300 U	NA	NA	NA	0.300 U	NA
Calcium	57,900	53,600	60,100	NA	NA	NA	49,500	49,900	47,900	57,800	NA	NA	NA	55,600	NA
Chromium	11.8 B	4.6 U	1.90 J	NA	NA	NA	7 U	4.6 U	4.6 U	1.5 J	NA	NA	NA	1.30 J	NA
Cobalt	8 U	6 U	0.5 U	NA	NA	NA	8 U	6 U	6 U	0.5 U	NA	NA	NA	0.770 B	NA
Copper	6 U	5.8 U	4.80 B	NA	NA	NA	6 U	5.8 U	5.8 U	3.40 B	NA	NA	NA	4.60 B	NA
Cyanide	5 U	5 U	5 U	NA	NA	NA	5 UL	5 U	5 U	5 U	NA	NA	NA	5 U	NA
Iron	3,820 K	59 B	138	NA	NA	NA	87.4 B	876	786	1,050	NA	NA	NA	398	NA
Lead	2.7 B	1.3 U	1 U	NA	NA	NA	1 U	1.3 U	1.3 U	1 U	NA	NA	NA	1.5 J	NA
Magnesium	5,200	3,720 J	6,850	NA	NA	NA	13,600	20,200	19,900	15,300	NA	NA	NA	8,450	NA
Manganese	45.5	5.6 B	36.1	NA	NA	NA	49.4 B	228	221	229	NA	NA	NA	120	NA
Mercury	0.13 U	0.12 U	0.100 U	NA	NA	NA	0.12 U	0.13 U	0.13 U	0.100 U	NA	NA	NA	0.100 U	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW01D						SJS02-MW02D							SJS02-MW05D	
Sample ID	SJS02-GW1D-001	SJS02-GW1D-002	SJS02-GW1D-003	SJS02-MW01D-04D	SJS02-MW01D-05A	SJS02-MW01D-07B	SJS02-GW2D-001	SJS02-GW2D-002	SJS02-GW2D-002P*	SJS02-GW2D-003	SJS02-MW02D-05A	SJS02-MW02D-05A-P*	SJS02-MW02D-07B	SJS02-GW5D-001	SJS02-MW05D-07B
Sample Date	07/31/97	11/06/97	05/18/99	12/01/04	03/28/05	06/04/07	07/17/97	11/06/97	11/06/97	05/18/99	03/28/05	03/28/05	06/05/07	05/18/99	06/05/07
Chemical Name															
Nickel	7 U	6.3 U	2.20 J	NA	NA	NA	7 U	6.3 U	6.3 U	1.10 J	NA	NA	NA	2.80 B	NA
Potassium	5,520	5,300	5,810	NA	NA	NA	8,800 B	11,600	11,300	8,240	NA	NA	NA	5,850	NA
Selenium	3 U	3.3 U	2.60 U	NA	NA	NA	3 UL	3.3 U	3.3 U	2.60 U	NA	NA	NA	2.60 U	NA
Silver	3.6 B	2 B	0.900 U	NA	NA	NA	2.9 B	2 B	3.1 B	0.900 U	NA	NA	NA	0.900 U	NA
Sodium	11,400	12,600	13,300	NA	NA	NA	19,100	18,300	17,800	15,800	NA	NA	NA	23,300	NA
Thallium	2 U	1.5 U	2 UL	NA	NA	NA	2 U	1.5 U	2.3 B	2 UL	NA	NA	NA	2 UL	NA
Vanadium	9.6 K	6.8 U	0.600 U	NA	NA	NA	9 U	6.8 U	6.8 U	0.600 U	NA	NA	NA	1 J	NA
Zinc	18.9 B	10.8 B	17.6 J	NA	NA	NA	5 U	23.6 B	18.8 B	3.5 B	NA	NA	NA	7 B	NA
Dissolved Metals (µg/L)															
Aluminum	79.2 B	38.1 U	60.2 J	NA	NA	NA	44 U	38.1 U	38.1 U	38.2 U	NA	NA	NA	46.4 J	NA
Antimony	3.1 J	1.7 U	2.70 U	NA	NA	NA	3 J	1.7 U	1.7 U	2.70 U	NA	NA	NA	2.70 U	NA
Arsenic	3 U	3.4 J	2 U	NA	NA	NA	4.4 J	3.2 U	3.2 U	2 U	NA	NA	NA	6.20 B	NA
Barium	11.7 B	6.7 B	15.1 J	NA	NA	NA	18.3 B	19.2 B	19.5 B	14.6 J	NA	NA	NA	39 J	NA
Beryllium	1 U	0.58 U	0.100 U	NA	NA	NA	1 U	0.58 U	0.58 U	0.100 U	NA	NA	NA	0.100 U	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.5 U	0.4 U	0.300 U	NA	NA	NA	0.5 U	0.4 U	0.4 U	0.300 U	NA	NA	NA	0.300 U	NA
Calcium	55,900	48,700	62,700	NA	NA	NA	49,300	45,600	44,100	52,300	NA	NA	NA	54,700	NA
Chromium	7 U	4.6 U	1.10 U	NA	NA	NA	7 U	4.6 U	4.6 U	1.10 U	NA	NA	NA	1.10 U	NA
Cobalt	8 U	6 U	0.5 U	NA	NA	NA	8 U	6 U	6 U	0.5 U	NA	NA	NA	0.5 U	NA
Copper	6 U	5.8 U	3.70 B	NA	NA	NA	6 U	5.8 U	5.8 U	5.30 B	NA	NA	NA	10.4 B	NA
Iron	30.4 B	34.6 B	94.3 J	NA	NA	NA	45.3 B	715	599	855	NA	NA	NA	203	NA
Lead	1 U	1.3 U	1 U	NA	NA	NA	1.5 B	1.3 U	1.3 U	1 U	NA	NA	NA	1 U	NA
Magnesium	4,790 J	3,420 J	7,000	NA	NA	NA	13,200	18,100	18,500	13,700	NA	NA	NA	8,480	NA
Manganese	3.3 B	4.8 B	35.5	NA	NA	NA	43.9 B	207	200	206	NA	NA	NA	112	NA
Mercury	0.12 U	0.12 U	0.100 U	NA	NA	NA	0.12 U	0.13 U	0.13 U	0.100 U	NA	NA	NA	0.100 U	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7 U	6.3 U	1.90 J	NA	NA	NA	7 U	6.3 U	6.3 U	1.30 J	NA	NA	NA	1.30 B	NA
Potassium	5,330	4,730 J	6,190	NA	NA	NA	8,800 B	10,300	10,400	7,520 J	NA	NA	NA	5,880 J	NA
Selenium	3 U	3.3 U	2.60 U	NA	NA	NA	3 U	3.3 U	3.3 U	2.60 U	NA	NA	NA	2.60 U	NA
Silver	3.4 B	1.4 B	0.900 U	NA	NA	NA	3.2 B	2.6 B	1.1 B	0.900 U	NA	NA	NA	0.900 U	NA
Sodium	11,800	11,400	14,000	NA	NA	NA	19,600	16,600	16,200	14,500	NA	NA	NA	23,700	NA
Thallium	2 U	2.3 B	2 U	NA	NA	NA	2 U	1.5 U	2.2 B	2 UL	NA	NA	NA	2 U	NA
Vanadium	9 U	6.8 U	0.600 U	NA	NA	NA	9 U	6.8 U	6.8 U	0.600 U	NA	NA	NA	0.600 U	NA
Zinc	9 B	7.5 B	1.90 U	NA	NA	NA	11.1 B	10.7 B	20.4 B	4.70 B	NA	NA	NA	6.70 B	NA
Wet Chemistry (mg/L)															
Alkalinity	NA	NA	NA	160 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	NA	NA	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	0.18	0.87	0.0750	NA	NA	NA	0.862	1.8	2.14	0.208	NA	NA	NA	0.0410	NA
Sulfate	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents Detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW10D								SJS02-MW10D			
Sample ID	SJS02-MW10D-04D	SJS02-MW10D-05A	SJS02-MW10D-05A2	SJS02-MW10D-06B	SJS02-MW10D-06B2	SJS02-MW10D-06B2P*	SJS02-MW10D-06B3	SJS02-MW10D-06B3P*	SJS02-MW10D-06D	SJS02-MW10DP-06D*	SJS02-MW10D-07B	SJS02-MW10D-07BP*
Sample Date	12/03/04	01/18/05	03/28/05	05/16/06	05/17/06	05/17/06	06/22/06	06/22/06	11/28/06	11/28/06	06/06/07	06/06/07
Chemical Name												
Volatile Organic Compounds (µg/L)												
1,1,1-Trichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.68	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
1,2,4-Trichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
1,2-Dichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	500 R	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	NA	NA
2-Hexanone	5 U	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	NA	NA
4-Methyl-2-pentanone	5 U	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	NA	NA
Acetone	4.9 J	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	NA	NA
Benzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Bromomethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Carbon disulfide	1 B	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Carbon tetrachloride	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	7.8	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.3 J	0.5 U	0.5 U	0.5 U	0.19 B	0.13 B
Cyclohexane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Dibromochloromethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Dichlorodifluoromethane (Freon-12)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	NA	NA
Isopropylbenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	NA	NA
Methyl acetate	50 R	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 R	0.5 R	NA	NA
Methyl-tert-butyl ether (MTBE)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Methylcyclohexane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Methylene chloride	0.77 B	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.67 B	0.21 B	0.24 B	0.18 B	0.5 U
Styrene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Tetrachloroethene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	3	83 U	1 J	10 U	10 U	10 U	0.3 J	0.5 U	0.11 B	0.1 B	NA	NA
Trichloroethene	2,200	700	900	3.9 J	10 U	10 U	0.26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	0.53	83 U	10 U	3.6 J	10 U	10 U	6.5	5	1.7	1.6	0.5 U	0.5 U
Xylene, total	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
cis-1,2-Dichloroethene	19	83 U	35	52	10 U	10 U	5	5.4	1.6	1.4	1.3	1.4
cis-1,3-Dichloropropene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (µg/L)												
1,1-Biphenyl	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW10D								SJS02-MW10D			
Sample ID	SJS02-MW10D-04D	SJS02-MW10D-05A	SJS02-MW10D-05A2	SJS02-MW10D-06B	SJS02-MW10D-06B2	SJS02-MW10D-06B2P*	SJS02-MW10D-06B3	SJS02-MW10D-06B3P*	SJS02-MW10D-06D	SJS02-MW10DP-06D*	SJS02-MW10D-07B	SJS02-MW10D-07BP*
Sample Date	12/03/04	01/18/05	03/28/05	05/16/06	05/17/06	05/17/06	06/22/06	06/22/06	11/28/06	11/28/06	06/06/07	06/06/07
Chemical Name												
2,4-Dimethylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	11 R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	1.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	1.5 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)												
4,4'-DDD	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW10D								SJS02-MW10D			
Sample ID	SJS02-MW10D-04D	SJS02-MW10D-05A	SJS02-MW10D-05A2	SJS02-MW10D-06B	SJS02-MW10D-06B2	SJS02-MW10D-06B2P*	SJS02-MW10D-06B3	SJS02-MW10D-06B3P*	SJS02-MW10D-06D	SJS02-MW10DP-06D*	SJS02-MW10D-07B	SJS02-MW10D-07BP*
Sample Date	12/03/04	01/18/05	03/28/05	05/16/06	05/17/06	05/17/06	06/22/06	06/22/06	11/28/06	11/28/06	06/06/07	06/06/07
Chemical Name												
4,4'-DDE	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	1.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	2.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	1.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	1.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	1.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	1.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	1.1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	0.11 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.06 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	0.53 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	5.3 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	0.05 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)												
1,3,5-Trinitrobenzene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (µg/L)												
Aluminum	53.2 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	12.8 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	147	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	41,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	1.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	1.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.5 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	54.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	3,920 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	17.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-4
Deep Groundwater Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-MW10D								SJS02-MW10D			
Sample ID	SJS02-MW10D-04D	SJS02-MW10D-05A	SJS02-MW10D-05A2	SJS02-MW10D-06B	SJS02-MW10D-06B2	SJS02-MW10D-06B2P*	SJS02-MW10D-06B3	SJS02-MW10D-06B3P*	SJS02-MW10D-06D	SJS02-MW10DP-06D*	SJS02-MW10D-07B	SJS02-MW10D-07BP*
Sample Date	12/03/04	01/18/05	03/28/05	05/16/06	05/17/06	05/17/06	06/22/06	06/22/06	11/28/06	11/28/06	06/06/07	06/06/07
Chemical Name												
Nickel	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	6,340 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	47,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	6.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	2.8 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	2.4 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)												
Aluminum	17.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	12.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	138	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	41,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	1.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	1.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.4 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	15.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	3,960 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	16.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	13.6 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	6,070 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	40,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	6.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	2.5 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	1.1 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg/L)												
Alkalinity	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents Detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table C-5
Surface Water Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SW02		SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08			SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample ID	SJS02-SW02-000	SJS02-SW02-000P*	SJS02-SW03-001	SJS02-SW04-001	SJS02-SW05-001	SJS02-SW06-001	SJS02-SW07-001	SJS02-SW08-001	SJS02-SW08-001P*	SJS02-SW08-002	SJS02-SW09	SJS02-SW10-03D	SJS02-SW11-03D
Sample Date	07/14/97	07/14/97	04/13/99	04/16/99	04/16/99	04/16/99	04/16/99	04/14/99	04/14/99	10/27/99	07/18/01	12/09/03	12/09/03
Chemical Name													
Volatile Organic Compounds (µg/L)													
1,1,1-Trichloroethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	3 B	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.5 U
1,1,2-Trichloroethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,1-Dichloroethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,1-Dichloroethene	10 U	10 U	0.300 J	0.700 J	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U
1,2,4-Trichlorobenzene	NA	NA	1 U	0.100 J	1 U	1 U	1 U	1 U	0.400 J	1 U	10 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,2-Dibromoethane	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,2-Dichlorobenzene	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,2-Dichloroethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,3-Dichlorobenzene	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
1,4-Dichlorobenzene	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
2-Butanone	10 U	10 U	5 U	NA	NA	NA	NA	5 U	5 U	5 U	10 U	5 U	5 U
2-Hexanone	10 U	10 U	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 U	10 U	5 U	5 U
4-Methyl-2-pentanone	10 U	10 U	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 U	10 U	5 U	5 U
Acetone	10 U	10 U	NA	5 U	NA	NA	NA	NA	NA	1.60 J	10 U	4.5 B	5 U
Benzene	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Bromochloromethane	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	0.5 U	0.5 U
Bromodichloromethane	10 U	10 U	1 U	1 U	0.800 J	1.30	1 U	1 U	1 U	1 U	10 U	4.2	0.5 U
Bromoform	10 U	10 U	1 U	1 U	1 U	1 U	0.400 J	0.800 J	0.800 J	1 U	10 U	0.5 U	0.5 U
Bromomethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Carbon disulfide	10 U	10 U	2.30 J	1.20 B	0.700 B	1.60 B	2.60 B	9.30	10.3	0.300 J	10 U	0.5 U	0.5 U
Carbon tetrachloride	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Chlorobenzene	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Chloroethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Chloroform	10 U	10 U	1 U	1 U	3.5	5.40	1 U	1 U	1 U	0.200 J	10 U	12	0.5 U
Chloromethane	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.5 U
Dibromochloromethane	10 U	10 U	1 U	1 U	0.200 J	0.300 J	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.5 U
Ethylbenzene	10 U	10 U	1 U	1 U	1 U	1 U	1 U	0.100 J	0.200 J	1 U	10 U	0.5 U	0.5 U
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.77
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.5 U
Methylene chloride	8 B	9 B	0.5 B	1 B	1 B	1.10 B	1 B	2 U	2 U	0.5 B	2.6 B	0.5 U	0.5 U
Styrene	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Tetrachloroethene	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Toluene	10 U	10 U	1 U	0.300 B	1 U	0.300 B	0.300 B	1.20 B	0.800 B	1 U	10 U	0.5 U	0.5 U
Trichloroethene	10 U	10 U	5.60	23.5	38.2	59.2	0.300 B	1 U	0.300 J	0.800 J	130	140	12
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	0.5 U	0.5 U
Vinyl chloride	10 U	10 U	7.5	21.9	1.40	1.80	1 U	1 U	1 U	1 U	5.7 J	1.4	5.2
Xylene, total	10 U	10 U	1 U	1 U	1 U	1 U	1 U	0.5 J	0.800 J	1 U	10 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	NA	NA	18.4	78.6	10.7	16.1	0.200 J	1 U	1 U	0.300 J	84	31	25
cis-1,3-Dichloropropene	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA

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Station ID	SJS02-SW02		SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08			SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample ID	SJS02-SW02-000	SJS02-SW02-000P*	SJS02-SW03-001	SJS02-SW04-001	SJS02-SW05-001	SJS02-SW06-001	SJS02-SW07-001	SJS02-SW08-001	SJS02-SW08-001P*	SJS02-SW08-002	SJS02-SW09	SJS02-SW10-03D	SJS02-SW11-03D
Sample Date	07/14/97	07/14/97	04/13/99	04/16/99	04/16/99	04/16/99	04/16/99	04/14/99	04/14/99	10/27/99	07/18/01	12/09/03	12/09/03
Chemical Name													
trans-1,2-Dichloroethene	NA	NA	0.300 J	0.5 J	0.200 J	0.200 J	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (µg/L)													
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	NA	NA	NA
1,2-Dichlorobenzene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	NA	NA	NA
1,3-Dichlorobenzene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	NA	NA	NA
1,4-Dichlorobenzene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2,4,5-Trichlorophenol	25 U	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
2,4,6-Trichlorophenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2,4-Dichlorophenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2,4-Dimethylphenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2,4-Dinitrophenol	NA	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
2,4-Dinitrotoluene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2,6-Dinitrotoluene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2-Chloronaphthalene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2-Chlorophenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2-Methylnaphthalene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2-Methylphenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
2-Nitroaniline	25 U	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
2-Nitrophenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
3,3'-Dichlorobenzidine	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA
3-Nitroaniline	25 U	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
4,6-Dinitro-2-methylphenol	25 U	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
4-Bromophenyl-phenylether	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
4-Chloro-3-methylphenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
4-Chloroaniline	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
4-Chlorophenyl-phenylether	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
4-Methylphenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	NA	NA	NA
4-Nitroaniline	25 U	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
4-Nitrophenol	25 U	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
Acenaphthene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Acenaphthylene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA
Anthracene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6 J	NA	NA
Benzo(a)anthracene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Benzo(a)pyrene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Benzo(b)fluoranthene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Benzo(g,h,i)perylene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Benzo(k)fluoranthene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Butylbenzylphthalate	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA
Carbazole	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Chrysene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Di-n-butylphthalate	10 U	10 U	11 U	2 B	5 B	2 B	2 B	10 U	11 U	2 B	10 U	NA	NA
Di-n-octylphthalate	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Dibenz(a,h)anthracene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA

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Surface Water Raw Analytical Results
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St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SW02		SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08			SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample ID	SJS02-SW02-000	SJS02-SW02-000P*	SJS02-SW03-001	SJS02-SW04-001	SJS02-SW05-001	SJS02-SW06-001	SJS02-SW07-001	SJS02-SW08-001	SJS02-SW08-001P*	SJS02-SW08-002	SJS02-SW09	SJS02-SW10-03D	SJS02-SW11-03D
Sample Date	07/14/97	07/14/97	04/13/99	04/16/99	04/16/99	04/16/99	04/16/99	04/14/99	04/14/99	10/27/99	07/18/01	12/09/03	12/09/03
Chemical Name													
Dibenzofuran	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Diethylphthalate	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Dimethyl phthalate	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Fluoranthene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Fluorene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Hexachlorobenzene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Hexachlorobutadiene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Hexachlorocyclopentadiene	10 U	10 U	11 U	11 UJ	11 U	11 UJ	11 UJ	10 U	11 U	10 U	10 U	NA	NA
Hexachloroethane	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Indeno(1,2,3-cd)pyrene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Isophorone	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Naphthalene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Nitrobenzene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Pentachlorophenol	25 U	25 U	28 U	28 U	28 U	29 U	28 U	26 U	27 U	26 U	25 U	NA	NA
Phenanthrene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Phenol	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Pyrene	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
bis(2-Chloroethoxy)methane	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
bis(2-Chloroethyl)ether	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
bis(2-Ethylhexyl)phthalate	3 J	1 J	11 U	11 U	1 B	11 U	84	10 U	11 U	10 U	10 U	NA	NA
n-Nitroso-di-n-propylamine	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
n-Nitrosodiphenylamine	10 U	10 U	11 U	11 U	11 U	11 U	11 U	10 U	11 U	10 U	10 U	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)													
4,4'-DDD	0.1 U	0.1 U	0.0180 J	0.200	0.0570 J	0.0200 J	0.0130 J	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
4,4'-DDE	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
4,4'-DDT	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
Aldrin	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
Aroclor-1016	1 U	1 U	1 U	1.10 U	1.10 U	1.10 U	1.20 U	1.10 U	1.10 U	1 U	1 U	NA	NA
Aroclor-1221	2 U	2 U	2.10 U	2.20 U	2.30 U	2.30 U	2.40 U	2.20 U	2.20 U	2.10 U	2 U	NA	NA
Aroclor-1232	1 U	1 U	1 U	1.10 U	1.10 U	1.10 U	1.20 U	1.10 U	1.10 U	1 U	1 U	NA	NA
Aroclor-1242	1 U	1 U	1 U	1.10 U	1.10 U	1.10 U	1.20 U	1.10 U	1.10 U	1 U	1 U	NA	NA
Aroclor-1248	1 U	1 U	1 U	1.10 U	1.10 U	1.10 U	1.20 U	1.10 U	1.10 U	1 U	1 U	NA	NA
Aroclor-1254	1 U	1 U	1 U	1.10 U	1.10 U	1.10 U	1.20 U	1.10 U	1.10 U	1 U	1 U	NA	NA
Aroclor-1260	1 U	1 U	1 U	1.10 U	1.10 U	1.10 U	1.20 U	1.10 U	1.10 U	1 U	1 U	NA	NA
Dieldrin	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
Endosulfan I	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
Endosulfan II	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
Endosulfan sulfate	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
Endrin	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
Endrin aldehyde	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
Endrin ketone	0.1 U	0.1 U	0.100 U	0.110 U	0.110 U	0.110 U	0.120 U	0.110 U	0.110 U	0.100 U	0.1 U	NA	NA
Heptachlor	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
Heptachlor epoxide	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
Methoxychlor	0.5 U	0.5 U	0.520 U	0.560 U	0.570 U	0.570 U	0.600 U	0.540 U	0.560 U	0.520 U	0.5 U	NA	NA
Toxaphene	5 U	5 U	5.20 U	5.60 U	5.70 U	5.70 U	6 U	5.40 U	5.60 U	5.20 U	5 U	NA	NA
alpha-BHC	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
alpha-Chlordane	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
beta-BHC	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
delta-BHC	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
gamma-BHC (Lindane)	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA
gamma-Chlordane	0.05 U	0.05 U	0.0520 U	0.0560 U	0.0570 U	0.0570 U	0.0600 U	0.0540 U	0.0560 U	0.0520 U	0.05 U	NA	NA

Table C-5
Surface Water Raw Analytical Results
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St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SW02		SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08			SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample ID	SJS02-SW02-000	SJS02-SW02-000P*	SJS02-SW03-001	SJS02-SW04-001	SJS02-SW05-001	SJS02-SW06-001	SJS02-SW07-001	SJS02-SW08-001	SJS02-SW08-001P*	SJS02-SW08-002	SJS02-SW09	SJS02-SW10-03D	SJS02-SW11-03D
Sample Date	07/14/97	07/14/97	04/13/99	04/16/99	04/16/99	04/16/99	04/16/99	04/14/99	04/14/99	10/27/99	07/18/01	12/09/03	12/09/03
Chemical Name													
Explosives (µg/L)													
1,3,5-Trinitrobenzene	25 U	25 U	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
1,3-Dinitrobenzene	25 U	25 U	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
2,4,6-Trinitrotoluene	25 U	25 U	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
2,4-Dinitrotoluene	NA	NA	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
2,6-Dinitrotoluene	NA	NA	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
2-Amino-4,6-dinitrotoluene	25 U	25 U	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
2-Nitrotoluene	25 U	25 U	2.60 U	2.10 U	2.60 U	2.60 U	2.60 U	2.10 U	2.10 U	2.60 U	1.3 U	NA	NA
3-Nitrotoluene	25 U	25 U	2.60 U	3.5	0.5 J	0.5 J	0.800 J	2.10 U	2.10 U	2.60 U	1.3 U	NA	NA
4-Amino-2,6-dinitrotoluene	25 U	25 U	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
4-Nitrotoluene	25 U	25 U	2.60 U	2.10 U	2.60 U	2.60 U	2.60 U	2.10 U	2.10 U	2.60 U	1.3 U	NA	NA
HMX	25 U	25 U	2.60 U	2.10 U	2.60 U	2.60 U	2.60 U	2.10 U	2.10 U	2.60 U	1.3 U	NA	NA
Nitrobenzene	NA	NA	1.20 U	1 U	1.20 U	1.20 U	1.20 U	1 U	0.900 U	1.20 U	1.3 U	NA	NA
RDX	25 U	25 U	2.60 U	2.10 U	2.60 U	2.60 U	2.60 U	2.10 U	2.10 U	2.60 U	1.3 U	NA	NA
Tetryl	25 U	25 U	2.60 U	2.10 U	2.60 U	2.60 U	2.60 U	2.10 U	2.10 U	2.60 U	1.3 U	NA	NA
Total Metals (µg/L)													
Aluminum	4,210	7,870	353	470	2,150	9,390	310	535	533	1,060	49.1	NA	NA
Antimony	2 J	2 U	2.70 U	2.70 U	2.70 U	2.70 U	2.70 U	2.70 U	3.70 B	3.30 J	3.7 U	NA	NA
Arsenic	3 U	3.1 J	2 U	4.40 J	4.40 B	2 U	4.40 B	2.70 B	2.70 B	3.60 U	5 U	NA	NA
Barium	58 J	70.7 J	27.9 J	35.2 B	59.7 J	16.5 J	30.4 J	32.2 J	32.9 J	40.7 J	61.4	NA	NA
Beryllium	1 U	1 U	0.100 U	0.100 U	0.100 U	3.5 J	0.100 U	0.100 U	0.100 U	0.200 U	0.1 U	NA	NA
Cadmium	1.2 L	1.9 L	0.890 J	0.440 J	2.5 J	1.5 J	0.450 J	0.350 J	0.530 J	0.330 J	3 U	NA	NA
Calcium	197,000	214,000	35,700	72,400	58,200	92,600	134,000	179,000	184,000	92,100	38,700	NA	NA
Chromium	104	166	4 J	2.20 J	83.6	2.10 J	3.40 J	4.90 J	4.5 J	2.80 J	5 U	NA	NA
Cobalt	8 U	8 U	1.20 B	0.560 B	1.10 B	55	0.900 B	0.730 B	0.5 U	1.10 J	1.8 U	NA	NA
Copper	132	203	13.8 J	12.1 J	107	17.9 J	20.9 J	17.5 J	15.3 J	12 J	6.5	NA	NA
Cyanide	5 U	5 U	18.9 L	5 U	5 U	5 U	5 U	7.5 L	18 L	5 U	NA	NA	NA
Iron	6,470	10,700	1,520	1,170	5,330	18,800	716	871	684	1,560	916	NA	NA
Lead	47.8 L	77.9 L	2.80 J	4.90 B	44.4	13.5	5.5 B	8	4.5	5.4	3 U	NA	NA
Magnesium	606,000	665,000	56,300	166,000	102,000	74,600	376,000	576,000	569,000	274,000	6,230	NA	NA
Manganese	85.8	120	78.1	61.9	148	2,490	86.9	92.1	87.8	71.9	339	NA	NA
Mercury	0.23 B	0.33 B	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 UL	0.2 U	NA	NA
Nickel	7 U	7 U	4 J	3.10 J	5.30 J	81.4	2.60 J	2.60 J	2.60 J	2.70 J	4 U	NA	NA
Potassium	214,000 J	237,000 J	22,200	61,600	40,500	28,200	148,000	205,000	201,000	101,000	4,420	NA	NA
Selenium	3 U	3 U	2.60 U	2.60 U	2.60 U	2.60 U	2.60 U	2.60 U	2.60 U	3.10 U	5 U	NA	NA
Silver	1 U	2 B	0.900 U	0.900 U	0.900 U	0.900 U	0.900 U	0.900 U	0.900 U	0.700 U	5 U	NA	NA
Sodium	5,240,000	5,640,000	461,000	1,590,000 J	989,000 J	320,000 J	3,670,000 J	4,930,000	4,870,000	2,380,000	28,200	NA	NA
Thallium	2 U	2 U	3.20 U	3.20 U	3.20 U	3.20 U	3.20 U	3.20 U	3.20 U	5.20 U	5.7 U	NA	NA
Vanadium	27.8 J	32.8 J	2.20 B	3.20 B	15.8 J	1.30 B	3.20 B	4.40 B	3.70 B	4.60 J	3.2 U	NA	NA
Zinc	175	268	44.1	23.4	131	1,310	30.8	35.4	14.4 J	46.4	68.6	NA	NA
Dissolved Metals (µg/L)													
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45.7 U	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.7 U	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	62.3	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 U	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39,500	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA

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Station ID	SJS02-SW02		SJS02-SW03	SJS02-SW04	SJS02-SW05	SJS02-SW06	SJS02-SW07	SJS02-SW08			SJS02-SW09	SJS02-SW10	SJS02-SW11
Sample ID	SJS02-SW02-000	SJS02-SW02-000P*	SJS02-SW03-001	SJS02-SW04-001	SJS02-SW05-001	SJS02-SW06-001	SJS02-SW07-001	SJS02-SW08-001	SJS02-SW08-001P*	SJS02-SW08-002	SJS02-SW09	SJS02-SW10-03D	SJS02-SW11-03D
Sample Date	07/14/97	07/14/97	04/13/99	04/16/99	04/16/99	04/16/99	04/16/99	04/14/99	04/14/99	10/27/99	07/18/01	12/09/03	12/09/03
Chemical Name													
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.8 U	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.6	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35.6	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 U	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6,460	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	376	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,470	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	29,900	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7 U	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.2 U	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	58.6	NA	NA
Wet Chemistry (mg/L)													
Alkalinity	107	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological oxygen demand	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand	154	154	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	338	706	405	430	1,960	2,090	2,180	NA	NA	NA	NA
Phosphorus	0.202	0.153	0.0200 U	0.0650	0.0850	0.169	0.184	0.0200 U	0.0200 U	NA	NA	NA	NA
Total dissolved solids (TDS)	19,100	26,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	16.4	24.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids (TSS)	124	98	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
* Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
K - Reported value may be biased high
L - Reported value may be biased low

Table C-6
Sediment Raw Analytical Results
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Chesapeake, Virginia

Station ID	SD-11	SD-12	SD-13		SD-14	SJS02-SD01	SJS02-SD02	SJS02-SD03			SJS02-SD04	SJS02-SD05		SJS02-SD06		SJS02-SD07	SJS02-SD08	
Sample ID	SD-11	SD-12	SD-13	SD-13P*	SD-14	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P*	SJS02-SD03-00-04D	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD05-00-04D	SJS02-SD06-001	SJS02-SD06-00-04D	SJS02-SD07-001	SJS02-SD08-001	SJS02-SD08-002
Sample Date	02/04/99	02/04/99	02/04/99	02/04/99	02/04/99	07/14/97	07/14/97	06/26/97	06/26/97	10/06/04	04/16/99	04/16/99	10/06/04	04/16/99	10/06/04	04/16/99	04/14/99	10/27/99
Chemical Name																		
Volatile Organic Compounds (µg/kg)																		
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	7 J	NA	28 UJ	16 U	18 U
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
1,1-Dichloroethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
1,1-Dichloroethene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	11 U	31 U	32 U	9 J	NA	14 U	20 U	NA	23 U	NA	3 J	16 U	18 U
1,2-Dichloropropane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
2-Hexanone	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 UJ	20 U	NA	23 U	NA	28 UJ	16 U	18 U
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	11 U	5 J	32 U	37 U	NA	14 UJ	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Acetone	14 B	10 U	24 B	NA	100 B	11 U	92 J	120	450	NA	NA	21 J	NA	37 J	NA	28 UJ	16 U	NA
Benzene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Bromodichloromethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Bromoform	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Bromomethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Carbon disulfide	2 J	2 J	4 J	NA	27 J	11 U	31 U	24 J	81	NA	14 U	8 B	NA	3 B	NA	12 B	16 UJ	4 J
Carbon tetrachloride	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Chlorobenzene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Chloroethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Chloroform	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	3 J	16 U	18 U
Chloromethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	16 B	5 B	7 B	NA	31 B	22 B	69 B	93 B	140 B	NA	4 B	26 B	NA	52 B	NA	6 B	17 B	81 B
Styrene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Tetrachloroethene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Toluene	10 U	10 U	10 U	NA	6 J	11 U	31 U	32 U	37 U	NA	4 J	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Trichloroethene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	4 J	4 J	NA	23 U	NA	28 UJ	10 J	18 U
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Xylene, total	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	11 U	31 U	32 U	37 U	NA	14 U	20 U	NA	23 U	NA	28 UJ	16 U	18 U
Semivolatile Organic Compounds (µg/kg)																		
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,700 U	NA	NA	1,200 U	NA	1,000 U	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	NA	480 UJ	670 UJ	NA	760 UJ	NA	930 UJ	550 UJ	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	NA	480 UJ	670 UJ	NA	760 UJ	NA	930 UJ	550 UJ	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	NA	480 UJ	670 UJ	NA	760 UJ	NA	930 UJ	550 UJ	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	NA	480 UJ	670 UJ	NA	760 UJ	NA	930 UJ	550 UJ	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	840 U	23,000 UJ	3,300 UL	3,600 UL	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA

Table C-6
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St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20	SJS02-SD21		SJS02-SD22
Sample ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15-00-04A	SJS02-SD16-00-04A	SJS02-SD16-00-04A-P*	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A	SJS02-SD21-00-04D	SJS02-SD21-00-04D-P*	SJS02-SD22-00-04D
Sample Date	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	11/18/04	11/18/04	11/18/04
Chemical Name																
Volatile Organic Compounds (µg/kg)																
1,1,1-Trichloroethane	3.6 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,1,2,2-Tetrachloroethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,1,2-Trichloroethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,1-Dichloroethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,1-Dichloroethene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15 J	34 J	36 U
1,2,4-Trichlorobenzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,2-Dibromo-3-chloropropane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,2-Dibromoethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,2-Dichlorobenzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,2-Dichloroethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	8.3 J
1,3-Dichlorobenzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
1,4-Dichlorobenzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
2-Butanone	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
2-Hexanone	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
4-Methyl-2-pentanone	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 UJ
Acetone	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	24 B	25 B
Benzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7 J	5.3 J	36 U
Bromodichloromethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Bromoform	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Bromomethane	6.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Carbon disulfide	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14 J	15 J	30 J
Carbon tetrachloride	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Chlorobenzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Chloroethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	4.2 J	36 U
Chloroform	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Chloromethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Cyclohexane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Dibromochloromethane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Dichlorodifluoromethane (Freon-12)	13 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Ethylbenzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Isopropylbenzene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Methyl acetate	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Methyl-tert-butyl ether (MTBE)	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Methylcyclohexane	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Methylene chloride	6.3 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	4.6 B
Styrene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Tetrachloroethene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Toluene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Trichloroethene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.4 J	9.8 J	36 U
Trichlorofluoromethane(Freon-11)	13 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Vinyl chloride	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7,700 J	9,800 J	4.8 J
Xylene, total	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
cis-1,2-Dichloroethene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	620 J	2,300	36 U
cis-1,3-Dichloropropene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
o-Xylene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 J	38 J	36 U
trans-1,3-Dichloropropene	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 UJ	39 UJ	36 U
Semivolatile Organic Compounds (µg/kg)																
1,1-Biphenyl	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2,4,5-Trichlorophenol	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
2,4,6-Trichlorophenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2,4-Dichlorophenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2,4-Dimethylphenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA

Table C-6
Sediment Raw Analytical Results
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Station ID	SJS02-SD23	SJS02-SD24	SJS02-SD25	SJS02-SD26
Sample ID	SJS02-SD23-00-04D	SJS02-SD24-00-04D	SJS02-SD25-00-04D	SJS02-SD26-00-04D
Sample Date	11/18/04	10/06/04	10/06/04	10/06/04
Chemical Name				
Volatile Organic Compounds (µg/kg)				
1,1,1-Trichloroethane	31 UJ	NA	NA	NA
1,1,2,2-Tetrachloroethane	31 UJ	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	31 UJ	NA	NA	NA
1,1,2-Trichloroethane	31 UJ	NA	NA	NA
1,1-Dichloroethane	31 UJ	NA	NA	NA
1,1-Dichloroethene	31 UJ	NA	NA	NA
1,2,4-Trichlorobenzene	31 UJ	NA	NA	NA
1,2-Dibromo-3-chloropropane	31 UJ	NA	NA	NA
1,2-Dibromoethane	31 UJ	NA	NA	NA
1,2-Dichlorobenzene	31 UJ	NA	NA	NA
1,2-Dichloroethane	31 UJ	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA
1,2-Dichloropropane	31 UJ	NA	NA	NA
1,3-Dichlorobenzene	31 UJ	NA	NA	NA
1,4-Dichlorobenzene	31 UJ	NA	NA	NA
2-Butanone	31 UJ	NA	NA	NA
2-Hexanone	31 UJ	NA	NA	NA
4-Methyl-2-pentanone	31 UJ	NA	NA	NA
Acetone	27 B	NA	NA	NA
Benzene	31 UJ	NA	NA	NA
Bromodichloromethane	31 UJ	NA	NA	NA
Bromoform	31 UJ	NA	NA	NA
Bromomethane	31 UJ	NA	NA	NA
Carbon disulfide	18 J	NA	NA	NA
Carbon tetrachloride	31 UJ	NA	NA	NA
Chlorobenzene	31 UJ	NA	NA	NA
Chloroethane	31 UJ	NA	NA	NA
Chloroform	31 UJ	NA	NA	NA
Chloromethane	31 UJ	NA	NA	NA
Cyclohexane	31 UJ	NA	NA	NA
Dibromochloromethane	31 UJ	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	31 UJ	NA	NA	NA
Ethylbenzene	31 UJ	NA	NA	NA
Isopropylbenzene	31 UJ	NA	NA	NA
Methyl acetate	31 UJ	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	31 UJ	NA	NA	NA
Methylcyclohexane	31 UJ	NA	NA	NA
Methylene chloride	3.3 B	NA	NA	NA
Styrene	31 UJ	NA	NA	NA
Tetrachloroethene	31 UJ	NA	NA	NA
Toluene	31 UJ	NA	NA	NA
Trichloroethene	31 UJ	NA	NA	NA
Trichlorofluoromethane(Freon-11)	31 UJ	NA	NA	NA
Vinyl chloride	4.4 J	NA	NA	NA
Xylene, total	31 UJ	NA	NA	NA
cis-1,2-Dichloroethene	31 UJ	NA	NA	NA
cis-1,3-Dichloropropene	31 UJ	NA	NA	NA
o-Xylene	NA	NA	NA	NA
trans-1,2-Dichloroethene	31 UJ	NA	NA	NA
trans-1,3-Dichloropropene	31 UJ	NA	NA	NA
Semivolatile Organic Compounds (µg/kg)				
1,1-Biphenyl	NA	700 U	840 U	1,100 U
1,2,4-Trichlorobenzene	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	700 U	840 U	1,100 U
2,4,5-Trichlorophenol	NA	1,700 U	2,100 U	2,600 U
2,4,6-Trichlorophenol	NA	700 U	840 U	1,100 U
2,4-Dichlorophenol	NA	700 U	840 U	1,100 U
2,4-Dimethylphenol	NA	700 U	840 U	1,100 U

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SD-11	SD-12	SD-13		SD-14	SJS02-SD01	SJS02-SD02	SJS02-SD03			SJS02-SD04	SJS02-SD05		SJS02-SD06		SJS02-SD07	SJS02-SD08	
Sample ID	SD-11	SD-12	SD-13	SD-13P*	SD-14	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P*	SJS02-SD03-00-04D	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD05-00-04D	SJS02-SD06-001	SJS02-SD06-00-04D	SJS02-SD07-001	SJS02-SD08-001	SJS02-SD08-002
Sample Date	02/04/99	02/04/99	02/04/99	02/04/99	02/04/99	07/14/97	07/14/97	06/26/97	06/26/97	10/06/04	04/16/99	04/16/99	10/06/04	04/16/99	10/06/04	04/16/99	04/14/99	10/27/99
Chemical Name																		
2,4-Dinitrophenol	NA	NA	NA	NA	NA	840 UJ	23,000 UJ	NA	3,600 UL	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2-Chlorophenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2-Methylnaphthalene	330 U	330 U	69 J	NA	330 U	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2-Methylphenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
2-Nitroaniline	NA	NA	NA	NA	NA	840 U	23,000 UJ	3,300 UL	3,600 U	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
2-Nitrophenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	840 U	23,000 UJ	3,300 UL	3,600 U	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	840 U	23,000 UJ	3,300 UL	3,600 UL	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
4-Chloroaniline	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
4-Methylphenol	48 J	330 U	330 U	NA	330 U	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
4-Nitroaniline	NA	NA	NA	NA	NA	840 U	23,000 UJ	3,300 UL	3,600 U	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
4-Nitrophenol	NA	NA	NA	NA	NA	840 U	23,000 UJ	3,300 UL	3,600 UL	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
Acenaphthene	330 U	330 U	67 J	NA	330 U	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Acenaphthylene	330 U	47 J	600	NA	190 J	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,700 U	NA	NA	1,200 U	NA	1,000 U	NA	NA	NA
Anthracene	330 U	50 J	1,400	NA	290 J	330 U	9,100 UJ	130 L	1,400 U	1,700 U	480 UJ	170 J	1,200 U	100 J	1,000 U	930 UJ	550 UJ	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,700 U	NA	NA	1,200 U	NA	1,000 U	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,700 U	NA	NA	1,200 U	NA	1,000 U	NA	NA	NA
Benzo(a)anthracene	140 J	180 J	4,400	NA	1,200	87 J	9,100 UJ	440 L	240 J	1,700 U	480 UJ	1,300 J	150 J	380 J	280 J	930 UJ	86 J	160 L
Benzo(a)pyrene	220 J	300 J	2,700	NA	1,400	79 J	9,100 UJ	660 L	370 J	1,700 U	480 UJ	910 J	200 J	360 J	380 J	930 UJ	91 J	100 L
Benzo(b)fluoranthene	220 J	380 J	4,800	NA	2,100	160 J	1,200 J	1,300 L	740 J	170 J	480 UJ	1,200 J	370 J	460 J	610 J	930 UJ	170 J	260 L
Benzo(g,h,i)perylene	52 J	68 J	780	NA	340 J	86 J	9,100 UJ	580 L	310 J	1,700 U	480 UJ	690 J	210 J	230 J	410 J	930 UJ	83 J	130 L
Benzo(k)fluoranthene	200 J	320 J	2,500	NA	1,900	59 J	9,100 UJ	440 L	470 J	1,700 U	480 UJ	420 J	1,200 U	170 J	210 J	930 UJ	77 J	130 L
Butylbenzylphthalate	NA	NA	NA	NA	NA	47 J	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,700 U	NA	NA	1,200 U	NA	1,000 U	NA	NA	NA
Carbazole	330 U	330 U	120 J	NA	330 U	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Chrysene	180 J	260 J	4,400	NA	1,500	130 J	9,100 UJ	680 L	330 J	1,700 U	480 UJ	1,400 J	190 J	360 J	390 J	930 UJ	120 J	550 L
Di-n-butylphthalate	160 B	160 B	330 U	NA	130 B	41 B	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	89 J	1,200 U	94 J	130 B	930 UJ	550 UJ	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Dibenz(a,h)anthracene	48 J	56 J	670	NA	180 J	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Dibenzofuran	330 U	330 U	61 J	NA	330 U	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Diethylphthalate	NA	NA	NA	NA	NA	330 U	9,100 UJ	250 L	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	100 L
Dimethyl phthalate	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Fluoranthene	180 J	380 J	9,200	NA	2,500	330 U	930 J	850 L	510 J	180 J	480 UJ	2,200 J	270 J	880 J	540 J	930 UJ	150 J	240 L
Fluorene	330 U	330 U	180 J	NA	330 U	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	79 J	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	330 UJ	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Hexachloroethane	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Indeno(1,2,3-cd)pyrene	97 J	120 J	1,400	NA	550 J	84 J	9,100 UJ	530 L	260 J	1,700 U	480 UJ	500 J	160 J	180 J	320 J	930 UJ	78 J	100 L
Isophorone	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Naphthalene	330 U	330 U	150 J	NA	330 U	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Nitrobenzene	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Pentachlorophenol	NA	NA	NA	NA	NA	840 U	23,000 UJ	3,300 UL	3,600 UL	4,300 U	1,200 UJ	1,700 UJ	3,100 U	1,900 UJ	2,500 U	2,300 UJ	1,400 UJ	NA
Phenanthrene	330 U	170 J	1,800	NA	320 J	47 J	9,100 UJ	190 L	1,400 U	1,700 U	480 UJ	1,100 J	1,200 U	530 J	190 J	930 UJ	550 UJ	160 L
Phenol	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 UL	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Pyrene	270 J	410 J	8,100	NA	1,900	230 J	1,200 J	1,100 L	600 J	170 J	48 J	3,100 J	290 J	850 J	720 J	930 UJ	130 J	230 L
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
bis(2-Ethylhexyl)phthalate	120 B	64 B	140 B	NA	300 B	49 B	9,100 UJ	360 B	230 B	1,700 U	480 UJ	160 J	130 B	170 J	330 B	930 UJ	550 UJ	110 L
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	330 U	9,100 UJ	1,300 UL	1,400 U	1,700 U	480 UJ	670 UJ	1,200 U	760 UJ	1,000 U	930 UJ	550 UJ	NA
Pesticides/Polychlorinated Biphenyls (µg/kg)																		
4,4'-DDD	12	6 J	20	NA	0.00E+00 U	3.7 J	310 J	NA	210	150	110 R	620 J	180	980 J	350	NA	12 J	91 L
4,4'-DDE	7.1 J	7.1	16	NA	70	7.5 J	71 J	130 J	110 J	71	13 J	61 J	44	70 J	49	34 J	3.80 J	NA

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20	SJS02-SD21		SJS02-SD22
Sample ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15-00-04A	SJS02-SD16-00-04A	SJS02-SD16-00-04A-P*	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A	SJS02-SD21-00-04D	SJS02-SD21-00-04D-P*	SJS02-SD22-00-04D
Sample Date	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	11/18/04	11/18/04	11/18/04
Chemical Name																
2,4-Dinitrophenol	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
2,4-Dinitrotoluene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2,6-Dinitrotoluene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2-Chloronaphthalene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2-Chlorophenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2-Methylnaphthalene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2-Methylphenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
2-Nitroaniline	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
2-Nitrophenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
3,3'-Dichlorobenzidine	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
3- and 4-Methylphenol	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
4,6-Dinitro-2-methylphenol	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
4-Bromophenyl-phenylether	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
4-Chloro-3-methylphenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
4-Chloroaniline	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
4-Chlorophenyl-phenylether	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
4-Nitroaniline	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
4-Nitrophenol	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
Acenaphthene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Acenaphthylene	440 U	NA	NA	NA	NA	NA	96 J	180 J	94 J	80 J	180 J	640 U	220 J	NA	NA	NA
Acetophenone	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Anthracene	440 U	NA	NA	NA	NA	NA	83 J	140 J	84 J	81 J	120 J	640 U	410 J	NA	NA	NA
Atrazine	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Benzaldehyde	440 U	NA	NA	NA	NA	NA	700 U	700 U	200 B	490 U	670 U	640 U	750 U	NA	NA	NA
Benzo(a)anthracene	100 J	NA	NA	NA	NA	NA	250 J	540 J	220 J	250 J	470 J	99 J	1,100	NA	NA	NA
Benzo(a)pyrene	100 J	NA	NA	NA	NA	NA	610 J	880	190 J	520	1,100	84 J	1,600	NA	NA	NA
Benzo(b)fluoranthene	110 J	NA	NA	NA	NA	NA	1,200	1,600	570 J	870	1,700	230 J	2,800	NA	NA	NA
Benzo(g,h,i)perylene	440 U	NA	NA	NA	NA	NA	700 U	88 J	690 U	280 J	560 J	640 U	760	NA	NA	NA
Benzo(k)fluoranthene	60 J	NA	NA	NA	NA	NA	340 J	630 J	210 J	340 J	580 J	78 J	970	NA	NA	NA
Butylbenzylphthalate	440 U	NA	NA	NA	NA	NA	90 J	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Caprolactam	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Carbazole	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Chrysene	120 J	NA	NA	NA	NA	NA	350 J	610 J	260 J	370 J	680	82 J	1,800	NA	NA	NA
Di-n-butylphthalate	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Di-n-octylphthalate	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Dibenz(a,h)anthracene	440 U	NA	NA	NA	NA	NA	120 J	210 J	690 U	100 J	190 J	640 U	290 J	NA	NA	NA
Dibenzofuran	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Diethylphthalate	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Dimethyl phthalate	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Fluoranthene	190 J	NA	NA	NA	NA	NA	440 J	860	330 J	350 J	700	130 J	2,300	NA	NA	NA
Fluorene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Hexachlorobenzene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Hexachlorobutadiene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Hexachlorocyclopentadiene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Hexachloroethane	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Indeno(1,2,3-cd)pyrene	440 U	NA	NA	NA	NA	NA	330 J	470 J	110 J	270 J	500 J	640 U	750	NA	NA	NA
Isophorone	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Naphthalene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Nitrobenzene	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Pentachlorophenol	1,100 U	NA	NA	NA	NA	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U	NA	NA	NA
Phenanthrene	150 J	NA	NA	NA	NA	NA	700 U	110 J	690 U	57 J	76 J	640 U	190 J	NA	NA	NA
Phenol	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Pyrene	220 J	NA	NA	NA	NA	NA	580 J	1,100	320 J	460 J	890	120 J	1,800	NA	NA	NA
bis(2-Chloroethoxy)methane	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
bis(2-Chloroethyl)ether	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
bis(2-Ethylhexyl)phthalate	660	NA	NA	NA	NA	NA	5,900	1,600	620 B	250 B	1,900	95 B	110 B	NA	NA	NA
n-Nitroso-di-n-propylamine	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
n-Nitrosodiphenylamine	440 U	NA	NA	NA	NA	NA	700 U	700 U	690 U	490 U	670 U	640 U	750 U	NA	NA	NA
Pesticides/Polychlorinated Biphenyls (µg/kg)																
4,4'-DDD	57	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	22	10	6.4 U	93	NA	NA	NA
4,4'-DDE	5.7 J	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	9.2 J	6.5 J	6.4 U	200 J	NA	NA	NA

Table C-6
Sediment Raw Analytical Results
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St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD23	SJS02-SD24	SJS02-SD25	SJS02-SD26
Sample ID	SJS02-SD23-00-04D	SJS02-SD24-00-04D	SJS02-SD25-00-04D	SJS02-SD26-00-04D
Sample Date	11/18/04	10/06/04	10/06/04	10/06/04
Chemical Name				
2,4-Dinitrophenol	NA	1,700 U	2,100 U	2,600 U
2,4-Dinitrotoluene	NA	700 U	840 U	1,100 U
2,6-Dinitrotoluene	NA	700 U	840 U	1,100 U
2-Chloronaphthalene	NA	700 U	840 U	1,100 U
2-Chlorophenol	NA	700 U	840 U	1,100 U
2-Methylnaphthalene	NA	700 U	250 J	1,100 U
2-Methylphenol	NA	700 U	840 U	1,100 U
2-Nitroaniline	NA	1,700 U	2,100 U	2,600 U
2-Nitrophenol	NA	700 U	840 U	1,100 U
3,3'-Dichlorobenzidine	NA	700 U	840 U	1,100 U
3- and 4-Methylphenol	NA	NA	NA	NA
3-Nitroaniline	NA	1,700 U	2,100 U	2,600 U
4,6-Dinitro-2-methylphenol	NA	1,700 U	2,100 U	2,600 U
4-Bromophenyl-phenylether	NA	700 U	840 U	1,100 U
4-Chloro-3-methylphenol	NA	700 U	840 U	1,100 U
4-Chloroaniline	NA	700 U	840 U	1,100 U
4-Chlorophenyl-phenylether	NA	700 U	840 U	1,100 U
4-Methylphenol	NA	700 U	840 U	1,100 U
4-Nitroaniline	NA	1,700 U	2,100 U	2,600 U
4-Nitrophenol	NA	1,700 U	2,100 U	2,600 U
Acenaphthene	NA	700 U	490 J	1,100 U
Acenaphthylene	NA	700 U	840 U	1,100 U
Acetophenone	NA	700 U	840 U	1,100 U
Anthracene	NA	700 U	1,200	1,100 U
Atrazine	NA	700 U	840 U	1,100 U
Benzaldehyde	NA	700 U	840 U	1,100 U
Benzo(a)anthracene	NA	100 J	3,500	270 J
Benzo(a)pyrene	NA	140 J	3,900	280 J
Benzo(b)fluoranthene	NA	270 J	3,800	410 J
Benzo(g,h,i)perylene	NA	150 J	2,700 J	230 J
Benzo(k)fluoranthene	NA	78 J	1,000	150 J
Butylbenzylphthalate	NA	700 U	840 U	1,100 U
Caprolactam	NA	700 U	840 U	1,100 U
Carbazole	NA	700 U	120 J	1,100 U
Chrysene	NA	120 J	3,300	390 J
Di-n-butylphthalate	NA	700 U	840 U	1,100 U
Di-n-octylphthalate	NA	700 U	840 U	1,100 U
Dibenz(a,h)anthracene	NA	700 U	500 J	1,100 U
Dibenzofuran	NA	700 U	130 J	1,100 U
Diethylphthalate	NA	700 U	840 U	1,100 U
Dimethyl phthalate	NA	700 U	840 U	1,100 U
Fluoranthene	NA	180 J	4,300	430 J
Fluorene	NA	700 U	550 J	1,100 U
Hexachlorobenzene	NA	700 U	840 U	1,100 U
Hexachlorobutadiene	NA	700 U	840 U	1,100 U
Hexachlorocyclopentadiene	NA	700 U	840 U	1,100 U
Hexachloroethane	NA	700 U	840 U	1,100 U
Indeno(1,2,3-cd)pyrene	NA	120 J	1,800 J	180 J
Isophorone	NA	700 U	840 U	1,100 U
Naphthalene	NA	700 U	280 J	1,100 U
Nitrobenzene	NA	700 U	840 U	1,100 U
Pentachlorophenol	NA	1,700 U	2,100 U	2,600 U
Phenanthrene	NA	700 U	5,300	260 J
Phenol	NA	700 U	840 U	1,100 U
Pyrene	NA	210 J	9,400 J	610 J
bis(2-Chloroethoxy)methane	NA	700 U	840 U	1,100 U
bis(2-Chloroethyl)ether	NA	700 U	840 U	1,100 U
bis(2-Ethylhexyl)phthalate	NA	99 B	130 B	350 B
n-Nitroso-di-n-propylamine	NA	700 U	840 U	1,100 U
n-Nitrosodiphenylamine	NA	700 U	840 U	1,100 U
Pesticides/Polychlorinated Biphenyls (µg/kg)				
4,4'-DDD	NA	93	340	400
4,4'-DDE	NA	30	48 J	63 J

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SD-11	SD-12	SD-13		SD-14	SJS02-SD01	SJS02-SD02	SJS02-SD03			SJS02-SD04	SJS02-SD05		SJS02-SD06		SJS02-SD07	SJS02-SD08	
Sample ID	SD-11	SD-12	SD-13	SD-13P*	SD-14	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P*	SJS02-SD03-00-04D	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD05-00-04D	SJS02-SD06-001	SJS02-SD06-00-04D	SJS02-SD07-001	SJS02-SD08-001	SJS02-SD08-002
Sample Date	02/04/99	02/04/99	02/04/99	02/04/99	02/04/99	07/14/97	07/14/97	06/26/97	06/26/97	10/06/04	04/16/99	04/16/99	10/06/04	04/16/99	10/06/04	04/16/99	04/14/99	10/27/99
Chemical Name																		
4,4'-DDT	3.3 U	2.8 J	0.00E+00 U	NA	34 J	9.3	28 J	12 U	8.8 J	24	25 J	73 J	26	3,200 J	47	12 J	3.40 J	NA
Aldrin	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
Aroclor-1016	NA	NA	NA	NA	NA	33 U	110 UJ	120 U	130 U	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA
Aroclor-1221	NA	NA	NA	NA	NA	67 U	210 UJ	240 U	270 U	350 U	95 UJ	130 UJ	250 U	150 UJ	200 U	190 UJ	110 UJ	NA
Aroclor-1232	NA	NA	NA	NA	NA	33 U	110 UJ	120 U	130 U	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA
Aroclor-1242	NA	NA	NA	NA	NA	33 U	110 UJ	120 U	130 U	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA
Aroclor-1248	NA	NA	NA	NA	NA	33 U	110 UJ	120 U	130 U	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA
Aroclor-1254	NA	NA	NA	NA	NA	33 U	110 J	120 U	130 U	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA
Aroclor-1260	NA	NA	NA	NA	NA	33 U	110 UJ	120 U	69 J	170 U	47 UJ	65 UJ	120 U	75 UJ	100 U	93 UJ	54 UJ	NA
Dieldrin	3.3 U	3.3 U	3.3 U	NA	54 J	3.3 U	11 UJ	36	30 J	1.3 J	4.70 UJ	6.5 UJ	1.8 J	7.5 UJ	1.4 J	9.30 UJ	5.40 UJ	NA
Endosulfan I	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
Endosulfan II	NA	NA	NA	NA	NA	3.3 U	11 UJ	12 U	13 U	17 U	4.70 UJ	6.5 UJ	12 U	7.5 UJ	10 U	9.30 UJ	5.40 UJ	NA
Endosulfan sulfate	3.3 U	3.3 U	0.00E+00 U	NA	93	3.3 U	11 UJ	12 U	13 U	17 U	4.70 UJ	6.5 UJ	12 U	7.5 UJ	10 U	9.30 UJ	5.40 UJ	NA
Endrin	NA	NA	NA	NA	NA	3.3 U	11 UJ	12 U	13 U	17 U	4.70 UJ	6.5 UJ	12 U	7.5 UJ	10 U	9.30 UJ	5.40 UJ	NA
Endrin aldehyde	3.3 U	3.3 U	3.3 U	NA	51 J	3.3 U	11 UJ	12 U	13 U	17 U	4.70 UJ	6.5 UJ	12 U	7.5 UJ	10 U	9.30 UJ	5.40 UJ	NA
Endrin ketone	3.3 U	3.3 U	3.3 U	NA	41 J	3.3 U	11 UJ	12 U	13 U	17 U	4.70 UJ	6.5 UJ	12 U	7.5 UJ	10 U	9.30 UJ	5.40 UJ	NA
Heptachlor	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
Methoxychlor	NA	NA	NA	NA	NA	17 U	54 UJ	60 U	68 U	86 U	24 UJ	33 UJ	62 U	37 UJ	51 U	46 UJ	27 UJ	NA
Toxaphene	NA	NA	NA	NA	NA	170 U	540 UJ	600 U	680 U	860 U	240 UJ	330 UJ	620 U	370 UJ	510 U	460 UJ	270 UJ	NA
alpha-BHC	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
alpha-Chlordane	3.3 U	4.5 J	3.3 U	NA	3.3 U	1.7 U	7.3 J	28	18	8.6 U	2.40 UJ	79 J	7.6	40 J	21	7.70 J	0.820 J	NA
beta-BHC	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
delta-BHC	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	1.7 U	5.4 UJ	6 U	6.8 U	8.6 U	2.40 UJ	3.30 UJ	6.2 U	3.70 UJ	5.1 U	4.60 UJ	2.70 UJ	NA
gamma-Chlordane	1.8 J	3.3 U	3.3 U	NA	19 J	1.7 U	9.8 J	29 J	21 J	8.6 U	2.40 UJ	96 J	12	58 J	31 J	12 J	1.5 J	NA
Dioxin/Furans (µg/kg)																		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/kg)																		
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U
2-Nitrotoluene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	500 U	476 U	NA	476 U	NA	500 U	500 U	480 U
3-Nitrotoluene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	500 U	476 U	NA	476 U	NA	500 U	500 U	480 U
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20	SJS02-SD21		SJS02-SD22
Sample ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15-00-04A	SJS02-SD16-00-04A	SJS02-SD16-00-04A-P*	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A	SJS02-SD21-00-04D	SJS02-SD21-00-04D-P*	SJS02-SD22-00-04D
Sample Date	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	11/18/04	11/18/04	11/18/04
Chemical Name																
4,4'-DDT	23	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	3 J	6.7 U	6.4 U	11 J	NA	NA	NA
Aldrin	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
Aroclor-1016	44 U	NA	NA	NA	NA	NA	70 U	70 U	69 U	49 U	67 U	64 U	75 U	NA	NA	NA
Aroclor-1221	88 U	NA	NA	NA	NA	NA	140 U	140 U	140 U	99 U	140 U	130 U	150 U	NA	NA	NA
Aroclor-1232	44 U	NA	NA	NA	NA	NA	70 U	70 U	69 U	49 U	67 U	64 U	75 U	NA	NA	NA
Aroclor-1242	44 U	NA	NA	NA	NA	NA	70 U	70 U	69 U	49 U	67 U	64 U	75 U	NA	NA	NA
Aroclor-1248	44 U	NA	NA	NA	NA	NA	70 U	70 U	69 U	49 U	67 U	64 U	75 U	NA	NA	NA
Aroclor-1254	44 U	NA	NA	NA	NA	NA	70 U	70 U	69 U	49 U	67 U	64 U	75 U	NA	NA	NA
Aroclor-1260	44 U	NA	NA	NA	NA	NA	70 U	70 U	69 U	49 U	67 U	64 U	75 U	NA	NA	NA
Dieldrin	4.4 U	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA
Endosulfan I	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
Endosulfan II	4.4 U	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA
Endosulfan sulfate	4.4 U	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA
Endrin	4.4 U	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA
Endrin aldehyde	4.4 U	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA
Endrin ketone	4.4 U	NA	NA	NA	NA	NA	7 U	7 U	6.9 U	4.9 U	6.7 U	6.4 U	7.5 U	NA	NA	NA
Heptachlor	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
Heptachlor epoxide	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
Methoxychlor	22 U	NA	NA	NA	NA	NA	36 U	36 U	35 U	25 U	34 U	33 U	39 U	NA	NA	NA
Toxaphene	220 U	NA	NA	NA	NA	NA	360 U	360 U	350 U	250 U	340 U	330 U	390 U	NA	NA	NA
alpha-BHC	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
alpha-Chlordane	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	1.6 J	3.4 U	3.3 U	6.7 J	NA	NA	NA
beta-BHC	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
delta-BHC	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
gamma-BHC (Lindane)	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.5 U	3.4 U	3.3 U	3.9 U	NA	NA	NA
gamma-Chlordane	2.2 U	NA	NA	NA	NA	NA	3.6 U	3.6 U	3.5 U	2.1 J	3.4 U	3.3 U	19 J	NA	NA	NA
Dioxin/Furans (µg/kg)																
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.42 J	0.13 J	0.34 J	0.016 J	0.19 J	0.094 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.23 J	0.056 J	0.087 J	0.0025 J	0.048 J	0.014 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.021 J	0.0044 J	0.0063 J	1.30E-04 UJ	0.0036 J	7.70E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.0085 J	0.0023 J	0.0051 J	3.00E-04 J	0.0029 J	0.0024 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	0.025 J	0.0099 J	0.019 J	7.40E-04 J	0.0082 J	0.0049 I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.018 J	0.0058 J	0.015 J	6.00E-04 J	0.008 J	0.004 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	0.06 J	0.0064 I	0.0094 J	5.00E-04 J	0.0044 J	7.60E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.016 J	0.0047 J	0.013 J	0.0011 J	0.008 J	0.0047 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	0.002 J	1.00E-03 J	0.0023 J	1.50E-04 UJ	2.50E-04 UJ	4.00E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.0036 J	0.0012 J	0.0028 J	1.70E-04 UJ	0.0012 J	0.0012 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	0.0043 J	0.0011 J	0.0027 J	2.40E-04 UJ	0.0014 J	0.0011 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	0.0093 J	0.0033 J	0.0068 J	3.60E-04 J	0.0024 J	1.00E-03 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	0.007 J	0.003 J	0.0061 J	4.30E-04 J	0.002 J	0.0016 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	5.80E-04 J	3.40E-04 J	9.60E-04 J	1.30E-04 UJ	4.30E-04 J	3.20E-04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	0.0082 NJ	0.0034 J	0.0097 J	7.10E-04 NJ	0.0032 J	0.0037 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	3.2 J	1.6 J	4.4 J	0.66 J	1.9 J	1.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	0.58 J	0.074 J	0.12 J	0.003 B	0.058 J	0.021 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	0.75 J	0.26 J	0.9 J	0.051 J	0.52 J	0.28 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	0.25 J	0.15 J	0.26 J	0.0046 J	0.13 J	0.014 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	0.14 J	0.046 J	0.17 J	0.015 J	0.11 J	0.07 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	0.3 J	0.091 J	0.19 J	0.0047 J	0.078 J	0.035 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	0.011 J	0.0048 J	0.02 J	1.70E-04 UJ	0.0091 J	0.0097 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	0.08 J	0.031 J	0.091 J	0.002 J	0.023 J	0.02 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	0.0067 J	0.0032 J	0.0066 J	3.70E-04 J	0.005 J	0.0029 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	0.036 J	0.0056 J	0.024 J	0.0021 J	0.016 J	0.013 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/kg)																
1,3,5-Trinitrobenzene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD23	SJS02-SD24	SJS02-SD25	SJS02-SD26
Sample ID	SJS02-SD23-00-04D	SJS02-SD24-00-04D	SJS02-SD25-00-04D	SJS02-SD26-00-04D
Sample Date	11/18/04	10/06/04	10/06/04	10/06/04
Chemical Name				
4,4'-DDT	NA	26	77	100
Aldrin	NA	3.5 U	4.2 U	5.3 U
Aroclor-1016	NA	70 U	84 U	110 U
Aroclor-1221	NA	140 U	170 U	210 U
Aroclor-1232	NA	70 U	84 U	110 U
Aroclor-1242	NA	70 U	84 U	110 U
Aroclor-1248	NA	70 U	84 U	110 U
Aroclor-1254	NA	70 U	84 U	110 U
Aroclor-1260	NA	70 U	84 U	110 U
Dieldrin	NA	0.91 J	1.2 J	2.9 J
Endosulfan I	NA	3.5 U	4.2 U	5.3 U
Endosulfan II	NA	7 U	8.4 U	11 U
Endosulfan sulfate	NA	7 U	8.4 U	11 U
Endrin	NA	7 U	8.4 U	11 U
Endrin aldehyde	NA	7 U	6.4 J	11 U
Endrin ketone	NA	7 U	8.4 U	2.2 J
Heptachlor	NA	3.5 U	4.2 U	5.3 U
Heptachlor epoxide	NA	3.5 U	4.2 U	5.3 U
Methoxychlor	NA	35 U	42 U	53 U
Toxaphene	NA	350 U	420 U	530 U
alpha-BHC	NA	3.5 U	4.2 U	5.3 U
alpha-Chlordane	NA	5.5 J	23	34
beta-BHC	NA	3.5 U	4.2 U	5.3 U
delta-BHC	NA	3.5 U	4.2 U	5.3 U
gamma-BHC (Lindane)	NA	3.5 U	4.2 U	5.3 U
gamma-Chlordane	NA	10	41 J	49
Dioxin/Furans (µg/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	NA	NA	NA	NA
Octachlorodibenzofuran	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	NA	NA	NA	NA
Total heptachlorodibenzofuran	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	NA	NA	NA	NA
Total hexachlorodibenzofuran	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	NA	NA	NA	NA
Total pentachlorodibenzofuran	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	NA	NA	NA	NA
Total tetrachlorodibenzofuran	NA	NA	NA	NA
Explosives (µg/kg)				
1,3,5-Trinitrobenzene	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SD-11	SD-12	SD-13		SD-14	SJS02-SD01	SJS02-SD02	SJS02-SD03			SJS02-SD04	SJS02-SD05		SJS02-SD06		SJS02-SD07	SJS02-SD08	
Sample ID	SD-11	SD-12	SD-13	SD-13P*	SD-14	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P*	SJS02-SD03-00-04D	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD05-00-04D	SJS02-SD06-001	SJS02-SD06-00-04D	SJS02-SD07-001	SJS02-SD08-001	SJS02-SD08-002
Sample Date	02/04/99	02/04/99	02/04/99	02/04/99	02/04/99	07/14/97	07/14/97	06/26/97	06/26/97	10/06/04	04/16/99	04/16/99	10/06/04	04/16/99	10/06/04	04/16/99	04/14/99	10/27/99
Chemical Name																		
4-Nitrotoluene	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	500 U	476 U	NA	476 U	NA	500 U	500 U	480 U
HMX	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	500 U	476 U	NA	476 U	NA	500 U	500 U	480 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	238 U	NA	238 U	NA	250 U	250 U	240 U
RDX	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	500 U	476 U	NA	476 U	NA	500 U	500 U	480 U
Tetryl	NA	NA	NA	NA	NA	540 U	NA	2,000 U	2,200 U	NA	500 U	476 U	NA	476 U	NA	500 U	500 U	480 U
Metals (mg/kg)																		
Aluminum	1,860	2,380	4,870	5,060	5,970	3,100	10,900	27,200	25,900	19,100	1,500	9,360	33,000	9,600	15,100	20,200	4,100	5,020
Antimony	0.00E+00 U	0.00E+00 U	0.00E+00 UL	0.00E+00 U	0.00E+00 U	0.42 UL	3.3 B	16.3 L	27.6 L	2.9 UL	0.400 UL	1.20 L	2.9 B	1.80 L	7.1 L	1.70 L	0.650 U	0.75 U
Arsenic	3.2 B	2.5 B	7.2	9.7	7.1	2.3	5.4 K	13.1	19.4	14	1.60 K	7.5 K	16.9	9.60 K	14	12 K	3.5	4.7
Barium	6.8	7.1	17.5	18.1	18.1	15.4 J	55.7 J	84.7 J	109 J	49.9 J	4.10 J	102	83.6 J	89.3	131	79.4 J	15.2 J	26 J
Beryllium	0.46 B	0.51 B	0.81 B	0.78 B	1 B	0.21 U	1.1 B	0.87 J	1.1 J	0.92 J	0.0700 J	0.590 J	1.5 J	0.620 J	0.87 J	0.900 J	0.300 J	0.370 J
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	27.3	NA	NA	25.1	NA	17.2	NA	NA	NA
Cadmium	0.33 L	0.00E+00 UL	0.35	0.33 L	0.00E+00 UL	0.14 J	4	2.5 J	2.1 J	4.6	0.530 J	8.20	8.5	7.30	12.3	4.60	1.10 J	1.5
Calcium	702	6,060	25,400	6,100	1,870	393 J	2,300 J	24,300 J	11,600 J	2,720 J	207 J	6,230	3,140 J	4,300	4,880 J	2,390 J	1,640	1,100 J
Chromium	13.2	8.4	13.9	16.6	29.1	6.5	277	1,640	2,630	249	11.6	1,180	905	1,900	1,920	392	67.1	84.1
Cobalt	1.7 L	1.7 L	4.4 L	5.7 L	5.4 L	1.67 U	4.06 U	9.1 J	10.7 J	6.8 J	0.660 J	5.10 J	12.8 J	6 J	8.4 J	7.80 J	2.40 J	2.80 J
Copper	28.6	30.2	55.3	42.4	72.2	4.4 J	344	1,700	2,620	327	18.2	1,200	1,040	2,030	1,790	494	94.8	115
Cyanide	0.00E+00 U	0.00E+00 U	0.00E+00 U	0.00E+00 U	0.00E+00 U	0.54 U	1.4 U	2.1 U	2 U	0.13 U	0.584	0.417 U	0.34	0.524 U	0.14 U	0.549 U	1.80 L	0.400 U
Iron	5,100	5,930	11,300	13,000	15,400	3,150	18,500	31,100	30,700	21,800	2,050	12,700	38,200	18,100	25,800	28,000	8,630	9,520
Lead	21.9	20.2	53.8	73.6	97.2	15.5	161	396	545	201	14.9	312	408	366	495	250	54.2	64.8
Magnesium	1,200	2,730	2,640	6,000	3,050	309 J	4,710	6,890 J	6,480 J	5,150	364 J	3,710	6,680	2,950	4,330	4,970	1,680	2,090
Manganese	24.6	33.7	66.2	110	110	16 K	105	235	224	112	8.30 K	174 K	242	204 K	205	148 K	51.6	58.2
Mercury	0.00E+00 U	0.00E+00 U	0.00E+00 U	0.37	0.5	0.05 U	0.45	0.72	0.79	0.78 K	0.0400 J	0.620	0.89 K	0.470	0.8 K	0.690	0.220	0.25
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.7	NA	NA	8.7	NA	7.1	NA	NA	NA
Nickel	3.9	3.8	8.2	9	16.5	1.8 B	16.4 K	41.5	40.9	23.6 J	2 J	32.6	45.8	35.9	41.2	29.1	7.10 J	8.60 J
Potassium	417	417	987	662	1,360	228 J	2,000 J	3,830	3,380 J	2,870 J	207 J	1,270 J	4,050	1,280	1,870	3,050	734 J	744 J
Selenium	0.00E+00 U	1.6 K	NA	2 K	1.8 K	0.63 UL	1.52 U	2.27 U	2.22 U	2.2 U	0.390 U	0.770 U	2.4	0.710 K	1.7	1.5 K	0.630 U	0.840 U
Silver	0.00E+00 U	0.00E+00 U	0.00E+00 U	0.67 B	0.00E+00 U	0.21 U	0.51 U	1.8 B	1.5 B	0.79 U	0.130 U	0.680 J	0.58 B	0.770 J	0.77 B	0.870 J	0.220 U	0.25 J
Sodium	1,950	1,950	4,670	3,730	7,270	33.7 B	11,800	17,800	16,300	14,200	1,040	3,830	10,300	4,820	6,540	9,550	3,280	2,320
Thallium	0.00E+00 U	1.1	1.6 L	2.4	0.00E+00 U	0.42 U	1.02 U	1.52 U	2.2 K	3.4 U	0.480 U	0.950 U	2.4 U	0.760 U	1.8 U	1.70 U	0.770 U	1.40 U
Vanadium	7.8	7.8	14.2 B	13.8 B	36.2 B	7.2 J	28.8	115	97.9	61	5 J	53	96.4	96.5	112	62.7	12.4	14.4
Zinc	131	91.5 L	188	219	241	19.2	416	1,140 L	1,400 L	424 J	42.8	888	991 J	1,120	1,470 J	539	173	203
Wet Chemistry (mg/kg)																		
Nitrogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.1	NA	NA	7.8	NA	3.5 U	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	10.5	13.5	19.1	20.2	NA	102	370	NA	177	NA	164	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	2,050	44,000	71,000 L	64,600 L	12,000	2,270	41,900	14,000	35,000	20,000	57,200	24,400	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.49	7.45	NA	7.39	NA	7.20	7.37	NA
AVS/SEM (umole/g)																		
Acid volatile sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	13	NA	NA	3.9	NA	4.5	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0339	NA	NA	0.0359	NA	0.0689	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.993	NA	NA	1.65	NA	0.252	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.779	NA	NA	1.35	NA	1.9	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20E-04 U	NA	NA	9.00E-05 U	NA	7.00E-05 U	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.103	NA	NA	0.119	NA	0.212	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.51	NA	NA	7.49	NA	16.9	NA	NA	NA

Notes:
AVS/SEM - Acid Volatile Sulfide/Simultaneously Extractable Metals
* - Duplicate Sample
Represents Detections
NA - Not analayzed
B - Anlayte not detected above the associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
U - Not detected

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20	SJS02-SD21		SJS02-SD22
Sample ID	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14	SJS02-SD15-00-04A	SJS02-SD16-00-04A	SJS02-SD16-00-04A-P*	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A	SJS02-SD21-00-04D	SJS02-SD21-00-04D-P*	SJS02-SD22-00-04D
Sample Date	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	11/18/04	11/18/04	11/18/04
Chemical Name																
4-Nitrotoluene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	630 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																
Aluminum	2,850	NA	NA	NA	NA	NA	16,600	19,600	16,200	6,540	15,700	18,600	17,600	NA	NA	NA
Antimony	2.4	NA	NA	NA	NA	NA	0.8 UL	0.73 UL	0.69 UL	0.58 UL	0.7 UL	0.76 UL	0.75 UL	NA	NA	NA
Arsenic	4	NA	NA	NA	NA	NA	13.7	13.7	14.2	5.4	13.4	7.6	10.4	NA	NA	NA
Barium	81.2	NA	NA	NA	NA	NA	38.5 J	43.8 J	38.2 J	21.6 J	35.6 J	40 J	68.5 J	NA	NA	NA
Beryllium	0.3	NA	NA	NA	NA	NA	0.7 J	0.83 J	0.73 J	0.32 J	0.69 J	0.74 J	0.83 J	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	9.2	NA	NA	NA	NA	NA	0.08 U	0.073 U	0.069 U	0.78 J	0.14 J	0.076 U	4.5	NA	NA	NA
Calcium	4,580	NA	NA	NA	NA	NA	1,920 J	222	2,010	1,210 J	3,920	1,890 J	4,380	NA	NA	NA
Chromium	55.9	NA	NA	NA	NA	NA	32.5	36.7	32.8	61.8	47.6	30.1	443	NA	NA	NA
Cobalt	4.3	NA	NA	NA	NA	NA	6.6 J	7.9 J	6.7 J	3.1 J	6.2 J	6.9 J	8.7 J	NA	NA	NA
Copper	160	NA	NA	NA	NA	NA	92.6 K	35 K	47.8 K	111 K	79.6 K	10.1 K	461 K	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	0.86 J	0.27 U	0.29 U	0.22 J	0.26 U	0.32 J	3	NA	NA	NA
Iron	6,470	NA	NA	NA	NA	NA	28,000	33,500	29,200	11,900	27,900	28,900	28,100	NA	NA	NA
Lead	211	NA	NA	NA	NA	NA	83.1	58.1	77	65.4	98.8	16.8	219	NA	NA	NA
Magnesium	1,370	NA	NA	NA	NA	NA	5,310	6,640	5,490	2,280	5,060	6,010	5,110	NA	NA	NA
Manganese	125	NA	NA	NA	NA	NA	178	223	181	77.8	165	211	181	NA	NA	NA
Mercury	0.39	NA	NA	NA	NA	NA	0.6	0.46	0.39	0.29	0.6	0.085 U	0.46	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.3	NA	NA	NA	NA	NA	13.6 J	16.7	14 J	8.5 J	14.4	14.6 J	20	NA	NA	NA
Potassium	403	NA	NA	NA	NA	NA	2,900	3,580	2,850	1,100 J	2,690	3,390	2,880	NA	NA	NA
Selenium	1.3 U	NA	NA	NA	NA	NA	0.8 U	0.73 U	0.69 U	0.58 U	0.7 U	0.76 U	0.75 U	NA	NA	NA
Silver	1.3 U	NA	NA	NA	NA	NA	1.4 J	1.6 J	1.5 J	0.71 J	1.5 J	1.3 J	1.8 J	NA	NA	NA
Sodium	144	NA	NA	NA	NA	NA	6,690	7,610	7,000	3,100	6,930	6,850	6,910	NA	NA	NA
Thallium	1.5 U	NA	NA	NA	NA	NA	0.8 U	0.73 U	0.69 U	0.58 U	0.7 U	0.76 U	0.75 U	NA	NA	NA
Vanadium	14.9	NA	NA	NA	NA	NA	34.3	37.3	30.9	17.2	30.6	35.2	37	NA	NA	NA
Zinc	405	NA	NA	NA	NA	NA	249 K	144 K	173 K	225 K	251 K	61.6 K	609 K	NA	NA	NA
Wet Chemistry (mg/kg)																
Nitrogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	63,000	37,000	35,000	15,000	34,000	32,000	32,000	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS/SEM (umole/g)																
Acid volatile sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
AVS/SEM - Acid Volatile Sulfide/Simultaneously Extracta
* - Duplicate Sample
Represents Detections
NA - Not analayzed
B - Anlayte not detected above the associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
U - Not detected

Table C-6
Sediment Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS02-SD23	SJS02-SD24	SJS02-SD25	SJS02-SD26
Sample ID	SJS02-SD23-00-04D	SJS02-SD24-00-04D	SJS02-SD25-00-04D	SJS02-SD26-00-04D
Sample Date	11/18/04	10/06/04	10/06/04	10/06/04
Chemical Name				
4-Nitrotoluene	NA	NA	NA	NA
HMX	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA
RDX	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA
Metals (mg/kg)				
Aluminum	NA	13,000	22,500	10,000
Antimony	NA	2.9 B	3.1 B	3.7 B
Arsenic	NA	7.7	16.9	16.9
Barium	NA	59.9	74.1	121
Beryllium	NA	0.77 L	1.1 J	0.54 L
Boron	NA	14.6	21.1	7.9
Cadmium	NA	3.6	4.4	10.9
Calcium	NA	2,690 J	2,700 J	2,410 J
Chromium	NA	600	387	260
Cobalt	NA	6.7 J	9.5 J	5.1 J
Copper	NA	692	521	421
Cyanide	NA	0.4	0.55	0.14 U
Iron	NA	19,300	29,900	24,900
Lead	NA	260	323	351
Magnesium	NA	3,640	5,650	2,050
Manganese	NA	127	196	125
Mercury	NA	0.46 K	0.94 K	0.51 K
Molybdenum	NA	3.8	3.7	4.7
Nickel	NA	23.3	25.3	21.2
Potassium	NA	1,760	3,240	895 J
Selenium	NA	1.7	1.7	1.3 U
Silver	NA	0.46 B	0.58 B	0.69 B
Sodium	NA	4,880	7,480	2,140
Thallium	NA	1.4 U	1.7 U	1.9 U
Vanadium	NA	50.2	44.4	147
Zinc	NA	619 J	1,270 J	758 J
Wet Chemistry (mg/kg)				
Nitrogen	NA	6.2	11	7
Phosphorus	NA	NA	NA	NA
Total organic carbon (TOC)	NA	14,000	15,000	15,000
pH	NA	NA	NA	NA
AVS/SEM (umole/g)				
Acid volatile sulfide	NA	3.1	5.6	4
Cadmium	NA	0.0247	0.069	0.0696
Copper	NA	0.683	0.507	3.44
Lead	NA	0.784	2.3	1.49
Mercury	NA	5.00E-05 U	6.00E-05 U	8.00E-05 U
Nickel	NA	0.0676	0.196	0.163
Zinc	NA	5.7	16.6	9.49

Notes:
AVS/SEM - Acid Volatile Sulfide/Simultaneously Extracta
* - Duplicate Sample
Represents Detections
NA - Not analayzed
B - Anlayte not detected above the associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
U - Not detected

Table C-7
Porewater Raw Analytical Results
Site 2 Expanded Remedial Investigation
St. Juliens Creek Annex
Cheasapeake, Virginia

Station ID	SJS02-PW01	SJS02-PW02	SJS02-PW03	SJS02-PW04	SJS02-PW05	SJS02-PW06		SJS02-PW07	SJS02-PW08	SJS02-PW09	SJS02-PW10	SJS02-PW11	SJS02-PW12	SJS02-PW13		SJS02-PW14	SJS02-PW15
Sample ID	SJS02-PW01-07B	SJS02-PW02-07B	SJS02-PW03-07B	SJS02-PW04-07B	SJS02-PW05-07B	SJS02-PW06-07B	SJS02-PW06-07BP*	SJS02-PW07-07B	SJS02-PW08-07B	SJS02-PW09-07B	SJS02-PW10-07B	SJS02-PW11-07B	SJS02-PW12-07B	SJS02-PW13-07B	SJS02-PW13-07BP*	SJS02-PW14-07B	SJS02-PW15-07B
Sample Date	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07	05/17/07
Chemical Name																	
Volatile Organic Compounds (µg/L)																	
1,1,1-Trichloroethane	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	2 U	2 U	100 U	2,000 U	100 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	1 U	1 U	50 U	730 J	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5 U	5 U	250 U	5,000 U	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dibromo-3-chloropropane	5 U	5 U	250 U	5,000 U	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene	2 U	2 U	100 U	2,000 U	100 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichloroethane	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	2 U	2 U	100 U	2,000 U	100 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,4-Dichlorobenzene	2 U	2 U	100 U	2,000 U	100 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Bromodichloromethane	2 U	2 U	100 U	2,000 U	100 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Carbon tetrachloride	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	5 U	5 U	250 U	5,000 U	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloromethane	5 U	5 U	250 U	5,000 U	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibenzofuran	2 U	2 U	100 U	2,000 U	100 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Dichlorodifluoromethane (Freon-12)	5 U	5 U	250 U	5,000 U	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene chloride	5 U	5 U	250 U	5,000 U	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	0.26 J	1.3	38 J	5,100	79	2.9	1.7	0.23 J	1.6	1.6	5.1	0.4 J	1.5	1 U	0.89 J	3	2.2
Trichlorofluoromethane(Freon-11)	5 U	5 U	250 U	5,000 U	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl chloride	2 U	2 U	250	2,000 U	4,400	16	22	2 U	2 U	2.3	0.3 J	0.33 J	0.27 J	2 U	0.91 J	2 U	1.1 J
cis-1,2-Dichloroethene	0.93 J	1.5	4,600	87,000	3,800	45	41	0.8 J	0.72 J	9.5	1.8	1.7	0.72 J	1 UJ	3.9 J	1.9	1.1
cis-1,3-Dichloropropene	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	1 U	1 U	50 U	710 J	50 U	0.57 J	0.63 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	1 U	1 U	50 U	1,000 U	50 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:
* Duplicate Sample
Represents detections
U - Analyte not detected
J - Reported value is estimated

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC								STJ-QC									
Sample ID	SJS02-FB071801	SJS02-EB071801	SJS02-TB071801	SJS02-TB120903	SJS02-TB121103	SJS02-TB121203	SJS02-FB121203	SJS02-EB121203	SJS02-FB010604	SJS02-EB010604	SJS02-EB100504	SJS02-FB100604	SJS02-EB100604	SJS02-TB111804	SJS02-EB111804	SJS02-FB111804	SJS02-TB120204	SJS02-FB120204
Sample Date	07/18/01	07/18/01	07/18/01	12/09/03	12/11/03	12/12/03	12/12/03	12/12/03	01/06/04	01/06/04	10/05/04	10/06/04	10/06/04	11/18/04	11/18/04	11/18/04	12/02/04	12/02/04
Chemical Name																		
Volatile Organic Compounds (µg/L)																		
1,1,1-Trichloroethane	2.5 B	2.9 B	3.1 B	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,1,2-Trichloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,1-Dichloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,1-Dichloroethene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dibromoethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dichloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dichloropropane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,3-Dichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
1,4-Dichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
2-Butanone	10 U	10 U	10 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	5 R	5 R
2-Hexanone	10 U	10 U	10 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	5 U	5 U
4-Methyl-2-pentanone	10 U	10 U	10 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	5 U	5 U
Acetone	10 U	10 U	10 U	4.3 J	5 U	5 U	4.8 J	NA	NA	NA	NA	NA	NA	10 U	7.8 J	7.9 J	5 R	5 R
Benzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Bromochloromethane	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Bromoform	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Bromomethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Carbon tetrachloride	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Chlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Chloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Chloroform	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Chloromethane	10 U	10 U	10 U	0.5 U	0.36 J	0.35 J	0.42 J	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Cyclohexane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Isopropylbenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 R	0.5 R
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Methylcyclohexane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Methylene chloride	3.1 B	3.5 B	3.3 B	3.6	1.6	1.5	7	NA	NA	NA	NA	NA	NA	1.2 J	10 U	10 U	0.5 U	1.1
Styrene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Tetrachloroethene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Toluene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Trichloroethene	10 U	10 U	10 U	0.5 U	0.5 U	5	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Vinyl chloride	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Xylene, total	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	0.5 U	0.5 U	0.83	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
o-Xylene	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (µg/L)																		
1,1-Biphenyl	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2,2'-Oxybis(1-chloropropane)	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2,4,5-Trichlorophenol	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
2,4,6-Trichlorophenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2,4-Dichlorophenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2,4-Dimethylphenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2,4-Dinitrophenol	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
2,4-Dinitrotoluene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2,6-Dinitrotoluene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2-Chloronaphthalene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2-Chlorophenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2-Methylnaphthalene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
2-Methylphenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC								STJ-QC									
Sample ID	SJS02-FB071801	SJS02-EB071801	SJS02-TB071801	SJS02-TB120903	SJS02-TB121103	SJS02-TB121203	SJS02-FB121203	SJS02-EB121203	SJS02-FB010604	SJS02-EB010604	SJS02-EB100504	SJS02-FB100604	SJS02-EB100604	SJS02-TB111804	SJS02-EB111804	SJS02-FB111804	SJS02-TB120204	SJS02-FB120204
Sample Date	07/18/01	07/18/01	07/18/01	12/09/03	12/11/03	12/12/03	12/12/03	12/12/03	01/06/04	01/06/04	10/05/04	10/06/04	10/06/04	11/18/04	11/18/04	11/18/04	12/02/04	12/02/04
Chemical Name																		
2-Nitroaniline	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
2-Nitrophenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
3,3'-Dichlorobenzidine	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
3- and 4-Methylphenol	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
4,6-Dinitro-2-methylphenol	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
4-Bromophenyl-phenylether	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
4-Chloro-3-methylphenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
4-Chloroaniline	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
4-Chlorophenyl-phenylether	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
4-Methylphenol	NA	NA	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
4-Nitroaniline	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
4-Nitrophenol	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
Acenaphthene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Acenaphthylene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Acetophenone	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Anthracene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Atrazine	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 R
Benzaldehyde	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Benzo(a)anthracene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Benzo(a)pyrene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Benzo(b)fluoranthene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Benzo(g,h,i)perylene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Benzo(k)fluoranthene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Butylbenzylphthalate	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Caprolactam	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Carbazole	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Chrysene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Di-n-butylphthalate	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	1.5 J	1.7 J	1.9 J	NA	NA	NA	NA	12 U
Di-n-octylphthalate	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Dibenz(a,h)anthracene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Dibenzofuran	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Diethylphthalate	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Dimethyl phthalate	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Fluoranthene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Fluorene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Hexachlorobenzene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Hexachlorobutadiene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Hexachlorocyclopentadiene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Hexachloroethane	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Isophorone	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Naphthalene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Nitrobenzene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Pentachlorophenol	25 U	25 U	NA	NA	NA	NA	13 U	NA	25 U	25 U	26 U	26 U	26 U	NA	NA	NA	NA	29 U
Phenanthrene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Phenol	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Pyrene	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
bis(2-Chloroethoxy)methane	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
bis(2-Chloroethyl)ether	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
bis(2-Ethylhexyl)phthalate	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	1.8 J	42	2 J	NA	NA	NA	NA	1.6 J
n-Nitroso-di-n-propylamine	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
n-Nitrosodiphenylamine	10 U	10 U	NA	NA	NA	NA	5 U	NA	10 U	10 U	11 U	10 U	11 U	NA	NA	NA	NA	12 U
Pesticide/Polychlorinated Biphenyls (µg/L)																		
4,4'-DDD	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
4,4'-DDE	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
4,4'-DDT	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
Aldrin	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
Aroclor-1016	1 U	1 U	NA	NA	NA	NA	1 U	NA	1 U	1 U	1.1 U	1.1 U	1.2 U	NA	NA	NA	NA	1.1 U
Aroclor-1221	2 U	2 U	NA	NA	NA	NA	2 U	NA	2 U	2 U	2.1 U	2.1 U	2.4 U	NA	NA	NA	NA	2.2 U
Aroclor-1232	1 U	1 U	NA	NA	NA	NA	1 U	NA	1 U	1 U	1.1 U	1.1 U	1.2 U	NA	NA	NA	NA	1.1 U
Aroclor-1242	1 U	1 U	NA	NA	NA	NA	1 U	NA	1 U	1 U	1.1 U	1.1 U	1.2 U	NA	NA	NA	NA	1.1 U
Aroclor-1248	1 U	1 U	NA	NA	NA	NA	1 U	NA	1 U	1 U	1.1 U	1.1 U	1.2 U	NA	NA	NA	NA	1.1 U
Aroclor-1254	1 U	1 U	NA	NA	NA	NA	1 U	NA	1 U	1 U	1.1 U	1.1 U	1.2 U	NA	NA	NA	NA	1.1 U
Aroclor-1260	1 U	1 U	NA	NA	NA	NA	1 U	NA	1 U	1 U	1.1 U	1.1 U	1.2 U	NA	NA	NA	NA	1.1 U
Dieldrin	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
Endosulfan I	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
Endosulfan II	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
Endosulfan sulfate	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
Endrin	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
Endrin aldehyde	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U
Endrin ketone	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.1 U	0.1 U	0.11 U	0.11 U	0.12 U	NA	NA	NA	NA	0.11 U

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC								STJ-QC									
Sample ID	SJS02-FB071801	SJS02-EB071801	SJS02-TB071801	SJS02-TB120903	SJS02-TB121103	SJS02-TB121203	SJS02-FB121203	SJS02-EB121203	SJS02-FB010604	SJS02-EB010604	SJS02-EB100504	SJS02-FB100604	SJS02-EB100604	SJS02-TB111804	SJS02-EB111804	SJS02-FB111804	SJS02-TB120204	SJS02-FB120204
Sample Date	07/18/01	07/18/01	07/18/01	12/09/03	12/11/03	12/12/03	12/12/03	12/12/03	01/06/04	01/06/04	10/05/04	10/06/04	10/06/04	11/18/04	11/18/04	11/18/04	12/02/04	12/02/04
Chemical Name																		
Heptachlor	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
Heptachlor epoxide	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
Methoxychlor	0.5 U	0.5 U	NA	NA	NA	NA	0.5 U	NA	0.5 U	0.5 U	0.53 U	0.53 U	0.59 U	NA	NA	NA	NA	0.54 U
Toxaphene	5 U	5 U	NA	NA	NA	NA	5 U	NA	5 U	5 U	5.3 U	5.3 U	5.9 U	NA	NA	NA	NA	5.4 U
alpha-BHC	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
alpha-Chlordane	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
beta-BHC	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
delta-BHC	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
gamma-BHC (Lindane)	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
gamma-Chlordane	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	NA	NA	NA	NA	0.05 U
Dioxin/Furans (µg/L)																		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1.50E-06 UJ	1.50E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.00E-06 UJ	9.90E-07 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.50E-06 UJ	1.40E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.80E-06 UJ	1.90E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	1.30E-06 UJ	1.30E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.60E-06 UJ	1.70E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	1.20E-06 UJ	1.30E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.60E-06 UJ	1.70E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	1.70E-06 UJ	1.80E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.60E-06 UJ	2.20E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	1.70E-06 UJ	1.90E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	1.40E-06 UJ	1.40E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	1.60E-06 UJ	1.80E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	1.70E-06 UJ	1.80E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	2.40E-06 UJ	2.50E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	3.70E-06 J	5.40E-06 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	2.10E-06 UJ	5.50E-06 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	1.50E-06 UJ	1.50E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	1.00E-06 UJ	9.90E-07 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	1.60E-06 UJ	1.70E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	1.20E-06 UJ	1.30E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	1.60E-06 UJ	2.20E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	1.60E-06 UJ	1.80E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	1.70E-06 UJ	1.80E-06 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	2.40E-06 UJ	7.60E-06 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)																		
1,3,5-Trinitrobenzene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
1,3-Dinitrobenzene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
2,4,6-Trinitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
2,4-Dinitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
2,6-Dinitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
2-Amino-4,6-dinitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
2-Nitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.52 U
3-Nitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.52 U
4-Amino-2,6-dinitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
4-Nitrotoluene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.52 U
HMX	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.52 U
Nitrobenzene	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.26 U
RDX	1.1 U	1.2 U	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.52 U
Tetryl	1.1 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.52 U
Total Metals (µg/L)																		
Aluminum	45.7 U	45.7 U	NA	NA	NA	NA	26 U	NA	5.1 J	57.1 J	21.4 U	21.4 U	21.4 U	NA	NA	NA	NA	21.4 U
Antimony	3.7 U	3.7 U	NA	NA	NA	NA	2 U	NA	2 U	2 U	4.7 U	4.7 U	4.7 U	NA	NA	NA	NA	4.7 U
Arsenic	5 U	5 U	NA	NA	NA	NA	2 U	NA	2 U	2 U	3.8 U	3.8 U	3.8 U	NA	NA	NA	NA	3.8 U
Barium	2 U	2 U	NA	NA	NA	NA	3 U	NA	5.7 J	6.3 J	0.3 U	0.3 U	0.3 U	NA	NA	NA	NA	0.3 U
Beryllium	0.1 U	0.1 U	NA	NA	NA	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA	NA	NA	0.2 U
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7 U	1.7 U	1.7 U	NA	NA	NA	NA	1.7 U
Cadmium	3 U	3 U	NA	NA	NA	NA	0.2 U	NA	0.2 U	0.2 U	0.3 U	0.3 U	0.3 U	NA	NA	NA	NA	0.3 U
Calcium	10.7 U	10.7 U	NA	NA	NA	NA	38 U	NA	45 U	96.6 J	151 J	118 J	124 J	NA	NA	NA	NA	71.5 J
Chromium	5 U	5 U	NA	NA	NA	NA	0.6 U	NA	0.4 U	0.7 J	0.9 U	0.9 U	0.9 U	NA	NA	NA	NA	0.9 U
Cobalt	1.8 U	1.8 U	NA	NA	NA	NA	0.27 J	NA	97 J	0.98 J	1.1 U	1.1 U	1.1 U	NA	NA	NA	NA	1.1 U
Copper	2.2 U	2.2 U	NA	NA	NA	NA	2.6 J	NA	3.4 J	4 J	1.3 U	1.3 U	1.3 U	NA	NA	NA	NA	1.3 U
Cyanide	NA	NA	NA	NA	NA	NA	3 U	NA	7.6 J	23.9	10 U	10 U	10 U	NA	NA	NA	NA	5 U
Iron	7 U	7 U	NA	NA	NA	NA	25.3 J	NA	25.2 J	136	22.1 U	22.1 U	22.1 U	NA	NA	NA	NA	22.1 U
Lead	3 U	3 U	NA	NA	NA	NA	0.7 U	NA	1.3 J	0.6 U	2 U	2 U	2 U	NA	NA	NA	NA	2 U
Magnesium	75.9 U	75.9 U	NA	NA	NA	NA	7.6 J	NA	4 U	68.6 J	24.4 J	12.6 U	15.4 J	NA	NA	NA	NA	12.6 U
Manganese	1.2 U	1.2 U	NA	NA	NA	NA	2 U	NA	2 U	3.7 J	2.4 J	0.3 U	0.3 U	NA	NA	NA	NA	0.3 U
Mercury	0.2 U	0.2 U	NA	NA	NA	NA	0.13 U	NA	0.13 U	0.13 U	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.9 U	1.9 U	NA	NA	NA	NA	1.9 U

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC								STJ-QC									
Sample ID	SJS02-FB071801	SJS02-EB071801	SJS02-TB071801	SJS02-TB120903	SJS02-TB121103	SJS02-TB121203	SJS02-FB121203	SJS02-EB121203	SJS02-FB010604	SJS02-EB010604	SJS02-EB100504	SJS02-FB100604	SJS02-EB100604	SJS02-TB111804	SJS02-EB111804	SJS02-FB111804	SJS02-TB120204	SJS02-FB120204
Sample Date	07/18/01	07/18/01	07/18/01	12/09/03	12/11/03	12/12/03	12/12/03	12/12/03	01/06/04	01/06/04	10/05/04	10/06/04	10/06/04	11/18/04	11/18/04	11/18/04	12/02/04	12/02/04
Chemical Name																		
Nickel	4 U	4 U	NA	NA	NA	NA	11.4 J	NA	0.89 J	2.7 J	0.9 U	0.9 U	1.5 J	NA	NA	NA	NA	0.9 U
Potassium	21.9 U	21.9 U	NA	NA	NA	NA	633 J	NA	106 J	162 J	20.2 J	19.1 U	19.1 U	NA	NA	NA	NA	19.1 U
Selenium	5 U	5 U	NA	NA	NA	NA	3 U	NA	2 UN	2 U	3.7 U	3.7 U	3.7 U	NA	NA	NA	NA	3.7 U
Silver	5 U	5 U	NA	NA	NA	NA	0.4 U	NA	0.3 U	0.3 U	1.3 U	1.3 U	1.3 U	NA	NA	NA	NA	1.3 U
Sodium	490 U	490 U	NA	NA	NA	NA	536 J	NA	202 J	684 J	236 U	360 J	236 U	NA	NA	NA	NA	236 U
Thallium	5.7 U	5.7 U	NA	NA	NA	NA	2 U	NA	2 U	2 U	5.6 U	5.6 U	5.6 U	NA	NA	NA	NA	5.6 U
Vanadium	3.2 U	3.2 U	NA	NA	NA	NA	0.4 U	NA	0.5 U	0.5 U	1.1 U	1.1 U	1.1 U	NA	NA	NA	NA	1.1 U
Zinc	8.5 U	8.5 U	NA	NA	NA	NA	3.1 J	NA	4.1 J	6.1 J	21.7	1 U	1.1 J	NA	NA	NA	NA	1 U
Dissolved Metals (µg/L)																		
Aluminum	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	38 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	0.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	1.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	12.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	0.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	0.14 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	0.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	404 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	190 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	3.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg_L)																		
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Ferrous iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U
Nitrate/Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U	NA	NA	NA	NA	NA	NA	NA	1 U

Notes:
Represents detections
NA - Not analayzed
B - Anlayte not detected above the associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC						STJ-QC										
Sample ID	SJS02-EB120204	SJS02-TB120304	SJS02-TB032805	SJS02-EB032805	SJS02-EB051806	SJS02-FB051806	SJS02-TB051806	SJS02-TB062206	SJS02-FB062206	SJS02-TB112806	SJS02-FB112806	SJS02-EB112806	SJS02-EB051707	SJS02-FB051707	SJS02-TB051707	SJS02-EB051807-GW	SJS02-EB051807-SO
Sample Date	12/02/04	12/03/04	03/28/05	03/28/05	05/18/06	05/18/06	05/18/06	06/22/06	06/22/06	11/28/06	11/28/06	11/28/06	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07
Chemical Name																	
Volatile Organic Compounds (µg/L)																	
1,1,1-Trichloroethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichloroethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U
1,4-Dichlorobenzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U
2-Butanone	5 R	5 R	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA
2-Hexanone	5 U	5 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	5 U	5 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA
Acetone	5 R	5 R	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA
Benzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Bromodichloromethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U
Bromoform	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	NA	NA	NA	NA	NA
Bromomethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	0.48 J	0.51	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Carbon tetrachloride	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
Chloromethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U	2 U
Dibromochloromethane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	NA	NA	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	5 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Isopropylbenzene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	0.5 R	0.5 R	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 R	0.5 R	0.5 R	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Methylcyclohexane	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Methylene chloride	0.9	1.2	10 U	10 U	1 J	10 U	10 U	0.5 UJ	0.5 UJ	0.22 J	0.39 J	0.37 J	5 U	5 U	5 U	5 U	5 U
Styrene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
Tetrachloroethene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
Toluene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.14 J	0.13 J	NA	NA	NA	NA	NA
Trichloroethene	0.5 U	0.5 U	2 J	3 J	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	5 U
Vinyl chloride	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U
Xylene, total	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	1 U	1 U	1 U	1 U	1 U
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	1 U	1 U	1 U	1 U	1 U
Semi-volatile Organic Compounds (µg/L)																	
1,1-Biphenyl	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC						STJ-QC										
Sample ID	SJS02-EB120204	SJS02-TB120304	SJS02-TB032805	SJS02-EB032805	SJS02-EB051806	SJS02-FB051806	SJS02-TB051806	SJS02-TB062206	SJS02-FB062206	SJS02-TB112806	SJS02-FB112806	SJS02-EB112806	SJS02-EB051707	SJS02-FB051707	SJS02-TB051707	SJS02-EB051807-GW	SJS02-EB051807-SO
Sample Date	12/02/04	12/03/04	03/28/05	03/28/05	05/18/06	05/18/06	05/18/06	06/22/06	06/22/06	11/28/06	11/28/06	11/28/06	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07
Chemical Name																	
2-Nitroaniline	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)																	
4,4'-DDD	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	2.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC						STJ-QC										
Sample ID	SJS02-EB120204	SJS02-TB120304	SJS02-TB032805	SJS02-EB032805	SJS02-EB051806	SJS02-FB051806	SJS02-TB051806	SJS02-TB062206	SJS02-FB062206	SJS02-TB112806	SJS02-FB112806	SJS02-EB112806	SJS02-EB051707	SJS02-FB051707	SJS02-TB051707	SJS02-EB051807-GW	SJS02-EB051807-SO
Sample Date	12/02/04	12/03/04	03/28/05	03/28/05	05/18/06	05/18/06	05/18/06	06/22/06	06/22/06	11/28/06	11/28/06	11/28/06	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07
Chemical Name																	
Heptachlor	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	0.53 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	5.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxin/Furans (µg/L)																	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)																	
1,3,5-Trinitrobenzene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	0.52 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (µg/L)																	
Aluminum	21.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	4.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	3.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	1.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	76.5 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	22.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	17.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC						STJ-QC										
Sample ID	SJS02-EB120204	SJS02-TB120304	SJS02-TB032805	SJS02-EB032805	SJS02-EB051806	SJS02-FB051806	SJS02-TB051806	SJS02-TB062206	SJS02-FB062206	SJS02-TB112806	SJS02-FB112806	SJS02-EB112806	SJS02-EB051707	SJS02-FB051707	SJS02-TB051707	SJS02-EB051807-GW	SJS02-EB051807-SO
Sample Date	12/02/04	12/03/04	03/28/05	03/28/05	05/18/06	05/18/06	05/18/06	06/22/06	06/22/06	11/28/06	11/28/06	11/28/06	05/17/07	05/17/07	05/17/07	05/18/07	05/18/07
Chemical Name																	
Nickel	0.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	19.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	236 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	5.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	2.6 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)																	
Aluminum	21.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	4.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	3.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.21 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	1.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	67.8 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	22.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	13.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	19.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	236 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	5.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	2.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg_L)																	
Alkalinity	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
Represents detections
NA - Not analayzed
B - Anlayte not detected above the associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC					STJ-QC								STJ-QC					
Sample ID	SJS02-EB052307	SJS02-EB052907	SJS02-FB052907	SJS02-TB052907	SJS02-EB053107	SJS02-FB053107	SJS02-TB053107	SJS02-TB060107	SJS02-TB060407	SJS02-TB060407-2	SJS02-TB060407-3	SJS02-FB060507	SJS02-FB060507-2	SJS02-TB060507	SJS02-TB060607	SJS02-TB060607-2	SJS02-EB071307	SJS02-FB071307	SJS02-TB071307
Sample Date	05/23/07	05/29/07	05/29/07	05/29/07	05/31/07	05/31/07	05/31/07	06/01/07	06/04/07	06/04/07	06/04/07	06/05/07	06/05/07	06/05/07	06/06/07	06/06/07	07/13/07	07/13/07	07/13/07
Chemical Name																			
Volatile Organic Compounds (µg/L)																			
1,1,1-Trichloroethane	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	2 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	2 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	2 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	2 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	0.5 U	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	NA	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Bromodichloromethane	2 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5,000 U	NA	NA	NA	NA	610 J	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Chlorobenzene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.12 J	0.5 U
Chloroethane	5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Chloroform	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Chloromethane	5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.11 J	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	10 U	10 U	NA	NA	10 U	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (Freon-12)	5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.025 U	NA	NA	NA	NA	0.17	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.056	NA	NA	NA	NA	0.54	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.5	NA	NA	NA	NA	6.4	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5 U	0.94	0.65	0.36 J	1 J	10 U	1.9	0.6 J	10 U	0.48 J	NA	1 J	0.77	0.52	1.1	NA	0.47 J	0.51	0.3 J
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Vinyl chloride	2 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	1 U	0.5 U	0.5 U	0.5 U	10 U	10 U	0.5 U	0.5 U	10 U	0.5 U	NA	10 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (µg/L)																			
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC					STJ-QC								STJ-QC					
Sample ID	SJS02-EB052307	SJS02-EB052907	SJS02-FB052907	SJS02-TB052907	SJS02-EB053107	SJS02-FB053107	SJS02-TB053107	SJS02-TB060107	SJS02-TB060407	SJS02-TB060407-2	SJS02-TB060407-3	SJS02-FB060507	SJS02-FB060507-2	SJS02-TB060507	SJS02-TB060607	SJS02-TB060607-2	SJS02-EB071307	SJS02-FB071307	SJS02-TB071307
Sample Date	05/23/07	05/29/07	05/29/07	05/29/07	05/31/07	05/31/07	05/31/07	06/01/07	06/04/07	06/04/07	06/04/07	06/05/07	06/05/07	06/05/07	06/06/07	06/06/07	07/13/07	07/13/07	07/13/07
Chemical Name																			
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (µg/L)																			
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC					STJ-QC								STJ-QC					
Sample ID	SJS02-EB052307	SJS02-EB052907	SJS02-FB052907	SJS02-TB052907	SJS02-EB053107	SJS02-FB053107	SJS02-TB053107	SJS02-TB060107	SJS02-TB060407	SJS02-TB060407-2	SJS02-TB060407-3	SJS02-FB060507	SJS02-FB060507-2	SJS02-TB060507	SJS02-TB060607	SJS02-TB060607-2	SJS02-EB071307	SJS02-FB071307	SJS02-TB071307
Sample Date	05/23/07	05/29/07	05/29/07	05/29/07	05/31/07	05/31/07	05/31/07	06/01/07	06/04/07	06/04/07	06/04/07	06/05/07	06/05/07	06/05/07	06/06/07	06/06/07	07/13/07	07/13/07	07/13/07
Chemical Name																			
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxin/Furans (µg/L)																			
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/L)																			
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (µg/L)																			
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C-8
QA/QC Raw Analytical Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC					STJ-QC								STJ-QC					
Sample ID	SJS02-EB052307	SJS02-EB052907	SJS02-FB052907	SJS02-TB052907	SJS02-EB053107	SJS02-FB053107	SJS02-TB053107	SJS02-TB060107	SJS02-TB060407	SJS02-TB060407-2	SJS02-TB060407-3	SJS02-FB060507	SJS02-FB060507-2	SJS02-TB060507	SJS02-TB060607	SJS02-TB060607-2	SJS02-EB071307	SJS02-FB071307	SJS02-TB071307
Sample Date	05/23/07	05/29/07	05/29/07	05/29/07	05/31/07	05/31/07	05/31/07	06/01/07	06/04/07	06/04/07	06/04/07	06/05/07	06/05/07	06/05/07	06/06/07	06/06/07	07/13/07	07/13/07	07/13/07
Chemical Name																			
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)																			
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (mg_L)																			
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
Represents detections
NA - Not analayzed
B - Anlayte not detected above the associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

SUMMARY REPORT

TOXICITY EVALUATION OF SEDIMENT WITH *Leptocheirus plumulosus* FOR CH2M HILL PROJECT # 157593.AS.SM (St. Juliens Creek Annex)

Submitted to:

CH2M HILL
13921 Park Center Road, Suite 600
Herndon, VA 20171

Study # 13830.6101

Study Director: Arthur E. Putt

Springborn Smithers Laboratories
790 Main Street
Wareham, Massachusetts 02571-1075

December 15, 2004

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EXECUTIVE SUMMARY

The following is a summary of testing performed with the estuarine amphipod (*Leptocheirus plumulosus*) to evaluate sediment for CH2M HILL project # 157593.AS.SM (St. Juliens Creek Annex). Nine test samples were collected were collected and identified as follows:

Sample Identification	Date(s) Sample was Collected	Date(s) Received at Springborn Smithers
SJREF-SD01-00-040	October 5, 2004	October 6, 2004
SJREF-SD04-00-040	October 5, 2004	October 6, 2004
SJREF-SD05-00-040	October 5, 2004	October 6, 2004
SJS02-SD03-00-040	October 6, 2004	October 7, 2004
SJS02-SD05-00-040	October 6, 2004	October 7, 2004
SJS02-SD06-00-040	October 6, 2004	October 7, 2004
SJS02-SD24-00-040	October 6, 2004	October 7, 2004
SJS02-SD25-00-040	October 6, 2004	October 7, 2004
SJS02-SD26-00-040	October 6, 2004	October 7, 2004

All containers of individual samples were combined, homogenized and then wet pressed through a 0.25-mm sieve to remove large debris and indigenous organisms.

In addition, Springborn Smithers collected natural marine sediment from Little Harbor, Wareham, MA to serve as the Laboratory Control sediment. This sediment was also wet pressed through a 0.25-mm sieve.

The procedures used during the conduct of this study followed Springborn Laboratories Test Method SED-Lp-152, "28-Day Static-Renewal Toxicity Test with Estuarine Amphipods (*Leptocheirus plumlosus*) to Meet U.S. EPA Guidelines". The methods described in this test method meet the testing requirements of EPA Guideline: " Methods for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-Associated Contaminants with the Amphipod *Leptocheirus plumulosus*" (U.S. EPA 2001). The test method followed during the conduct of this test is attached in Appendix I.

One 96-hour reference test with *L. plumulosus* was initiated on October 27, 2004. Cadmium chloride was the reference toxicant used. The population of organisms used to initiate the reference test was from the same population of organisms used to initiate all of test sediments. The 96-hour LC50 for cadmium and *L. plumulosus* were calculated to be 2.3 mg cadmium/L. Appendix II contains the control chart for this reference test and previously conducted reference tests. The reference test conducted October 27, 2004 fell within the acceptable 2 standard deviation range established from the calculated LC50 values.

A summary of the water quality characteristics of overlying water during the 28-day exposure is presented in Tables 1, 2 and 3. Water quality remained acceptable throughout the 28-day exposure period. Throughout the exposure period, dissolved oxygen concentrations were greater than or equal to the required 4.0 mg/L in all samples. Ammonia concentrations, measured in overlying and pore water during the exposure, were ≤ 8 mg/L in all samples except for Day 0 and 7 in the laboratory control sample (ammonia concentration ranged from 21 to 55 mg/L). Significant sulfide concentrations (55 mg/L) were observed in the porewater of only one sample (SJS02-SD05-00-040). Water temperature, measured daily in the exposure vessels, ranged from 23 to 27°C, except for a minor deviation on test day 10 (i.e., 20 to 21°C) in all test vessels. This deviation occurred due to a malfunction of the heaters in the waterbath housing the test vessels.

A summary of the *Leptocheirus plumlosus* survival, growth and reproduction during the 28-day exposure periods is presented in Table 4. The mean percent survival for organisms exposed to the laboratory control was 76%. The mean percent survival for the three reference control sites (samples SJREF-SD01-00-040, SJREF-SD04-00-040 and SJREF-SD05-00-040) ranged from 83 to 90%. The mean percent survival in the laboratory control fell slightly below the minimum survival criteria for this type of study (i.e., ≥ 80% survival). The mean percent survival of amphipods in all of the reference samples met the minimum survival criteria for this type of study (i.e., ≥ 80% survival). Based on the performance of the reference control sites and the normal growth and reproduction of the laboratory control organisms, the results of the testing were deemed to be acceptable. The performance (survival, reproduction and growth) of the

each of the test site was statistically comparable to the performance of the laboratory control and reference control organisms

The mean percent survival in samples SD06, SD24 and SD25 ranged from 0 to 33% and were statistically different compared to the survival of the laboratory control organisms. The mean percent survival in samples SD05, SD06, SD24 and SD25 ranged from 0 to 58% and were statistically different compared to the survival of the reference control organisms (samples SJREF-SD01-00-040, SJREF-SD04-00-040 and SJREF-SD05-00-040). The mean percent survival in the two remaining samples were 77 and 87% and were comparable to the survival of the laboratory control organisms and the reference control organisms.

The mean dry weight of the laboratory control and reference control organisms (samples SJREF-SD01-00-040, SJREF-SD04-00-040 and SJREF-SD05-00-040), were 1.19, 1.88, 2.51 and 2.27 mg per amphipod, respectively. The mean dry weight in samples SD05 and SD24 averaged 1.28 and 0.94 mg per amphipod and were statistically different compared to the mean dry weight of the reference control organisms (samples SJREF-SD01-00-040, SJREF-SD04-00-040 and SJREF-SD05-00-040). The mean dry weight in samples SD03 and SD26 averaged 2.36 and 2.06 mg per amphipod, respectively and were similar to the mean dry weight of the laboratory control and reference control organisms.

The mean number of offspring pre amphipod of the laboratory control and reference control organisms (samples SJREF-SD01-00-040, SJREF-SD04-00-040 and SJREF-SD05-00-040), were 3.18, 9.26, 7.25 and 6.45 offspring per amphipod, respectively. The mean offspring per amphipod in sample SD24 averaged 0.51 offspring per amphipod and was statistically different compared to the mean offspring per amphipod of the reference control organisms (samples SJREF-SD01-00-040, SJREF-SD04-00-040 and SJREF-SD05-00-040). The mean offspring per amphipod in samples SD03, SD05 and SD26 averaged 12.53, 5.01 and 8.38 offspring per amphipod, respectively and were similar to the mean offspring per amphipod of the laboratory control and reference control organisms.

Conclusions

Results of the samples tested established that the laboratory control and reference control organism survival, growth and reproduction were within the range of acceptance criteria. The survival, growth and reproduction effects observed among the amphipods are thus reliable. Significant reductions in amphipod survival (0% survival) were observed in samples SD06 and SD25). Reductions in either reproduction or growth were observed in samples SD05 and SD25 suggesting the potential for chronic toxicity associated with these sediment samples. Only samples SD03 and SD26 produced results similar to the laboratory and reference control organisms.

SUMMARY OF TEST CONDITIONS
Sediment Toxicity Test with *Leptocheirus plumlosus*

DATE SAMPLES RECEIVED:	October 6 to 7, 2004
TEST DATES:	October 19, 2004 to November 15, 2004
TEST TYPE:	Whole-sediment toxicity test
TEMPERATURE:	20 to 27°C
LIGHT INTENSITY:	54 to 98 footcandles
PHOTOPERIOD:	16 hours light, 8 hours dark
TEST CHAMBER SIZE:	1000 mL
SEDIMENT VOLUME:	Approximately 120 mL
OVERLYING WATER VOLUME:	750 mL
RENEWAL OF TEST SOLUTIONS:	400 mL overlying water renewed three times per week
AGE/SIZE OF TEST ORGANISMS:	Neonates; those captured between a 0.50 mm and 0.25 mm screen
NUMBER OF ORGANISMS PER TEST CHAMBER:	20
NUMBER OF REPLICATE TEST CHAMBERS PER TREATMENT:	5
NUMBER ORGANISMS/SAMPLE:	100
FEEDING:	2.0 mL of flaked fish food suspension per test chamber daily for days 0-7, three times per week for days 8-13, 4.0 mL three times per week for days 14-27
AERATION:	Gentle oil-free aeration (2 to 3 bubble/second)
TEST CONCENTRATION:	100% (no dilutions)
TEST DURATION:	28 days
ENDPOINTS:	Survival, growth (dry weight) and reproduction

TEST ACCEPTABILITY: Minimum mean control survival of 80%

Table 1. Water quality summary (Dissolved oxygen, temperature, salinity and pH) for the *Leptocheirus plumulosus* 28-day exposure.

Sample Identification	Dissolved Oxygen Day 0 - Day 28	Temperature (°C) Day 0 - Day 28	Salinity (‰) Day 0 - Day 28
Lab Control	6.4 – 7.8	20 - 27	11 - 13
SJREF-SD01-00-040	6.6 – 8.4	20 - 27	11 - 13
SJREF-SD04-00-040	6.4 – 8.3	20 - 27	11 - 13
SJREF-SD05-00-040	6.7 – 8.5	20 - 27	11 - 13
SJS02-SD03-00-040	6.3– 8.5	20 - 27	11 - 13
SJS02-SD05-00-040	6.6 – 8.4	20 - 27	11 - 13
SJS02-SD06-00-040	6.6 – 8.5	20 - 27	11 - 13
SJS02-SD24-00-040	6.4 – 8.5	20 - 27	11 - 13
SJS02-SD25-00-040	6.5 – 8.6	20 - 27	11 - 13
SJS02-SD26-00-040	5.9 – 8.5	20 - 26	11 - 13

Sample Identification	pH Day 0	pH Day 28
Lab Control	7.7 – 7.8	7.6 – 8.0
SJREF-SD01-00-040	7.5 – 7.6	6.4 – 7.4
SJREF-SD04-00-040	7.8 – 7.9	7.2 – 7.4
SJREF-SD05-00-040	7.8	7.5
SJS02-SD03-00-040	7.8 – 7.9	7.4
SJS02-SD05-00-040	7.8 - 7.9	7.5 – 7.8
SJS02-SD06-00-040	7.8	7.7 – 7.9
SJS02-SD24-00-040	7.8 – 7.9	7.7- 7.9
SJS02-SD25-00-040	7.8 – 7.9	7.6 – 7.8
SJS02-SD26-00-040	7.7	7.3 – 7.6

Table 2. Summary of overlying and porewater ammonia concentrations measured during the *Leptocheirus plumulosus* 28-day exposure.

Sample Identification	Overlying Water Ammonia (mg/L)				
	Day 0	Day 7	Day 14	Day 21	Day 28
Lab Control	8.2	9.6	2.7	0.23	<0.10
SJREF-SD01-00-040	0.24	2.3	0.31	0.24	<0.10
SJREF-SD04-00-040	0.50	0.48	0.19	0.10	<0.10
SJREF-SD05-00-040	0.61	0.30	0.11	0.14	<0.10
SJS02-SD03-00-040	0.84	1.9	<0.10	<0.10	<0.10
SJS02-SD05-00-040	1.0	2.2	0.10	0.14	<0.10
SJS02-SD06-00-040	0.56	2.1	0.11	0.19	<0.10
SJS02-SD24-00-040	0.81	1.4	<0.10	<0.10	<0.10
SJS02-SD25-00-040	1.3	2.5	0.63	0.14	<0.10
SJS02-SD26-00-040	0.53	3.1	0.13	<0.10	<0.10

Sample Identification	Porewater Ammonia (mg/L)				
	Day 0	Day 7	Day 14	Day 21	Day 28
Lab Control	55	21	3.7	1.6	0.36
SJREF-SD01-00-040	0.69	2.4	0.46	0.88	0.34
SJREF-SD04-00-040	3.8	1.3	0.32	0.59	0.10
SJREF-SD05-00-040	3.3	1.0	0.22	0.54	0.28
SJS02-SD03-00-040	5.8	2.2	0.16	0.63	0.25
SJS02-SD05-00-040	7.7	3.3	0.17	0.62	0.12
SJS02-SD06-00-040	4.2	3.9	0.49	0.53	0.12
SJS02-SD24-00-040	3.7	2.1	0.21	0.35	<0.10
SJS02-SD25-00-040	7.8	4.1	2.5	0.41	<0.10
SJS02-SD26-00-040	2.9	4.6	0.37	2.2	0.24

Table 3. Summary of overlying and porewater sulfide concentrations measured during the *Leptocheirus plumulosus* 28-day exposure.

Sample Identification	Overlying Water Sulfides (mg/L)		Porewater Sulfides (mg/L)	
	Day 0	Day 28	Day 0	Day 28
Lab Control	< 0.010	< 0.010	< 0.010	< 0.010
SJREF-SD01-00-040	< 0.010	< 0.010	0.17	< 0.010
SJREF-SD04-00-040	< 0.010	< 0.010	< 0.010	< 0.010
SJREF-SD05-00-040	< 0.010	< 0.010	< 0.010	< 0.010
SJS02-SD03-00-040	< 0.010	< 0.010	< 0.010	< 0.010
SJS02-SD05-00-040	< 0.010	< 0.010	55	< 0.010
SJS02-SD06-00-040	< 0.010	< 0.010	< 0.010	< 0.010
SJS02-SD24-00-040	< 0.010	< 0.010	< 0.010	< 0.010
SJS02-SD25-00-040	< 0.010	< 0.010	2.2	< 0.010
SJS02-SD26-00-040	< 0.010	< 0.010	< 0.010	< 0.010

Table 4. Summary of survival, growth and reproduction of *Leptocheirus plumulosus* at termination of the 28-day exposure.

Sample Identification	Average Percent Survival (SD)	Average Number of Offspring/female (SD)	Average Dry Wt. (mg) per Amphipod (SD)
Lab Control	76 (15)	1.19 (0.47) bcd	3.18 (0.95) b
SJREF-SD01-00-040	83 (16)	1.88 (0.36) c	9.26 (4.48)
SJREF-SD04-00-040	90 (8)	2.51 (0.23)	7.25 (2.65)
SJREF-SD05-00-040	87 (14)	2.27 (0.38)	6.45 (3.05)
SJS02-SD03-00-040	87 (10)	2.36 (0.30)	12.53 (2.25)
SJS02-SD05-00-040	58 (12) bcd	1.28 (0.22) bcd	5.01 (0.98)
SJS02-SD06-00-040	0 (0) abcd	NA	NA
SJS02-SD24-00-040	33 (26) abcd	0.94 (0.24) bcd	0.51 (0.51) bcd
SJS02-SD25-00-040	0 (0) abcd	NA	NA
SJS02-SD26-00-040	77 (19)	2.06 (0.28)	8.38 (3.78)

SD = Standard Deviation

NA = Not Applicable

a Statistically different ($p \leq 0.050$) compared to the control data.

b Statistically different ($p \leq 0.050$) compared to the SJREF-SD01-00-040.

c Statistically different ($p \leq 0.050$) compared to the SJREF-SD04-00-040.

d Statistically different ($p \leq 0.050$) compared to the SJREF-SD05-00-040.

REFERENCES

U.S. EPA. 2001. Methods for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-Associated Contaminants with the Amphipod *Leptocheirus plumulosus*. Office of Research and Development. Washington, DC EPA/600/R-01/020.

APPENDIX I

Test Method (SED - Lp - 152) - 28-Day Static-Renewal Toxicity Test with Estuarine Amphipods (*Leptocheirus plumlosus*)to Meet U.S. EPA Guidelines

1.0 OBJECTIVE

The objective of this study is to determine the chronic toxicity of sediment to estuarine amphipods (*Leptocheirus plumulosus*) during a 28-day exposure. Amphipods are exposed to the sediment sample to assess survival, growth, number of young per surviving female and percent gravid females on test day 28 (test termination). The methods (Springborn Smithers Laboratories test method #: SED-Lp-152) described in this test method generally meet the standard procedures described in 'Methods for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-Associated Contaminants with the Amphipod *Leptocheirus plumulosus*' (U.S. EPA, 2001).

2.0 MATERIALS AND METHODS

2.1. TEST ORGANISMS

2.1.1. **Species** - The estuarine amphipod, *Leptocheirus plumulosus*, is used to conduct the 28-day toxicity test. The neonate amphipods used to initiate the 28-day test are the same size and age and are those amphipods that pass through a 0.5 mm sieve and retained on a 0.25 mm sieve.

2.1.2. **Source** - The neonate amphipods are obtained from a reliable commercial supplier. The neonate amphipods will be held under the same conditions as testing (i.e., salinity 20 ± 2 ‰, temperature 25 ± 2 °C).

2.1.3. **Feeding** - While being maintained in the culture prior to the test, neonate amphipods are fed a flaked fish food suspension (100 mg/mL) *ad libitum* each day. During the test, each exposure vessels is fed a flaked fish food suspension (10 mg/mL) three times per week (following renewal of overlying water). On test day 0 through 13, 2.0 mL of the

flaked fish food suspension (10 mg/mL) is added to each exposure vessel. On days 14 through 27, 4.0 mL of the flaked fish food suspension (10 mg/mL) is added to each exposure vessel.

2.1.4. **Handling** - Wide-bore pipets and 0.25 mm mesh sieves are used to transfer the neonate amphipods to the test vessels, taking care to minimize possible stress due to handling. Amphipods that are damaged or dropped during transfer are not used.

2.1.5. **Reference Test** - A 96-hour reference test, water-only exposure, using cadmium is conducted on a sub-population of organisms (from the same population used to initiate the test) within 30 days of the study. The health of the test population is assessed using the LC50 from the reference test..

2.2. PHYSICAL SYSTEM

2.2.1. **Sediment Samples** - Sediment samples (both test and reference sites) should be shipped overnight to Springborn Smithers Laboratories. Upon receipt at Springborn, sample containers are inspected for leakage or damage and the sample identity is recorded. If storage is required, the samples are refrigerated at approximately 4 °C. Prior to use, all sediment samples are pressed through a 0.25 mm sieve to remove debris, large clumps of sediment, large predators, indigenous amphipods and to facilitate removal of offspring at termination of the test. A control sediment, collected by Springborn Smithers Laboratories, will be included in the test to evaluate performance of the test organisms and exposure system. The test is initiated within 14 days of sediment collection.

2.2.2. **Test Chambers** - The test chambers used in the static acute bioassay are 1000 mL glass jars which are chemically clean. Each jar contains 2 cm of sediment (approximately 120 mL) and 750 mL of overlying water. Test vessels will be covered with plastic during the test minimize evaporation of the overlying water. Each test vessel

is labeled with the appropriate test concentration and replicate. Test vessels are cleaned by an appropriate method to remove residue of test material previously used (i.e., acid to remove metals and bases; detergents and organic solvents to remove organic compounds) and rinsed several times using dilution water.

2.2.3. **Overlying Water** - Natural, filtered seawater from the Cape Cod Canal is used as dilution water for the test. The water is filtered through a 20-Φm and 5-Φm polypropylene core filter and heated to the required test temperature. Salinity and pH of each new batch of seawater is measured and recorded to ensure that these parameters are within acceptable ranges. Natural values for seawater, generally, are a pH range of 7.5 - 8.2 and salinity 29 - 35 $^{o}/_{oo}$. Prior to use in the cultures or test system, the seawater used in diluted, with deionized water, to a salinity of 20 ‰. Periodic analysis of representative samples of seawater are conducted to ensure the absence of potential toxicants, including pesticides, PCBs and selected toxic metals, at concentrations which may be harmful to the amphipods.

2.2.4. **Control Sediment** - The laboratory control sediment, will be collected from a site, known to be free of contamination and supports a local population of amphipods. Sediment will be consistent with estuarine sediment and contain a high content of silt and clay (i.e., > 90% fines).

2.3. TEST PROCEDURES

2.3.1. **Test Concentration** - Each sediment sample is tested in five replicates, as 100% whole sediment (no dilutions). Sediment from one or more uncontaminated reference sites are usually included in the test to evaluate the survival, growth (dry weight) and sexual maturation potential of the test organisms in a non-contaminated sediment. The laboratory control sediment is also tested in five replicates. Twenty amphipods per replicate (100 per sediment sample or reference control) are used to initiate the test.

2.3.2. **Test Initiation** - The day before test initiation (day -1) test sediment, reference control sediment and laboratory control sediment are added to the test vessels. The overlying

water is added gently to prevent resuspension of the sediment layer in the water column. This allows the sediment and water to equilibrate prior to addition of the test organisms.

Neonate amphipods are removed from the cultures vessels and twenty amphipods are impartially selected and pipeted into each replicate test or control vessel. This procedure is repeated until all vessels contain twenty amphipods. Test vessels are inspected within 2 hours after amphipods are introduced to ensure organisms are not trapped in the surface tension. Organisms trapped in the surface tension are removed and replaced with new amphipods.

2.3.3. **Renewal of Overlying Water** - During the 28-day study, the overlying water is renewed by siphoning 400 mL of the overlying water and replacing it with fresh overlying water three times per week. The siphoning and replacement of overlying water is done carefully so as to not disturb the sediment layer. The 400 mL of fresh overlying water contains the food ration for that test day (i.e., either 2.0 mL or 4.0 mL of a 10 mg/mL flaked fish food suspension, see Section 2.1.3).

2.3.4. **Photoperiod** - The test vessels are illuminated at a light intensity of 20 to 100 footcandles using a combination of fluorescent bulbs. A 16-hour light, 8-hour dark photoperiod is maintained with an automatic timer. Sudden transitions from light to dark and vice versa are avoided.

2.3.5. **Measurement of Water Quality Variables** - At test initiation and test termination, temperature, pH, dissolved oxygen (DO) concentration and salinity in the overlying water are measured in each replicate test vessel. Temperature, DO, pH and salinity are measured three additional times per week (at each renewal interval) in one replicate test vessel of each treatment and control. These additional measurements are alternated between replicates at each interval. Ammonia concentrations are measured at test initiation and at test termination in a composite sample overlying water from each replciate vessel of each treatment and control. Temperature is monitored continuously

in the waterbath using a minimum-maximum thermometer. Temperature extremes are recorded daily.

2.3.6. **Dissolved Oxygen** - To prevent total dissolved oxygen from dropping below 4.0 mg/L, aeration (with oil-free air) is maintained throughout the exposure at a rate of 1 to 3 bubbles per second with a 1 mL glass pipette.

2.3.7. **Temperature** - Water temperature of the test solutions is maintained at 25 ± 2°C by conducting the study in a temperature controlled waterbath.

2.3.8. **Biological Data** - Survival of the adult amphipods is determined in each test vessel at test termination by sieving the sediment, through a 0.75 mm and 0.25 mm sieve, to remove all surviving adult amphipods (retained on the 0.75 mm sieve) and young produced (retained on the 0.25 mm sieve). All surviving adult amphipods for each replicate vessel are then to a tared weigh boat and dried overnight at 70°C. Following drying, the samples are cooled to room temperature and weighed on an analytical balance to the nearest 0.01 mg.

Young amphipods are removed from the 0.25 mm sieve and transferred to a labeled sample jar. Sufficient alcohol is added to the sample jar to preserve the offspring and 3.0 milliliters of concentrated Rose Bengal solution (1 mg/mL) is then preserved in 70% ethanol solution until young can be counted. Reproduction is reported as number of young per surviving female in each replicate vessel.

2.3.9 **Acceptability Criteria** - The percent survival of adult amphipods in the control must be > 80 % after 28 days of exposure.

3.0 CALCULATIONS

Mean survival, growth, number of young per surviving adult amphipod for each sediment sample is compared to the mean survival, growth, number of young per surviving adult

amphipod of the appropriate reference sediment sample for determination of significant adverse effects.

The mean survival, growth, number of young per surviving adult amphipod of each sediment sample will be tested for normality and homogeneity of variance using Shapiro-Wilks Test and Bartlett's Test. If the data set passes these two tests, then a parametric method (e.g., Dunnett's Test) will be used to evaluate the results of the mean survival of each test sample for significant adverse effects. If the data set fails the test for normality and homogeneity of variance, then a non-parametric method (e.g., Steel's Many-One Rank Test will be used to determine significant adverse effects. If necessary, mean values (i.e., percent survival) will be transformed (e.g., arcsine square root).

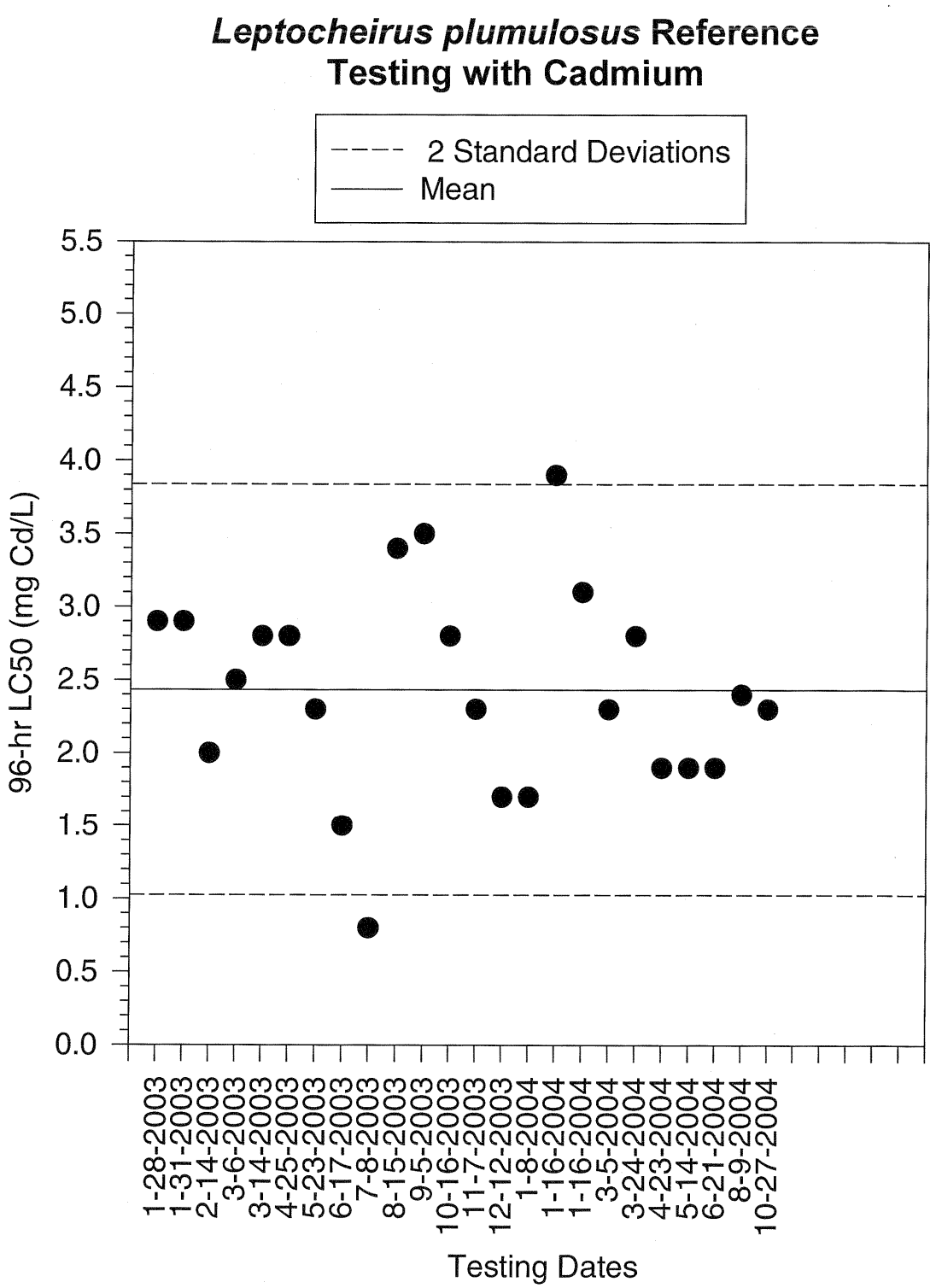
4.0 REPORTING

The raw data and summary report are reviewed by the Study Director. The test results will be presented in an outline format on a per sample basis.

5.0 REFERENCES

U.S. EPA. 2001. Methods for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-Associated Contaminants with the Amphipod *Leptocheirus plumulosus*. Office of Research and Development. Washington, DC EPA/600/R-01/020.

APPENDIX II


Leptocheirus plumulosus Reference Testing with Cadmium
2 Standard Deviations
Mean
96-hr LC50 (mg Cd/L)
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-28-2003
1-31-2003
2-14-2003
3-6-2003
3-14-2003
4-25-2003
5-23-2003
6-17-2003
7-8-2003
8-15-2003
9-5-2003
10-16-2003
11-7-2003
12-12-2003
1-8-2004
1-16-2004
1-16-2004
3-5-2004
3-24-2004
4-23-2004
5-14-2004
6-21-2004
8-9-2004
10-27-2004
Testing Dates

SIGNATURES AND APPROVAL

SUBMITTED BY:

Springborn Smithers Laboratories
790 Main Street
Wareham, Massachusetts 02571-1075

PREPARED BY:

Arthur E. Putt
Study Director

12/15/2004
Date

Biological observations - Percent Survival, Dry Weight and Offspring

Test Sample ID	Rep.	Number Surviving Amphipods	Average Percent Survival	Tin Tare Wt. (g)	Tin + Dry Amphipod Wt. (g)	Average Dry Wt. per Amphipod (mg)	Total # Offspring	Average # Offspring per Amphipod
Control	a	14	70	2.23570	2.24819	0.89	40	2.9
	b	19	95	2.20931	2.23231	1.21	62	3.3
	c	12	60	2.22073	2.23065	0.83	26	2.2
	d	*	*	*	*	*	*	*
	e	16	80	2.17735	2.20692	1.85	71	4.4
SJREF-SD01-00-040	a	16	80	2.20838	2.24465	2.27	149	9.3
	b	13	65	2.21785	2.24714	2.25	193	14.8
	c	20	100	2.19779	2.23116	1.67	173	8.7
	d	20	100	2.19521	2.22451	1.47	50	2.5
	e	14	70	2.19114	2.21547	1.74	154	11.0
SJREF-SD04-00-040	a	19	95	2.23219	2.28156	2.60	165	8.7
	b	17	85	2.19330	2.23572	2.50	142	8.4
	c	16	80	2.20194	2.24633	2.77	90	5.6
	d	18	90	2.19160	2.23029	2.15	182	10.1
	e	20	100	2.19576	2.24637	2.53	70	3.5
SJREF-SD05-00-040	a	20	100	2.20746	2.25085	2.17	92	4.6
	b	19	95	2.22605	2.26501	2.05	109	5.7
	c	13	65	2.21902	2.25725	2.94	56	4.3
	d	17	85	2.20508	2.23963	2.03	200	11.8
	e	18	90	2.22393	2.26266	2.15	105	5.8
SJS02-SD03-00-040	a	16	80	2.18515	2.22129	2.26	243	15.2
	b	18	90	2.21445	2.26148	2.61	204	11.3
	c	15	75	2.19402	2.23342	2.63	185	12.3
	d	20	100	2.23020	2.27841	2.41	191	9.6
	e	18	90	2.19951	2.23375	1.90	256	14.2
SJS02-SD05-00-040	a	8	40	2.20868	2.21901	1.29	53	6.6
	b	12	60	2.19605	2.21460	1.55	48	4.0
	c	11	55	2.20419	2.21896	1.34	50	4.5
	d	14	70	2.19902	2.21663	1.26	68	4.9
	e	13	65	2.18770	2.19998	0.94	65	5.0
SJS02-SD06-00-040	a	0	0	NA	NA	NA	NA	NA
	b	0	0	NA	NA	NA	NA	NA
	c	0	0	NA	NA	NA	NA	NA
	d	0	0	NA	NA	NA	NA	NA
	e	0	0	NA	NA	NA	NA	NA
SJS02-SD24-00-040	a	3	15	2.20615	2.20868	0.84	3	1.0
	b	0	0	NA	NA	NA	NA	NA
	c	9	45	2.21984	2.23124	1.27	8	0.9
	d	8	40	2.20588	2.21155	0.71	0	0.0
	e	13	65	2.20784	2.22032	0.96	2	0.2
SJS02-SD25-00-040	a	0	0	NA	NA	NA	NA	NA
	b	0	0	NA	NA	NA	NA	NA
	c	0	0	NA	NA	NA	NA	NA
	d	0	0	NA	NA	NA	NA	NA
	e	0	0	NA	NA	NA	NA	NA
SJS02-SD26-00-040	a	16	80	2.21242	2.24961	2.32	41	2.6
	b	18	90	2.19555	2.23364	2.12	195	10.8
	c	18	90	2.19184	2.23252	2.26	205	11.4
	d	9	45	2.18279	2.19734	1.62	59	6.6
	e	16	80	2.19702	2.22889	1.99	169	10.6

*** Replicate data was dropped from mean**

Biological observations - Percent Survival and Dry Weight

Test Day 28			
Test Sample ID	**Average Percent Survival (SD)**	**Average Dry Weight per Amphipod in Milligrams (SD)**	**Average # Offspring per Amphipod (SD)**
Control	76 (15)	1.19 (0.47) bcd	3.18 (0.95) b
SJREF-SD01-00-040	83 (16)	1.88 (0.36) c	9.26 (4.48)
SJREF-SD04-00-040	90 (8)	2.51 (0.23)	7.25 (2.65)
SJREF-SD05-00-040	87 (14)	2.27 (0.38)	6.45 (3.05)
SJS02-SD03-00-040	87 (10)	2.36 (0.30)	12.53 (2.25)
SJS02-SD05-00-040	58 (12) bcd	1.28 (0.22) bcd	5.01 (0.98)
SJS02-SD06-00-040	0 (0) abcd	NA	NA
SJS02-SD24-00-040	33 (26) abcd	0.94 (0.24) bcd	0.51 (0.51) bcd
SJS02-SD25-00-040	0 (0) abcd	NA	NA
SJS02-SD26-00-040	77 (19)	2.06 (0.28)	8.38 (3.78)

SD = Standard Deviation
NA = Not Applicable
a Statistically different compared to the control data.
b Statistically different compared to the SJREF-SD01-00-040.
c Statistically different compared to the SJREF-SD04-00-040.
d Statistically different compared to the SJREF-SD05-00-040.

13830.6101 Amphipod Survival	13830.6101 Amphipod Dry Weights	13830.6101 Mean Offspring per Adult
10	10	10
5	5	5
5	5	5
5	5	5
5	5	5
5	5	5
5	5	5
5	5	5
5	5	5
5	5	5
5	5	5
Control	Control	Control
0.7	0.89	2.86
0.95	1.21	3.26
0.6	0.83	2.17
#VALUE!	*	*
0.8	1.85	4.44
SJRef-SD01	SJRef-SD01	SJRef-SD01
0.8	2.27	9.31
0.65	2.25	14.85
1	1.67	8.65
1	1.47	2.50
0.7	1.74	11.00
SJRef-SD04	SJRef-SD04	SJRef-SD04
0.95	2.60	8.68
0.85	2.50	8.35
0.8	2.77	5.63
0.9	2.15	10.11
1	2.53	3.50
SJRef-SD05	SJRef-SD05	SJRef-SD05
1	2.17	4.60
0.95	2.05	5.74
0.65	2.94	4.31
0.85	2.03	11.76
0.9	2.15	5.83
SJS02-SD03	SJS02-SD03	SJS02-SD03
0.8	2.26	15.19
0.9	2.61	11.33
0.75	2.63	12.33
1	2.41	9.55
0.9	1.90	14.22
SJS02-SD05	SJS02-SD05	SJS02-SD05
0.4	1.29	6.63
0.6	1.55	4.00
0.55	1.34	4.55
0.7	1.26	4.86
0.65	0.94	5.00
SJS02-SD06	SJS02-SD06	SJS02-SD06
0	NA	NA
0	NA	NA
0	NA	NA
0	NA	NA
0	NA	NA
SJS02-SD24	SJS02-SD24	SJS02-SD24
0.15	0.84	1.00
0	NA	NA
0.45	1.27	0.89
0.4	0.71	0.00
0.65	0.96	0.15
SJS02-SD25	SJS02-SD25	SJS02-SD25
0	NA	NA
0	NA	NA
0	NA	NA
0	NA	NA
0	NA	NA
SJS02-SD26	SJS02-SD26	SJS02-SD26
0.8	2.32	2.56
0.9	2.12	10.83
0.9	2.26	11.39
0.45	1.62	6.56
0.8	1.99	10.56

LABORATORY DATA SUMMARY

Project: CH2M Hill Laboratory Testing 2007
CTO-0024, Site 2
St. Juliens Creek Annex, Chesapeake, Virginia
CH2M Hill Project Number: 181812.SA.SM
Navy CLEAN III Contract Number N62470-02D-3052

Number: 4076-110
Date: 06-25-07

SAMPLE NUMBER	DEPTH (FEET)	SAMPLE TYPE	CLASS. (USCS)	MOISTURE CONTENT (%)	PERCENT FINER THAN No. 200 SIEVE	DRY BULK DENSITY (pcf)	SPECIFIC GRAVITY	POROSITY (%)
SJS02-SB08-17-07B	16.5	Acetate Sleeve	SM	44.6	35.6	73.2	2.557	33.5
SJS02-SB08-17-07B	18 to 19	Acetate Sleeve	SM	19.4	15.7	106.9	2.677	24.3
SJS02-SB09-07B	10 to 11	Acetate Sleeve	SP-SM	25.7	10.2	93.2	2.651	28.9

etc.

References: ASTM D 2216, ASTM D 854, ASTM D 422, ATI RP40, ASTM D 2487

Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M Hill Laboratory Testing 2007**
CTO 0024, Site 2
St. Juliens Creek Annex, Chesapeake, Virginia
Project Number: 181812.SA.SM and Navy CLEAN III Contract # N62470-02D-3052
Number: 4076-110
Sample Number: **SJS02-SB08-17-07B** Sample Depth: 16.5 feet
Sample Description: Silty SAND (SM), Brown and Gray, Fine to Coarse, with Clay and Organics, Trace Fine Gravel
Test Method: ASTM D 422

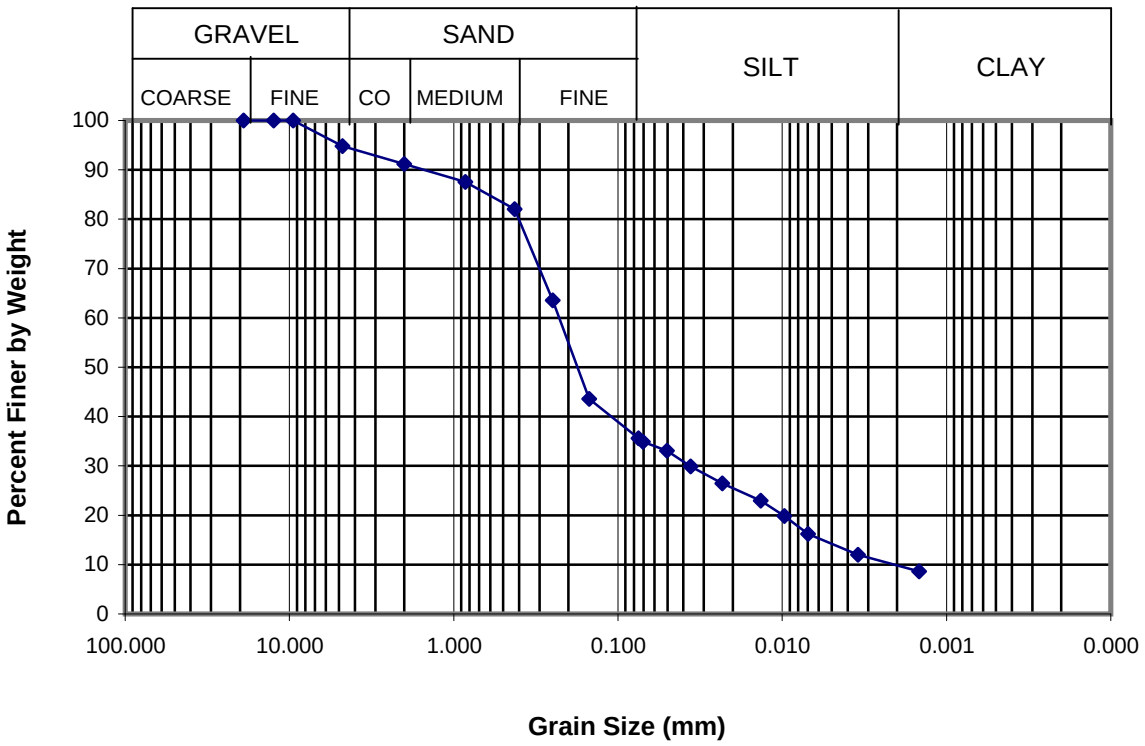
Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
3/4 Inch	100.0
1/2 Inch	100.0
3/8 Inch	100.0
4	94.8
10	91.2
20	87.5
40	82.1
60	63.6
100	43.6
200	35.6

Hydrometer Analysis Data

DIAMETER (mm)	PERCENT FINER
0.0705	34.9
0.0503	33.0
0.0361	29.9
0.0231	26.5
0.0135	23.0
0.0097	19.8
0.0070	16.2
0.0035	12.0
0.0015	8.6

GRAIN SIZE DISTRIBUTION



Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M Hill Laboratory Testing 2007**
CTO 0024, Site 2
St. Juliens Creek Annex, Chesapeake, Virginia
Project Number: 181812.SA.SM and Navy CLEAN III Contract # N62470-02D-3052
Number: 4076-110
Sample Number: **SJS02-SB08-17-07B** Sample Depth: 18 to 19 feet
Sample Description: Silty SAND (SM), Gray, Fine to Medium, Trace Clay
Test Method: ASTM D 422

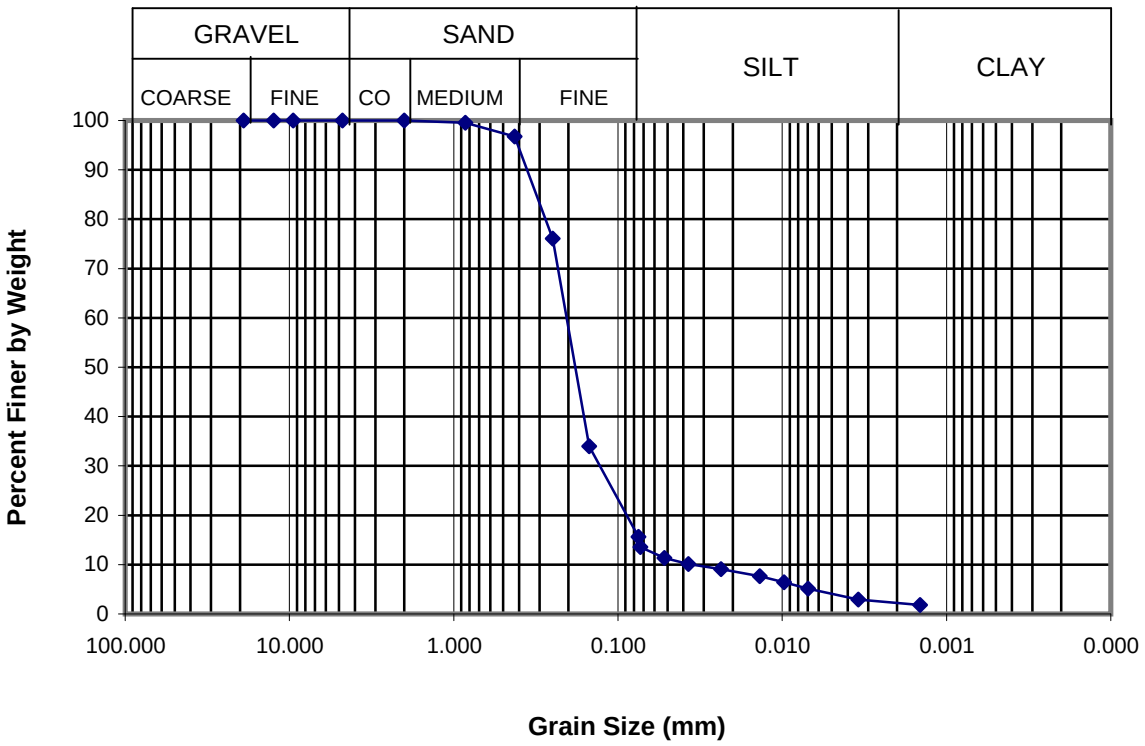
Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
3/4 Inch	100.0
1/2 Inch	100.0
3/8 Inch	100.0
4	100.0
10	100.0
20	99.5
40	96.7
60	76.0
100	34.0
200	15.7

Hydrometer Analysis Data

DIAMETER (mm)	PERCENT FINER
0.0731	13.5
0.0523	11.3
0.0372	10.1
0.0236	9.1
0.0137	7.6
0.0098	6.4
0.0070	5.1
0.0034	2.9
0.0014	1.8

GRAIN SIZE DISTRIBUTION



Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M Hill Laboratory Testing 2007**
CTO 0024, Site 2
St. Juliens Creek Annex, Chesapeake, Virginia
Project Number: 181812.SA.SM and Navy CLEAN III Contract # N62470-02D-3052
Number: 4076-110
Sample Number: **SJS02-SB09-07B** Sample Depth: 10 to 11 feet
Sample Description: Slightly Silty SAND (SP-SM), Tan-Orange, Fine to Medium, Trace Clay
Test Method: ASTM D 422

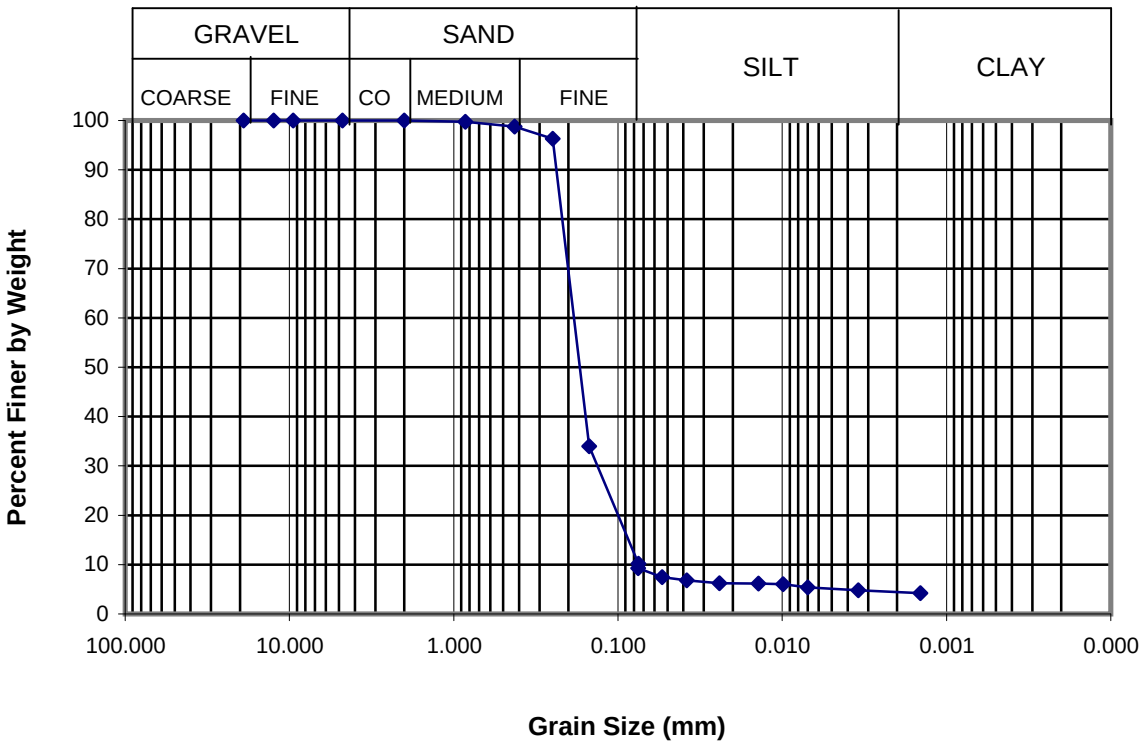
Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
3/4 Inch	100.0
1/2 Inch	100.0
3/8 Inch	100.0
4	100.0
10	100.0
20	99.7
40	98.7
60	96.3
100	34.0
200	10.2

Hydrometer Analysis Data

DIAMETER (mm)	PERCENT FINER
0.0753	9.3
0.0537	7.4
0.0381	6.8
0.0242	6.2
0.0139	6.2
0.0099	6.1
0.0070	5.4
0.0034	4.8
0.0014	4.2

GRAIN SIZE DISTRIBUTION



Appendix D
Deep Groundwater Technical Memorandum

Aquifer Test Results for Deep Groundwater at Site 2, St. Juliens Creek Annex, Chesapeake, Virginia

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DATE: January 9, 2007

1 Introduction

This technical memorandum documents the results of the aquifer testing and groundwater sampling conducted to evaluate the presence of chlorinated volatile organic compounds (CVOCs) detected in deep groundwater (Yorktown Aquifer) at Site 2, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. The technical approach and field methodology was presented in the *Final Technical Memorandum – Expanded Remedial Investigation Work Plan Addendum for Deep Groundwater at Site 2* (CH2M HILL, May 2006).

The objective of this project was to investigate the potential causes for the presence of CVOCs in the deep groundwater at monitoring well SJS02-MW10D. The following field activities were conducted to support this objective:

- Aquifer pump testing on the Yorktown Aquifer at Site 2, using monitoring well SJS02-MW10D, and
- Groundwater sampling at monitoring well SJS02-MW10D for VOCs analysis prior to and following the aquifer pumping test.

2 Background

Site 2 (Waste Disposal Area B) was an unlined waste disposal area that operated from 1921 to 1947. During the Remedial Investigation (RI) (CH2M HILL, February 2004) and the Expanded RI (CH2M HILL, October 2005) both shallow (Columbia Aquifer) and deep groundwater at Site 2 were evaluated for potential contamination.

A localized CVOC plume was discovered in the shallow groundwater at Site 2 (Figure 1) using a Membrane Interface Probe (MIP). The plume was found to be confined to a relatively small area (17,000 square feet [ft]). Elevated CVOCs were encountered at a depth of approximately 4 ft below ground surface (bgs), the approximate elevation of the water

table, and extended to the total depth logged during the MIP investigation, approximately 16 ft, or until the underlying Yorktown Confining Unit was encountered. Several monitoring wells were installed to characterize the CVOC plume.

The highest CVOC concentrations were of trichloroethene (TCE) detected in groundwater samples collected from monitoring wells SJS02-MW07S (270,000 µg/L) and SJS02-MW10S (330,000 µg/L). These elevated concentrations indicate the potential presence of free phase TCE, which is a dense non-aqueous phase liquid (DNAPL) and tends to migrate vertically downward through the water column until a significant permeability contrast is encountered. Additionally, the significant presence of TCE degradation products (i.e., 1,2-dichloroethene and vinyl chloride) indicates that natural remediation processes are occurring.

One deep monitoring well (SJS02-MW10D) was installed within the area of the shallow groundwater plume, to evaluate the potential migration of CVOCs from the Columbia Aquifer to the Yorktown Aquifer. The deep monitoring well was installed in a manner consistent with CH2M HILL standard operating procedures (SOPs) so as to minimize the potential for cross-contamination between aquifers. Construction of the well included a double casing into the Yorktown Confining Unit, with the well screening the top five feet of the Yorktown Aquifer.

TCE and its breakdown products were detected at SJS02-MW10D in significant concentrations. No CVOCs were detected in upgradient (SJS02-MW01D) or downgradient (SJS02-MW02D) monitoring wells. These monitoring well locations are shown on Figure 2. Based on previous investigations, the Yorktown Confining Unit appears to be intact at Site 2 and should retard the migration of CVOCs from the shallow to deep groundwater; therefore, the detection of CVOCs warranted further investigation. The Expanded RI recommended additional investigation to aid in determining the potential cause for the presence of TCE detected in deep groundwater at SJS02-MW10D.

An aquifer pump test and sampling were conducted to investigate the possible origins of the TCE detected in the deep aquifer, including:

- Transport of the TCE into the deep aquifer during the monitoring well installation as a result of the drilling process,
- Migration of the relatively dense TCE into the Yorktown Aquifer as a result of a leaking Yorktown Confining Unit, or
- Migration of the TCE into the Yorktown Aquifer via a conduit created by the installation of the monitoring well.

3 Field Investigation Activities and Results

A description of the field activities and results is included in the following subsections. All work was conducted in accordance with the site-specific work plan (CH2M HILL, May 2006) and the *Final Master Project Plan, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, July 2003).

3.1 Aquifer Testing Activities

Aquifer testing was performed in SJS02-MW10D. Aquifer testing activities included the following:

- Background Monitoring
- Preliminary Testing
- Well Pumping and Recovery

Background Monitoring

Background barometric pressure and ambient water level measurements were collected from the test well (SJS02-MW10D) and nearby shallow (SJS02-MW10S and SJS02-MW12S) and deep (SJS02-MW01D) observation wells to identify any extraneous hydraulic influences that would have to be removed from the pump test data set. The background measurements were conducted using pressure transducers over a 72 hour period from May 1 to May 4, 2006 prior to the pump test. Figure 3 provides a chart of the of the background measurements. The results show that the water levels in the deep aquifer wells (SJS02-MW01D and SJS02-MW10D) are influenced by the tidal cycle. This influence interferes with the effects of the aquifer test. Therefore, the background measurements were used to offset the tidal influence in order to isolate the effect of the pumping at the test well. An explanation of the tidal correction is provided in Attachment A. The background measurements did not indicate a tidal influence in the shallow aquifer wells (SJS02-MW10S and SJS02-MW12S). This has been observed at other locations in Southeastern Virginia, and may be attributed to a much lower hydraulic conductivity in the shallower aquifer and a higher storage coefficient, both of which suppress tidal propagation in the aquifer.

Preliminary Testing

The test well was installed for the purpose of collecting groundwater samples and not for production. It was constructed with a two inch inside diameter; limiting the size of the pump and ability to obtain a desirable flow rate and adequately stress the aquifer. Therefore, preliminary yield testing was conducted to assess the feasibility of proceeding with the aquifer test and determine the production capacity of the test well, SJS02-MW10D.

The test well was pumped for 90 minutes on May 16, 2006 to evaluate the yield obtained using a Grundfos Rediflo 2 submersible pump. The pump was lowered to the bottom of the well, which placed the intake for the pump approximately 1 ft above the bottom of the five ft well screen (67 ft bgs). During testing, the flow rate of the pump was gradually increased to a maximum sustainable rate of 5 gallons per minute (gpm). The flow rate achieved (5 gpm) was less than the maximum designed flow rate for the pump (10 gpm). This was likely a result of head loss within the well due to inefficiency caused by the relatively short screened interval and small well diameter of 2 inches. The achieved flow rate was within the minimum range (5 to 6 gpm) anticipated necessary to perform the pump test.

A water level indicator was used to record water levels and ensure that the drawdown in the test well had stabilized. The water level in the test well stabilized at approximately 46 ft below the top of casing with an approximate drawdown of 33 ft. An estimated 400 gallons of groundwater was purged during the well yield testing.

Well Pumping and Recovery

The aquifer pumping test was conducted over a period of approximately nine hours on May 17, 2006. Transducers were placed in the test well (SJS02-MW10D), deep aquifer observation well (SJS02-MW01D), and the two shallow aquifer observation wells (SJS02-MW10S and SJS02-MW12S). The test well was pumped using a Grundfos RediFlo 2 submersible pump. The initial depth to water in the test well prior to the well yield test was compared to the initial depth to water prior to the pump test to ensure that the test well had recovered following the well yield testing. Manual water level measurements were periodically collected at the test and observation wells to confirm the pressure transducer readings. In addition, water level measurements were also collected at two additional deep aquifer wells (SJS02-MW02D and SJS02-MW05D) to provide additional data (locations shown in Figure 2).

During the test, a maximum flow rate of 5.6 gpm was reached. This value is slightly higher than that achieved during the well yield test and may result from redevelopment of the well during the preliminary testing. Pumping was terminated after nine hours due to a lack of observable drawdown in the observation wells and stabilized water level in the pumping well. The recovery of the test and observation wells was recorded until the water level reached approximately 95% of the initial water level. Approximately 2,700 gallons of groundwater was purged during the aquifer pumping test.

The shallow aquifer wells (SJS02-MW10S and SJS02-MW12S) were not impacted by pumping in the test well. The deep observation well (SJS02-MW01D) showed a limited response by the pumping at the test well (approximately 0.1 ft). The limited influence of the pumping well is likely related to the short screened interval (5 ft), lack of penetration into the deep aquifer (5 ft), and limitations of the two inch diameter well on the size of the pump and flow rate. The data from the aquifer pumping test and an analysis of the deep aquifer properties is provided in Attachment B.

3.2 Groundwater Sampling

The historical analytical results from SJS02-MW10D (collected in December 2004, January 2005, and March 2005) show concentrations of TCE that significantly exceeded the Maximum Contaminant Level (MCL) of 5 µg/L. The highest concentration (2,200 µg/L) was found in the sample collected following monitoring well installation in December 2004. Subsequent sampling rounds (January and March 2005), conducted to confirm the initial result, demonstrated a significant decrease in TCE concentrations (700 and 900 µg/L, respectively).

A baseline groundwater sample was collected at SJS02-MW10D on May 16, 2006 prior to the preliminary testing. A second groundwater sample was collected on May 17, 2006 after the completion of the aquifer pumping test and subsequent recovery to evaluate CVOC concentrations following the withdrawal of significant amounts of groundwater from the deep aquifer. A third and fourth groundwater sample was collected on June 22, 2006 and November 28, 2006 to evaluate the long-term impact of the removal of groundwater during the aquifer testing. The groundwater samples were analyzed for Target Compound List (TCL) VOCs and collected using a peristaltic pump and low-flow purging and sampling techniques to be consistent with previous sampling rounds.

The current and historical data detailing the exceedances of the MCL for TCE at SJS02-MW10D are provided in Table 1. The raw analytical data is provided in Attachment C. The samples collected prior to, immediately following, one month following the aquifer testing, and six months following the aquifer testing indicated further reduction of TCE concentrations (3.9 J, 10 U, 0.26 J, and 0.5 U µg/L respectively). Additionally, the presence of vinyl chloride (3.6 J, 10 U, 6.5, and 1.7 µg/L, respectively) indicates that natural remediation processes are occurring.

3.3 Investigation-Derived Waste

Investigation-derived waste (IDW) consisting of approximately 3,100 gallons of purge water and equipment decontamination water generated during the aquifer testing and groundwater sampling was containerized in a Baker tank. Waste characterization samples (toxicity characteristic leaching procedure (TCLP) and reactivity, corrosivity, and ignitability) were collected following the completion of the field investigation activities. During analysis of the waste samples, the tank was temporarily stored at Site 2. The IDW was properly disposed of as non-hazardous water by subcontractors within 90-days of generation.

4 Conclusions and Recommendations

The aquifer testing was completed with no interruptions or malfunctions, however well construction did result in limitations to the effectiveness of the test (i.e., low flow rate and only partial penetration of the aquifer). The results of the time-drawdown data from the observation well are consistent with regional information for the deep aquifer with an estimated transmissivity of 1,521 ft^2/day and a storage coefficient of 3.4×10^{-4}. This supports the validity of the data obtained from the testing.

The hydraulic and analytical data obtained from the aquifer testing allow anecdotal conclusions to be made about the possible reasons for the contamination presented in the Work Plan as follows:

- Flattening of the drawdown curve was not observed within the nine hour test indicating the leakance of the Yorktown Confining Unit is as low as suggested in Hamilton and Larson, 1988. It can be concluded that the confining unit is not leaky enough to cause the TCE contamination.
- No drawdown was observed in monitoring well SJS02-MW10S, a shallow well located adjacent to the deep test well (SJS02-MW10D), indicating that the drawdown from the aquifer test was not transmitted vertically up to the shallow aquifer. It can be concluded that a vertical conduit created during monitoring well construction is not the source of the TCE contamination.
- TCE was not detected in groundwater collected from SJS02-MW10D immediately following the test and subsequent samples had concentrations only slightly above detection limits to a non-detect in the most recent sample. A significant rebound in TCE concentrations would indicate the presence of DNAPL or the existence of a contaminant plume. Because the concentrations decreased during the test and only a slight rebound

was observed afterward, it may be concluded that the TCE was carried down as a contaminant during well installation.

The analytical results, demonstrating significant reduction in the concentration of TCE (from 2,200 to 0.5U µg/L), support the conclusions of the aquifer test, suggesting neither continual transmission of the CVOCs from the shallow to the deep aquifer nor existence of a large dissolved contaminant plume. Based on the field investigation results, it is likely that the source of TCE in the deep aquifer well (SJS02-MW10D) is contaminated soil, free product, or a volume of contaminated groundwater carried from the shallow to the deep aquifer during the installation of the monitoring well. It is possible that the decreasing CVOC concentrations in the deep aquifer can be attributed to removal of the CVOC-contaminated groundwater. The TCE source may have been effectively removed over repeated purging and sampling, the additional development, and pump testing.

It is recommended that one additional groundwater monitoring event be conducted at well SJS02-MW10D in April 2007. The sample will be analyzed for CVOCs analysis to verify the findings of this technical memorandum. If the follow-up monitoring demonstrates that the CVOC concentrations in the monitoring well do not rebound, the abandonment of deep monitoring well SJS02-MW10D is recommended to remove it as a potential conduit for transmission of the CVOC plume (DNAPL) from the shallow aquifer into the deep aquifer. Should results from the follow-up monitoring reveal significant increases (i.e, above the MCLs) in CVOC concentrations in deep monitoring well SJS02-MW10D then this recommendation will be reassessed.

5 References

CH2M HILL, July 2003. *Final Master Project Plan, St. Juliens Creek Annex, Chesapeake, Virginia*.

CH2M HILL, February 2004. *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Site 2*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, October 2005. *Draft Expanded Remedial Investigation Report for Site 2*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, May 2006. *Final Technical Memorandum – Expanded Remedial Investigation Work Plan Addendum for Deep Groundwater at Site 2*. St. Juliens Creek Annex, Chesapeake, Virginia.

Hamilton, A.P. and Larson, J.D., 1988. *Hydrogeology and Analysis of the Groundwater Flow System in the Coastal Plain of Southeastern Virginia*. USGS WRI Report 87-4240. 1988.

Harsh and Laczniak, 1990. *Conceptualization and Analysis of Ground-Water Flow System in the Coastal Plain of Virginia and Adjacent Parts of Maryland and North Carolina.* USGS Professional Paper 1404-F.

Table 1
Groundwater Exceedances of the MCLs
Monitoring Well SJS02-MW10D
Deep Groundwater at Site 2
St. Juliens Creek Annex
Chesapeake, Virginia

Sample ID	**MCL**	SJS02-MW10D-04D	SJS02-MW10D-05A	SJS02-MW10D-05A2	SJS02-MW10D-06B	SJS02-MW10D-06B2[1]	SJS02-MW10D-06B3[1]	SJS02-MW10D-06D[1, 2]
Sample Date		12/03/04	01/18/05	03/28/05	05/16/06	05/17/06	06/22/06	11/28/06
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1-Dichloroethene	7	0.68	83 U	10 U	10 U	10 U	0.5 U	0.5 U
Acetone	--	4.9 J	83 U	10 U	10 U	10 U	5 U	5 U
Chloroform	80	7.8	83 U	10 U	10 U	10 U	0.5 U	0.5 U
Chloromethane	--	0.5 U	83 U	10 U	10 U	10 U	0.3 J	0.5 J
Toluene	1,000	3	83 U	1 J	10 U	10 U	0.3 J	0.11 J
Trichloroethene	5	2,200	700	900	3.9 J	10 U	0.26 J	0.5 U
Vinyl chloride	2	0.53	83 U	10 U	3.6 J	10 U	6.5	1.7
cis-1,2-Dichloroethene	70	19	83 U	35	52	10 U	5.4	1.6

Notes:

Exceeds MCL

J- Reported value is estimated

U- Not detected

[1] A duplicate was collected for this sample; the results provided are the maximum concentration between the sample and the duplicate.

[2] Unvalidated results shown, validated results will be provided in the Draft Final Site 2 ERI Report

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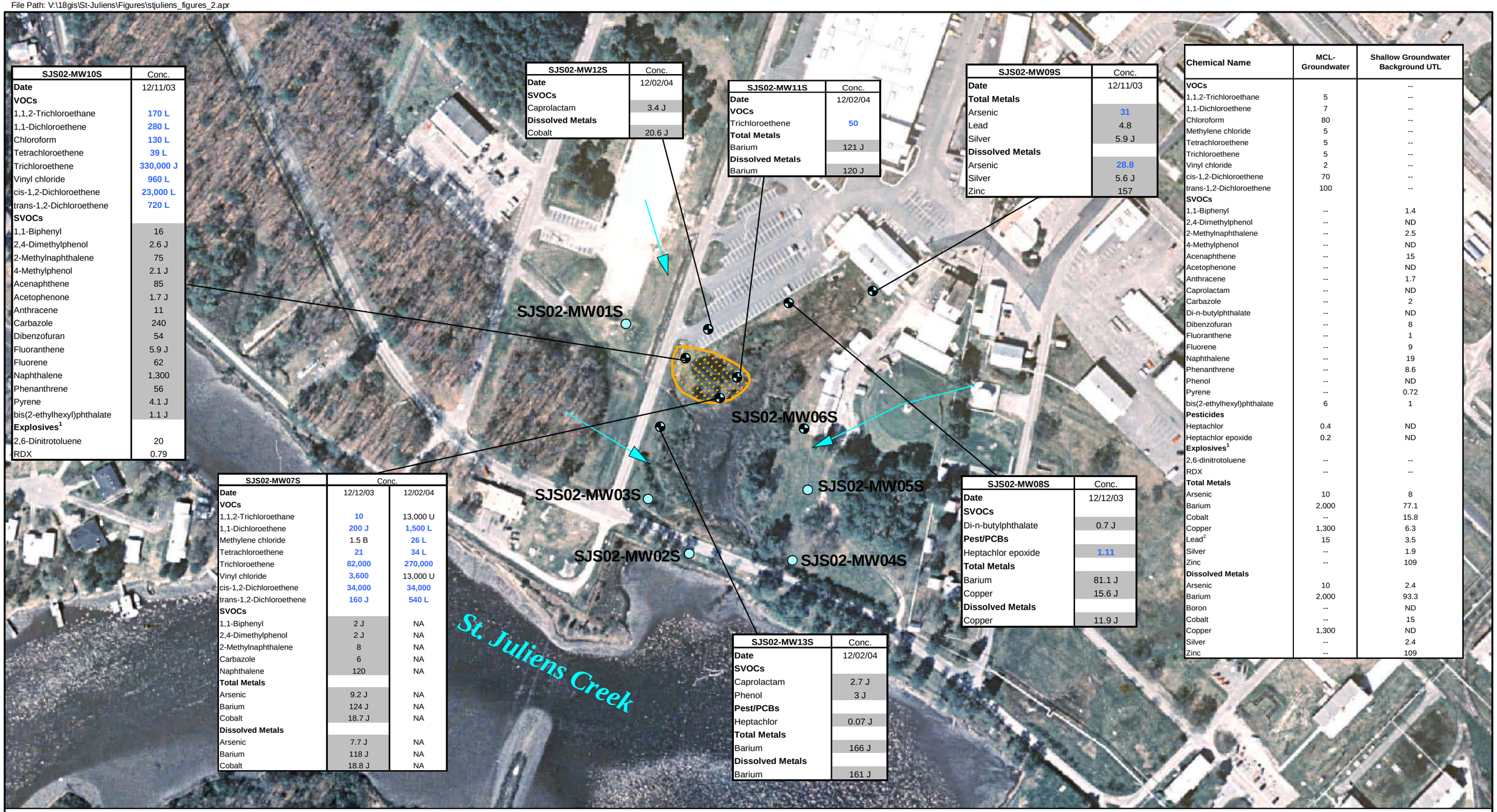

SJS02-MW10S	Conc.
Date	12/11/03
VOCs	
1,1,2-Trichloroethane	**170 L**
1,1-Dichloroethene	**280 L**
Chloroform	**130 L**
Tetrachloroethene	**39 L**
Trichloroethene	**330,000 J**
Vinyl chloride	**960 L**
cis-1,2-Dichloroethene	**23,000 L**
trans-1,2-Dichloroethene	**720 L**
SVOCs	
1,1-Biphenyl	16
2,4-Dimethylphenol	2.6 J
2-Methylnaphthalene	75
4-Methylphenol	2.1 J
Acenaphthene	85
Acetophenone	1.7 J
Anthracene	11
Carbazole	240
Dibenzofuran	54
Fluoranthene	5.9 J
Fluorene	62
Naphthalene	1,300
Phenanthrene	56
Pyrene	4.1 J
bis(2-ethylhexyl)phthalate	1.1 J
Explosives[1]	
2,6-Dinitrotoluene	20
RDX	0.79

SJS02-MW12S	Conc.
Date	12/02/04
SVOCs	
Caprolactam	3.4 J
Dissolved Metals	
Cobalt	20.6 J

SJS02-MW11S	Conc.
Date	12/02/04
VOCs	
Trichloroethene	**50**
Total Metals	
Barium	121 J
Dissolved Metals	
Barium	120 J

SJS02-MW09S	Conc.
Date	12/11/03
Total Metals	
Arsenic	**31**
Lead	4.8
Silver	5.9 J
Dissolved Metals	
Arsenic	**28.8**
Silver	5.6 J
Zinc	157

SJS02-MW07S	Conc.	
Date	12/12/03	12/02/04
VOCs		
1,1,2-Trichloroethane	**10**	13,000 U
1,1-Dichloroethene	**200 J**	**1,500 L**
Methylene chloride	1.5 B	**26 L**
Tetrachloroethene	**21**	**34 L**
Trichloroethene	**82,000**	**270,000**
Vinyl chloride	**3,600**	13,000 U
cis-1,2-Dichloroethene	**34,000**	**34,000**
trans-1,2-Dichloroethene	**160 J**	**540 L**
SVOCs		
1,1-Biphenyl	2 J	NA
2,4-Dimethylphenol	2 J	NA
2-Methylnaphthalene	8	NA
Carbazole	6	NA
Naphthalene	120	NA
Total Metals		
Arsenic	9.2 J	NA
Barium	124 J	NA
Cobalt	18.7 J	NA
Dissolved Metals		
Arsenic	7.7 J	NA
Barium	118 J	NA
Cobalt	18.8 J	NA

SJS02-MW08S	Conc.
Date	12/12/03
SVOCs	
Di-n-butylphthalate	0.7 J
Pest/PCBs	
Heptachlor epoxide	**1.11**
Total Metals	
Barium	81.1 J
Copper	15.6 J
Dissolved Metals	
Copper	11.9 J

SJS02-MW13S	Conc.
Date	12/02/04
SVOCs	
Caprolactam	2.7 J
Phenol	3 J
Pest/PCBs	
Heptachlor	0.07 J
Total Metals	
Barium	166 J
Dissolved Metals	
Barium	161 J

Chemical Name	MCL-Groundwater	Shallow Groundwater Background UTL
VOCs		--
1,1,2-Trichloroethane	5	--
1,1-Dichloroethene	7	--
Chloroform	80	--
Methylene chloride	5	--
Tetrachloroethene	5	--
Trichloroethene	5	--
Vinyl chloride	2	--
cis-1,2-Dichloroethene	70	--
trans-1,2-Dichloroethene	100	--
SVOCs		
1,1-Biphenyl	--	1.4
2,4-Dimethylphenol	--	ND
2-Methylnaphthalene	--	2.5
4-Methylphenol	--	ND
Acenaphthene	--	15
Acetophenone	--	ND
Anthracene	--	1.7
Caprolactam	--	ND
Carbazole	--	2
Di-n-butylphthalate	--	ND
Dibenzofuran	--	8
Fluoranthene	--	1
Fluorene	--	9
Naphthalene	--	19
Phenanthrene	--	8.6
Phenol	--	ND
Pyrene	--	0.72
bis(2-ethylhexyl)phthalate	6	1
Pesticides		
Heptachlor	0.4	ND
Heptachlor epoxide	0.2	ND
Explosives[1]		
2,6-dinitrotoluene	--	--
RDX	--	--
Total Metals		
Arsenic	10	8
Barium	2,000	77.1
Cobalt	--	15.8
Copper	1,300	6.3
Lead[2]	15	3.5
Silver	--	1.9
Zinc	--	109
Dissolved Metals		
Arsenic	10	2.4
Barium	2,000	93.3
Boron	--	ND
Cobalt	--	15
Copper	1,300	ND
Silver	--	2.4
Zinc	--	109

LEGEND

- Shallow Monitoring Well Locations sampled during ERI
- Shallow Monitoring Well Locations not sampled during ERI
- Estimated Extent of VOC Plume
- Groundwater Flow Direction

-- no criteria
ND - No Detections
NA - Not Analyzed
J- Analyte present. Reported value is estimated.
L- Analyte present. Reported value is biased low.
U - Not Detected

Bold Blue text indicates MCL Exceedances
Shaded cells indicate Background UTL Exceedances

Conc. - Concentration
All concentrations are measured in ug/L.
[1]All explosives detections are presented because no screening criteria exist.
[2]EPA Action Level for Lead

N

0 100 200 300 Feet

Figure 1
Shallow Groundwater Detection and Exceedances of Screening Criteria
Site 2 Expanded Remediation Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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LEGEND

- Shallow Monitoring Well Locations
- Deep Monitoring Well Locations

N

0 150 300 Feet

Figure 2
Monitoring Wells Evaluated During the Aquifer Pumping Test
Site 2 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

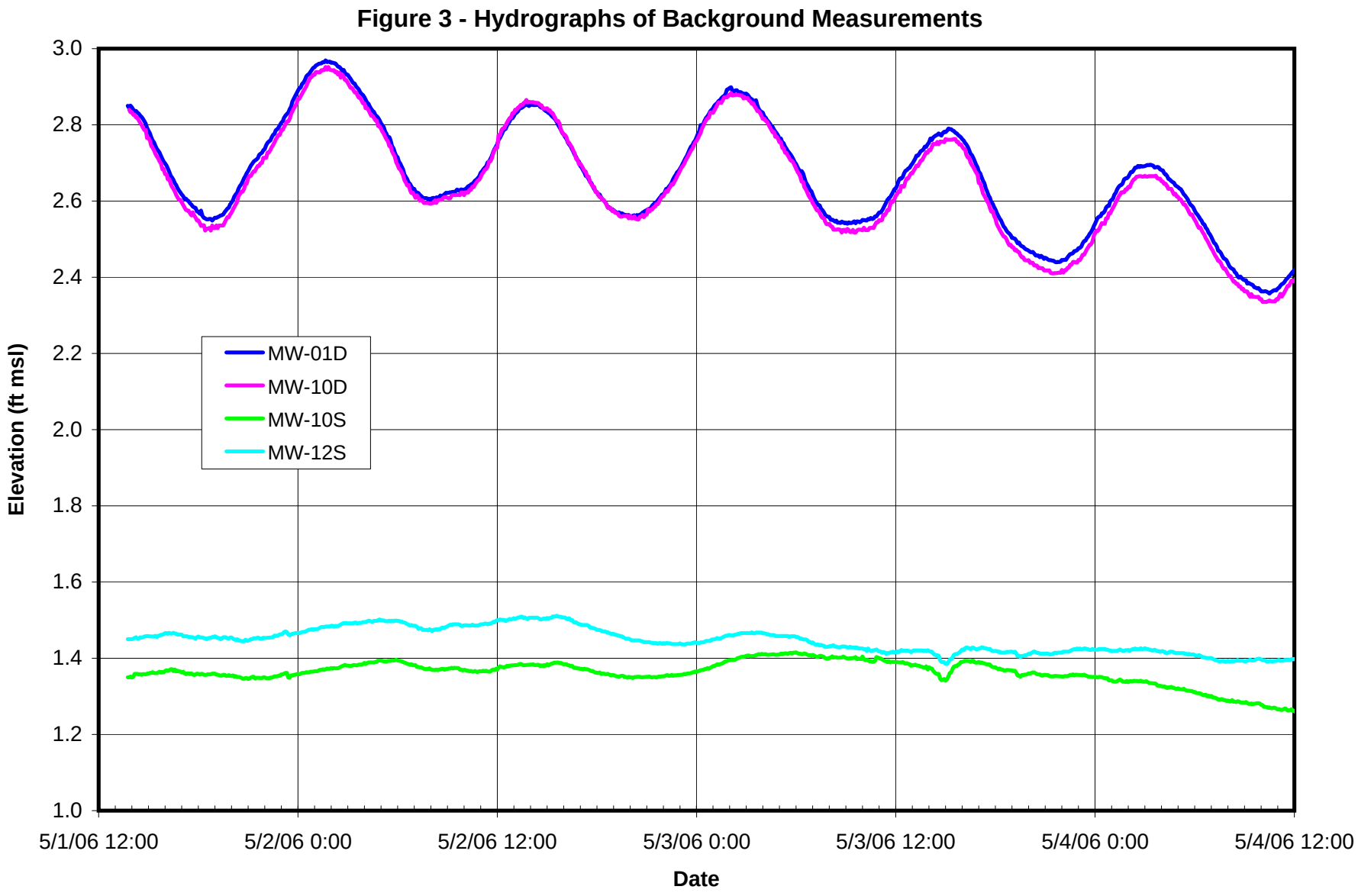
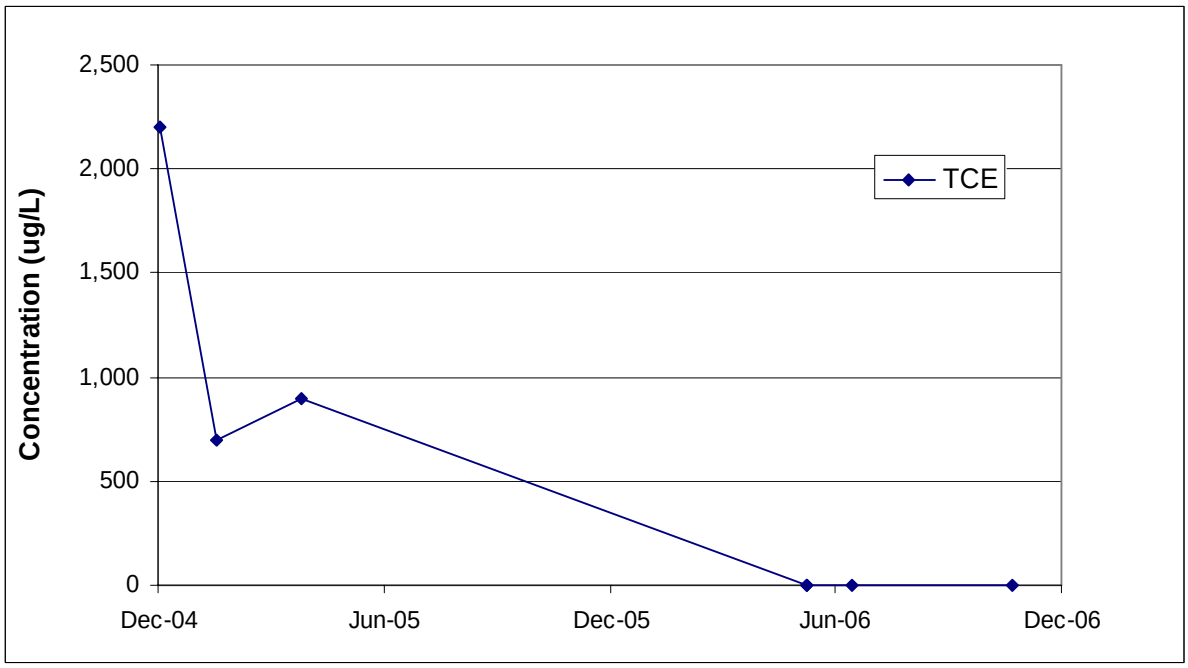


Figure 3 - Hydrographs of Background Measurements
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
Elevation (ft msl)
MW-01D
MW-10D
MW-10S
MW-12S
5/1/06 12:00
5/2/06 0:00
5/2/06 12:00
5/3/06 0:00
5/3/06 12:00
5/4/06 0:00
5/4/06 12:00
Date

FIGURE 4
TCE Concentration Trends in SJS02-MW10D
Deep Groundwater at Site 2
St. Juliens Creek Annex
Chesapeake, Virginia



Note: The November 2006 data is based on unvalidated analytical results, validated results will be provided in the Draft Final Site 2 ERI Report.

Attachment A: Mitigation of Tidal Effects

Background monitoring revealed that the water level in the deep aquifer wells (SJS02-MW01D and SJS02-MW10D) is influenced by the tidal cycle. By comparing the tide data from the nearby Money Point tide gauge in the Southern Branch of the Elizabeth River and the tidal fluctuations in the observation well SJS02-MW01D, a lag time of 32 minutes between the tide cycle in the Southern Branch of the Elizabeth River and the deep aquifer groundwater was estimated. The impact of the tidal influence on the water levels in the observation well was estimated by calculating the tidal efficiency. Tidal efficiency is defined as the ratio of the piezometric water level amplitude (observation well) to the surface water tidal amplitude (Southern Branch of the Elizabeth River) and is represented in the following equation:

$$TE = \Delta P / \Delta H \times 100$$

Where: TE=tide efficiency
ΔP=change in piezometric level
ΔH=change in tide level

Based on the observed water levels, the tidal efficiency in the deep aquifer wells was estimated to be 13.5%.

The background measurements are provided on Tables A-1 and A-2 and the tidal correction is depicted in Figures A-1 and A-2.

Table A-1
Time Drawdown at Well MW01D Corrected for Transducer Drift and Tidal Influences

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.270	0.0	0.000
2.272	1.0	-0.002
2.271	2.0	-0.001
2.263	3.0	0.007
2.250	4.0	0.020
2.239	5.0	0.031
2.229	6.0	0.041
2.219	7.0	0.051
2.211	8.0	0.059
2.205	9.0	0.065
2.201	10.0	0.069
2.197	11.0	0.073
2.191	12.0	0.079
2.187	13.0	0.083
2.182	14.0	0.088
2.177	15.0	0.093
2.174	16.0	0.096
2.172	17.0	0.098
2.167	18.0	0.103
2.165	19.0	0.105
2.162	20.0	0.108
2.161	21.0	0.109
2.159	22.0	0.111
2.164	23.0	0.106
2.161	24.0	0.109
2.157	25.0	0.113
2.155	26.0	0.115
2.154	27.0	0.116
2.153	28.0	0.117
2.151	29.0	0.119
2.148	30.0	0.122
2.147	31.0	0.123
2.146	32.0	0.124
2.144	33.0	0.126
2.145	34.0	0.125
2.142	35.0	0.128
2.143	36.0	0.127
2.145	37.0	0.125
2.140	38.0	0.130
2.140	39.0	0.130
2.137	40.0	0.133
2.137	41.0	0.133
2.134	42.0	0.136
2.135	43.0	0.135
2.133	44.0	0.137
2.130	45.0	0.140
2.134	46.0	0.136

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.130	47.0	0.140
2.129	48.0	0.141
2.130	49.0	0.140
2.128	50.0	0.142
2.127	51.0	0.143
2.127	52.0	0.143
2.129	53.0	0.141
2.128	54.0	0.142
2.127	55.0	0.143
2.127	56.0	0.143
2.123	57.0	0.147
2.124	58.0	0.146
2.120	59.0	0.150
2.122	60.0	0.148
2.118	61.0	0.152
2.120	62.0	0.150
2.118	63.0	0.152
2.122	64.0	0.148
2.120	65.0	0.150
2.121	66.0	0.149
2.123	67.0	0.147
2.119	68.0	0.151
2.116	69.0	0.154
2.112	70.0	0.158
2.111	71.0	0.159
2.111	72.0	0.159
2.113	73.0	0.157
2.112	74.0	0.158
2.110	75.0	0.160
2.107	76.0	0.163
2.107	77.0	0.163
2.110	78.0	0.160
2.108	79.0	0.162
2.109	80.0	0.161
2.111	81.0	0.159
2.110	82.0	0.160
2.110	83.0	0.160
2.113	84.0	0.157
2.104	85.0	0.166
2.105	86.0	0.165
2.104	87.0	0.166
2.106	88.0	0.164
2.105	89.0	0.165
2.102	90.0	0.168
2.103	91.0	0.167
2.100	92.0	0.170
2.101	93.0	0.169
2.098	94.0	0.172
2.099	95.0	0.171

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.096	96.0	0.174
2.098	97.0	0.172
2.098	98.0	0.172
2.100	99.0	0.170
2.096	100.0	0.174
2.095	101.0	0.175
2.095	102.0	0.175
2.098	103.0	0.172
2.097	104.0	0.173
2.099	105.0	0.171
2.095	106.0	0.175
2.098	107.0	0.172
2.096	108.0	0.174
2.094	109.0	0.176
2.095	110.0	0.175
2.098	111.0	0.172
2.099	112.0	0.171
2.096	113.0	0.174
2.095	114.0	0.175
2.094	115.0	0.176
2.091	116.0	0.179
2.096	117.0	0.174
2.095	118.0	0.175
2.095	119.0	0.175
2.094	120.0	0.176
2.093	121.0	0.177
2.095	122.0	0.175
2.094	123.0	0.176
2.097	124.0	0.173
2.097	125.0	0.173
2.096	126.0	0.174
2.095	127.0	0.175
2.095	128.0	0.175
2.093	129.0	0.177
2.094	130.0	0.176
2.094	131.0	0.176
2.086	132.0	0.184
2.081	133.0	0.189
2.079	134.0	0.191
2.079	135.0	0.191
2.082	136.0	0.188
2.081	137.0	0.189
2.082	138.0	0.188
2.082	139.0	0.188
2.081	140.0	0.189
2.080	141.0	0.190
2.079	142.0	0.191
2.081	143.0	0.189
2.081	144.0	0.189

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.078	145.0	0.192
2.080	146.0	0.190
2.081	147.0	0.189
2.081	148.0	0.189
2.080	149.0	0.190
2.080	150.0	0.190
2.081	151.0	0.189
2.081	152.0	0.189
2.078	153.0	0.192
2.079	154.0	0.191
2.079	155.0	0.191
2.081	156.0	0.189
2.082	157.0	0.188
2.080	158.0	0.190
2.079	159.0	0.191
2.077	160.0	0.193
2.078	161.0	0.192
2.076	162.0	0.194
2.074	163.0	0.196
2.077	164.0	0.193
2.076	165.0	0.194
2.076	166.0	0.194
2.077	167.0	0.193
2.075	168.0	0.195
2.074	169.0	0.196
2.076	170.0	0.194
2.077	171.0	0.193
2.076	172.0	0.194
2.078	173.0	0.192
2.075	174.0	0.195
2.075	175.0	0.195
2.073	176.0	0.197
2.076	177.0	0.194
2.077	178.0	0.193
2.074	179.0	0.196
2.071	180.0	0.199
2.073	181.0	0.197
2.071	182.0	0.199
2.073	183.0	0.197
2.070	184.0	0.200
2.073	185.0	0.197
2.068	186.0	0.202
2.071	187.0	0.199
2.067	188.0	0.203
2.070	189.0	0.200
2.069	190.0	0.201
2.069	191.0	0.201
2.065	192.0	0.205
2.067	193.0	0.203

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.066	194.0	0.204
2.062	195.0	0.208
2.084	196.0	0.186
2.082	197.0	0.188
2.085	198.0	0.185
2.082	199.0	0.188
2.082	200.0	0.188
2.079	201.0	0.191
2.074	202.0	0.196
2.076	203.0	0.194
2.074	204.0	0.196
2.070	205.0	0.200
2.072	206.0	0.198
2.074	207.0	0.196
2.072	208.0	0.198
2.071	209.0	0.199
2.071	210.0	0.199
2.068	211.0	0.202
2.062	212.0	0.208
2.062	213.0	0.208
2.059	214.0	0.211
2.060	215.0	0.210
2.059	216.0	0.211
2.058	217.0	0.212
2.057	218.0	0.213
2.057	219.0	0.213
2.056	220.0	0.214
2.057	221.0	0.213
2.053	222.0	0.217
2.049	223.0	0.221
2.050	224.0	0.220
2.050	225.0	0.220
2.051	226.0	0.219
2.050	227.0	0.220
2.049	228.0	0.221
2.050	229.0	0.220
2.048	230.0	0.222
2.045	231.0	0.225
2.045	232.0	0.225
2.048	233.0	0.222
2.045	234.0	0.225
2.043	235.0	0.227
2.044	236.0	0.226
2.040	237.0	0.230
2.037	238.0	0.233
2.037	239.0	0.233
2.038	240.0	0.232
2.036	241.0	0.234
2.035	242.0	0.235

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.034	243.0	0.236
2.034	244.0	0.236
2.034	245.0	0.236
2.031	246.0	0.239
2.029	247.0	0.241
2.029	248.0	0.241
2.026	249.0	0.244
2.023	250.0	0.247
2.023	251.0	0.247
2.024	252.0	0.246
2.024	253.0	0.246
2.024	254.0	0.246
2.019	255.0	0.251
2.020	256.0	0.250
2.021	257.0	0.249
2.018	258.0	0.252
2.018	259.0	0.252
2.018	260.0	0.252
2.020	261.0	0.250
2.017	262.0	0.253
2.021	263.0	0.249
2.019	264.0	0.251
2.019	265.0	0.251
2.014	266.0	0.256
2.015	267.0	0.255
2.014	268.0	0.256
2.018	269.0	0.252
2.019	270.0	0.251
2.018	271.0	0.252
2.024	272.0	0.246
2.020	273.0	0.250
2.020	274.0	0.250
2.021	275.0	0.249
2.021	276.0	0.249
2.020	277.0	0.250
2.020	278.0	0.250
2.022	279.0	0.248
2.023	280.0	0.247
2.022	281.0	0.248
2.023	282.0	0.247
2.021	283.0	0.249
2.023	284.0	0.247
2.024	285.0	0.246
2.022	286.0	0.248
2.022	287.0	0.248
2.021	288.0	0.249
2.020	289.0	0.250
2.020	290.0	0.250
2.019	291.0	0.251

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.020	292.0	0.250
2.020	293.0	0.250
2.021	294.0	0.249
2.023	295.0	0.247
2.021	296.0	0.249
2.020	297.0	0.250
2.022	298.0	0.248
2.020	299.0	0.250
2.021	300.0	0.249
2.021	301.0	0.249
2.020	302.0	0.250
2.022	303.0	0.248
2.020	304.0	0.250
2.022	305.0	0.248
2.021	306.0	0.249
2.021	307.0	0.249
2.023	308.0	0.247
2.020	309.0	0.250
2.022	310.0	0.248
2.021	311.0	0.249
2.020	312.0	0.250
2.021	313.0	0.249
2.021	314.0	0.249
2.021	315.0	0.249
2.019	316.0	0.251
2.019	317.0	0.251
2.023	318.0	0.247
2.021	319.0	0.249
2.023	320.0	0.247
2.022	321.0	0.248
2.022	322.0	0.248
2.018	323.0	0.252
2.020	324.0	0.250
2.021	325.0	0.249
2.023	326.0	0.247
2.019	327.0	0.251
2.021	328.0	0.249
2.022	329.0	0.248
2.023	330.0	0.247
2.022	331.0	0.248
2.024	332.0	0.246
2.018	333.0	0.252
2.018	334.0	0.252
2.017	335.0	0.253
2.017	336.0	0.253
2.017	337.0	0.253
2.024	338.0	0.246
2.022	339.0	0.248
2.020	340.0	0.250

Water Level (ft msl)	Elapsed Time (min)	Drawdown (ft)
2.021	341.0	0.249
2.019	342.0	0.251
2.020	343.0	0.250
2.020	344.0	0.250
2.019	345.0	0.251
2.020	346.0	0.250
2.018	347.0	0.252
2.019	348.0	0.251
2.017	349.0	0.253
2.018	350.0	0.252
2.021	351.0	0.249
2.020	352.0	0.250
2.016	353.0	0.254
2.015	354.0	0.255
2.017	355.0	0.253
2.013	356.0	0.257
2.010	357.0	0.260
2.012	358.0	0.258
2.010	359.0	0.260
2.012	360.0	0.258
2.009	361.0	0.261
2.012	362.0	0.258
2.010	363.0	0.260
2.011	364.0	0.259
2.008	365.0	0.262
2.009	366.0	0.261
2.008	367.0	0.262
2.006	368.0	0.264
2.007	369.0	0.263
2.008	370.0	0.262
2.007	371.0	0.263
2.006	372.0	0.264
2.002	373.0	0.268
2.006	374.0	0.264
2.007	375.0	0.263
2.003	376.0	0.267
2.004	377.0	0.266
2.004	378.0	0.266
2.006	379.0	0.264
2.003	380.0	0.267
2.011	381.0	0.259
2.003	382.0	0.267
2.002	383.0	0.268
2.003	384.0	0.267
2.002	385.0	0.268

Table A-2
Corrected Water Levels for Tidal Influence at MW01D

	Time	Tide	Lagged Tide
0	5/17/2006 9:00	-0.660	
1	5/17/2006 9:01	-0.652	
2	5/17/2006 9:02	-0.643	
3	5/17/2006 9:03	-0.635	
4	5/17/2006 9:04	-0.627	
5	5/17/2006 9:05	-0.618	
6	5/17/2006 9:06	-0.610	
7	5/17/2006 9:07	-0.602	
8	5/17/2006 9:08	-0.593	
9	5/17/2006 9:09	-0.585	
10	5/17/2006 9:10	-0.577	
11	5/17/2006 9:11	-0.568	
12	5/17/2006 9:12	-0.560	
13	5/17/2006 9:13	-0.555	
14	5/17/2006 9:14	-0.550	
15	5/17/2006 9:15	-0.545	
16	5/17/2006 9:16	-0.540	
17	5/17/2006 9:17	-0.535	
18	5/17/2006 9:18	-0.530	
19	5/17/2006 9:19	-0.522	
20	5/17/2006 9:20	-0.513	
21	5/17/2006 9:21	-0.505	
22	5/17/2006 9:22	-0.497	
23	5/17/2006 9:23	-0.488	
24	5/17/2006 9:24	-0.480	
25	5/17/2006 9:25	-0.472	
26	5/17/2006 9:26	-0.463	
27	5/17/2006 9:27	-0.455	
28	5/17/2006 9:28	-0.447	
29	5/17/2006 9:29	-0.438	
30	5/17/2006 9:30	-0.430	
31	5/17/2006 9:31	-0.422	
32	5/17/2006 9:32	-0.413	
33	5/17/2006 9:33	-0.405	
34	5/17/2006 9:34	-0.397	
35	5/17/2006 9:35	-0.388	
36	5/17/2006 9:36	-0.380	
37	5/17/2006 9:37	-0.373	
38	5/17/2006 9:38	-0.367	
39	5/17/2006 9:39	-0.360	
40	5/17/2006 9:40	-0.353	
41	5/17/2006 9:41	-0.347	
42	5/17/2006 9:42	-0.340	
43	5/17/2006 9:43	-0.333	
44	5/17/2006 9:44	-0.327	
45	5/17/2006 9:45	-0.320	
46	5/17/2006 9:46	-0.313	
47	5/17/2006 9:47	-0.307	

	Time	Tide	Lagged Tide			
48	5/17/2006 9:48	-0.300				
49	5/17/2006 9:49	-0.290				
50	5/17/2006 9:50	-0.280				
51	5/17/2006 9:51	-0.270				
52	5/17/2006 9:52	-0.260				
53	5/17/2006 9:53	-0.250				
54	5/17/2006 9:54	-0.240				
55	5/17/2006 9:55	-0.233				
56	5/17/2006 9:56	-0.227				
57	5/17/2006 9:57	-0.220				
58	5/17/2006 9:58	-0.213				
59	5/17/2006 9:59	-0.207				
60	5/17/2006 10:00	-0.200				
61	5/17/2006 10:01	-0.188				
62	5/17/2006 10:02	-0.177				
63	5/17/2006 10:03	-0.165				
64	5/17/2006 10:04	-0.153				
65	5/17/2006 10:05	-0.142				
66	5/17/2006 10:06	-0.130				
67	5/17/2006 10:07	-0.122				
68	5/17/2006 10:08	-0.113				
69	5/17/2006 10:09	-0.105				
70	5/17/2006 10:10	-0.097				Corrected
71	5/17/2006 10:11	-0.088		MW01D	Elapsed	MW01D
72	5/17/2006 10:12	-0.080		Level	Time	Level
73	5/17/2006 10:13	-0.070	-0.347	2.270	0.0	2.270
74	5/17/2006 10:14	-0.060	-0.340	2.273	1.0	2.272
75	5/17/2006 10:15	-0.050	-0.333	2.272	2.0	2.271
76	5/17/2006 10:16	-0.040	-0.327	2.266	3.0	2.263
77	5/17/2006 10:17	-0.030	-0.320	2.254	4.0	2.250
78	5/17/2006 10:18	-0.020	-0.313	2.244	5.0	2.239
79	5/17/2006 10:19	-0.008	-0.307	2.234	6.0	2.229
80	5/17/2006 10:20	0.003	-0.300	2.226	7.0	2.219
81	5/17/2006 10:21	0.015	-0.290	2.219	8.0	2.211
82	5/17/2006 10:22	0.027	-0.280	2.214	9.0	2.205
83	5/17/2006 10:23	0.038	-0.270	2.211	10.0	2.201
84	5/17/2006 10:24	0.050	-0.260	2.208	11.0	2.197
85	5/17/2006 10:25	0.060	-0.250	2.204	12.0	2.191
86	5/17/2006 10:26	0.070	-0.240	2.202	13.0	2.187
87	5/17/2006 10:27	0.080	-0.233	2.197	14.0	2.182
88	5/17/2006 10:28	0.090	-0.227	2.193	15.0	2.177
89	5/17/2006 10:29	0.100	-0.220	2.191	16.0	2.174
90	5/17/2006 10:30	0.110	-0.213	2.190	17.0	2.172
91	5/17/2006 10:31	0.122	-0.207	2.186	18.0	2.167
92	5/17/2006 10:32	0.133	-0.200	2.185	19.0	2.165
93	5/17/2006 10:33	0.145	-0.188	2.183	20.0	2.162
94	5/17/2006 10:34	0.157	-0.177	2.184	21.0	2.161
95	5/17/2006 10:35	0.168	-0.165	2.184	22.0	2.159
96	5/17/2006 10:36	0.180	-0.153	2.190	23.0	2.164
97	5/17/2006 10:37	0.192	-0.142	2.188	24.0	2.161
98	5/17/2006 10:38	0.203	-0.130	2.186	25.0	2.157

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
99	5/17/2006 10:39	0.215	-0.122	2.186	26.0	2.155
100	5/17/2006 10:40	0.227	-0.113	2.186	27.0	2.154
101	5/17/2006 10:41	0.238	-0.105	2.186	28.0	2.153
102	5/17/2006 10:42	0.250	-0.097	2.184	29.0	2.151
103	5/17/2006 10:43	0.260	-0.088	2.182	30.0	2.148
104	5/17/2006 10:44	0.270	-0.080	2.183	31.0	2.147
105	5/17/2006 10:45	0.280	-0.070	2.184	32.0	2.146
106	5/17/2006 10:46	0.290	-0.060	2.183	33.0	2.144
107	5/17/2006 10:47	0.300	-0.050	2.185	34.0	2.145
108	5/17/2006 10:48	0.310	-0.040	2.184	35.0	2.142
109	5/17/2006 10:49	0.322	-0.030	2.186	36.0	2.143
110	5/17/2006 10:50	0.333	-0.020	2.189	37.0	2.145
111	5/17/2006 10:51	0.345	-0.008	2.186	38.0	2.140
112	5/17/2006 10:52	0.357	0.003	2.187	39.0	2.140
113	5/17/2006 10:53	0.368	0.015	2.186	40.0	2.137
114	5/17/2006 10:54	0.380	0.027	2.188	41.0	2.137
115	5/17/2006 10:55	0.392	0.038	2.186	42.0	2.134
116	5/17/2006 10:56	0.403	0.050	2.188	43.0	2.135
117	5/17/2006 10:57	0.415	0.060	2.188	44.0	2.133
118	5/17/2006 10:58	0.427	0.070	2.187	45.0	2.130
119	5/17/2006 10:59	0.438	0.080	2.192	46.0	2.134
120	5/17/2006 11:00	0.450	0.090	2.189	47.0	2.130
121	5/17/2006 11:01	0.460	0.100	2.189	48.0	2.129
122	5/17/2006 11:02	0.470	0.110	2.191	49.0	2.130
123	5/17/2006 11:03	0.480	0.122	2.192	50.0	2.128
124	5/17/2006 11:04	0.490	0.133	2.192	51.0	2.127
125	5/17/2006 11:05	0.500	0.145	2.193	52.0	2.127
126	5/17/2006 11:06	0.510	0.157	2.197	53.0	2.129
127	5/17/2006 11:07	0.522	0.168	2.198	54.0	2.128
128	5/17/2006 11:08	0.533	0.180	2.198	55.0	2.127
129	5/17/2006 11:09	0.545	0.192	2.200	56.0	2.127
130	5/17/2006 11:10	0.557	0.203	2.197	57.0	2.123
131	5/17/2006 11:11	0.568	0.215	2.200	58.0	2.124
132	5/17/2006 11:12	0.580	0.227	2.198	59.0	2.120
133	5/17/2006 11:13	0.590	0.238	2.201	60.0	2.122
134	5/17/2006 11:14	0.600	0.250	2.199	61.0	2.118
135	5/17/2006 11:15	0.610	0.260	2.202	62.0	2.120
136	5/17/2006 11:16	0.620	0.270	2.201	63.0	2.118
137	5/17/2006 11:17	0.630	0.280	2.207	64.0	2.122
138	5/17/2006 11:18	0.640	0.290	2.206	65.0	2.120
139	5/17/2006 11:19	0.652	0.300	2.208	66.0	2.121
140	5/17/2006 11:20	0.663	0.310	2.211	67.0	2.123
141	5/17/2006 11:21	0.675	0.322	2.209	68.0	2.119
142	5/17/2006 11:22	0.687	0.333	2.208	69.0	2.116
143	5/17/2006 11:23	0.698	0.345	2.206	70.0	2.112
144	5/17/2006 11:24	0.710	0.357	2.206	71.0	2.111
145	5/17/2006 11:25	0.722	0.368	2.207	72.0	2.111
146	5/17/2006 11:26	0.733	0.380	2.211	73.0	2.113
147	5/17/2006 11:27	0.745	0.392	2.212	74.0	2.112

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
148	5/17/2006 11:28	0.757	0.403	2.211	75.0	2.110
149	5/17/2006 11:29	0.768	0.415	2.210	76.0	2.107
150	5/17/2006 11:30	0.780	0.427	2.211	77.0	2.107
151	5/17/2006 11:31	0.788	0.438	2.216	78.0	2.110
152	5/17/2006 11:32	0.797	0.450	2.216	79.0	2.108
153	5/17/2006 11:33	0.805	0.460	2.218	80.0	2.109
154	5/17/2006 11:34	0.813	0.470	2.221	81.0	2.111
155	5/17/2006 11:35	0.822	0.480	2.221	82.0	2.110
156	5/17/2006 11:36	0.830	0.490	2.223	83.0	2.110
157	5/17/2006 11:37	0.838	0.500	2.228	84.0	2.113
158	5/17/2006 11:38	0.847	0.510	2.220	85.0	2.104
159	5/17/2006 11:39	0.855	0.522	2.222	86.0	2.105
160	5/17/2006 11:40	0.863	0.533	2.223	87.0	2.104
161	5/17/2006 11:41	0.872	0.545	2.226	88.0	2.106
162	5/17/2006 11:42	0.880	0.557	2.227	89.0	2.105
163	5/17/2006 11:43	0.888	0.568	2.225	90.0	2.102
164	5/17/2006 11:44	0.897	0.580	2.228	91.0	2.103
165	5/17/2006 11:45	0.905	0.590	2.226	92.0	2.100
166	5/17/2006 11:46	0.913	0.600	2.229	93.0	2.101
167	5/17/2006 11:47	0.922	0.610	2.227	94.0	2.098
168	5/17/2006 11:48	0.930	0.620	2.230	95.0	2.099
169	5/17/2006 11:49	0.940	0.630	2.228	96.0	2.096
170	5/17/2006 11:50	0.950	0.640	2.232	97.0	2.098
171	5/17/2006 11:51	0.960	0.652	2.233	98.0	2.098
172	5/17/2006 11:52	0.970	0.663	2.237	99.0	2.100
173	5/17/2006 11:53	0.980	0.675	2.234	100.0	2.096
174	5/17/2006 11:54	0.990	0.687	2.234	101.0	2.095
175	5/17/2006 11:55	0.998	0.698	2.236	102.0	2.095
176	5/17/2006 11:56	1.007	0.710	2.240	103.0	2.098
177	5/17/2006 11:57	1.015	0.722	2.241	104.0	2.097
178	5/17/2006 11:58	1.023	0.733	2.244	105.0	2.099
179	5/17/2006 11:59	1.032	0.745	2.243	106.0	2.095
180	5/17/2006 12:00	1.040	0.757	2.247	107.0	2.098
181	5/17/2006 12:01	1.047	0.768	2.247	108.0	2.096
182	5/17/2006 12:02	1.053	0.780	2.246	109.0	2.094
183	5/17/2006 12:03	1.060	0.788	2.249	110.0	2.095
184	5/17/2006 12:04	1.067	0.797	2.252	111.0	2.098
185	5/17/2006 12:05	1.073	0.805	2.255	112.0	2.099
186	5/17/2006 12:06	1.080	0.813	2.253	113.0	2.096
187	5/17/2006 12:07	1.085	0.822	2.253	114.0	2.095
188	5/17/2006 12:08	1.090	0.830	2.253	115.0	2.094
189	5/17/2006 12:09	1.095	0.838	2.251	116.0	2.091
190	5/17/2006 12:10	1.100	0.847	2.257	117.0	2.096
191	5/17/2006 12:11	1.105	0.855	2.257	118.0	2.095
192	5/17/2006 12:12	1.110	0.863	2.258	119.0	2.095
193	5/17/2006 12:13	1.117	0.872	2.258	120.0	2.094
194	5/17/2006 12:14	1.123	0.880	2.259	121.0	2.093
195	5/17/2006 12:15	1.130	0.888	2.261	122.0	2.095
196	5/17/2006 12:16	1.137	0.897	2.262	123.0	2.094

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
197	5/17/2006 12:17	1.143	0.905	2.266	124.0	2.097
198	5/17/2006 12:18	1.150	0.913	2.267	125.0	2.097
199	5/17/2006 12:19	1.155	0.922	2.267	126.0	2.096
200	5/17/2006 12:20	1.160	0.930	2.268	127.0	2.095
201	5/17/2006 12:21	1.165	0.940	2.269	128.0	2.095
202	5/17/2006 12:22	1.170	0.950	2.269	129.0	2.093
203	5/17/2006 12:23	1.175	0.960	2.270	130.0	2.094
204	5/17/2006 12:24	1.180	0.970	2.272	131.0	2.094
205	5/17/2006 12:25	1.185	0.980	2.265	132.0	2.086
206	5/17/2006 12:26	1.190	0.990	2.262	133.0	2.081
207	5/17/2006 12:27	1.195	0.998	2.261	134.0	2.079
208	5/17/2006 12:28	1.200	1.007	2.262	135.0	2.079
209	5/17/2006 12:29	1.205	1.015	2.266	136.0	2.082
210	5/17/2006 12:30	1.210	1.023	2.266	137.0	2.081
211	5/17/2006 12:31	1.215	1.032	2.269	138.0	2.082
212	5/17/2006 12:32	1.220	1.040	2.269	139.0	2.082
213	5/17/2006 12:33	1.225	1.047	2.269	140.0	2.081
214	5/17/2006 12:34	1.230	1.053	2.269	141.0	2.080
215	5/17/2006 12:35	1.235	1.060	2.269	142.0	2.079
216	5/17/2006 12:36	1.240	1.067	2.272	143.0	2.081
217	5/17/2006 12:37	1.243	1.073	2.273	144.0	2.081
218	5/17/2006 12:38	1.247	1.080	2.271	145.0	2.078
219	5/17/2006 12:39	1.250	1.085	2.273	146.0	2.080
220	5/17/2006 12:40	1.253	1.090	2.275	147.0	2.081
221	5/17/2006 12:41	1.257	1.095	2.276	148.0	2.081
222	5/17/2006 12:42	1.260	1.100	2.276	149.0	2.080
223	5/17/2006 12:43	1.263	1.105	2.276	150.0	2.080
224	5/17/2006 12:44	1.267	1.110	2.278	151.0	2.081
225	5/17/2006 12:45	1.270	1.117	2.278	152.0	2.081
226	5/17/2006 12:46	1.273	1.123	2.277	153.0	2.078
227	5/17/2006 12:47	1.277	1.130	2.279	154.0	2.079
228	5/17/2006 12:48	1.280	1.137	2.279	155.0	2.079
229	5/17/2006 12:49	1.282	1.143	2.282	156.0	2.081
230	5/17/2006 12:50	1.283	1.150	2.284	157.0	2.082
231	5/17/2006 12:51	1.285	1.155	2.283	158.0	2.080
232	5/17/2006 12:52	1.287	1.160	2.283	159.0	2.079
233	5/17/2006 12:53	1.288	1.165	2.281	160.0	2.077
234	5/17/2006 12:54	1.290	1.170	2.283	161.0	2.078
235	5/17/2006 12:55	1.292	1.175	2.281	162.0	2.076
236	5/17/2006 12:56	1.293	1.180	2.280	163.0	2.074
237	5/17/2006 12:57	1.295	1.185	2.284	164.0	2.077
238	5/17/2006 12:58	1.297	1.190	2.284	165.0	2.076
239	5/17/2006 12:59	1.298	1.195	2.284	166.0	2.076
240	5/17/2006 13:00	1.300	1.200	2.286	167.0	2.077
241	5/17/2006 13:01	1.300	1.205	2.284	168.0	2.075
242	5/17/2006 13:02	1.300	1.210	2.285	169.0	2.074
243	5/17/2006 13:03	1.300	1.215	2.287	170.0	2.076
244	5/17/2006 13:04	1.300	1.220	2.288	171.0	2.077
245	5/17/2006 13:05	1.300	1.225	2.288	172.0	2.076

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
246	5/17/2006 13:06	1.300	1.230	2.290	173.0	2.078
247	5/17/2006 13:07	1.302	1.235	2.289	174.0	2.075
248	5/17/2006 13:08	1.303	1.240	2.289	175.0	2.075
249	5/17/2006 13:09	1.305	1.243	2.288	176.0	2.073
250	5/17/2006 13:10	1.307	1.247	2.291	177.0	2.076
251	5/17/2006 13:11	1.308	1.250	2.292	178.0	2.077
252	5/17/2006 13:12	1.310	1.253	2.290	179.0	2.074
253	5/17/2006 13:13	1.310	1.257	2.288	180.0	2.071
254	5/17/2006 13:14	1.310	1.260	2.290	181.0	2.073
255	5/17/2006 13:15	1.310	1.263	2.288	182.0	2.071
256	5/17/2006 13:16	1.310	1.267	2.290	183.0	2.073
257	5/17/2006 13:17	1.310	1.270	2.289	184.0	2.070
258	5/17/2006 13:18	1.310	1.273	2.292	185.0	2.073
259	5/17/2006 13:19	1.308	1.277	2.287	186.0	2.068
260	5/17/2006 13:20	1.307	1.280	2.290	187.0	2.071
261	5/17/2006 13:21	1.305	1.282	2.287	188.0	2.067
262	5/17/2006 13:22	1.303	1.283	2.290	189.0	2.070
263	5/17/2006 13:23	1.302	1.285	2.290	190.0	2.069
264	5/17/2006 13:24	1.300	1.287	2.290	191.0	2.069
265	5/17/2006 13:25	1.297	1.288	2.285	192.0	2.065
266	5/17/2006 13:26	1.293	1.290	2.288	193.0	2.067
267	5/17/2006 13:27	1.290	1.292	2.287	194.0	2.066
268	5/17/2006 13:28	1.287	1.293	2.284	195.0	2.062
269	5/17/2006 13:29	1.283	1.295	2.305	196.0	2.084
270	5/17/2006 13:30	1.280	1.297	2.304	197.0	2.082
271	5/17/2006 13:31	1.277	1.298	2.307	198.0	2.085
272	5/17/2006 13:32	1.273	1.300	2.305	199.0	2.082
273	5/17/2006 13:33	1.270	1.300	2.304	200.0	2.082
274	5/17/2006 13:34	1.267	1.300	2.302	201.0	2.079
275	5/17/2006 13:35	1.263	1.300	2.296	202.0	2.074
276	5/17/2006 13:36	1.260	1.300	2.299	203.0	2.076
277	5/17/2006 13:37	1.255	1.300	2.296	204.0	2.074
278	5/17/2006 13:38	1.250	1.300	2.293	205.0	2.070
279	5/17/2006 13:39	1.245	1.302	2.295	206.0	2.072
280	5/17/2006 13:40	1.240	1.303	2.297	207.0	2.074
281	5/17/2006 13:41	1.235	1.305	2.295	208.0	2.072
282	5/17/2006 13:42	1.230	1.307	2.295	209.0	2.071
283	5/17/2006 13:43	1.228	1.308	2.294	210.0	2.071
284	5/17/2006 13:44	1.227	1.310	2.291	211.0	2.068
285	5/17/2006 13:45	1.225	1.310	2.286	212.0	2.062
286	5/17/2006 13:46	1.223	1.310	2.285	213.0	2.062
287	5/17/2006 13:47	1.222	1.310	2.283	214.0	2.059
288	5/17/2006 13:48	1.220	1.310	2.283	215.0	2.060
289	5/17/2006 13:49	1.213	1.310	2.283	216.0	2.059
290	5/17/2006 13:50	1.207	1.310	2.281	217.0	2.058
291	5/17/2006 13:51	1.200	1.308	2.281	218.0	2.057
292	5/17/2006 13:52	1.193	1.307	2.280	219.0	2.057
293	5/17/2006 13:53	1.187	1.305	2.279	220.0	2.056
294	5/17/2006 13:54	1.180	1.303	2.280	221.0	2.057

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
295	5/17/2006 13:55	1.175	1.302	2.276	222.0	2.053
296	5/17/2006 13:56	1.170	1.300	2.271	223.0	2.049
297	5/17/2006 13:57	1.165	1.297	2.272	224.0	2.050
298	5/17/2006 13:58	1.160	1.293	2.271	225.0	2.050
299	5/17/2006 13:59	1.155	1.290	2.272	226.0	2.051
300	5/17/2006 14:00	1.150	1.287	2.271	227.0	2.050
301	5/17/2006 14:01	1.145	1.283	2.269	228.0	2.049
302	5/17/2006 14:02	1.140	1.280	2.270	229.0	2.050
303	5/17/2006 14:03	1.135	1.277	2.267	230.0	2.048
304	5/17/2006 14:04	1.130	1.273	2.264	231.0	2.045
305	5/17/2006 14:05	1.125	1.270	2.263	232.0	2.045
306	5/17/2006 14:06	1.120	1.267	2.266	233.0	2.048
307	5/17/2006 14:07	1.112	1.263	2.262	234.0	2.045
308	5/17/2006 14:08	1.103	1.260	2.260	235.0	2.043
309	5/17/2006 14:09	1.095	1.255	2.260	236.0	2.044
310	5/17/2006 14:10	1.087	1.250	2.256	237.0	2.040
311	5/17/2006 14:11	1.078	1.245	2.252	238.0	2.037
312	5/17/2006 14:12	1.070	1.240	2.252	239.0	2.037
313	5/17/2006 14:13	1.063	1.235	2.251	240.0	2.038
314	5/17/2006 14:14	1.057	1.230	2.249	241.0	2.036
315	5/17/2006 14:15	1.050	1.228	2.248	242.0	2.035
316	5/17/2006 14:16	1.043	1.227	2.247	243.0	2.034
317	5/17/2006 14:17	1.037	1.225	2.246	244.0	2.034
318	5/17/2006 14:18	1.030	1.223	2.246	245.0	2.034
319	5/17/2006 14:19	1.022	1.222	2.243	246.0	2.031
320	5/17/2006 14:20	1.013	1.220	2.240	247.0	2.029
321	5/17/2006 14:21	1.005	1.213	2.240	248.0	2.029
322	5/17/2006 14:22	0.997	1.207	2.235	249.0	2.026
323	5/17/2006 14:23	0.988	1.200	2.232	250.0	2.023
324	5/17/2006 14:24	0.980	1.193	2.231	251.0	2.023
325	5/17/2006 14:25	0.972	1.187	2.231	252.0	2.024
326	5/17/2006 14:26	0.963	1.180	2.230	253.0	2.024
327	5/17/2006 14:27	0.955	1.175	2.230	254.0	2.024
328	5/17/2006 14:28	0.947	1.170	2.224	255.0	2.019
329	5/17/2006 14:29	0.938	1.165	2.224	256.0	2.020
330	5/17/2006 14:30	0.930	1.160	2.224	257.0	2.021
331	5/17/2006 14:31	0.922	1.155	2.221	258.0	2.018
332	5/17/2006 14:32	0.913	1.150	2.220	259.0	2.018
333	5/17/2006 14:33	0.905	1.145	2.220	260.0	2.018
334	5/17/2006 14:34	0.897	1.140	2.221	261.0	2.020
335	5/17/2006 14:35	0.888	1.135	2.218	262.0	2.017
336	5/17/2006 14:36	0.880	1.130	2.220	263.0	2.021
337	5/17/2006 14:37	0.872	1.125	2.217	264.0	2.019
338	5/17/2006 14:38	0.863	1.120	2.217	265.0	2.019
339	5/17/2006 14:39	0.855	1.112	2.211	266.0	2.014
340	5/17/2006 14:40	0.847	1.103	2.211	267.0	2.015
341	5/17/2006 14:41	0.838	1.095	2.209	268.0	2.014
342	5/17/2006 14:42	0.830	1.087	2.211	269.0	2.018
343	5/17/2006 14:43	0.820	1.078	2.212	270.0	2.019

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
344	5/17/2006 14:44	0.810	1.070	2.210	271.0	2.018
345	5/17/2006 14:45	0.800	1.063	2.214	272.0	2.024
346	5/17/2006 14:46	0.790	1.057	2.209	273.0	2.020
347	5/17/2006 14:47	0.780	1.050	2.208	274.0	2.020
348	5/17/2006 14:48	0.770	1.043	2.209	275.0	2.021
349	5/17/2006 14:49	0.760	1.037	2.208	276.0	2.021
350	5/17/2006 14:50	0.750	1.030	2.206	277.0	2.020
351	5/17/2006 14:51	0.740	1.022	2.204	278.0	2.020
352	5/17/2006 14:52	0.730	1.013	2.206	279.0	2.022
353	5/17/2006 14:53	0.720	1.005	2.206	280.0	2.023
354	5/17/2006 14:54	0.710	0.997	2.203	281.0	2.022
355	5/17/2006 14:55	0.700	0.988	2.203	282.0	2.023
356	5/17/2006 14:56	0.690	0.980	2.200	283.0	2.021
357	5/17/2006 14:57	0.680	0.972	2.201	284.0	2.023
358	5/17/2006 14:58	0.670	0.963	2.201	285.0	2.024
359	5/17/2006 14:59	0.660	0.955	2.198	286.0	2.022
360	5/17/2006 15:00	0.650	0.947	2.196	287.0	2.022
361	5/17/2006 15:01	0.640	0.938	2.195	288.0	2.021
362	5/17/2006 15:02	0.630	0.930	2.193	289.0	2.020
363	5/17/2006 15:03	0.620	0.922	2.191	290.0	2.020
364	5/17/2006 15:04	0.610	0.913	2.189	291.0	2.019
365	5/17/2006 15:05	0.600	0.905	2.189	292.0	2.020
366	5/17/2006 15:06	0.590	0.897	2.188	293.0	2.020
367	5/17/2006 15:07	0.582	0.888	2.188	294.0	2.021
368	5/17/2006 15:08	0.573	0.880	2.188	295.0	2.023
369	5/17/2006 15:09	0.565	0.872	2.185	296.0	2.021
370	5/17/2006 15:10	0.557	0.863	2.184	297.0	2.020
371	5/17/2006 15:11	0.548	0.855	2.184	298.0	2.022
372	5/17/2006 15:12	0.540	0.847	2.181	299.0	2.020
373	5/17/2006 15:13	0.528	0.838	2.181	300.0	2.021
374	5/17/2006 15:14	0.517	0.830	2.180	301.0	2.021
375	5/17/2006 15:15	0.505	0.820	2.178	302.0	2.020
376	5/17/2006 15:16	0.493	0.810	2.178	303.0	2.022
377	5/17/2006 15:17	0.482	0.800	2.175	304.0	2.020
378	5/17/2006 15:18	0.470	0.790	2.175	305.0	2.022
379	5/17/2006 15:19	0.460	0.780	2.174	306.0	2.021
380	5/17/2006 15:20	0.450	0.770	2.172	307.0	2.021
381	5/17/2006 15:21	0.440	0.760	2.172	308.0	2.023
382	5/17/2006 15:22	0.430	0.750	2.168	309.0	2.020
383	5/17/2006 15:23	0.420	0.740	2.169	310.0	2.022
384	5/17/2006 15:24	0.410	0.730	2.167	311.0	2.021
385	5/17/2006 15:25	0.402	0.720	2.164	312.0	2.020
386	5/17/2006 15:26	0.393	0.710	2.164	313.0	2.021
387	5/17/2006 15:27	0.385	0.700	2.162	314.0	2.021
388	5/17/2006 15:28	0.377	0.690	2.161	315.0	2.021
389	5/17/2006 15:29	0.368	0.680	2.158	316.0	2.019
390	5/17/2006 15:30	0.360	0.670	2.156	317.0	2.019
391	5/17/2006 15:31	0.352	0.660	2.159	318.0	2.023
392	5/17/2006 15:32	0.343	0.650	2.156	319.0	2.021

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
393	5/17/2006 15:33	0.335	0.640	2.156	320.0	2.023
394	5/17/2006 15:34	0.327	0.630	2.154	321.0	2.022
395	5/17/2006 15:35	0.318	0.620	2.152	322.0	2.022
396	5/17/2006 15:36	0.310	0.610	2.147	323.0	2.018
397	5/17/2006 15:37	0.298	0.600	2.148	324.0	2.020
398	5/17/2006 15:38	0.287	0.590	2.148	325.0	2.021
399	5/17/2006 15:39	0.275	0.582	2.148	326.0	2.023
400	5/17/2006 15:40	0.263	0.573	2.143	327.0	2.019
401	5/17/2006 15:41	0.252	0.565	2.145	328.0	2.021
402	5/17/2006 15:42	0.240	0.557	2.144	329.0	2.022
403	5/17/2006 15:43	0.232	0.548	2.144	330.0	2.023
404	5/17/2006 15:44	0.223	0.540	2.142	331.0	2.022
405	5/17/2006 15:45	0.215	0.528	2.142	332.0	2.024
406	5/17/2006 15:46	0.207	0.517	2.135	333.0	2.018
407	5/17/2006 15:47	0.198	0.505	2.133	334.0	2.018
408	5/17/2006 15:48	0.190	0.493	2.130	335.0	2.017
409	5/17/2006 15:49	0.182	0.482	2.129	336.0	2.017
410	5/17/2006 15:50	0.173	0.470	2.128	337.0	2.017
411	5/17/2006 15:51	0.165	0.460	2.133	338.0	2.024
412	5/17/2006 15:52	0.157	0.450	2.130	339.0	2.022
413	5/17/2006 15:53	0.148	0.440	2.126	340.0	2.020
414	5/17/2006 15:54	0.140	0.430	2.126	341.0	2.021
415	5/17/2006 15:55	0.130	0.420	2.122	342.0	2.019
416	5/17/2006 15:56	0.120	0.410	2.122	343.0	2.020
417	5/17/2006 15:57	0.110	0.402	2.121	344.0	2.020
418	5/17/2006 15:58	0.100	0.393	2.119	345.0	2.019
419	5/17/2006 15:59	0.090	0.385	2.119	346.0	2.020
420	5/17/2006 16:00	0.080	0.377	2.116	347.0	2.018
421	5/17/2006 16:01	0.073	0.368	2.115	348.0	2.019
422	5/17/2006 16:02	0.067	0.360	2.112	349.0	2.017
423	5/17/2006 16:03	0.060	0.352	2.112	350.0	2.018
424	5/17/2006 16:04	0.053	0.343	2.114	351.0	2.021
425	5/17/2006 16:05	0.047	0.335	2.112	352.0	2.020
426	5/17/2006 16:06	0.040	0.327	2.107	353.0	2.016
427	5/17/2006 16:07	0.028	0.318	2.104	354.0	2.015
428	5/17/2006 16:08	0.017	0.310	2.105	355.0	2.017
429	5/17/2006 16:09	0.005	0.298	2.100	356.0	2.013
430	5/17/2006 16:10	-0.007	0.287	2.096	357.0	2.010
431	5/17/2006 16:11	-0.018	0.275	2.096	358.0	2.012
432	5/17/2006 16:12	-0.030	0.263	2.093	359.0	2.010
433	5/17/2006 16:13	-0.040	0.252	2.092	360.0	2.012
434	5/17/2006 16:14	-0.050	0.240	2.088	361.0	2.009
435	5/17/2006 16:15	-0.060	0.232	2.090	362.0	2.012
436	5/17/2006 16:16	-0.070	0.223	2.087	363.0	2.010
437	5/17/2006 16:17	-0.080	0.215	2.087	364.0	2.011
438	5/17/2006 16:18	-0.090	0.207	2.083	365.0	2.008
439	5/17/2006 16:19	-0.095	0.198	2.082	366.0	2.009
440	5/17/2006 16:20	-0.100	0.190	2.080	367.0	2.008
441	5/17/2006 16:21	-0.105	0.182	2.077	368.0	2.006

	Time	Tide	Lagged Tide	MW01D Level	Elapsed Time	Corrected MW01D Level
442	5/17/2006 16:22	-0.110	0.173	2.077	369.0	2.007
443	5/17/2006 16:23	-0.115	0.165	2.077	370.0	2.008
444	5/17/2006 16:24	-0.120	0.157	2.076	371.0	2.007
445	5/17/2006 16:25	-0.130	0.148	2.072	372.0	2.006
446	5/17/2006 16:26	-0.140	0.140	2.068	373.0	2.002
447	5/17/2006 16:27	-0.150	0.130	2.070	374.0	2.006
448	5/17/2006 16:28	-0.160	0.120	2.070	375.0	2.007
449	5/17/2006 16:29	-0.170	0.110	2.065	376.0	2.003
450	5/17/2006 16:30	-0.180	0.100	2.065	377.0	2.004
451	5/17/2006 16:31	-0.190	0.090	2.063	378.0	2.004
452	5/17/2006 16:32	-0.200	0.080	2.063	379.0	2.006
453	5/17/2006 16:33	-0.210	0.073	2.060	380.0	2.003
454	5/17/2006 16:34	-0.220	0.067	2.067	381.0	2.011
455	5/17/2006 16:35	-0.230	0.060	2.058	382.0	2.003
456	5/17/2006 16:36	-0.240	0.053	2.056	383.0	2.002
457	5/17/2006 16:37	-0.248	0.047	2.056	384.0	2.003
458	5/17/2006 16:38	-0.257	0.040	2.054	385.0	2.002
459	5/17/2006 16:39	-0.265				
460	5/17/2006 16:40	-0.273				
461	5/17/2006 16:41	-0.282				
462	5/17/2006 16:42	-0.290				
463	5/17/2006 16:43	-0.300				
464	5/17/2006 16:44	-0.310				
465	5/17/2006 16:45	-0.320				
466	5/17/2006 16:46	-0.330				
467	5/17/2006 16:47	-0.340				
468	5/17/2006 16:48	-0.350				
469	5/17/2006 16:49	-0.360				
470	5/17/2006 16:50	-0.370				
471	5/17/2006 16:51	-0.380				
472	5/17/2006 16:52	-0.390				
473	5/17/2006 16:53	-0.400				
474	5/17/2006 16:54	-0.410				
475	5/17/2006 16:55	-0.422				
476	5/17/2006 16:56	-0.433				
477	5/17/2006 16:57	-0.445				
478	5/17/2006 16:58	-0.457				

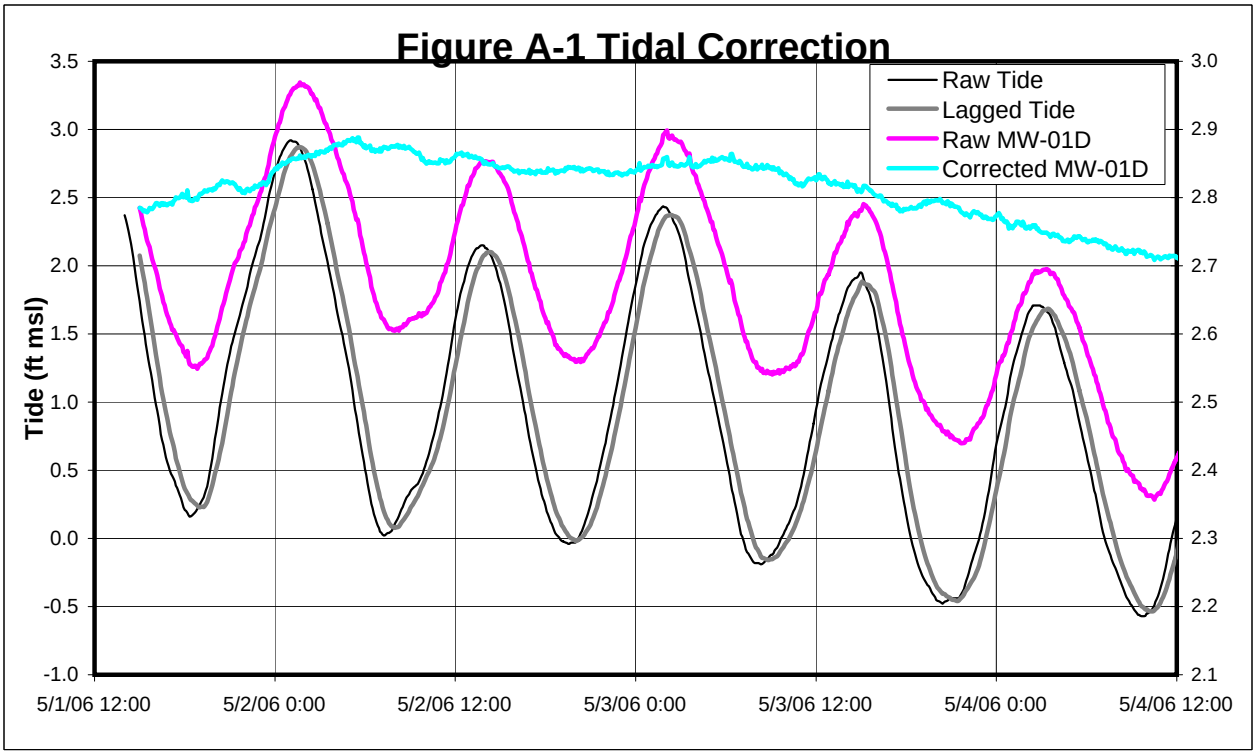


Figure A-1 Tidal Correction
Raw Tide
Lagged Tide
Raw MW-01D
Corrected MW-01D
Tide (ft msl)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
5/1/06 12:00
5/2/06 0:00
5/2/06 12:00
5/3/06 0:00
5/3/06 12:00
5/4/06 0:00
5/4/06 12:00

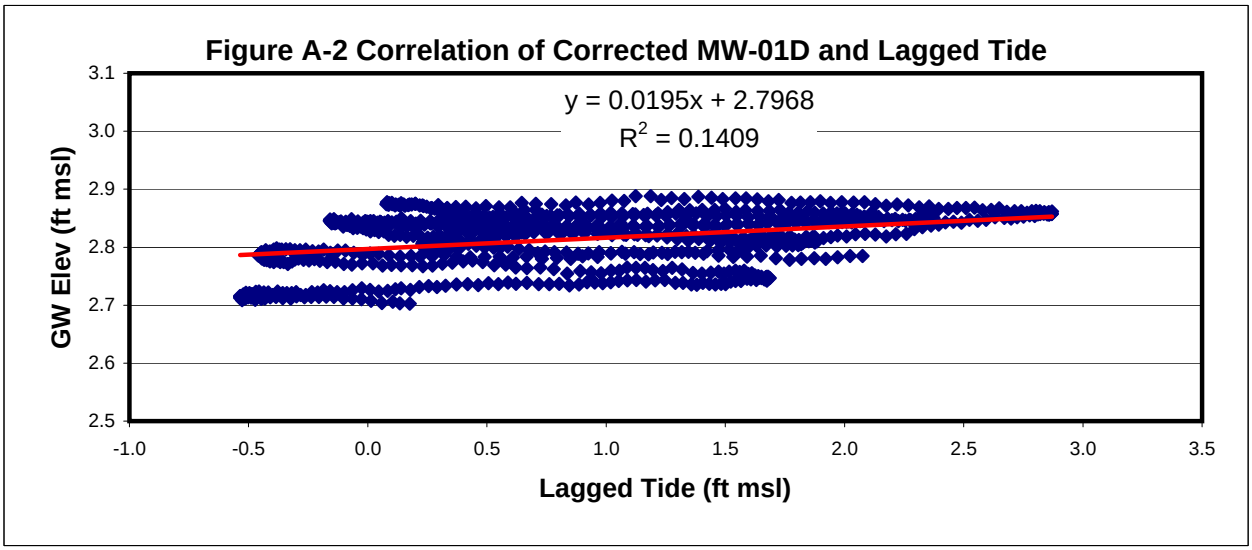


Figure A-2 Correlation of Corrected MW-01D and Lagged Tide
y = 0.0195x + 2.7968
R2 = 0.1409
GW Elev (ft msl)
3.1
3.0
2.9
2.8
2.7
2.6
2.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Lagged Tide (ft msl)

Attachment B: Pump Test Results and Analysis

The data from the aquifer pumping test is provided in Table B-1 and the manual water level measurements and flowrates collected are provided in Table B-2. The time-drawdown data from the deep aquifer observation well SJS02-MW01D was analyzed to provide estimates of the deep aquifer properties. The analysis was conducted using commercially available software (Aqtesolv) and the Hantush-Jacob Leaky Aquifer Method and is shown on Figure B-1. The results show an estimated transmissivity of 1,521 ft^2/day and a storage coefficient of 3.4×10^{-4}. These values are consistent with regional information for the deep aquifer (Harsh and Laczniak, 1990). The time-water level curve is provided as Figure B-2.

Table B-1
Aquifer Pumping Test Data

In-Situ Inc.	MiniTroll Pro
Report generated:	5/26/2006 11:39:18
Report from file:	\\Ariadne\Proj\CLEANII\BASES\St. Juliens\Site 2\ERI\Deep Groundwater Tech Memo\Pump Test Data\Test Data\SN13796 2006-05-17 100437 mw01d051706.bin
DataMgr Version	3.71
Serial number:	13796
Firmware Version	3.09
Unit name:	
Test name:	mw01d
Test defined on:	5/17/2006 10:04:24
Test started on:	5/17/2006 10:04:37
Test stopped on:	N/A N/A
Test extracted on: N/A	

Data gathered using Linear testing

Time between data points:	1.0000	Minutes.
Number of data samples:	395	

TOTAL DATA SAMPLES 395

Channel number [1]

Measurement type:	Temperature
Channel name:	OnBoard Temp

Channel number [2]

Measurement type:	Pressure	
Channel name:	Head	
Sensor Range:	30 PSI.	
Specific gravity:	1	
Mode:	TOC	
User-defined reference:	0	Feet H2O
Referenced on:	channel definition.	
Pressure head at reference:	14.781	Feet H2O

Manual Water Levels

Time	Level
0.0	2.27
23.0	2.19
85.0	2.22
130.0	2.27
191.0	2.29
263.0	2.22
339.0	2.13
380.0	2.06

Table B-1
Aquifer Pumping Test Data

Date	Time	ET (min)		Chan[1] Fahrenheit	Chan[2] Feet H2O	Test Time	Logged Water Level (ft msl)	Manual Water Level (ft msl)	Corrected Water Levels (ft msl)
5/17/2006	10:05		1	59.58	-0.001				
5/17/2006	10:06		2	59.56	-0.001				
5/17/2006	10:07		3	59.49	-0.002				
5/17/2006	10:08		4	59.56	-0.001				
5/17/2006	10:09		5	59.51	0.001				
5/17/2006	10:10		6	59.51	0.001				
5/17/2006	10:11		7	59.46	0				
5/17/2006	10:12		8	59.42	0				
5/17/2006	10:13		9	59.4	0	0.0	2.27	2.27	2.270
5/17/2006	10:14		10	59.4	-0.003	1.0	2.273		2.273
5/17/2006	10:15		11	59.46	-0.002	2.0	2.272		2.272
5/17/2006	10:16		12	59.46	0.005	3.0	2.265		2.266
5/17/2006	10:17		13	59.46	0.017	4.0	2.253		2.254
5/17/2006	10:18		14	59.49	0.027	5.0	2.243		2.244
5/17/2006	10:19		15	59.49	0.037	6.0	2.233		2.234
5/17/2006	10:20		16	59.46	0.046	7.0	2.224		2.226
5/17/2006	10:21		17	59.42	0.053	8.0	2.217		2.219
5/17/2006	10:22		18	59.46	0.058	9.0	2.212		2.214
5/17/2006	10:23		19	59.49	0.061	10.0	2.209		2.211
5/17/2006	10:24		20	59.56	0.064	11.0	2.206		2.208
5/17/2006	10:25		21	59.58	0.069	12.0	2.201		2.204
5/17/2006	10:26		22	59.58	0.071	13.0	2.199		2.202
5/17/2006	10:27		23	59.56	0.076	14.0	2.194		2.197
5/17/2006	10:28		24	59.44	0.08	15.0	2.19		2.193
5/17/2006	10:29		25	59.44	0.082	16.0	2.188		2.191
5/17/2006	10:30		26	59.44	0.084	17.0	2.186		2.190
5/17/2006	10:31		27	59.35	0.088	18.0	2.182		2.186
5/17/2006	10:32		28	59.4	0.089	19.0	2.181		2.185
5/17/2006	10:33		29	59.4	0.091	20.0	2.179		2.183
5/17/2006	10:34		30	59.42	0.091	21.0	2.179		2.184
5/17/2006	10:35		31	59.42	0.091	22.0	2.179		2.184
5/17/2006	10:36		32	59.49	0.085	23.0	2.185	2.19	2.190
5/17/2006	10:37		33	59.49	0.087	24.0	2.183		2.188
5/17/2006	10:38		34	59.46	0.089	25.0	2.181		2.186
5/17/2006	10:39		35	59.49	0.09	26.0	2.18		2.186
5/17/2006	10:40		36	59.53	0.09	27.0	2.18		2.186
5/17/2006	10:41		37	59.53	0.09	28.0	2.18		2.186
5/17/2006	10:42		38	59.51	0.092	29.0	2.178		2.184
5/17/2006	10:43		39	59.46	0.094	30.0	2.176		2.182
5/17/2006	10:44		40	59.44	0.094	31.0	2.176		2.183
5/17/2006	10:45		41	59.4	0.093	32.0	2.177		2.184
5/17/2006	10:46		42	59.42	0.094	33.0	2.176		2.183
5/17/2006	10:47		43	59.44	0.092	34.0	2.178		2.185
5/17/2006	10:48		44	59.42	0.094	35.0	2.176		2.184
5/17/2006	10:49		45	59.44	0.092	36.0	2.178		2.186
5/17/2006	10:50		46	59.46	0.089	37.0	2.181		2.189
5/17/2006	10:51		47	59.44	0.092	38.0	2.178		2.186
5/17/2006	10:52		48	59.4	0.091	39.0	2.179		2.187
5/17/2006	10:53		49	59.37	0.093	40.0	2.177		2.186
5/17/2006	10:54		50	59.4	0.091	41.0	2.179		2.188
5/17/2006	10:55		51	59.4	0.093	42.0	2.177		2.186
5/17/2006	10:56		52	59.4	0.091	43.0	2.179		2.188
5/17/2006	10:57		53	59.42	0.091	44.0	2.179		2.188
5/17/2006	10:58		54	59.35	0.093	45.0	2.177		2.187
5/17/2006	10:59		55	59.37	0.088	46.0	2.182		2.192
5/17/2006	11:00		56	59.35	0.091	47.0	2.179		2.189
5/17/2006	11:01		57	59.35	0.091	48.0	2.179		2.189
5/17/2006	11:02		58	59.4	0.089	49.0	2.181		2.191
5/17/2006	11:03		59	59.4	0.089	50.0	2.181		2.192
5/17/2006	11:04		60	59.42	0.089	51.0	2.181		2.192
5/17/2006	11:05		61	59.37	0.088	52.0	2.182		2.193

Table B-1
Aquifer Pumping Test Data

Date	Time	ET (min)		Chan[1] Fahrenheit	Chan[2] Feet H2O	Test Time	Logged Water Level (ft msl)	Manual Water Level (ft msl)	Corrected Water Levels (ft msl)
5/17/2006	11:06		62	59.42	0.084	53.0	2.186		2.197
5/17/2006	11:07		63	59.42	0.084	54.0	2.186		2.198
5/17/2006	11:08		64	59.44	0.084	55.0	2.186		2.198
5/17/2006	11:09		65	59.46	0.082	56.0	2.188		2.200
5/17/2006	11:10		66	59.46	0.085	57.0	2.185		2.197
5/17/2006	11:11		67	59.46	0.082	58.0	2.188		2.200
5/17/2006	11:12		68	59.46	0.085	59.0	2.185		2.198
5/17/2006	11:13		69	59.42	0.082	60.0	2.188		2.201
5/17/2006	11:14		70	59.4	0.084	61.0	2.186		2.199
5/17/2006	11:15		71	59.4	0.081	62.0	2.189		2.202
5/17/2006	11:16		72	59.42	0.082	63.0	2.188		2.201
5/17/2006	11:17		73	59.46	0.077	64.0	2.193		2.207
5/17/2006	11:18		74	59.51	0.078	65.0	2.192		2.206
5/17/2006	11:19		75	59.53	0.076	66.0	2.194		2.208
5/17/2006	11:20		76	59.53	0.073	67.0	2.197		2.211
5/17/2006	11:21		77	59.51	0.075	68.0	2.195		2.209
5/17/2006	11:22		78	59.42	0.077	69.0	2.193		2.208
5/17/2006	11:23		79	59.37	0.079	70.0	2.191		2.206
5/17/2006	11:24		80	59.35	0.079	71.0	2.191		2.206
5/17/2006	11:25		81	59.31	0.078	72.0	2.192		2.207
5/17/2006	11:26		82	59.35	0.074	73.0	2.196		2.211
5/17/2006	11:27		83	59.37	0.074	74.0	2.196		2.212
5/17/2006	11:28		84	59.28	0.075	75.0	2.195		2.211
5/17/2006	11:29		85	59.33	0.076	76.0	2.194		2.210
5/17/2006	11:30		86	59.26	0.075	77.0	2.195		2.211
5/17/2006	11:31		87	59.31	0.071	78.0	2.199		2.216
5/17/2006	11:32		88	59.31	0.071	79.0	2.199		2.216
5/17/2006	11:33		89	59.33	0.069	80.0	2.201		2.218
5/17/2006	11:34		90	59.33	0.066	81.0	2.204		2.221
5/17/2006	11:35		91	59.33	0.066	82.0	2.204		2.221
5/17/2006	11:36		92	59.4	0.065	83.0	2.205		2.223
5/17/2006	11:37		93	59.42	0.06	84.0	2.21		2.228
5/17/2006	11:38		94	59.46	0.068	85.0	2.202	2.22	2.220
5/17/2006	11:39		95	59.49	0.066	86.0	2.204		2.222
5/17/2006	11:40		96	59.49	0.066	87.0	2.204		2.223
5/17/2006	11:41		97	59.51	0.063	88.0	2.207		2.226
5/17/2006	11:42		98	59.51	0.063	89.0	2.207		2.227
5/17/2006	11:43		99	59.46	0.065	90.0	2.205		2.225
5/17/2006	11:44		100	59.46	0.063	91.0	2.207		2.228
5/17/2006	11:45		101	59.46	0.065	92.0	2.205		2.226
5/17/2006	11:46		102	59.44	0.063	93.0	2.207		2.229
5/17/2006	11:47		103	59.44	0.065	94.0	2.205		2.227
5/17/2006	11:48		104	59.44	0.063	95.0	2.207		2.230
5/17/2006	11:49		105	59.42	0.065	96.0	2.205		2.228
5/17/2006	11:50		106	59.42	0.062	97.0	2.208		2.232
5/17/2006	11:51		107	59.46	0.061	98.0	2.209		2.233
5/17/2006	11:52		108	59.49	0.058	99.0	2.212		2.237
5/17/2006	11:53		109	59.51	0.061	100.0	2.209		2.234
5/17/2006	11:54		110	59.46	0.061	101.0	2.209		2.234
5/17/2006	11:55		111	59.42	0.06	102.0	2.21		2.236
5/17/2006	11:56		112	59.49	0.056	103.0	2.214		2.240
5/17/2006	11:57		113	59.46	0.056	104.0	2.214		2.241
5/17/2006	11:58		114	59.46	0.053	105.0	2.217		2.244
5/17/2006	11:59		115	59.44	0.055	106.0	2.215		2.243
5/17/2006	12:00		116	59.51	0.051	107.0	2.219		2.247
5/17/2006	12:01		117	59.53	0.052	108.0	2.218		2.247
5/17/2006	12:02		118	59.46	0.053	109.0	2.217		2.246
5/17/2006	12:03		119	59.46	0.051	110.0	2.219		2.249
5/17/2006	12:04		120	59.46	0.048	111.0	2.222		2.252
5/17/2006	12:05		121	59.49	0.046	112.0	2.224		2.255
5/17/2006	12:06		122	59.46	0.048	113.0	2.222		2.253

Table B-1
Aquifer Pumping Test Data

Date	Time	ET (min)		Chan[1] Fahrenheit	Chan[2] Feet H2O	Test Time	Logged Water Level (ft msl)	Manual Water Level (ft msl)	Corrected Water Levels (ft msl)
5/17/2006	12:07		123	59.49	0.049	114.0	2.221		2.253
5/17/2006	12:08		124	59.51	0.049	115.0	2.221		2.253
5/17/2006	12:09		125	59.46	0.051	116.0	2.219		2.251
5/17/2006	12:10		126	59.46	0.046	117.0	2.224		2.257
5/17/2006	12:11		127	59.44	0.046	118.0	2.224		2.257
5/17/2006	12:12		128	59.46	0.046	119.0	2.224		2.258
5/17/2006	12:13		129	59.44	0.046	120.0	2.224		2.258
5/17/2006	12:14		130	59.42	0.046	121.0	2.224		2.259
5/17/2006	12:15		131	59.46	0.044	122.0	2.226		2.261
5/17/2006	12:16		132	59.46	0.044	123.0	2.226		2.262
5/17/2006	12:17		133	59.53	0.04	124.0	2.23		2.266
5/17/2006	12:18		134	59.53	0.04	125.0	2.23		2.267
5/17/2006	12:19		135	59.56	0.04	126.0	2.23		2.267
5/17/2006	12:20		136	59.53	0.04	127.0	2.23		2.268
5/17/2006	12:21		137	59.51	0.039	128.0	2.231		2.269
5/17/2006	12:22		138	59.53	0.04	129.0	2.23		2.269
5/17/2006	12:23		139	59.51	0.039	130.0	2.231	2.27	2.270
5/17/2006	12:24		140	59.49	0.037	131.0	2.233		2.272
5/17/2006	12:25		141	59.49	0.044	132.0	2.226		2.265
5/17/2006	12:26		142	59.46	0.048	133.0	2.222		2.262
5/17/2006	12:27		143	59.49	0.049	134.0	2.221		2.261
5/17/2006	12:28		144	59.46	0.048	135.0	2.222		2.262
5/17/2006	12:29		145	59.49	0.044	136.0	2.226		2.266
5/17/2006	12:30		146	59.49	0.044	137.0	2.226		2.266
5/17/2006	12:31		147	59.51	0.042	138.0	2.228		2.269
5/17/2006	12:32		148	59.53	0.042	139.0	2.228		2.269
5/17/2006	12:33		149	59.53	0.042	140.0	2.228		2.269
5/17/2006	12:34		150	59.51	0.042	141.0	2.228		2.269
5/17/2006	12:35		151	59.51	0.042	142.0	2.228		2.269
5/17/2006	12:36		152	59.53	0.04	143.0	2.23		2.272
5/17/2006	12:37		153	59.49	0.039	144.0	2.231		2.273
5/17/2006	12:38		154	59.44	0.041	145.0	2.229		2.271
5/17/2006	12:39		155	59.49	0.039	146.0	2.231		2.273
5/17/2006	12:40		156	59.51	0.037	147.0	2.233		2.275
5/17/2006	12:41		157	59.56	0.037	148.0	2.233		2.276
5/17/2006	12:42		158	59.56	0.037	149.0	2.233		2.276
5/17/2006	12:43		159	59.56	0.037	150.0	2.233		2.276
5/17/2006	12:44		160	59.56	0.035	151.0	2.235		2.278
5/17/2006	12:45		161	59.56	0.035	152.0	2.235		2.278
5/17/2006	12:46		162	59.53	0.037	153.0	2.233		2.277
5/17/2006	12:47		163	59.51	0.035	154.0	2.235		2.279
5/17/2006	12:48		164	59.51	0.035	155.0	2.235		2.279
5/17/2006	12:49		165	59.53	0.032	156.0	2.238		2.282
5/17/2006	12:50		166	59.53	0.03	157.0	2.24		2.284
5/17/2006	12:51		167	59.51	0.032	158.0	2.238		2.283
5/17/2006	12:52		168	59.51	0.032	159.0	2.238		2.283
5/17/2006	12:53		169	59.46	0.034	160.0	2.236		2.281
5/17/2006	12:54		170	59.49	0.032	161.0	2.238		2.283
5/17/2006	12:55		171	59.46	0.034	162.0	2.236		2.281
5/17/2006	12:56		172	59.51	0.035	163.0	2.235		2.280
5/17/2006	12:57		173	59.53	0.032	164.0	2.238		2.284
5/17/2006	12:58		174	59.53	0.032	165.0	2.238		2.284
5/17/2006	12:59		175	59.51	0.032	166.0	2.238		2.284
5/17/2006	13:00		176	59.51	0.03	167.0	2.24		2.286
5/17/2006	13:01		177	59.49	0.032	168.0	2.238		2.284
5/17/2006	13:02		178	59.53	0.032	169.0	2.238		2.285
5/17/2006	13:03		179	59.56	0.03	170.0	2.24		2.287
5/17/2006	13:04		180	59.62	0.029	171.0	2.241		2.288
5/17/2006	13:05		181	59.67	0.029	172.0	2.241		2.288
5/17/2006	13:06		182	59.69	0.027	173.0	2.243		2.290
5/17/2006	13:07		183	59.67	0.029	174.0	2.241		2.289

Table B-1
Aquifer Pumping Test Data

Date	Time	ET (min)		Chan[1] Fahrenheit	Chan[2] Feet H2O	Test Time	Logged Water Level (ft msl)	Manual Water Level (ft msl)	Corrected Water Levels (ft msl)
5/17/2006	13:08		184	59.69	0.029	175.0	2.241		2.289
5/17/2006	13:09		185	59.71	0.03	176.0	2.24		2.288
5/17/2006	13:10		186	59.69	0.027	177.0	2.243		2.291
5/17/2006	13:11		187	59.65	0.026	178.0	2.244		2.292
5/17/2006	13:12		188	59.65	0.029	179.0	2.241		2.290
5/17/2006	13:13		189	59.62	0.031	180.0	2.239		2.288
5/17/2006	13:14		190	59.62	0.029	181.0	2.241		2.290
5/17/2006	13:15		191	59.62	0.031	182.0	2.239		2.288
5/17/2006	13:16		192	59.65	0.029	183.0	2.241		2.290
5/17/2006	13:17		193	59.62	0.031	184.0	2.239		2.289
5/17/2006	13:18		194	59.6	0.028	185.0	2.242		2.292
5/17/2006	13:19		195	59.58	0.033	186.0	2.237		2.287
5/17/2006	13:20		196	59.56	0.03	187.0	2.24		2.290
5/17/2006	13:21		197	59.58	0.033	188.0	2.237		2.287
5/17/2006	13:22		198	59.58	0.031	189.0	2.239		2.290
5/17/2006	13:23		199	59.62	0.031	190.0	2.239		2.290
5/17/2006	13:24		200	59.6	0.031	191.0	2.239	2.29	2.290
5/17/2006	13:25		201	59.53	0.035	192.0	2.235		2.285
5/17/2006	13:26		202	59.51	0.032	193.0	2.238		2.288
5/17/2006	13:27		203	59.51	0.032	194.0	2.238		2.287
5/17/2006	13:28		204	59.53	0.035	195.0	2.235		2.284
5/17/2006	13:29		205	59.53	0.013	196.0	2.257		2.305
5/17/2006	13:30		206	59.6	0.014	197.0	2.256		2.304
5/17/2006	13:31		207	59.65	0.01	198.0	2.26		2.307
5/17/2006	13:32		208	59.67	0.012	199.0	2.258		2.305
5/17/2006	13:33		209	59.67	0.012	200.0	2.258		2.304
5/17/2006	13:34		210	59.65	0.014	201.0	2.256		2.302
5/17/2006	13:35		211	59.6	0.019	202.0	2.251		2.296
5/17/2006	13:36		212	59.6	0.016	203.0	2.254		2.299
5/17/2006	13:37		213	59.56	0.018	204.0	2.252		2.296
5/17/2006	13:38		214	59.56	0.021	205.0	2.249		2.293
5/17/2006	13:39		215	59.58	0.018	206.0	2.252		2.295
5/17/2006	13:40		216	59.6	0.016	207.0	2.254		2.297
5/17/2006	13:41		217	59.62	0.017	208.0	2.253		2.295
5/17/2006	13:42		218	59.65	0.017	209.0	2.253		2.295
5/17/2006	13:43		219	59.65	0.017	210.0	2.253		2.294
5/17/2006	13:44		220	59.62	0.019	211.0	2.251		2.291
5/17/2006	13:45		221	59.6	0.024	212.0	2.246		2.286
5/17/2006	13:46		222	59.6	0.024	213.0	2.246		2.285
5/17/2006	13:47		223	59.58	0.026	214.0	2.244		2.283
5/17/2006	13:48		224	59.53	0.025	215.0	2.245		2.283
5/17/2006	13:49		225	59.56	0.025	216.0	2.245		2.283
5/17/2006	13:50		226	59.58	0.026	217.0	2.244		2.281
5/17/2006	13:51		227	59.6	0.026	218.0	2.244		2.281
5/17/2006	13:52		228	59.65	0.026	219.0	2.244		2.280
5/17/2006	13:53		229	59.67	0.027	220.0	2.243		2.279
5/17/2006	13:54		230	59.71	0.025	221.0	2.245		2.280
5/17/2006	13:55		231	59.65	0.029	222.0	2.241		2.276
5/17/2006	13:56		232	59.58	0.033	223.0	2.237		2.271
5/17/2006	13:57		233	59.53	0.032	224.0	2.238		2.272
5/17/2006	13:58		234	59.53	0.032	225.0	2.238		2.271
5/17/2006	13:59		235	59.6	0.031	226.0	2.239		2.272
5/17/2006	14:00		236	59.65	0.031	227.0	2.239		2.271
5/17/2006	14:01		237	59.67	0.032	228.0	2.238		2.269
5/17/2006	14:02		238	59.65	0.031	229.0	2.239		2.270
5/17/2006	14:03		239	59.6	0.033	230.0	2.237		2.267
5/17/2006	14:04		240	59.62	0.036	231.0	2.234		2.264
5/17/2006	14:05		241	59.62	0.036	232.0	2.234		2.263
5/17/2006	14:06		242	59.6	0.033	233.0	2.237		2.266
5/17/2006	14:07		243	59.6	0.036	234.0	2.234		2.262
5/17/2006	14:08		244	59.58	0.038	235.0	2.232		2.260

Table B-1
Aquifer Pumping Test Data

Date	Time	ET (min)		Chan[1] Fahrenheit	Chan[2] Feet H2O	Test Time	Logged Water Level (ft msl)	Manual Water Level (ft msl)	Corrected Water Levels (ft msl)
5/17/2006	14:09		245	59.53	0.037	236.0	2.233		2.260
5/17/2006	14:10		246	59.46	0.041	237.0	2.229		2.256
5/17/2006	14:11		247	59.49	0.044	238.0	2.226		2.252
5/17/2006	14:12		248	59.51	0.044	239.0	2.226		2.252
5/17/2006	14:13		249	59.46	0.044	240.0	2.226		2.251
5/17/2006	14:14		250	59.49	0.046	241.0	2.224		2.249
5/17/2006	14:15		251	59.49	0.046	242.0	2.224		2.248
5/17/2006	14:16		252	59.53	0.047	243.0	2.223		2.247
5/17/2006	14:17		253	59.51	0.047	244.0	2.223		2.246
5/17/2006	14:18		254	59.51	0.047	245.0	2.223		2.246
5/17/2006	14:19		255	59.49	0.049	246.0	2.221		2.243
5/17/2006	14:20		256	59.49	0.051	247.0	2.219		2.240
5/17/2006	14:21		257	59.46	0.051	248.0	2.219		2.240
5/17/2006	14:22		258	59.44	0.055	249.0	2.215		2.235
5/17/2006	14:23		259	59.44	0.058	250.0	2.212		2.232
5/17/2006	14:24		260	59.44	0.058	251.0	2.212		2.231
5/17/2006	14:25		261	59.46	0.058	252.0	2.212		2.231
5/17/2006	14:26		262	59.46	0.058	253.0	2.212		2.230
5/17/2006	14:27		263	59.46	0.058	254.0	2.212		2.230
5/17/2006	14:28		264	59.44	0.063	255.0	2.207		2.224
5/17/2006	14:29		265	59.44	0.063	256.0	2.207		2.224
5/17/2006	14:30		266	59.42	0.062	257.0	2.208		2.224
5/17/2006	14:31		267	59.44	0.065	258.0	2.205		2.221
5/17/2006	14:32		268	59.44	0.065	259.0	2.205		2.220
5/17/2006	14:33		269	59.46	0.065	260.0	2.205		2.220
5/17/2006	14:34		270	59.51	0.063	261.0	2.207		2.221
5/17/2006	14:35		271	59.49	0.066	262.0	2.204		2.218
5/17/2006	14:36		272	59.49	0.063	263.0	2.207	2.22	2.220
5/17/2006	14:37		273	59.49	0.066	264.0	2.204		2.217
5/17/2006	14:38		274	59.49	0.066	265.0	2.204		2.217
5/17/2006	14:39		275	59.46	0.073	266.0	2.197		2.211
5/17/2006	14:40		276	59.49	0.073	267.0	2.197		2.211
5/17/2006	14:41		277	59.49	0.075	268.0	2.195		2.209
5/17/2006	14:42		278	59.46	0.073	269.0	2.197		2.211
5/17/2006	14:43		279	59.49	0.073	270.0	2.197		2.212
5/17/2006	14:44		280	59.49	0.075	271.0	2.195		2.210
5/17/2006	14:45		281	59.53	0.071	272.0	2.199		2.214
5/17/2006	14:46		282	59.58	0.076	273.0	2.194		2.209
5/17/2006	14:47		283	59.62	0.077	274.0	2.193		2.208
5/17/2006	14:48		284	59.67	0.077	275.0	2.193		2.209
5/17/2006	14:49		285	59.69	0.078	276.0	2.192		2.208
5/17/2006	14:50		286	59.71	0.08	277.0	2.19		2.206
5/17/2006	14:51		287	59.69	0.082	278.0	2.188		2.204
5/17/2006	14:52		288	59.76	0.081	279.0	2.189		2.206
5/17/2006	14:53		289	59.81	0.081	280.0	2.189		2.206
5/17/2006	14:54		290	59.83	0.084	281.0	2.186		2.203
5/17/2006	14:55		291	59.85	0.084	282.0	2.186		2.203
5/17/2006	14:56		292	59.85	0.087	283.0	2.183		2.200
5/17/2006	14:57		293	59.85	0.087	284.0	2.183		2.201
5/17/2006	14:58		294	59.9	0.087	285.0	2.183		2.201
5/17/2006	14:59		295	59.92	0.09	286.0	2.18		2.198
5/17/2006	15:00		296	59.9	0.092	287.0	2.178		2.196
5/17/2006	15:01		297	59.9	0.094	288.0	2.176		2.195
5/17/2006	15:02		298	59.83	0.096	289.0	2.174		2.193
5/17/2006	15:03		299	59.81	0.098	290.0	2.172		2.191
5/17/2006	15:04		300	59.76	0.1	291.0	2.17		2.189
5/17/2006	15:05		301	59.74	0.1	292.0	2.17		2.189
5/17/2006	15:06		302	59.71	0.102	293.0	2.168		2.188
5/17/2006	15:07		303	59.74	0.102	294.0	2.168		2.188
5/17/2006	15:08		304	59.76	0.102	295.0	2.168		2.188
5/17/2006	15:09		305	59.76	0.105	296.0	2.165		2.185

Table B-1
Aquifer Pumping Test Data

Date	Time	ET (min)		Chan[1] Fahrenheit	Chan[2] Feet H2O	Test Time	Logged Water Level (ft msl)	Manual Water Level (ft msl)	Corrected Water Levels (ft msl)
5/17/2006	15:10		306	59.76	0.107	297.0	2.163		2.184
5/17/2006	15:11		307	59.76	0.107	298.0	2.163		2.184
5/17/2006	15:12		308	59.76	0.11	299.0	2.16		2.181
5/17/2006	15:13		309	59.76	0.11	300.0	2.16		2.181
5/17/2006	15:14		310	59.76	0.112	301.0	2.158		2.180
5/17/2006	15:15		311	59.71	0.114	302.0	2.156		2.178
5/17/2006	15:16		312	59.71	0.114	303.0	2.156		2.178
5/17/2006	15:17		313	59.74	0.117	304.0	2.153		2.175
5/17/2006	15:18		314	59.74	0.117	305.0	2.153		2.175
5/17/2006	15:19		315	59.74	0.119	306.0	2.151		2.174
5/17/2006	15:20		316	59.74	0.121	307.0	2.149		2.172
5/17/2006	15:21		317	59.71	0.121	308.0	2.149		2.172
5/17/2006	15:22		318	59.65	0.125	309.0	2.145		2.168
5/17/2006	15:23		319	59.65	0.125	310.0	2.145		2.169
5/17/2006	15:24		320	59.62	0.127	311.0	2.143		2.167
5/17/2006	15:25		321	59.62	0.13	312.0	2.14		2.164
5/17/2006	15:26		322	59.62	0.13	313.0	2.14		2.164
5/17/2006	15:27		323	59.6	0.132	314.0	2.138		2.162
5/17/2006	15:28		324	59.62	0.134	315.0	2.136		2.161
5/17/2006	15:29		325	59.6	0.137	316.0	2.133		2.158
5/17/2006	15:30		326	59.6	0.139	317.0	2.131		2.156
5/17/2006	15:31		327	59.58	0.136	318.0	2.134		2.159
5/17/2006	15:32		328	59.65	0.14	319.0	2.13		2.156
5/17/2006	15:33		329	59.67	0.14	320.0	2.13		2.156
5/17/2006	15:34		330	59.65	0.142	321.0	2.128		2.154
5/17/2006	15:35		331	59.62	0.144	322.0	2.126		2.152
5/17/2006	15:36		332	59.6	0.149	323.0	2.121		2.147
5/17/2006	15:37		333	59.62	0.149	324.0	2.121		2.148
5/17/2006	15:38		334	59.67	0.149	325.0	2.121		2.148
5/17/2006	15:39		335	59.67	0.149	326.0	2.121		2.148
5/17/2006	15:40		336	59.62	0.154	327.0	2.116		2.143
5/17/2006	15:41		337	59.6	0.153	328.0	2.117		2.145
5/17/2006	15:42		338	59.62	0.154	329.0	2.116		2.144
5/17/2006	15:43		339	59.62	0.154	330.0	2.116		2.144
5/17/2006	15:44		340	59.62	0.156	331.0	2.114		2.142
5/17/2006	15:45		341	59.6	0.156	332.0	2.114		2.142
5/17/2006	15:46		342	59.51	0.164	333.0	2.106		2.135
5/17/2006	15:47		343	59.46	0.166	334.0	2.104		2.133
5/17/2006	15:48		344	59.49	0.169	335.0	2.101		2.130
5/17/2006	15:49		345	59.53	0.17	336.0	2.1		2.129
5/17/2006	15:50		346	59.56	0.172	337.0	2.098		2.128
5/17/2006	15:51		347	59.53	0.167	338.0	2.103		2.133
5/17/2006	15:52		348	59.53	0.17	339.0	2.1	2.13	2.130
5/17/2006	15:53		349	59.49	0.174	340.0	2.096		2.126
5/17/2006	15:54		350	59.51	0.174	341.0	2.096		2.126
5/17/2006	15:55		351	59.56	0.177	342.0	2.093		2.122
5/17/2006	15:56		352	59.58	0.177	343.0	2.093		2.122
5/17/2006	15:57		353	59.6	0.178	344.0	2.092		2.121
5/17/2006	15:58		354	59.65	0.18	345.0	2.09		2.119
5/17/2006	15:59		355	59.65	0.18	346.0	2.09		2.119
5/17/2006	16:00		356	59.65	0.183	347.0	2.087		2.116
5/17/2006	16:01		357	59.67	0.183	348.0	2.087		2.115
5/17/2006	16:02		358	59.69	0.186	349.0	2.084		2.112
5/17/2006	16:03		359	59.71	0.186	350.0	2.084		2.112
5/17/2006	16:04		360	59.76	0.184	351.0	2.086		2.114
5/17/2006	16:05		361	59.74	0.186	352.0	2.084		2.112
5/17/2006	16:06		362	59.69	0.191	353.0	2.079		2.107
5/17/2006	16:07		363	59.67	0.193	354.0	2.077		2.104
5/17/2006	16:08		364	59.65	0.192	355.0	2.078		2.105
5/17/2006	16:09		365	59.6	0.197	356.0	2.073		2.100
5/17/2006	16:10		366	59.58	0.201	357.0	2.069		2.096

Table B-1
Aquifer Pumping Test Data

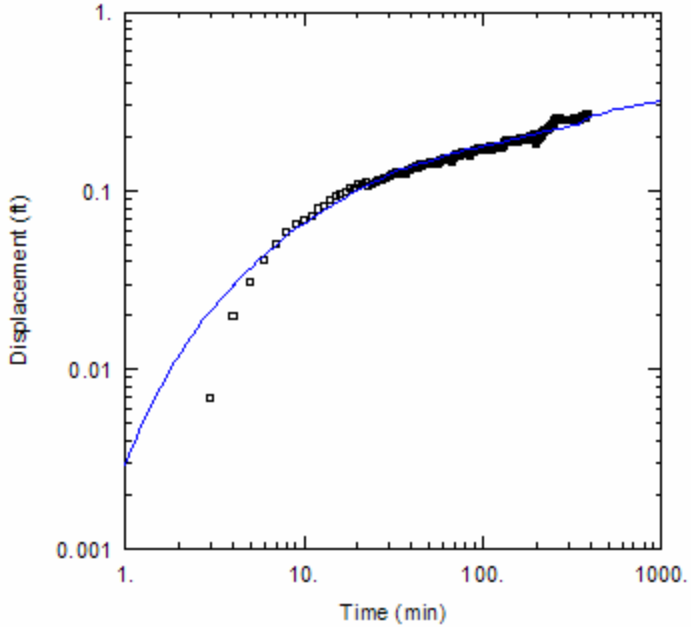
Date	Time	ET (min)		Chan[1] Fahrenheit	Chan[2] Feet H2O	Test Time	**Logged Water Level (ft msl)**	**Manual Water Level (ft msl)**	**Corrected Water Levels (ft msl)**
5/17/2006	16:11		367	59.58	0.201	358.0	2.069		2.096
5/17/2006	16:12		368	59.58	0.204	359.0	2.066		2.093
5/17/2006	16:13		369	59.58	0.204	360.0	2.066		2.092
5/17/2006	16:14		370	59.56	0.208	361.0	2.062		2.088
5/17/2006	16:15		371	59.6	0.206	362.0	2.064		2.090
5/17/2006	16:16		372	59.62	0.209	363.0	2.061		2.087
5/17/2006	16:17		373	59.6	0.209	364.0	2.061		2.087
5/17/2006	16:18		374	59.53	0.213	365.0	2.057		2.083
5/17/2006	16:19		375	59.53	0.213	366.0	2.057		2.082
5/17/2006	16:20		376	59.53	0.215	367.0	2.055		2.080
5/17/2006	16:21		377	59.53	0.218	368.0	2.052		2.077
5/17/2006	16:22		378	59.56	0.218	369.0	2.052		2.077
5/17/2006	16:23		379	59.6	0.218	370.0	2.052		2.077
5/17/2006	16:24		380	59.67	0.219	371.0	2.051		2.076
5/17/2006	16:25		381	59.67	0.222	372.0	2.048		2.072
5/17/2006	16:26		382	59.67	0.226	373.0	2.044		2.068
5/17/2006	16:27		383	59.67	0.224	374.0	2.046		2.070
5/17/2006	16:28		384	59.65	0.224	375.0	2.046		2.070
5/17/2006	16:29		385	59.69	0.229	376.0	2.041		2.065
5/17/2006	16:30		386	59.71	0.229	377.0	2.041		2.065
5/17/2006	16:31		387	59.76	0.23	378.0	2.04		2.063
5/17/2006	16:32		388	59.81	0.23	379.0	2.04		2.063
5/17/2006	16:33		389	59.81	0.233	380.0	2.037	2.06	2.060
5/17/2006	16:34		390	59.81	0.226	381.0	2.044		2.067
5/17/2006	16:35		391	59.78	0.235	382.0	2.035		2.058
5/17/2006	16:36		392	59.76	0.237	383.0	2.033		2.056
5/17/2006	16:37		393	59.76	0.237	384.0	2.033		2.056
5/17/2006	16:38		394	59.76	0.239	385.0	2.031		2.054

Table B-2
Manual Water Level Measurements and Flowrates
During Aquifer Pumping Test

Date	Time	Well ID	DTW	TOC Elevation	Water Table Elevation	Flow Rate (gal/min)
5/17/2006	822	MW10D	7.05	9.24	2.19	
	825	MW10S	7.63	9.18	1.55	
	856	MW12S	4.44	6.13	1.69	
	859	MW01D	5.71	7.94	2.23	
	902	MW02D	4.82	7.04	2.22	
	905	MW05D	6.61	8.66	2.05	
	957	MW10S	7.64	9.18	1.54	
	1000	MW12S	4.45	6.13	1.68	
	1002	MW01D	5.67	7.94	2.27	
	1006	MW10D	6.99	9.24	2.25	
	1013 Start of Pump Test					
	1015	MW10D	30.29	9.24	-21.05	4.8
	1017	MW10D	41.38	9.24	-32.14	5.2
	1028	MW10D	43.86	9.24	-34.62	5.5
	1036	MW01D	5.75	7.94	2.19	
	1039	MW02D	4.72	7.04	2.32	
	1041	MW05D	6.55	8.66	2.11	
	1047	MW12S	4.45	6.13	1.68	
	1048	MW10D	42.69	9.24	-33.45	5.2
	1049	MW10S	7.64	9.18	1.54	
	1134	MW10D	42.7	9.24	-33.46	5
	1136	MW12S	4.44	6.13	1.69	
	1138	MW01D	5.72	7.94	2.22	
	1208	MW02D	4.63	7.04	2.41	
	1212	MW05D	6.45	8.66	2.21	
	1220	MW10D	42.45	9.24	-33.21	5
	1223	MW01D	5.67	7.94	2.27	
	1226	MW02D	4.62	7.04	2.42	
	1229	MW05D	6.43	8.66	2.23	
	1234	MW12S	4.45	6.13	1.68	
	1235	MW10S	7.65	9.18	1.53	
	1320	MW10D	42.28	9.24	-33.04	5
	1322	MW12S	4.44	6.13	1.69	
	1324	MW01D	5.65	7.94	2.29	
	1331	MW02D	4.63	7.04	2.41	
	1335	MW05D	6.4	8.66	2.26	
	1339	MW10S	7.66	9.18	1.52	
	1433	MW10D	42.35	9.24	-33.11	5
	1434	MW12S	4.44	6.13	1.69	
	1436	MW01D	5.72	7.94	2.22	
	1442	MW02D	4.73	7.04	2.31	
	1445	MW05D	6.45	8.66	2.21	
	1450	MW10S	7.68	9.18	1.5	
	1546	MW10D	45	9.24	-35.76	5.5

Table B-2
Manual Water Level Measurements and Flowrates
During Aquifer Pumping Test

Date	Time	Well ID	DTW	TOC Elevation	Water Table Elevation	Flow Rate (gal/min)
	1549	MW12S	4.47	6.13	1.66	
	1552	MW01D	5.81	7.94	2.13	
	1557	MW05D	6.52	8.66	2.14	
	1559	MW02D	4.89	7.04	2.15	
	1602	MW10S	7.68	9.18	1.5	
	1627	MW10D	46.65	9.24	-37.41	5.6
	1631	MW12S	4.48	6.13	1.65	
	1633	MW01D	5.88	7.94	2.06	
	1635	MW02D	4.97	7.04	2.07	
	1638	MW05D	6.59	8.66	2.07	
	1646	MW10S	7.69	9.18	1.49	
	1747	MW10D	46.49	9.24	-37.25	5.6
	1751	MW12S	4.5	6.13	1.63	
	1753	MW01D	5.98	7.94	1.96	
	1757	MW02D	5.11	7.04	1.93	
	1800	MW05D	6.72	8.66	1.94	
	1804	MW10S	7.72	9.18	1.46	
	1826	MW10D	45.92	9.24	-36.68	5.6
	1826	MW12S	4.5	6.13	1.63	
	1828	MW01D	6.03	7.94	1.91	
	1831	MW02D	5.15	7.04	1.89	
	1834	MW05D	6.75	8.66	1.91	
	1839	MW10S	7.71	9.18	1.47	
	1845 Shut Pump off and begin recovery test					
	1848	MW10D	8.32	9.24	0.92	
	1849	MW10D	7.89	9.24	1.35	
	1850	MW10D	7.5	9.24	1.74	
	1851	MW10D	7.4	9.24	1.84	
	1852	MW10D	7.36	9.24	1.88	
	1853	MW10D	7.33	9.24	1.91	
	1854	MW10D	7.32	9.24	1.92	
	1855	MW10D	7.32	9.24	1.92	
	1856	MW10D	7.31	9.24	1.93	
	1857	MW10D	7.29	9.24	1.95	
	1902	MW10D	7.28	9.24	1.96	
	1904	MW12S	4.5	6.13	1.63	
	1906	MW01D	5.93	7.94	2.01	
	1909	MW02D	5.13	7.04	1.91	
	1912	MW05D	6.77	8.66	1.89	
	1921	MW10D	7.25	9.24	1.99	
	1922	MW10S	7.72	9.18	1.46	



WELL TEST ANALYSIS

Data Set: C:\StJuliens\AquiferTest\MW-01D.aqt
Date: 05/30/06 Time: 16:08:27

PROJECT INFORMATION

Company: CH2M HILL
Client: U. S. Navy
Location: St. Julien Creek, Site 2
Test Well: MW-10D
Test Date: 5/17/2006

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 1520.9 ft^2/day
S = 0.0003405
r/B = 1.0E-5
Kz/Kr = 1.
b = 100. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW-10D	12122477	3452833

Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW-01D	12122328	3452861

Figure B-1
Time-Drawdown Analysis from Observation Well MW01D

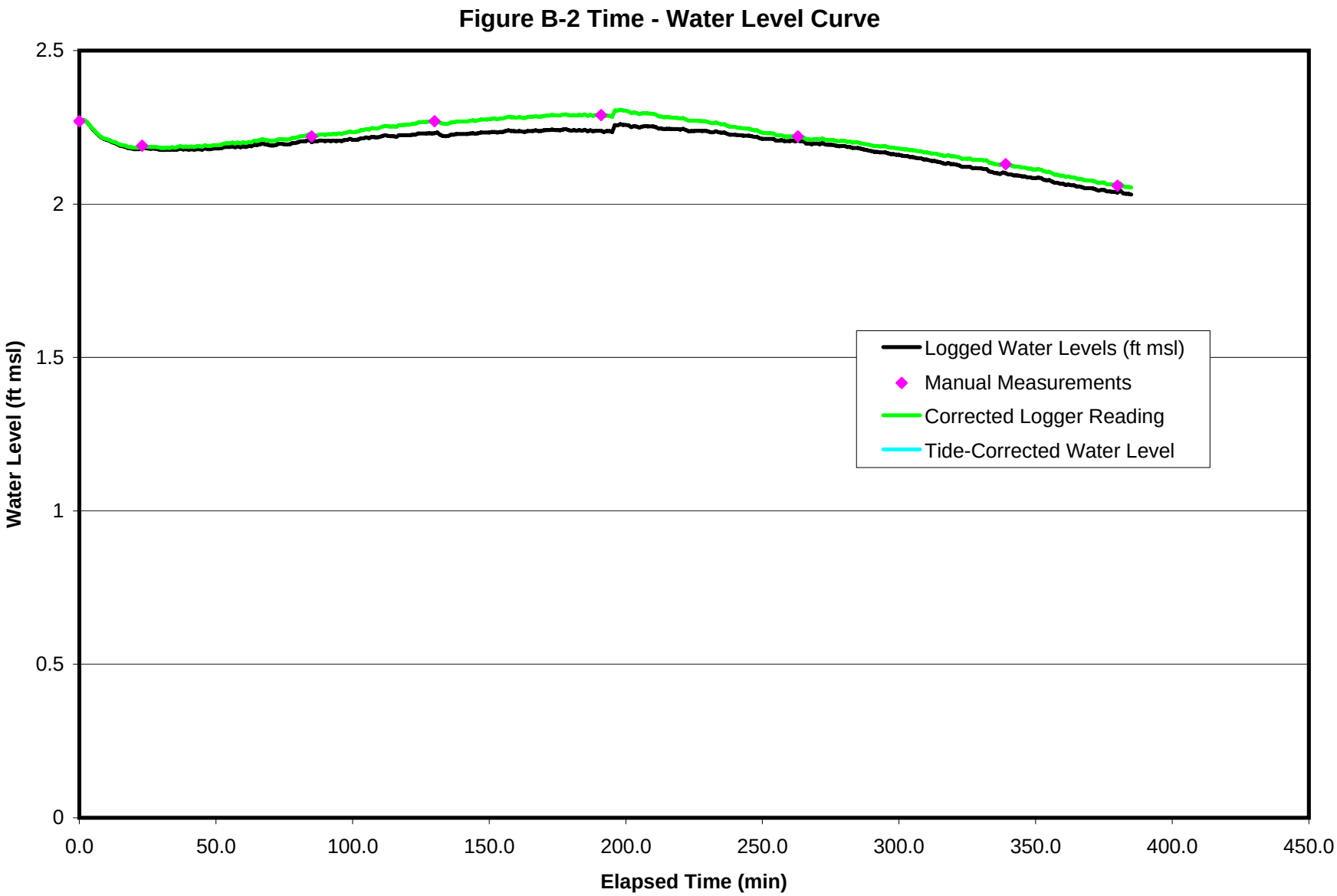


Figure B-2 Time - Water Level Curve
2.5
2
1.5
1
0.5
0
Water Level (ft msl)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
Elapsed Time (min)
Logged Water Levels (ft msl)
Manual Measurements
Corrected Logger Reading
Tide-Corrected Water Level

Attachment C: Raw Analytical Data

Table C-1
Raw Analytical Data
Monitoring Well SJS02-MW10D
Site 2 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Sample ID	SJS02-MW10D-04D	SJS02-MW10D-05A	SJS02-MW10D-05A2	SJS02-MW10D-06B	SJS02-MW10D-06B2	SJS02-MW10D-06B2P	SJS02-MW10D-06B3	SJS02-MW10D-06B3P	SJS02-MW10D-06D[1]	SJS02-MW10DP-06D[1]
Sample Date	12/03/04	01/18/05	03/28/05	05/16/06	05/17/06	05/17/06	06/22/06	06/22/06	11/28/06	11/28/06
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,1-Trichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.68	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	500 R	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U
2-Hexanone	5 U	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	5 U	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U
Acetone	4.9 J	83 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U
Benzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	1 B	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	7.8	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.3 J	0.5 U	0.5 U	0.5 U
Cyclohexane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U
Ethylbenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U
Methyl acetate	50 R	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylcyclohexane	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	0.77 B	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.67 B	0.21 JB	0.24 JB
Styrene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	3	83 U	1 J	10 U	10 U	10 U	0.3 J	0.5 U	0.11 J	0.1 J
Trichloroethene	2,200	700	900	3.9 J	10 U	10 U	0.26 J	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	0.53	83 U	10 U	3.6 J	10 U	10 U	6.5	5	1.7	1.6
Xylene, total	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	19	83 U	35	52	10 U	10 U	5	5.4	1.6	1.4
cis-1,3-Dichloropropene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
isopropylbenzene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	83 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
B- Not detected substantially above the level reported in laboratory or field blanks
J- Reported value is estimated
R- Unreliable result
U- Not detected
NA- Not analyzed
Shading represents detection
[1] Unvalidated results shown, validated results will be provided in the Draft Final Site 2 ERI Report

Appendix E
Boring Logs and Well Construction Diagrams

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
6207-028	MW-15 SJS02	1 OF 1

SOIL BORING LOG

PROJECT St. Juliens Creek Annex LOCATION Land Fill B Site 2

ELEVATION GROUND 5.49 / TOC 7.72 m s/(ft) DRILLING CONTRACTOR American Environmental Drilling Services

DRILLING METHOD AND EQUIPMENT 6 1/4" ID Hollow Stem Augers - Ingersoll Rand - A-300 Drill Rig

WATER LEVELS START 7/2/97 FINISH 7/01/97 LOGGER S. Bilney (CH2M Federal)

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		SS-1				Began Drilling 0800
	3-5	S-1	24/24"	1-2-2-1	3-4.4' Sandy silt trace gravel & organics (ML) interbedded with ~~the~~ Clay to sand (ML) 4.4-5' Silty F. Sand with organics (SM) (roots) moist very dark greyish brown 10YR 3/2	color greenish grey 10Y 5/1 trace light olive brown 2.5Y 5/6; OVM - 0 ppm
5	5-7	S-2	9/24"	2-2-3-3	Silty F. Sand wet subrounded well sorted trace organics (SM) greyish brown 2.5Y 5/2	5' Hit water very wet; OVM - 0 ppm
	10-12	S-3	24/24	2-3-4-1	Silty F. Sand wet subrounded (SM) Color bands - olive yellow 2.5Y 6/6 reddish yellow 7.5YR 6/8; 11.8-12' Soft silty clay (CL) grey N 5/1; Bottom of augers V. soft wet silty clay w/ sand grey N 5/ (CL)	OVM - 0 ppm; Driller reports - Material got Stiff at 11.5' BGS
15					Bottom of Boring 15' BGS	0925 Finished Drilling

Figure 1
SOIL BORING LOG, FORM D1586

REV 11/89 FORM

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET	OF
CT02E	SJS02 MW01D	1	3

SOIL BORING LOG

PROJECT NAVY CLEAN II / ST. JULIENS CREEK ANNEX LOCATION SITE 2 MW01D

ELEVATION GROUND: 5.27 TOC: 7.94 DRILLING CONTRACTOR AEDS

DRILLING METHOD AND EQUIPMENT INGERSOLL RAND A300 RIG / 8 1/4" and 4 1/4" HSA / 6" Mud Rotary

WATER LEVELS _____ START _____ FINISH _____ LOGGER L. FRANCE

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					SEE LOG FOR SITE 2 MW01S FOR 0-12' INTERVAL	
5						
10						
		SP / CL	1.4	2-2-1-2	SAND, f-med (SP). Strong brown (7.5YR 5/8). Wet. to 14.0'	
					CLAY (CL) Bluish grey (GLEY 5/1). Sand in end of spoon.	
15		SP / CL	1.5	2-1-1-2	SAND, med-fine. Same as @12'.	
					CLAY. DK. Greenish grey (GLEY 4/1)	
			0.6	2-3-2-2	SAND and CLAY as above. Poor sample recovery.	
			.2	7-7-8-8		
20		SP	1.6	4-4-3-4	SAND (SP) fine. Dk. bluish grey (GLEY 4/1). Wet. Little clay in thin (<0.5") layers. Increasing clay content to 22.8'	
		CL	2.0	4-3-3-4	22.8 CLAY (CL) Dk greenish grey (GLEY 4/1) Blocky.	
25		SP / CL	1.7	5-4-4-5	SAND (SP)	
					CLAY, sandy to 27.2'	
		SP	2.0	5-6-6-7	27.2' SAND, fine (SP) shell fragments. Little med. sand	
30			NOT RECVD.	4-5-5-5	SAND, as above. Tr. organics and shells little clay.	

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
CTO 25	SJS02 MW01D	2 OF 3

SOIL BORING LOG

PROJECT NAVYCLEAN II / ST JULIENS CREEK LOCATION SITE 2 MW01D

ELEVATION . DRILLING CONTRACTOR AEPS

DRILLING METHOD AND EQUIPMENT SEE p. 1

WATER LEVELS START FINISH LOGGER L. FRANCIS

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
30		SP	2.0	5-4-45	SAND, as above	
					31. CLAY little to no sand.	
		CL	2.0	4-3-3-5	CLAY, (CL) with 0.25-3.0" thick layers of fine sand. Greenish gray (5GY 5/1)	
35			2.0	5-4-4-5		
		SW	2.0	3-3-5-5	SAND, (SW) med - coarse. Sand, (SW) fining downward to silt and clay (CL) at 38', tr. organics and shell fragments	
			2.0	3-2-2-3		Stopped drilling 7/9/97. Set 6" PVC isolation casing to 44'. Start sampling at 46' 7/11/97
40		CL	2.0	3-3-2-3	CLAY, greenish grey (GLEY 5/1) Sandy to 40.5' Little organics and mica	
			2.0	3-3-4-5	clay, as above, tr v. fine sand. Few shell fragments	
45			2.0	3-2-2-2		
			2.0	3-3-4-3	Some brown organics. Clay is DK. greenish gray (GLEY 3/1). Little mica.	
			2.0	4-3-3-3		
50			2.0	3-3-2-3		
			2.0	3-2-2-3	clay, as above	
55			1.0	3-3-2-3		
		SP	0.7	5-5-6-6	SAND, (SP), v. fine to fine DK greenish grey (GLEY 3/1)	Losing water to fm. at 56'.
60			0.6	6-5-5-6	Fine sand, as above, Little mica	

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
CT02E	MW01D SJS02	3 OF 3

SOIL BORING LOG

PROJECT NAVY CLEAN II / ST. JULIENS CREEK ANNEX LOCATION SITE 2 MW01D

ELEVATION . DRILLING CONTRACTOR AEDS

DRILLING METHOD AND EQUIPMENT See p. 1

WATER LEVELS START FINISH LOGGER L. FRANCO

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
60			1.0	6-6-5-6	SAND, as above, with trace med. sand	
		SP	0.5	6-6-6-5	SAND, as above, Same med. Sand	
65			1.5	7-7-6-7		
			1.5	7-6-6-7		END SAMPLING at 65!
					BORING TERMINATED 68'	
70						
75						

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
6207-028	SJS02 MW-25	1 OF 1

SOIL BORING LOG

PROJECT St Juliens Creek Annex LOCATION Landfill B Site 2

ELEVATION GROUND 4.59 TOC 6.48 ft MSL DRILLING CONTRACTOR American Environmental Drilling Services

DRILLING METHOD AND EQUIPMENT 6"/4" ID Hollow Stem Augers - Ingersoll Rand A-300 Drill Rig

WATER LEVELS _____ START 6/30/97 FINISH 6/30/97 LOGGER S. Bussey (CH2M Hill)

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						1045 Begin drilling
	3-5'	S-1	17/24	1-2-2-1	Silty v. fine - fine sand trace clay (SM) trace shells + organics moist mottled dark greenish gray 10Y 4/1 light yellowish brown 2.5Y 6/4 + gray 2.5Y 6/1	OVM 0 ppm
5						
	5-7'	S-2	24/24	3-3-1-3	Same as above moist	OVM 0 ppm
10						
	10-12'	S-3	10"/24"	3-3-4-5	Silty Clay with F. Sand (CL) trace organics soft greenish gray 10Y 6/1 wet	Slight petroleum Smell OVM 0 ppm
15						1140 Complete drilling install well material
					Bottom of Boring 15' BGS	

Figure 1
SOIL BORING LOG, FORM D1586

CH2M HILL

PROJECT NUMBER	BORING NUMBER		
CT028	SJS02-MW2D	SHEET 1	OF 3

SOIL BORING LOG

PROJECT NAVYCLEAN II/ST. JULIENS CREEK LOCATION SITE 2 MW02D

ELEVATION GROUND: 4.71/TOC: 7.04 DRILLING CONTRACTOR AFDS

DRILLING METHOD AND EQUIPMENT INGERSO A300 RIG/8 1/4" ID HSA / 4 1/4" HSA / 6" MUD ROTARY

WATER LEVELS START 1230 7/12/97 FINISH LOGGER L. FRANCE

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					SEE LOG FOR SITE 2 MW02S FOR 0-12' INTERVAL	START DRILLING 1230 7/
5						
10						
			1.9	4-4-5-5	CLAY (CL) and SAND (SP) 50%, moist. Greenish grey (GLEY 5/1) sand is med-fine grained. Some orang mottling	
15		CL	1.4	3-3-4-4		
			2.0	3-4-4-5		
		ML	1.25	3-5-5-7	SILT (ML) clayey. DK greenish grey (GLEY 3/1) Some organics, Rubbery texture.	
20		SM	2.0	3-5-5-7	SAND (SM). some sandy silt.	
		ML	2.0	4-5-5-5	SILT. Some to little fine sand. One 1"-layer of fine sand at 23.8'.	
25		SC			SAND (SC) clayey 25.3'	
		SM	1.7	4-5-5-5	SAND (SM) silty, fine DK Greenish Grey (GLEY 3/1)	
			2.0	1-1-2-4	Abundant wood fragments. 4" layer of sandy silt. 28.5'	
30		SP	NOT Recvd.	3-3-2-3	SAND, (SP) fine. Light greenish Grey (GLEY 7/1)	

CH2M HILL

PROJECT NUMBER	BORING NUMBER		
CO25	SJ502-MW02D	SHEET 2	OF 3

SOIL BORING LOG

PROJECT NAVY CLEAN II/ST. JULIENS CREEK ANNEX LOCATION SITE 2 MW02D

ELEVATION . DRILLING CONTRACTOR AEDS

DRILLING METHOD AND EQUIPMENT See p. 1

WATER LEVELS START FINISH LOGGER L FRANCE

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
30		SP	2.0	2-1-1-2	SAND (SP) f. v. wet little med sand	
			Not recorded	1-1/12"-1	33.0	
		CL			CLAY (CL) Shell fragment	
35		SP	2.0	2-2-1-2	SAND, as at 30'. Loose	
			Not Rec.	2-2-3-2		
			Not Rec	2-2-1-2	clay in nose of split spoon at 40'	
40		CL	1.0	2-2-1-2	CLAY, DK greenish (GLEY 4/1) soft	Will set PVC 6" PS Protection casing @ 45'
				2-2-3-2	clay, as above, med. stiff. organics	Stopped drilling at 1,91 1800 7/7
45			1.0	2-2-3-2		Start drilling with 8 1/4" HSA 0720 7/8/97. with PVC plug. Charged augers with water prevent find sand from comm into augers.
			0.3	Not Recorded		
			2.0	3-4-4-5	Clay, as above, stiff	
50			2.0	3-3-2-2	tr. fine sand 50-51' Inc. sand to 51.5'	Start drilling at 50' 6" mud rotary. 7/12/97 OVM headspace 4.2 ppm
		SP	1.5	2-3-3-2	SAND (SP) fine with little med. Some shell fragments, DK greenish grey (GLEY 4/1). Loose.	
55			1.0	3-2-2-3	abundant shell fragments 55.7	Losing water to fm. at 54'
		CL	0.6	5-5-4-5	CLAY (CL) DK greenish grey (GLEY 3/1). Little shell sand organics. Stiff.	
		SP			SAND f-v. fine tr mica. DK greenish grey (GLEY 3/1) 58.0	
		CL	1.6	6-6-5-4	CLAY 59.5	
60		ML			SILT and fin SAND, Some m. Sand	

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
CT025	ST502-MW02D	SHEET 3 OF 3

SOIL BORING LOG

PROJECT NAVY CLEAN II/ST. JULIENS CREEK ANNEX LOCATION SITE 2 MW02D

ELEVATION . DRILLING CONTRACTOR AEDS

DRILLING METHOD AND EQUIPMENT Sup. 1

WATER LEVELS START FINISH LOGGER L France

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
60		SP	0.6	5-6-6-5	SAND (SP) as above. Dk greenish grey (GLEY 3/1).	Drillers add bentonite to w. at 60'.
			0.5	7-7-6-7	Some med. sand. Little shell fragments	
					BORING TERMINATED @ 64'	Stopped Drilling and sam @64' 7/12/97 1245
65						
70						

REV 11/89 FORM

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
6207-028	MW-35 SJ502	1 OF 1

SOIL BORING LOG

PROJECT St Juliens Creek Annex LOCATION LandFill B Site 2

ELEVATION GROUND: 4.69 TOC: 7.27 ft msl DRILLING CONTRACTOR American Environmental Drilling Services

DRILLING METHOD AND EQUIPMENT 6 1/4" ID Hollow Stem Auger - Ingersoll Rand A-300 Drill Rig

WATER LEVELS _____ START 6/30/97 FINISH 6/30/97 LOGGER S. Bowley (CH2M Hill)

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Began drilling 0820
2	2-4	S-1	24"/24"	2-3-3-2	2.-2.8 Fill Silty gravel + Sand (GM) dry Black 2.5Y 2.5/1 2.8-4' Silty F. Sand (SM) moist light olive Brown 2.5Y 5/4	Fill Material ended 2.8' BG OVM - 0ppm
4					4: Silty Clay w/ F. Sand (CL) wet dark gray (N4/)	
5	4-6	S-2	16"/24"	1-3-3-4	Silty F - Med. Sand (SM) Color bands wet greenish gray 5GY 5/1, light yellowish brown 2.5Y 6/4 Olive yellow 2.5Y 6/6	
6						OVM - 0ppm
10						
	10-12	S-3	23"/24"	3/2/5/4	Silty F. Sand (SM) wet well sorted Stranded Color bands gray N5/ + light yellowish brown 2.5Y 6/4	
12.						OVM 0ppm
14						
15					Bottom of Boring 14' BGS	0930 finished drilling

Figure 1
SOIL BORING LOG, FORM D1586

CH2MHILL

PROJECT NUMBER	BORING NUMBER	SHEET	OF
6207-028	SJS02-MW4S	1	

SOIL BORING LOG

PROJECT CT028, ST. JULIENS CREEK LOCATION SITE 2 MW4S

ELEVATION DRILLING CONTRACTOR GROUNDWATER SYSTEMS

DRILLING METHOD AND EQUIPMENT PACKER AD-2 RIG, SPLITSPOON (2'), 3 1/4" ID HSA

WATER LEVELS START 0915 4/21/99 FINISH LOGGER L. FRANCIS

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		1	15"	4-5-4-6	SAND, fine, and SILT (SM), very dk grey (2.5Y 3/1), Roots to 3". V. fine sand trace clay, slightly moist (2.5Y 4/4)	Start drilling 0915 4/21/99 Cleaning for UXO at 2-ft intervals.
		2	18"	5-5-5-5	SAND, v. fine (SM) light yellowish brown (2.5Y 6/4), WET, little silt	WATER TABLE @ ~2.5'
5		3	24"	4-4-5-6	Same as above	
		4	24"	4-4-5-6	Same as above, some orange mottling.	
		5	14"	5-7-16-13	Same as above, coarsening to fine sand, orange mottling.	Finish sampling 4/21/99 1010
10						
15						

Figure 1
SOIL BORING LOG, FORM D1586

CH2MHILL

PROJECT NUMBER	BORING NUMBER	SHEET	OF
0207-02E	SJS02-MW5S	1	1

SOIL BORING LOG

PROJECT CTO 2E - ST. JULIENS CREEK LOCATION SITE 2, MWST
ELEVATION DRILLING CONTRACTOR GROUNDWATER SYSTEMS
DRILLING METHOD AND EQUIPMENT Acker AD-2 Rig, 2' splitspoon, 3¼" ID HSA
WATER LEVELS START 1050 4/21/99 FINISH LOGGER L. FRANCE

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		1	16"	6-6-9-7	0-2" SILT (SM), roots. Dk brown (2.5Y 3/1), Moist. more sand 2-10".	Start drilling 1050 4/21/99 Clearing for UXO in 2-ft intervals as we drill.
		2	19"	4-4-6-3	SAND (SM), fine, light yellowish-brown. Wet, (2.5Y 6/4), trace clay in 2" layer, little silt.	Water table @ ~2.5'
5		3	12"	3-3-2-3	Same as above. Pale yellow (2.5Y 7/3)	
		4	18"	2-3-3-4	Same as above	Drillers note an "oily" odor @ 8'. No response from OVM.
		5	18"	NO DATA	Same as above	Stopped sampling @ 10' 1145 4/21/99
10						
15						

Figure 1
SOIL BORING LOG, FORM D1586

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET 12 OF 13
6207-028	SJS02MW5D	

SOIL BORING LOG

PROJECT ST Juliens Creek Annex LOCATION Landfill B (Site 2)
ELEVATION . DRILLING CONTRACTOR GROUNDWATER S/V STAFF
DRILLING METHOD AND EQUIPMENT Acker AD-2 rig, 8 1/4" HSA to 35', 6" water/mud rotary to 51
WATER LEVELS START 1155 4/21/99 FINISH LOGGER L. FRANCE

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		1	22"	4-6-6-7	0-5": SILTY (SM) FINE SAND, Dk brown (2.5Y 3/1), roots: 0-1". 5"-2' SAND, v. fine, little clay, moist light yellowish brown (2.5Y 6/4)	Start sampling and drilling 1155 4/21/99. Clearing for UXO at 2-ft intervals. 8 1/4" HSA
		2	14"	4-4-5-6	CLAY (CL), some sand, light olive brown (2.5Y 5/3) Grades to fi sand @ 3.5'	Water table ~2.5 ft based on adjacent holes drilled earlier today
5		3	19"	9-6-7-10	SAND (SM) fine, little silt. Saturated light yellowish brown (2.5Y 6/4)	
		4	14"	4-6-9-9	same as above	
		5	22"	5-2-8-7	same as above	Stopped drilling @ 10' bgs at 1300. Resumed sampling at 10' with 5'-long CME sampler.
10		6	2.5'	—	same as above	OVM = 0ppm
15					SAND (SP) fine to med. qtz	Checked borehole with OVM - @ 15': 0ppm
		7	6"	—	— — — — — — — —	Soft drilling at 17'
20					silt on end of sampler. Dk greenish grey (10GY 4/1)	Stopped using CME sampler. Used 2' split spoon for remainder of sampling.
		8			CLAY (CL). dk greenish grey (10GY 4/1), trace sand.	1515 4/21/99 Start drilling with 8 1/4" HSA to 22.5' to install 6" sch. 40 PVC isolation casing. 1630 4/21/99 - Place casing 1700 grouted with cement/bentonite grout. Pressure grouted through tremie.
		9			same as above	
25		10			CLAY (SC) some med sand to 25' SAND LSC (SM) little clay	1245 4/23/99 Start mud/water rotary sampling 24.5-26.5'
		11			SAND + CLAY	

Figure 1
SOIL BORING LOG, FORM D1586

CH2MHILL

PROJECT NUMBER	BORING NUMBER	SHEET	OF
62017-028	SJS02MW5D	2	3

SOIL BORING LOG

PROJECT SJ. Juliens Creek Annex LOCATION Landfill B (Site 2)

ELEVATION DRILLING CONTRACTOR

DRILLING METHOD AND EQUIPMENT See page 1

WATER LEVELS START FINISH LOGGER

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
30		12	1	27-29	SAND (SW) med to fine. Dk greenish grey. clay in nose of spoon.	Sample 12 is from 29.5 - 31.5' bgs Clay at ~~35'~~ 30.5'
		13		2-3-35	CLAY (CL) dk greenish grey. Occ. shell fragment.	
35		14		2-2-2-4	Same as above, 3" sand layer (v. fine sand)	
		15		2-2-3-3	CLAY, as above. No sand.	
40		16		6-12-15-19	CLAY as above to 40.5'	
					SAND (SW) and shell frag. little clay. Light greenish grey GLEY 7/1. (Yorktown Fm)	Stopped sampling @ 41.5' ~~Constructed well (screen & casing).~~ Moved ~18' E and redrilled to set casing deeper on 4/26/99
45						
50						
55						
60						

Figure 1
SOIL BORING LOG,
FORM D1586

CH2MHILL

PROJECT NUMBER	BORING NUMBER	SHEET	OF
6207-028	SJ502 MW5D	3	3

SOIL BORING LOG

PROJECT St. Juliens Creek Annex LOCATION Site 2 Landfill B

ELEVATION DRILLING CONTRACTOR

DRILLING METHOD AND EQUIPMENT See p. 1

WATER LEVELS START FINISH LOGGER

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
30		1	19"	WOH-1-1	SAND (SW) to 30.75', Dk greenish grey m ~f. ; At 31.8 - sandy CLAY (SC)	4/26/99: Start drilling at 7:30 am. at new location 18' E of original and downgradient of MW5S. 8" of fill at surface. Drill with 8 1/4" HSA. Change with water @ 10', Hit clay @ 14'. Start sampling at 30-32'.
		2	24"	1-1-2-1	Sandy CLAY (SC) Dk. greenish grey 2" shell + sand layer, 33.2-34' - CLAY (CL) tr. silt.	
35		3	24"	WOH-1-1-2	CLAY (CL) Soft. Little silt to 34.5	4/26/99 1100. Set isolation casing @ 35'. Push to 35.5'
		4	24"	1-5-10-15	CLAY (CL) to 38'. Dk. greenish grey (GLEY 4/1)	4/27/99 1110: Start drilling
40		5	15"	11-15-14-10	Coarse Shell fragments, trace silt. Light greenish gray (GLEY 7/1)	Yorktown fm at 38'
		6	9"	8-10-12-8	Shells, as above. One large (3/4") Qtz pebble, subangular	
45		7	8"	15-14-14-15	Shells as above, tr. gravel.	@ 44 ft had to add bentonite to water
		8	11"	25-27-17-22	Shells as above.	
50		9	NR	11-23-17-22		Finish sampling @ 51.5' 1155
					Boring Terminated @ 51.5'.	
55						

Figure 1
SOIL BORING LOG, FORM D1586

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	SJS02-MW06S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CTO- | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : SJCA

ELEVATION : | NORTHING: | EASTING:

DRILLING METHOD AND EQUIPMENT USED : 6 1/4" Hollow Stem Auger

WATER LEVELS 4.5 | START : 12/08/03 1315 | END : 12/08/03 1445 | LOGGER : J. Culbreth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2		1		**0-0.6"**	Topsoil, silty clay, (ML), dusty brown, 5Y 2/2, moist, medium density.	
					0.6-1.2"	Medium sand with trace silt (SM), light olive, 10Y 5/4, slightly moist, medium density	
	4-6		2		**2-4"**	Same as above	
5					**4-4.5"**	Clay mixed w/ sand, (SC), dark greenish yellow, 10Y 6/6, saturated, dense	PID=0.0 ppm
					4.5-6"	Wet Clean sand, (SW), medium density, saturated	Water table at 4.5"
	9-11		3		**9-9.5"**	Clay sand, (SC), moderate greenish yellow, 10Y 7/4, saturated, dense	
10					**9.5-10.5"**	Medium sand, (SW), dark greenish yellow, 10Y 6/6, saturated, dense	
					10.5-11	Same as above	
	14-16		4		**14-14.5**	Same as above	
15					**14.5-15.6**	Fat clay, (CH), light olive gray, 5Y 5/2, stiff	Yorktown Confining Unit
					15.6-16"	sandy clay, (ML), pale brown, 5YR 5/2, low plasticity	
						Boring Terminated	
20							
25							

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	SJS02-MW07S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CTO- | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 2

ELEVATION : | NORTHING: | EASTING:

DRILLING METHOD AND EQUIPMENT USED : 6 1/4" Hollow Stem Auger

WATER LEVELS : | START: 12/09/03 1010 | END: 12/09/03 1050 | LOGGER : J. Culbreth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2		1		0-0.1' Top soil, organic matter, silty clay, Grayish brown, 5YR 3/2 0.1-0.5' ABM, black, medium grain	
	2-4	5"	2		0.5-1.1' Mixture of gravel, ABM, fill material, silty sand, (SW/GC), Graish brown, 5YR 3/2, slightly moist, medium density, quartz gravel-angular 2-2.5' Fill material, ABM, some grit gravel backfill	No recovery beyond, pushed 2' to determi whether through the blast grit cover.
5	4-6		3		4-5.2' Sandy clay, trace ABM and gravel, (SC), Grayish brown, 5YR 3/2, saturated at 5.2 5.2-6.0' Medium sand, coarsening down-ward, (SW), Pale yellowish brown, 10YR 6/2, wet, medium density	root layer at 5.0' PID = 1.0 ppm at hole PID= 0.0 ppm at breathing zone
10	9-11	24"	4		9-11' Medium sand, poorly sorted, (SW), Pale yellowish brown, more gray green at 11' bgs, 10YR 6/2, saturated, dense	
15	14-16'		5		14-14.5' Medium sand with fines, (SW), Pale yellowish brown, 10YR 6/2, 14.5-15.1' Clay, (CL), Pale yellowish brown, 10YR 6/2 15.1-15.4 Sand less coarse grained with oxidation, Pale yellowish brown, 10YR 6/2 15.4-16' Silty clay, (CH), Pale yellowish brown, 10YR 6/2, very stiff but fat clay	
20					Boring Terminated	
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	SJS02-MW08S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CTO- | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 2

ELEVATION : | NORTHING: | EASTING:

DRILLING METHOD AND EQUIPMENT USED : 6 1/4" Hollow Stem Auger

WATER LEVELS 4.2' | START: 12/09/03 0750 | END: 12/09/03 0900 | LOGGER : J. Culbreth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2		1		0-0.4'	Top soil, organic, silty clay, (ML), Grayish brown, 5YR 3/2, slightly moist, medium density	
					0.4-1.0'	Organic matter, sandy clay, (SC), Grayish brown, 5YR 3/2, moist, friable, stiff	fill material from 0.4-0.6'
					1.0-2.0'	Same as above, more silts present, stiff	PID = 0.0 ppm
5	4-6	1'	2		4-4.2'	Clay with silt, (OL), Grayish brown, 5YR 3/2, slightly moist, soft	
					4.2-5.1'	Medium grain sand, (SW), Pale yellowish brown, 10YR 6/2, saturated at 4.2'	PID = 0.0 ppm
10	9-11		3		9-9.3'	Silty clay, (CL), Grayish brown, 5YR 3/2, very moist, medium density	
					9.3 -11'	Silty sand, (SM), Dark yellowish orange, 10YR 6/6, saturated, medium density	
15	14-16		4		14-14.5'	Same as above	
					14.5-15.1'	Silty clay, (CL), Light olive gray, 5Y5/2, very moist, medium density	
					15.1-15.5'	Silty sand, coarse grain, (SM), Light olive gray, 5Y 5/2, very moist, medium density	
20					15.5-16'	Silty clay, (CH), Light olive gray, 5Y 5/2, very moist, high plasticity	Yorktown Confining Unit
						Boring Terminated	
25							

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	SJS02-MW09S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CTO- | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 2

ELEVATION : | NORTHING: | EASTING:

DRILLING METHOD AND EQUIPMENT USED : 6 1/4" Hollow Stem Auger

WATER LEVELS : | START : 12/08/03 1500 | END:12/08/03 1610 | LOGGER : J. Culbreth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2		1		0-1"	Top soil; silty clay, (ML), Dusky brown, 5 YR 2/2, slightly moist, medium density	
					0.1-1'	Fill material mixed with sandy clay, (ML), Dusky brown, 5YR 2/2, moist, soft	
					1-1.2'	Clay sand, some organic matter at 1', (SL), grayish brown, 5YR 3/2, soft coarsening downward, saturated at 1'	UXO comment: 0-3' bgs is noisy with tras Shawnstat quiet at 3' bgs.
5	4-6		2		4-5'	Sandy clay, (CL), Dusky brown, 5YR 2/2, saturated, very soft	Petroleum odor, No PID = 0.0 ppm
					5-6'	Subrounded Sand, (SP), Pale yellowish brown, 10YR 6/2, wet, medium density	No PID = 0.0 ppm
	9-11		3				
10					9-10'	Silty sand, (SC), Light Brown, 5YR 5/6, saturated, loose	Some oxidation
					10-11'	Silty Clay, (CH), Dark yellowish brown, 10YR 4/2, moist, stiff	Yorktown Confining Unit
						Boring Terminated	
15							
20							
25							

PROJECT NUMBER	BORING NUMBER	
181812.RP.DR	SJS02-MW10S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation LOCATION : Site 2

ELEVATION : 9.18 ft amsl DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : 3' bgs during drilling START : 16 NOV 2004 0730 END: 0910 LOGGER : J. Butler/ R. Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
	0-2'	18"		no blow counts recorded	0-0.5': fill, organics 0.5-1.5': fine sand (SM); (7.5YR3/2); loose	0 ppm	
	2-4'	12"					
	4-8'	42"			3-3.5': fine sand (SM); (7.5YR3/2); saturated, loose 3.5-4': clay (CL); (7.5YR3/2); stiff	0 ppm	11.5 ppm
5					4.5-5': silty clay with some sand (ML); 7.5YR6/6; moist; soft 5-7': silty sand with some clay (SM); (7.5YR6/6); sat. 7-8': fine sand (SM); (2.5YR7/1); sat.; petroleum/ Volatile odor	0 ppm	23 ppm
	8-12'	42"			8-11.5': fine sand (SM); (2.5Y6/8); saturated; loose; Volatile odor	0 ppm	
10							
	12-16'	48"			12-16': silty sand (SW); (2.5Y6/8); saturated; loose	0 ppm	
15							
	16-20'	48"			16-17': silty clay (SC); gray (2.5Y2.5/1); moderate	0 ppm	
					Boring Terminated at 17'		

PROJECT NUMBER	BORING NUMBER	
181812.RP.DR	SJS02-MW10D	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation — LOCATION : Site 2

ELEVATION : 9.24 ft amsl — DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : 3' bgs during drilling — START : 12 NOV 2004 0810 — END : 16 NOV 0800 — LOGGER : Jamie Butler/ Rebekah Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
	0-2'	18"		no blow counts recorded	0-0.5': fill, organics 0.5-1.5': fine sand (SM); (7.5YR3/2); loose	
	2-4'	12"			3-3.5': fine sand (SM); (7.5YR3/2); saturated, loose 3.5-4': clay (CL); (7.5YR3/2); stiff	
	4-8'	42"			4.5-5': silty clay with some sand (ML); 7.5YR6/6; moist; soft 5-7': silty sand with some clay (SM); (7.5YR6/6); sat. 7-8': fine sand (SM); (2.5YR7/1); sat.; petroleum/ Volatile odor	0 ppm 0 ppm / 11.5 ppm
10	8-12'	42"			8-11.5': fine sand (SM); (2.5Y6/8); saturated; loose; volatile odor	0 ppm / 23 ppm
	12-16'	48"			12-16': silty sand (SW); (2.5Y6/8); saturated; loose	0 ppm
	16-20'	48"			16-17': silty clay (SC); gray (2.5Y2.5/1); moderate 17-20': clay (CH); (2.5Y2.5/1); Yorktown Confining Unit	0 ppm
20	20-22'	24"			Split spoon sampler used after 20' bgs 20-20.5':gravely clay (GC); greenish gray (5Y3/1); Volatile odor 20.5-22': clay (CH); greenish gray (5Y3/1); moist; medium stiff	
	27-29' 29-31'	24" 24"			27-28.5': silty clay (CL); greenish gray (gley 1 2.5/10Y); moist; soft (medium stiff 27-27.5')	0 ppm
30					29-29.5': sandy clay (SC); greenish gray (gley 1 2.5/10Y); moist 29.5-29.8': fine silty sand with some clay (SM); greenish gray (Gley 1 2.5/10Y); sat.; loose 29.8-30.8': sandy clay with some fines/silts; greenish gray (Gley 1 2.5/10Y) 30.8-31': fine sand with little clay (SM); greenish gray (Gley 1 2.5/10Y); moist; loose	
40					Continued	

PROJECT NUMBER	BORING NUMBER
181812.RP.DR	SJS02-MW10D SHEET 2 OF 2

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation LOCATION : Site 2

ELEVATION : 9.24 ft amsl DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : 3' bgs during drilling START : 12 NOV 2004 0810 END : 16 NOV 0800 LOGGER : J.Butler/ R. Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): 3reathing Zone Above Hole
30					34-34.5': silty clay (CL); greenish gray (Gley 1 2.5/10Y); moist, organic odor	
					34.5-35.5': silty clay with some sand (CL); greenish gray (Gley 1 2.5/10Y); moist	
	34-36'	24"			35.5-36': silty clay with some sand (CL); greenish gray (Gley 1 2.5/10Y); more silts & stiffer t	
					38-38.2': sandy silt with some clay (CL); greenish gray (Gley 1 2.5/10Y); soft	
	38-40'	24"			38.2-39.7': silty clay (CL); greenish gray (Gley 1 2.5/10Y); medium; 39-39.3' slightl than surrounding soils	
40					39.7-40': sandy silt with some clay (CL); n change; moist; medium; few shell fragments	
	43-45'	24"			43-44.5': silty clay with some sand (CL); s moist; medium; sand lens 44-44.08'	
					44.5-45': clay with some silt (CH); no colo stiff	
	48-50'	24"			48-50': clay (CH); no color change; stiff; some wood	
50					53-54.5': same as above	
					54.5-55': silty clay (CL); no color change; moderate	
					58-60': same as above	
	53-55'	24"				
	58-60'	24"			64-64.2': clayey sand (CL); greenish gray (Gley 1 2.5/10Y); moist	
60					64.2-64.7': fine silty sand with some clay (1 2.5/10Y); moist	
					64.7-65': fine grain sand (SM); no color ch saturated; loose	
	63-65'	12"			65-65.2': slag material; no color change	
	65-67'	24"			65.2-67': fine/medium sand with some silt (SM); no color change; saturated	
70					Boring Terminated at 68'	

PROJECT NUMBER	BORING NUMBER
181812.RP.DR	SJS02-MW11S SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation LOCATION : Site 2

ELEVATION : 5.68 ft amsl DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : 4.14 btc START : 17 NOV 2004 0925 END : 1130 LOGGER : R. Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): 3reathing Zone Above Hole
	0-5'	no sample collected		no blow counts recorded	No Recovery	0 ppm
5	5-7'	6"			rock, debris, organics	0 ppm
10	10-12'	24"			10-10.2': clay (CH); greenish gray (Gley 1 3/5GY); moist; soft; fragments of brick and rock de 10.2-10.8': same as above; less brick fragments 10.8-11.2': same as above; no brick fragm	0 ppm
	12-14'	24"			11.2-12': same as above; phragmites debris 12-14': same as above; exceptions below 12-12.25': wet; brick and rock fragments 13.2-14': wood fibers	
15	14-18'	36"			15-16.5': peat with phragmites fibers, dark gray (10YR3/1); moist; organic odor 16.5-17.2': silty peat with some fine sand; dark gray (10YR3/1); moist; organic odor 17.2-17.8': same as above; saturated 17.8-18': fine silty sand (SM); black (10YR	
	18-22'	24"			saturated 18-19': silty sand with some clay (SM); da (10YR3/1); saturated; medium dense 19-19.7': fine sand with slight silt (SW); oli (2.5Y4/2); saturated; medium dense 19.7'-20: sandy clay (SC); olive brown (2.5 saturated 20-21': clay (CH); greenish gray (Gley 1 6 medium 21-22': clay (CH); greenish gray (Gley 1 7 yellow (2.5Y6/8); medium	
20						
25					Boring Terminated at 22'	

PROJECT NUMBER	BORING NUMBER
181812.SI.DR	SJS02-MW12S SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation LOCATION : Site 2

ELEVATION : 6.13 ft amsl DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : 4.61 btc START : 17 NOV 2004 1430 END : 1540 LOGGER : R.Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): 3reathing Zone Above Hole
	0-4'	no sample collected		no blow counts recorded	No recovery	0 ppm
5	4-8'	42"			4.5-4.8': sandy clay (SC); olive brown (2.5Y4/6); stiff; gravel fragments 4.8-5.2': clayey sand (SC); yellowish brown (10YR5/6); 5.2-6': fine sand (SW); light olive brown (2.5Y5/4); wet; medium loose 6-7.5': fine sand (SW); light gray (2.5Y7/1); wet; medium dense	0 ppm
	8-12'	42"			7.5-8': fine sand (SW); light olive brown (2.5Y5/4); saturated; dense 8.5-12': fine sand (SW); olive yellow (2.5Y6/8);	0 ppm
10					saturated; dense; color change at 9' (2.5Y color change at 10.8' (2.5Y6/8)	
	12-16.2'	42"			12.5-13': fine sand (SW); olive yellow (2.5Y6/8); saturated; dense 13-15.5': same as above; brown (7.5YR5/8) 15.5-16': same as above; olive yellow (2.5 16-16.2': clay (CH); greenish gray (Gley 1 4/10Y);	0 ppm
15					soft	
					Boring Terminated at 16.2'	

PROJECT NUMBER	BORING NUMBER	
181812.RP.DR	SJS02-MW13S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation — LOCATION : Site 2

ELEVATION : 6.30 ft amsl — DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : 4.02 btoc — START : 17 NOV 2004 1630 — END : 18 NOV 0800 — LOGGER : R.Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-4'	no sample collected		no blow counts recorded	No Recovery	0 ppm
5	4-8'	18"				0 ppm
	8-12'	30"			6.5-7': gravelly sands (SP); dark gray (2.5Y3/1); saturated 7-7.5': gravelly sands (SP); black (5Y2.5/1); TCE odor 7.5-8': gravelly sands (SP); dark gray (2.5Y3/1); saturated 10.5-12': clay (CH); greenish gray (Gley 1 3/5GY); soft; organic odor; wood fragments throughout	0 ppm
10	12-16'	32"				0 ppm
	16-20'	48"			13.2-14': same as above 14-15':clayey peat (PT); dark brown (7.5YR2.5/1); soft; some organic and phragmites debris 15-15.8': peat (PT); dark brown (10YR2/2); phragmites and organic debris, organic odor 15.8-16': sandy peat (PT); black (10YR2/1) 16-17.5': peat (PT); dark brown (10YR2/2); phragmites and organic debris, organic odor 17.5-17.8' fine silty sand (SM); dark gray 2.5Y4/1; stiff 17.8-20': clayey sand with silt (SC); dark gray 2.5Y4/1; soft	0 ppm
15						

PROJECT NUMBER	BORING NUMBER
181812.RP.DR	SJS02-MW14S SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation LOCATION : Site 2
ELEVATION : 6.51 ft amsl DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger
WATER LEVELS : not measured START : 17 5/30/2007 0930 END : 5/30/2007 1030 LOGGER : A. Jones/A. Bogdanski

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-4'	42"		no blow counts recorded	0-1': topsoil with organics and wood chips 1-1.5': crushed concrete 1.5-3': fine sand with organic clay (SP-SC); very dark greenish brown (2.5Y 3/2); stiff/dense 3-4': silty clay with fine sand (CL); very dark grayish brown (10YR 3/2); moist; medium dense; p	
	4-8'	48"			4-4.75': sand and clay, fallen into borehole from above 4.75-6.5': clay (OH); dark gray (10YR 4/1); medium dense; highly plastic 6.5-8': clay (OH); dark gray (10 YR 4/1); m dense; highly plastic	
5						
	8-12'	6"			8-11.5': no recovery 11.5-12': organic clay (OH); black (2.5Y 2.5 soft	
10						
	12-16'	42"			12-12.5': no recovery 12.5-13': organic clay (OH); black (2.5 soft 13-15': organic clay (OH); black (5Y 2.5/1); soft; highly plastic 15-15.5': silty fine sand (SM); very dark gra (10 YR 3/2); moist; stiff 15.5-16': fine sand (SP); gray (2.5Y 6/1); s stiff	
15						
	16-20'	36"			16-17': no recovery 17-19.5': silty clay (CL); very dark gray (2.5Y 3/1); moist; soft 19.5-20': fine sand (SP); dark gray (2.5 4/1); saturated; stiff	
20						
	20-24'	48"			20-24': clay (CH); greenish gray (GLEY1 6/5G); moist; stiff; high plasticity	
25					Boring Terminated at 24'	

PROJECT NUMBER	BORING NUMBER	
181812.RP.DR	SJS02-MW15S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation — LOCATION : Site 2

ELEVATION : 5.59 ft amsl — DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : not measured — START : 17 5/30/2007 — END : 5/30/2007 — LOGGER : A. Jones/M. Hilton

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-4'	12"		no blow counts recorded	0-0.5': fill 0.5-3.5': no recovery 3.5-3.8': silty clay with sand (CL); olive gray (5Y 4/2); moist; soft 3.8-4': organic clay (OH); black (GLEY1 2.5N); moist; soft; medium plasticity	
	4-8'	36"			4-5': no recovery 5-6.5': silty sand with clay (SM); very dark g (2.5Y 3/1); saturated; loose; wood debris 6.5-8': organic clay (OH); very dark greenisl (GLEY1 3/10Y); moist; stiff; medium plasticity	
	8-12'	24"			8-10': no recovery 10-11': clay with gravel (CL); very dark gree (GLEY 1 3/10Y); saturated; very soft 11-12': organic clay (OH); very dark greenis (GLEY1 3/10Y); moist; very soft; medium plasticity	
	12-16'	18"			12-14.5': no recovery 14.5-16': silty clay (CL); very dark gree (GLEY1 3/10Y); saturated; very soft; medium plasticity	
	16-20'	30"			16-17.5': no recovery 17.5-19': fine sand with silt (SM); dark saturated; dense; gradual color change to gray (2.5Y 5/1) 19-20': silty clay (ML); greenish gray (GLEY1 5/5GY); moist; very stiff	
	20-24'	30"			20-24': clayey sand (SC); greenish gray (GLEY1 6/5GY); saturated; medium dense	
	24-28'	48"			24-27.5': medium sand (SP); greenish gray (GLEY1 6/5GY); saturated; medium dense 27.5-28': clayey sand (SC); greenish gray (GLEY1 6/5GY); saturated; loose	
	28-32'	36"			28-29': no recovery 29-32': clayey sand (SC); dark gray (GLEY1 saturated; loose	
					Boring Terminated at 32'	

5 10 15 20 25 30

PROJECT NUMBER	BORING NUMBER	
181812.RP.DR	SJS02-MW16S	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : SJCA Site 2 Investigation — LOCATION : Site 2

ELEVATION : — DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : 4.25" hollow stem auger

WATER LEVELS : not measured — START : 17 6/1/2007 — END : 6/1/2007 — LOGGER : A. Jones/M. Hilton

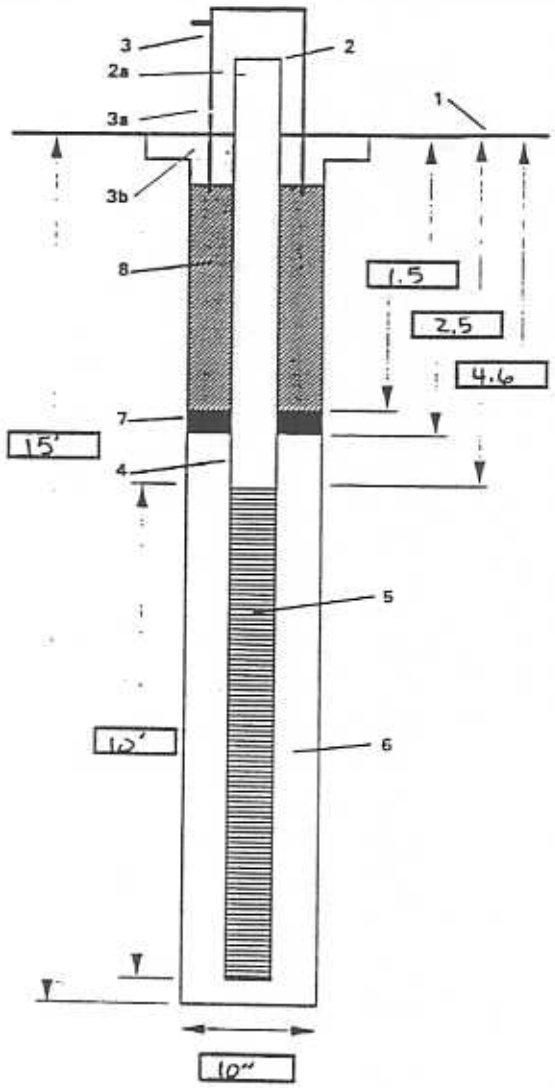
DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): 3reathing Zone Above Hole
	0-4'	42"		no blow counts recorded	0-4': fill material with organics	
	4-8'	42"			4-4.5': no recovery 4.5-6': fill 6-6'3": organic silt (OL); olive (5Y 5/3); dry; roots 6'3"-6'6": clayey silt (ML); dark gray (5Y 4/1 moisture; dense 6'6"-6'8": silty sand (SM); grayish brown (2 moist; dense 6'8"-8': silty clay with sand (CL); dark gray	
	8-12'	36"			moist; stiff; slight plasticity 8-9': no recovery 9'-9'6": silty sand with clay (ML); very dark gray (2.5Y 3/1); moist; loose; grass roots in last 2" 9'6"-10'6": sandy clay with silt (ML); greenish gray (GLEY1 5/10Y); moist; soft; slight plasticity layer, olive brown (2.5Y 4/3) from 9'8" - 9'10" 10'6"-12": silty sand with clay (ML); greenis	
	12-16'	48"			(GLEY1 5/10Y) changing to light olive gray (5Y 6/2) at 11'10"; moist; medium dense; brick/te from 11'9"-11'10' 12-15': sandy clay with silt (CL); dark gray moist; very soft 15-16': clay (CH); very dark gray (5Y 3/1); medium plasticity	
	16-20'	48"			16-18': clayey silt with sand (ML); dark gray (2.5Y 4/1); moist; loose 18-20': clay (CH); very dark greenish gray (GLEY1 3/10Y); moist; stiff; medium plasticity	
	20-24'	48"			20'-20'6": clayey sand (SC); dark gray (5Y 4/1); moist; loose 22'6"-23'10": sandy clay (CL); very dark greenish gray (GLEY1 3/10Y); moist; medium soft; organ 23'10"-24': clayey sand (SC); dark gray (2.5Y 4/1); saturated; loose	
25					Boring Terminated at 28'	

PROJECT NUMBER	BORING NUMBER	SHEET	OF
6207-028	MW-15 SJS02	1	1

CH2M HILL

WELL COMPLETION DIAGRAM

PROJECT: St Juliens Creek Annex
LOCATION: Landfill B - Site 2
ELEVATION: TOC: 7.72 ft
DRILLING CONTRACTOR: American Environmental Drilling Services
DRILLING METHOD AND EQUIPMENT USED: 6 1/4" I.D. Hollow Stem Augers Ingersoll Rand A-300 Drill Rig
WATER LEVELS:
START: 7/01/97 END: 7/12/97 LOGGER: S Bunney (CDM Federal)



1- Ground elevation at well: 5.19 ft msl

2- Top of casing elevation: 7.72 ft msl
a) vent hole? YES

3- Wellhead protection cover type: Steel Stick up
a) weep hole? Yes
b) concrete pad dimensions: 3' x 3'

4- Diameter/type of well casing: 2" Dia PVC

5- Type/slot size of screen: 0.010 Slot 2" Dia PVC
Screen - 4.6 - 14.6

6- Type screen filter
a) Quantity used: med. Sand 4.5 cubic ft

7- Type of seal
a) Quantity used: Bentonite 1.5'-2.5' BGS

8- Grout
a) Grout mix used: Concrete
b) Method of placement: NA
c) Quantity of well casing grout: NA

Development method: Purge / Surge

Development time: 4 hrs on 7/12/97

Estimated purge volume: 55 gal

Comments: Bottom of well 15.1' BGS

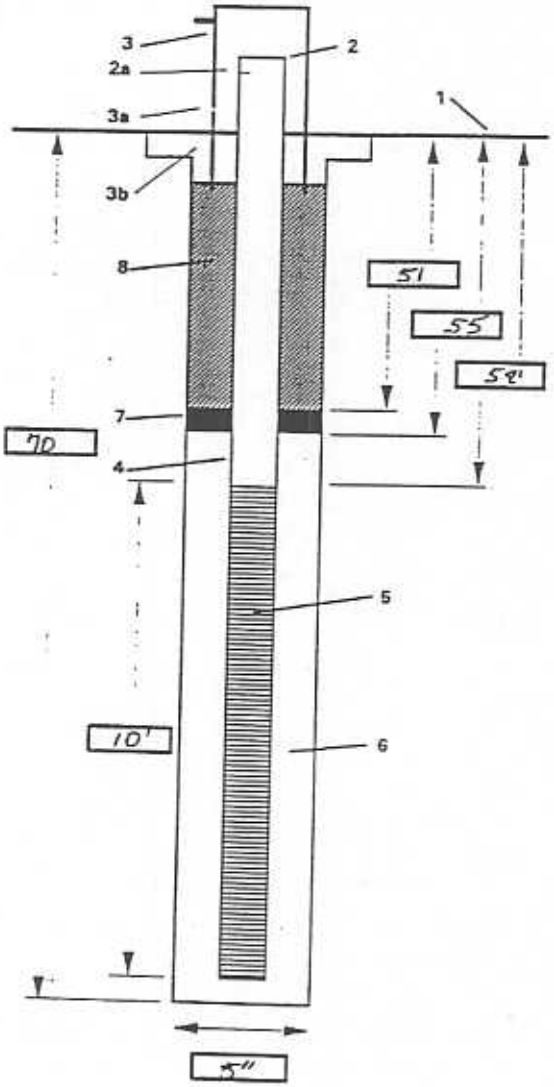
ABOVDIAG.XLS

PROJECT NUMBER	BORING NUMBER	
6207-028	SJS02-MW1D	SHEET 1 OF

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT: St Juliens Creek Annex LOCATION: Landfill B/Site 2
ELEVATION: TOC 7.99 ft msl DRILLING CONTRACTOR: AEDS
DRILLING METHOD AND EQUIPMENT USED: HSA - 8¼" ID / MUD ROTARY - 5" R.T
WATER LEVELS: START: END: LOGGER: L. FRANCE



1- Ground elevation at well: 5.27 ft msl

2- Top of casing elevation: 7.94 ft msl
a) vent hole? YES

3- Wellhead protection cover type: Stick-up
a) weep hole?
b) concrete pad dimensions

4- Diameter/type of well casing: 2" PVC, Sch. 40

5- Type/slot size of screen: 2" PVC, Sch40, .010-Slot

6- Type screen filter: Medium Sand (primary) 70 to 56.5'. Fine Sand 56.5 to 55'
a) Quantity used

7- Type of seal
a) Quantity used: Bentonite Pellet

8- Grout
a) Grout mix used: Cement/Bentonite
b) Method of placement: Pump/tremmie
c) Quantity of well casing grout

Development method: Purge/Surge

Development time

Estimated purge volume: 210 gallons

Comments: 6" PVC isolation casing to 49' BGS. ~~Also~~ 0.4" PVC Plug at bottom

ABOVDIAG.XLS

PROJECT NUMBER	BORING NUMBER	SHEET	OF
6207-028	MW-25 SJS02	1	1

CH2M HILL

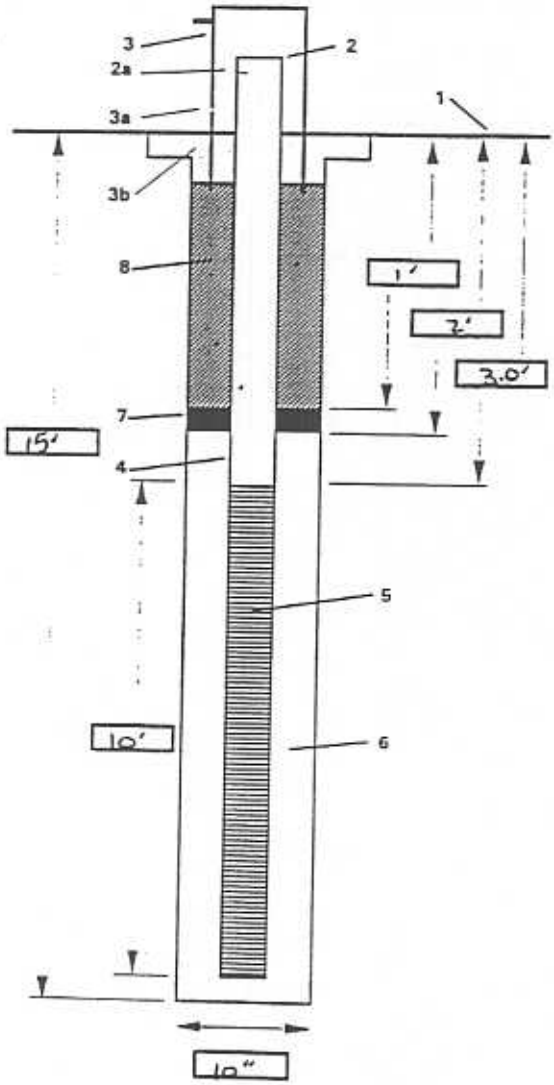
WELL COMPLETION DIAGRAM

PROJECT: St Julians Creek Annex LOCATION: Landfill B Site 2

ELEVATION: TOC ~~4.59 ft msl~~ 6.98 ft msl DRILLING CONTRACTOR: American Environmental Drilling Services

DRILLING METHOD AND EQUIPMENT USED: 6 1/4" ID Hollow Stem Auger - Ingersoll Rand A-300 Drill Rig

WATER LEVELS: START: 6/30/97 END: LOGGER: S Burney (CH2M Federal)



1- Ground elevation at well: 4.59 ft msl

2- Top of casing elevation: 6.98 ft msl
a) vent hole? Yes

3- Wellhead protection cover type: Steel - Stick up
a) weep hole? Yes
b) concrete pad dimensions: 3' x 3'

4- Diameter/type of well casing: 2" PVC

5- Type/slot size of screen: 0.010 slot 2" Dia PVC
Screen 3.0' - 13.0'

6- Type screen filter
a) Quantity used: Med. Sand ~6 cubic Ft.

7- Type of seal
a) Quantity used: Bentonite 1'-2' BGS

8- Grout
a) Grout mix used: Concrete to Surface
b) Method of placement: NA
c) Quantity of well casing grout: NA

Development method: Purge / Surge

Development time: 1 hour 7/14/97 + ½ hour 7/16/97

Estimated purge volume: 13½ gal

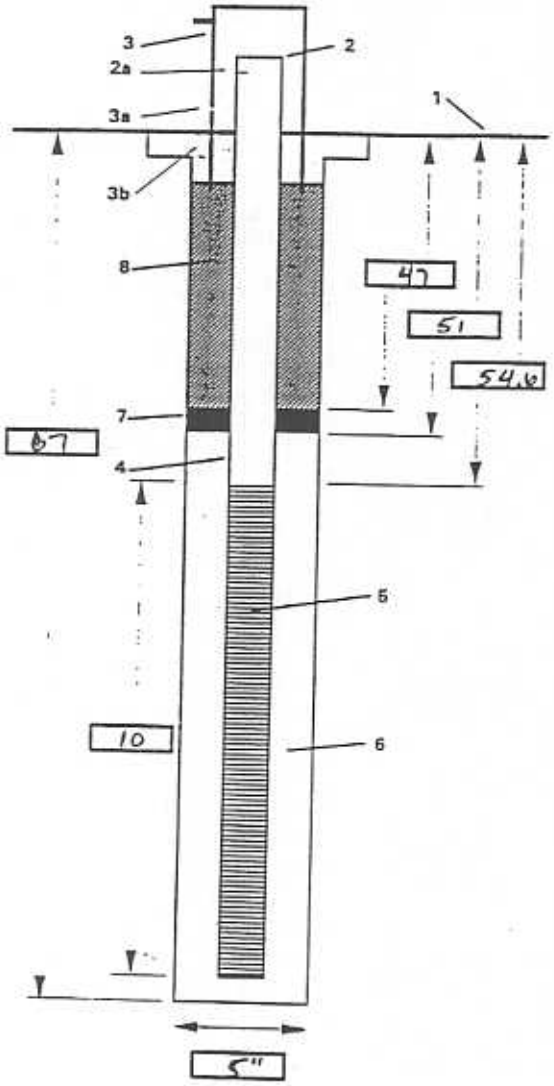
Comments: Bottom of well 13.5'

PROJECT NUMBER	BORING NUMBER	
6207 028	SJS02-MW2D	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT: NAVY CLEAN ST. JULIENS CREEK LOCATION: SITE 2 MW2D
ELEVATION: TOP OF PVC 7.04 DRILLING CONTRACTOR: AEDS
DRILLING METHOD AND EQUIPMENT USED: 1+SA - 8¼" ID / Mud rotary - 5" Bit
WATER LEVELS: START: END: LOGGER: L. FRANCK



1- Ground elevation at well: 4.71 ft. msl

2- Top of casing elevation: 7.04 ft msl
a) vent hole? yes

3- Wellhead protection cover type: stick up
a) weep hole? yes
b) concrete pad dimensions:

4- Diameter/type of well casing: 2" PVC Sch. 40

5- Type/slot size of screen: 2" PVC 010- slot

6- Type screen filter
a) Quantity used: medium sand (primary) 67-~~64.6~~ 52'
fine sand (Secondary) 52-51'

7- Type of seal
a) Quantity used: Bentonite Pellet 51-47'

8- Grout
a) Grout mix used: Cement/Bentonite
b) Method of placement: Pump/tremmie
c) Quantity of well casing grout:

Development method: Purge/Surge

Development time: 3½ Hrs

Estimated purge volume: ~145 gallons

Comments: 6" PVC isolation casing to 45'
0.4" bottom plug.

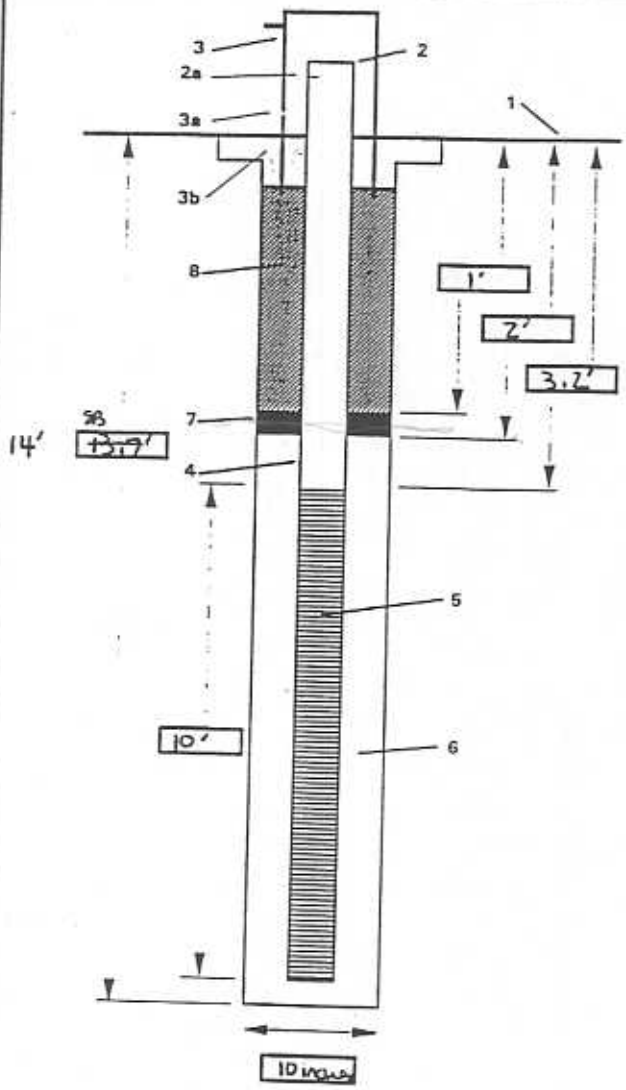
ABOVDIAG XLS

PROJECT NUMBER	BORING NUMBER	SHEET	OF
6207-028	MW-3S STS02	1	1

CH2M HILL

WELL COMPLETION DIAGRAM

PROJECT: St Juliens Creek Annex
LOCATION: Landfill B Site 2
ELEVATION: TOC 7.29 ft msl
DRILLING CONTRACTOR: American Environmental Drilling Services
DRILLING METHOD AND EQUIPMENT USED: 6 1/4" ID Hollow Stem Auger - Ingersoll Rand A-300 Drill Rig
WATER LEVELS:
START: 6/30/97 END: 7/7/97 LOGGER: S Bowen (CDM Federal)



1- Ground elevation at well: 4.69 ft msl

2- Top of casing elevation: 7.27 ft msl
a) vent hole? Yes

3- Wellhead protection cover type: Steel Stick up
a) weep hole? Yes
b) concrete pad dimensions: 3' x 3'

4- Diameter/type of well casing: 2" Dia. PVC

5- Type/slot size of screen: 0.010 Slot - 2" Dia. PVC
3.2' - 13.2' BGS

6- Type screen filter
a) Quantity used: ~5 cubic feet med sand

7- Type of seal
a) Quantity used: Bentonite 1'-2' BGS

8- Grout
a) Grout mix used: Concrete from 1' BGS
b) Method of placement: NA
c) Quantity of well casing grout: NA

Development method: Pump + Surge

Development time: 4 hours on 7/07/97

Estimated purge volume: 165 gal.

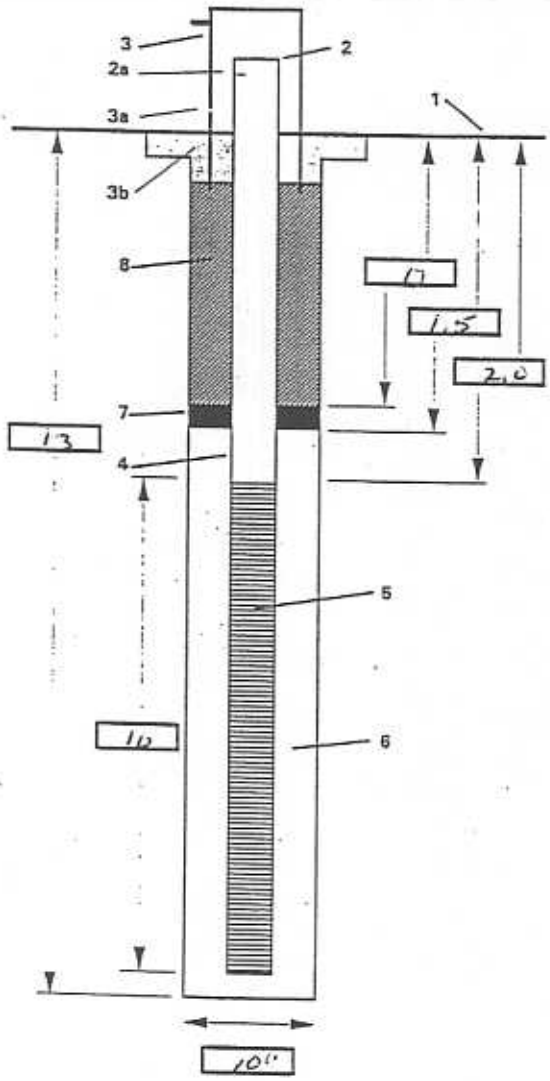
Comments: Bottom of well 13.7' BGS

ABOVDIAG.XLS

PROJECT NUMBER	BORING NUMBER	
6207-02E	SJS02 MW2S	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT: ST. Juliens Creek Annex LOCATION: Landfill B (Site 2)
ELEVATION: DRILLING CONTRACTOR: Groundwater Systems
DRILLING METHOD AND EQUIPMENT USED: HSA 6 1/4" ID
WATER LEVELS: START: 4/27/99 END: 4/27/99 LOGGER: L. Campbell



1- Ground elevation at well 4.60' msl

2- Top of casing elevation 5.53' msl
a) vent hole?

3- Wellhead protection cover type 4" Steel casing / concrete pad
a) weep hole?
b) concrete pad dimensions

4- Diameter/type of well casing 2" PVC Sch. 40

5- Type/slot size of screen 2" PVC 010-slot, Sch. 40

6- Type screen filter
a) Quantity used #1 Silica Sand

7- Type of seal
a) Quantity used bentonite chips (3/8")

8- Grout
a) Grout mix used N/A No grout used due to shallow water table
b) Method of placement
c) Quantity of well casing grout

Development method Pump + Surge

Development time ~3 HOURS

Estimated purge volume 5.5 gal (3x well casing vol)

Comments

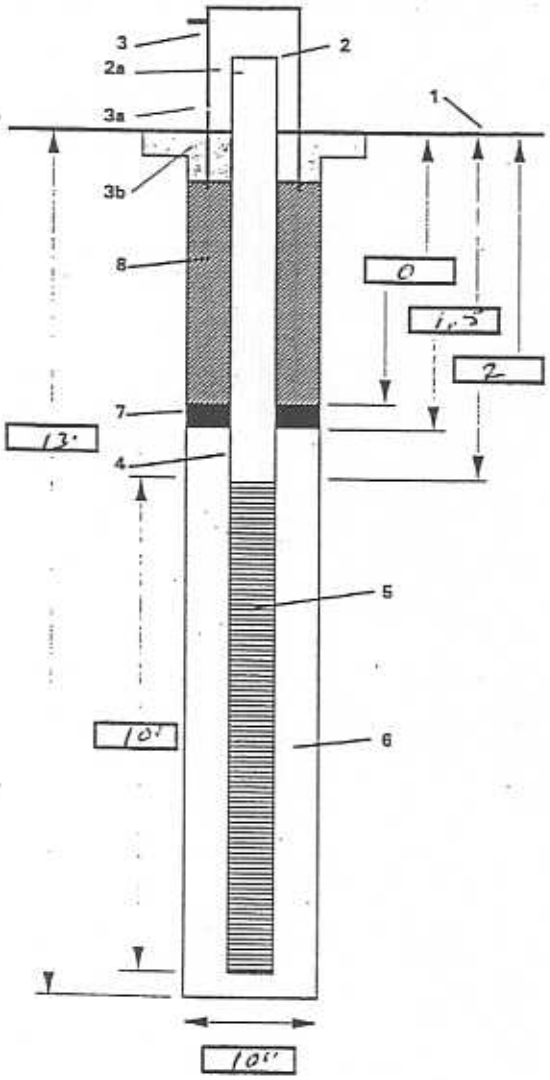
ABOVDIAG.XLS

PROJECT NUMBER	BORING NUMBER	
6207-02E	SJS02-MW-5S	SHEET 1 OF 1

CH2M HILL

WELL COMPLETION DIAGRAM

PROJECT: St. Juliens Creek LOCATION: Landfill B (Site 2)
ELEVATION: DRILLING CONTRACTOR: Groundwater Systems Inc.
DRILLING METHOD AND EQUIPMENT USED: 6 1/4" ID HSA
WATER LEVELS: START: 4/27/99 END: 4/27/99 LOGGER:



1- Ground elevation at well: 5.87 ft msl

2- Top of casing elevation: 8.52 ft msl
a) vent hole?

3- Wellhead protection cover type: 4" steel casing / concrete pad
a) weep hole?
b) concrete pad dimensions

4- Diameter/type of well casing: 2" PVC Sch. 40

5- Type/slot size of screen: 2" PVC 010-slot Sch. 40

6- Type screen filter
a) Quantity used: #1 Silica sand

7- Type of seal
a) Quantity used: bentonite chips (3/8")

8- Grout
a) Grout mix used: None due to shallow water table
b) Method of placement
c) Quantity of well casing grout

Development method: pump & surge

Development time: 3.5 HOURS

Estimated purge volume: ~5.4 gallons (3 x casing vol).

Comments

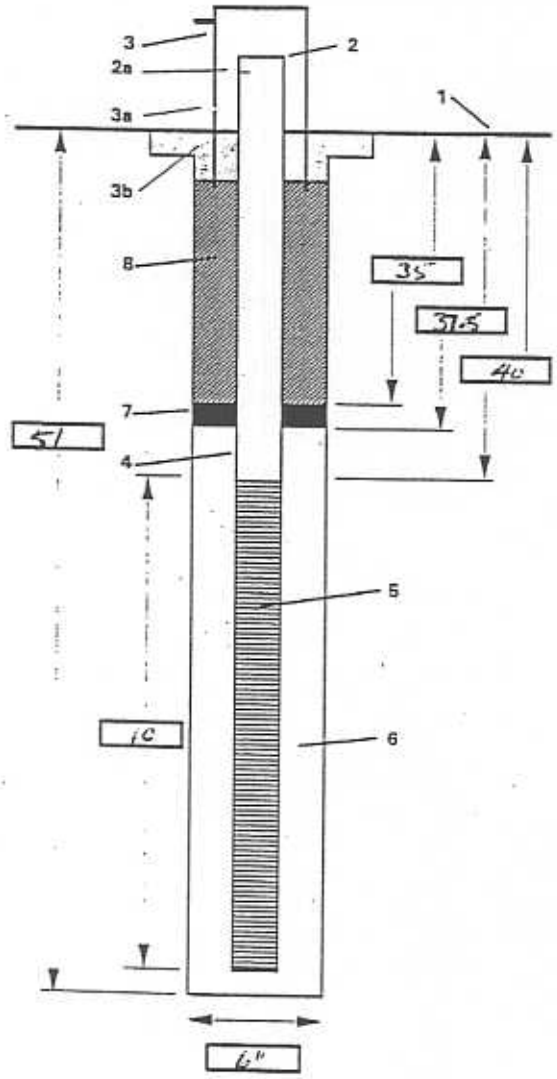
ABOVDIAG.XLS

PROJECT NUMBER	BORING NUMBER	
6207-02E	SJSO2-MW5D	SHEET 1 OF 1

CH2M HILL

WELL COMPLETION DIAGRAM

PROJECT: St. Juliens Creek Annex LOCATION: Landfill B (Site 2)
ELEVATION: DRILLING CONTRACTOR: Groundwater Systems
DRILLING METHOD AND EQUIPMENT USED: 8 1/4" ID HSA / 6" Water Rotary
WATER LEVELS: START: 4/26/99 END: 4/27/99 LOGGER: L. France



1- Ground elevation at well: 6.04 ft msl

2- Top of casing elevation: 8.66 ft. msl
a) vent hole?

3- Wellhead protection cover type: 4" steel casing / concrete pad
a) weep hole?
b) concrete pad dimensions

4- Diameter/type of well casing: 2" PVC Sch. 40
6" PVC isolation casing to 35.5 ft ~~mbl~~ bgs

5- Type/slot size of screen: 2" 010-slot PVC, Sch. 40

6- Type screen filter
a) Quantity used: #1 silica sand

7- Type of seal
a) Quantity used: bentonite Sureseal chips (3/8")

8- Grout
a) Grout mix used: Cement - 5% bentonite
b) Method of placement: Tremie / Pressure
c) Quantity of well casing grout: ~ 50 gals.

Development method: pump + surge

Development time: 1.75 Hours

Estimated purge volume: 23.5 gal (3x casing Vol)

Comments: 6" PVC isolation casing pressure grouted into place at 35.5 bgs. Isolation casing was pressure grouted into a 13" borehole with bentonite/cement grout.

ABOVDIAG.XLS

PROJECT NUMBER	WELL NUMBER	
181812.FI.FK	SJS02-MW06S	SHEET 1 OF 1

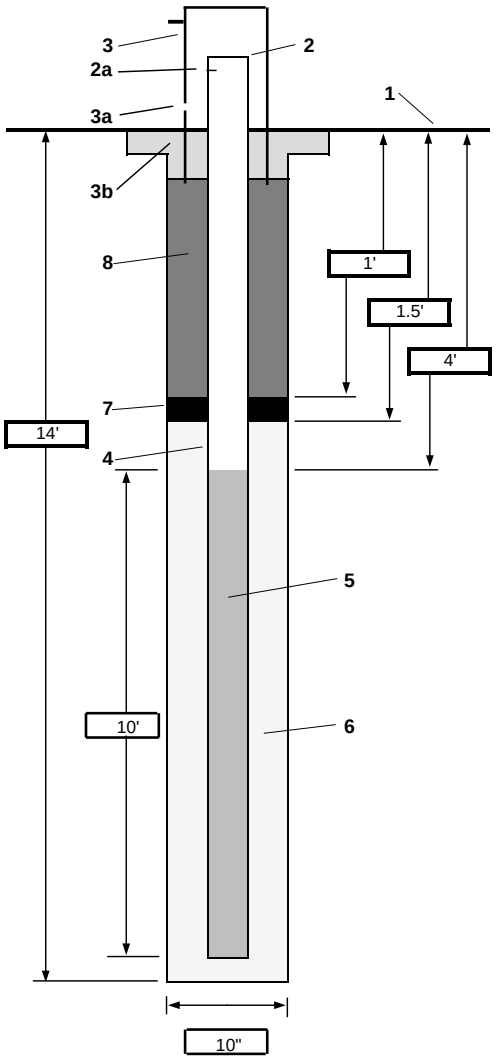
WELL COMPLETION DIAGRAM

PROJECT : SJCA Sites 2 & 5 LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger

WATER LEVELS : START : 12/08/2003 1315 END: 12/08/03 1445 LOGGER : J. Culbreth



1-	Ground elevation at well	Survey
2-	Top of casing elevation	Survey
	a) vent hole?	
3-	Wellhead protection cover type	3' Stick up
	a) weep hole?	
	b) concrete pad dimensions	2' diameter
4-	Dia./type of well casing	2" PVC Schedule 40
5-	Type/slot size of screen	2" PVC 0.010-inch slot Schedule 40 PVC
6-	Type screen filter	1, Industrial Quartz #1 silica filter pack
	a) Quantity used	225 lbs.
7-	Type of seal	3/8" Bentonite Grout
	a) Quantity used	1.5 feet
8-	Grout	
	a) Grout mix used	Concrete/Portland Cement
	b) Method of placement	Tremie
	c) Vol. of well casing grout	
	Development method	Submersible pump (whole)
	Development time	
	Estimated purge volume	55 gallons

Comments

PROJECT NUMBER	WELL NUMBER	
181812.FI.FK	SJS02-MW07S	SHEET 1 OF 1

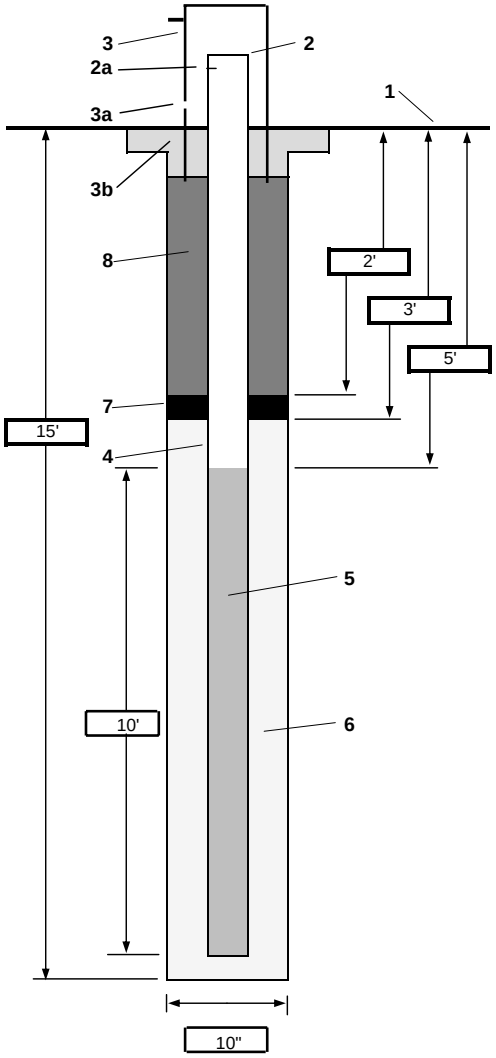
WELL COMPLETION DIAGRAM

PROJECT: SJCA Sites 2 & 5 LOCATION: Site 2

DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger

WATER LEVELS: START: 12/09/2003 1010 END:12/09/2003 1050 LOGGER: J. Culbreth



1-	Ground elevation at well	Survey
2-	Top of casing elevation	Survey
	a) vent hole?	
3-	Wellhead protection cover type	3' Stick Up
	a) weep hole?	
	b) concrete pad dimensions	2' diameter
4-	Dia./type of well casing	2" PVC Schedule 40
5-	Type/slot size of screen	2" PVC 0.010-inch slot Schedule 40 PVC
6-	Type screen filter	1, Industrial Quartz #1 silica filter pack
	a) Quantity used	225 lbs.
7-	Type of seal	3/8" Bentonite Grout
	a) Quantity used	2 feet
8-	Grout	
	a) Grout mix used	Concrete/Portland Cement
	b) Method of placement	Tremie
	c) Vol. of well casing grout	
	Development method	Submersible pump (whole)
	Development time	
	Estimated purge volume	55 gallons

Comments

PROJECT NUMBER	WELL NUMBER	
181812.FI.FK	SJS02-MW08S	SHEET 1 OF 1

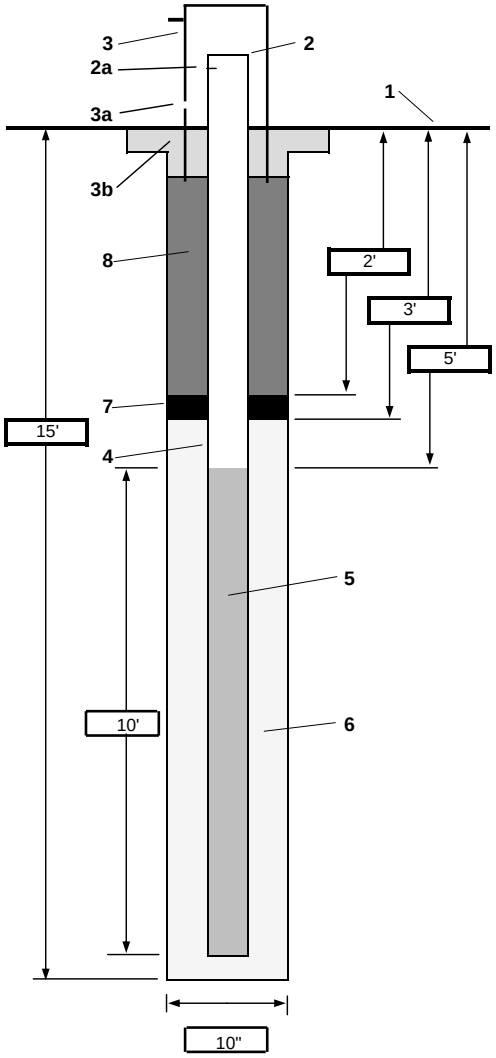
WELL COMPLETION DIAGRAM

PROJECT: SJCA Sites 2 & 5 LOCATION: Site 2

DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger

WATER LEVELS: START: 12/09/2003 0750 END:12/09/2003 0900 LOGGER: J. Culbreth



1-	Ground elevation at well	Survey
2-	Top of casing elevation	Survey
	a) vent hole?	
3-	Wellhead protection cover type	3' Stick Up
	a) weep hole?	
	b) concrete pad dimensions	2' diameter
4-	Dia./type of well casing	2" PVC Schedule 40
5-	Type/slot size of screen	2" PVC 0.010-inch slot Schedule 40 PVC
6-	Type screen filter	1, Industrial Quartz #1 silica filter pack
	a) Quantity used	275 lbs.
7-	Type of seal	3/8" Bentonite Grout
	a) Quantity used	2 feet
8-	Grout	
	a) Grout mix used	Concrete/Portland Cement
	b) Method of placement	Tremie
	c) Vol. of well casing grout	
	Development method	Submersible pump (whole)
	Development time	
	Estimated purge volume	55 gallons

Comments

PROJECT NUMBER	WELL NUMBER	
181812.FI.FK	SJS02-MW09S	SHEET 1 OF 1

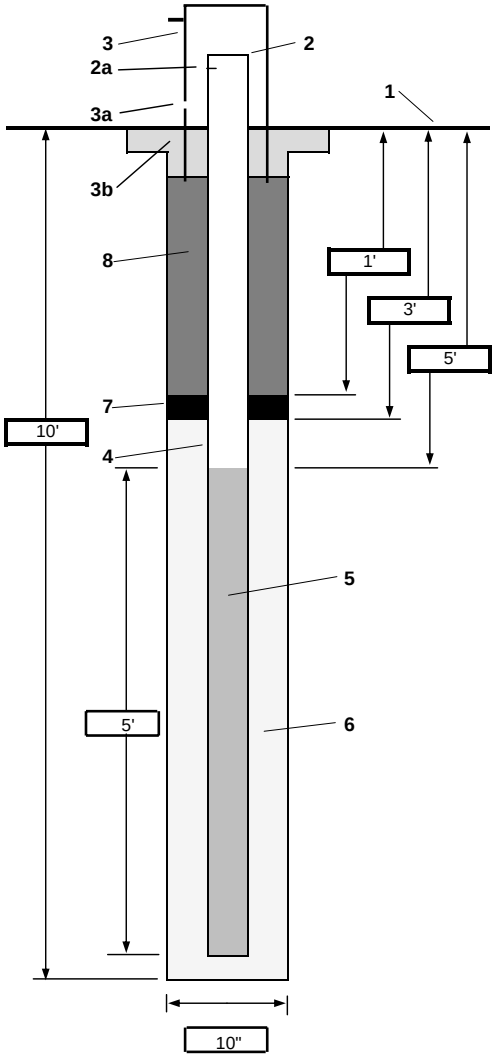
WELL COMPLETION DIAGRAM

PROJECT: SJCA Sites 2 & 5 LOCATION: Site 2

DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger

WATER LEVELS: START: 12/08/2003 1500 END:12/08/2003 1610 LOGGER: J. Culbreth



1-	Ground elevation at well	Survey
2-	Top of casing elevation	Survey
	a) vent hole?	
3-	Wellhead protection cover type	3' Stick Up
	a) weep hole?	
	b) concrete pad dimensions	2' diameter
4-	Dia./type of well casing	2" PVC Schedule 40
5-	Type/slot size of screen	2" PVC 0.010-inch Slot Schedule 40 PVC
6-	Type screen filter	1, Industrial Quartz #1 silica filter pack
	a) Quantity used	138 lbs.
7-	Type of seal	3/8" Bentontine Chips
	a) Quantity used	2 feet
8-	Grout	
	a) Grout mix used	Concrete/Portland Cement
	b) Method of placement	Tremie
	c) Vol. of well casing grout	
	Development method	Submersible pump (whole)
	Development time	
	Estimated purge volume	55 gallons
	Comments	5' screen used due to shallow confining unit

PROJECT NUMBER	WELL NUMBER
181812.RP.DR	SJS02-MW10S SHEET 1 OF 1

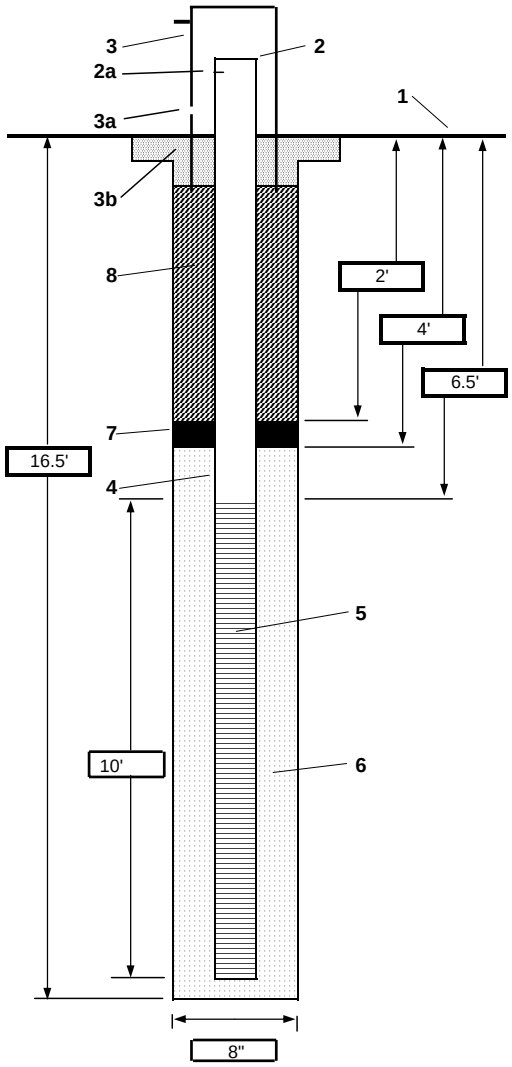
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3452839.30 EASTING: 12122473.11

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : DTW = 7.74' btoc START : 11/16/2004 0730 END : 0910 LOGGER : R. Ives and J. Butler



1- Ground elevation at well: 6.2 ft amsl

2- Top of casing elevation (ft AMSL): 9.18 ft amsl
a) vent hole?: not applicable

3- Wellhead protection cover type: stick-up
a) weep hole?:
b) concrete pad dimensions: ~2 feet by 2 feet, elevation= 6.24 ft amsl

4- Dia./type of well casing: 2" PVC Sch. 40

5- Type/slot size of screen: 2" PVC Sch. 40 10 slot

6- Type screen filter: DSI #1 Filter Sand
a) Quantity used: 5 1/4 BAGS

7- Type of seal: Bentonite, 3/8" chips
a) Quantity used: not available

8- Grout
a) Grout mix used: Bentonite Cement Grout
b) Method of placement: pour
c) Vol. of well casing grout: not available

Development method: Whale Pump

Development time:

Estimated purge volume:

Comments:

PROJECT NUMBER	WELL NUMBER	
181812.RP.DR	SJS02-MW10D	SHEET 1 OF 1

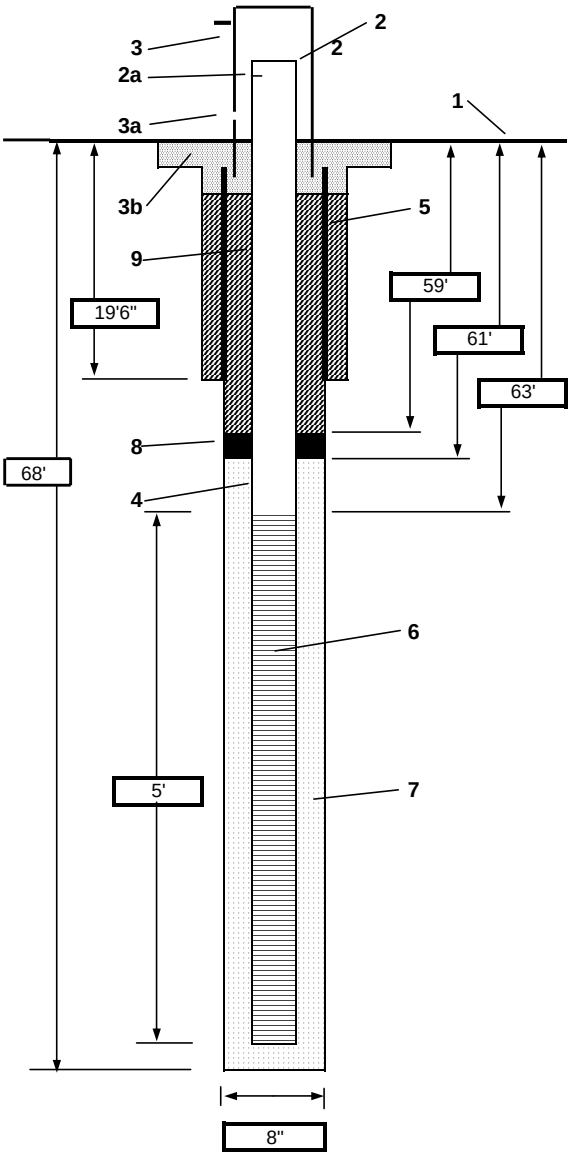
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3452833.87 EASTING: 12122477.36

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : DTW = 7.54' btoc START : 11/12/04 0745 END : 11/10/04 0800 LOGGER : R. Ives and J. Butler



1- Ground elevation at well: 6.5 ft amsl

2- Top of casing elevation: 9.24 ft amsl
a) vent hole? not applicable

3- Wellhead protection cover type: stick-up
a) weep hole?
b) concrete pad dimensions: approx. 2' by 2', elevation = 6.53 ft amsl

4- Diameter/type of well casing: 2" PVC Sch. 40 (Double cased to 19'6")

5- Diameter/type of surface casing: 8-inch ID Schedule 40 PVC casing to 19'6"

6- Type/slot size of screen: 2" PVC Sch.40, 10 slot

7- Type screen filter: DSI #1 Filter sand
a) Quantity used: 4 bags

8- Type of seal: Bentonite, 3/8" chips
a) Quantity used: not available

9- Grout
a) Grout mix used: Bentonite Cement Grout
b) Method of placement: tremie pipe
c) Quantity of well casing grout: not available

Development method: Whale Pump

Development time: approximately 40 minutes

Estimated purge volume: 55 gallons

Comments

PROJECT NUMBER	WELL NUMBER
181812.RP.DR	SJS02-MW11S SHEET 1 OF 1

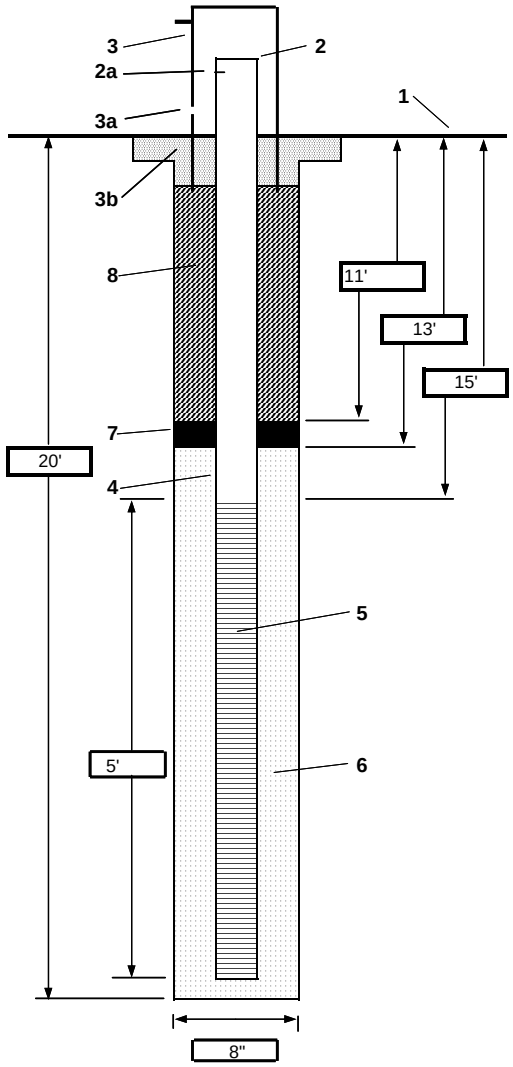
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3452790.39 EASTING: 12122586.84

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : DTW = 4.14' btoc START : 11/16/2004 0925 END : 1230 LOGGER : R. Ives / J. Butler



1- Ground elevation at well: 2.5 ft amsl

2- Top of casing elevation (ft AMSL): 5.68 ft amsl
   a) vent hole?: not applicable

3- Wellhead protection cover type: stick-up
   a) weep hole?:
   b) concrete pad dimensions: ~2 feet by 2 feet, elevation=2.81 ft amsl

4- Dia./type of well casing: 2" PVC Sch. 40

5- Type/slot size of screen: 2" PVC Sch. 40 10 slot

6- Type screen filter: DSI #1 Filter Sand
   a) Quantity used: 4 BAGS

7- Type of seal: Bentonite, 3/8" chips
   a) Quantity used: not available

8- Grout
   a) Grout mix used: Bentonite Cement Grout
   b) Method of placement: pour
   c) Vol. of well casing grout: not available

Development method: Whale Pump

Development time: approximately 1 1/2 hours

Estimated purge volume: 10 gallons

Comments: well is not a good producer. It will go dry, and recharge is relatively slow

PROJECT NUMBER	WELL NUMBER		
181812.RP.DR	SJS02-MW12S	SHEET 1	OF 1

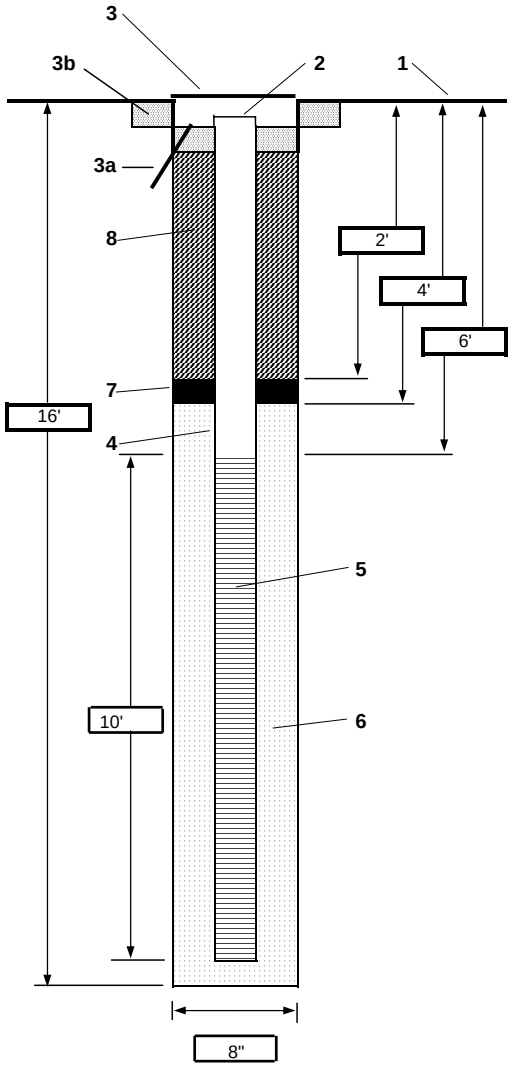
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex — LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff — NORTHING: 3452868.41 — EASTING: 12122490.03

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : 4.61' btoc — START : 11/17/04 1430 — END : 1630 — LOGGER : R. Ives and J. Butler



1- Ground elevation at well	6.68 ft amsl
2- Top of casing elevation	6.13 ft amsl
3- Wellhead protection cover type	flush mount
a) drain tube?	no
b) concrete pad dimensions	~2 ft. by 2 ft. square, elevation=6.66 ft amsl
4- Dia./type of well casing	2 " PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40 10 slot
6- Type screen filter	DSI # 1 Filter Sand
a) Quantity used	5 bags
7- Type of seal	bentonite, 3/8" chips
a) Quantity used	not available
8- Grout	
a) Grout mix used	bentonite cement grout
b) Method of placement	pour
c) Vol. of well casing grout	not available
Development method	whale pump
Development time	approximately 45 minutes
Estimated purge volume	not available

Comments

PROJECT NUMBER	WELL NUMBER
181812.RP.DR	SJS02-MW13S SHEET 1 OF 1

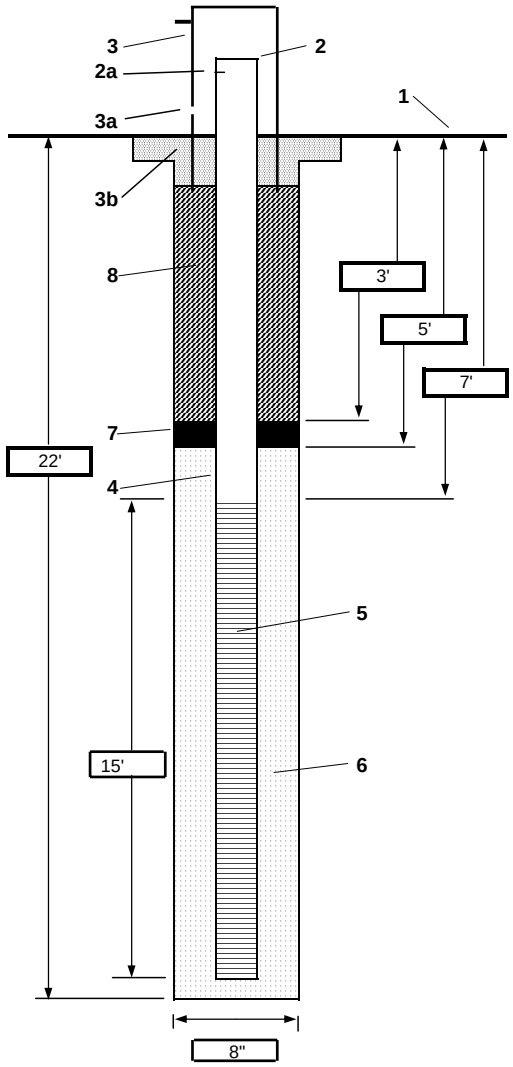
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3452665.90 EASTING: 12122415.57

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : DTW = 4.02' btoc START : 11/17/2004 1630 END :11/18 0945 LOGGER : R. Ives / J. Butler



1- Ground elevation at well	3.8 ft amsl
2- Top of casing elevation (ft AMSL)	6.30 ft amsl
a) vent hole?	not applicable
3- Wellhead protection cover type	stick-up
a) weep hole?	
b) concrete pad dimensions	~2 feet by 2 feet, elevation=3.87 ft amsl
4- Dia./type of well casing	2 " PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40 10 slot
6- Type screen filter	DSI # 1 Filter Sand
a) Quantity used	5 bags
7- Type of seal	bentonite, 3/8" chips
a) Quantity used	not available
8- Grout	
a) Grout mix used	Bentonite Cement Grout
b) Method of placement	pour
c) Vol. of well casing grout	not available
Development method	Whale Pump
Development time	approximately 35 minutes
Estimated purge volume	approximately 10 gallons

Comments

PROJECT NUMBER	WELL NUMBER	
181812.RP.DR	SJS02-MW14S	SHEET 1 OF 1

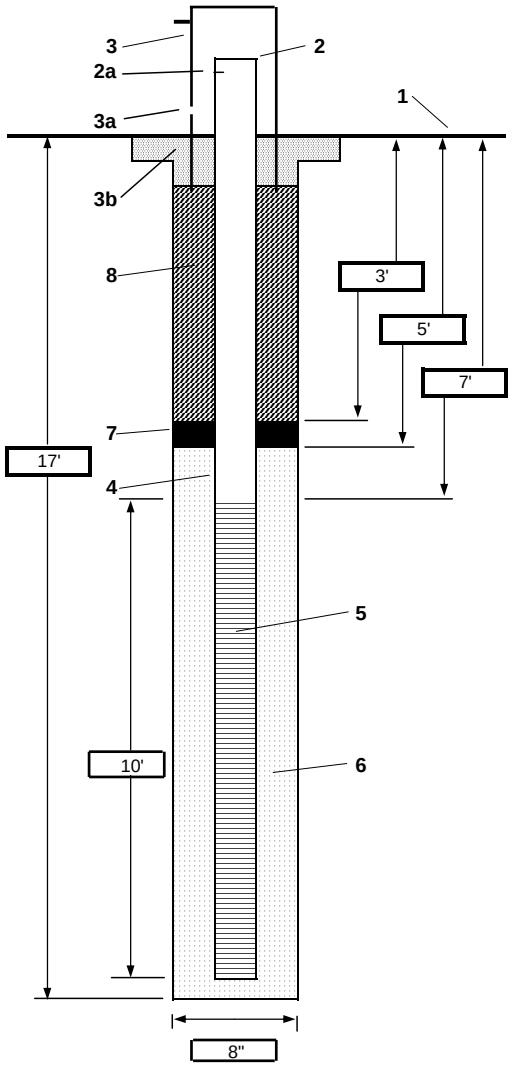
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex | LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff | NORTHING: 3452583.71 | EASTING: 12122454.94

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : DTW = not measured | START : 5/30/2007 0930 | END: 5/30/2007 1030 | LOGGER : A. Jones



1- Ground elevation at well	3.3 ft amsl
2- Top of casing elevation (ft AMSL)	6.51 ft amsl
a) vent hole?	not applicable
3- Wellhead protection cover type	stick-up
a) weep hole?	no
b) concrete pad dimensions	~2 feet by 2 feet
4- Dia./type of well casing	2 " PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40 10 slot
6- Type screen filter	DSI # 1 Filter Sand
a) Quantity used	not available
7- Type of seal	bentonite, 3/8" chips
a) Quantity used	not available
8- Grout	
a) Grout mix used	Bentonite Cement Grout
b) Method of placement	pour
c) Vol. of well casing grout	not available
Development method	Whale Pump
Development time	approximately 70 minutes
Estimated purge volume	approximately 45 gallons

Comments

PROJECT NUMBER	WELL NUMBER	
181812.RP.DR	SJS02-MW15S	SHEET 1 OF 1

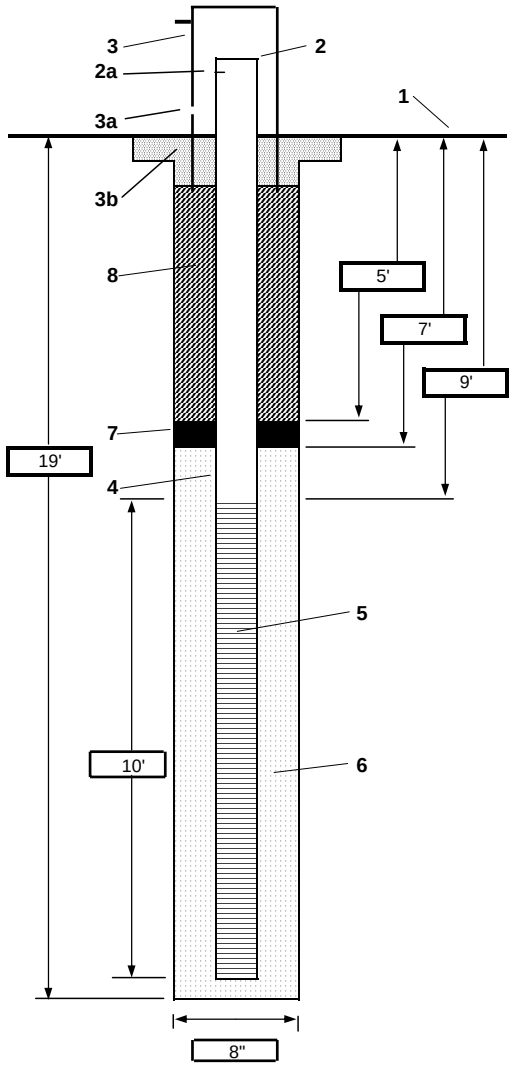
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex | LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff | NORTHING: 3452636 | EASTING: 12122459.46

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : DTW = not measured | START : 5/30/2007 | END: 5/30/2007 | LOGGER : A. Jones



1- Ground elevation at well	2.6 ft amsl
2- Top of casing elevation (ft AMSL)	5.59 ft amsl
a) vent hole?	not applicable
3- Wellhead protection cover type	stick-up
a) weep hole?	no
b) concrete pad dimensions	~2 feet by 2 feet
4- Dia./type of well casing	2 " PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40 10 slot
6- Type screen filter	DSI # 1 Filter Sand
a) Quantity used	not available
7- Type of seal	bentonite, 3/8" chips
a) Quantity used	not available
8- Grout	
a) Grout mix used	Bentonite Cement Grout
b) Method of placement	pour
c) Vol. of well casing grout	not available
Development method	Whale Pump
Development time	approximately 140 minutes
Estimated purge volume	not available

Comments

PROJECT NUMBER	WELL NUMBER	
181812.RP.DR	SJS02-MW16S	SHEET 1 OF 1

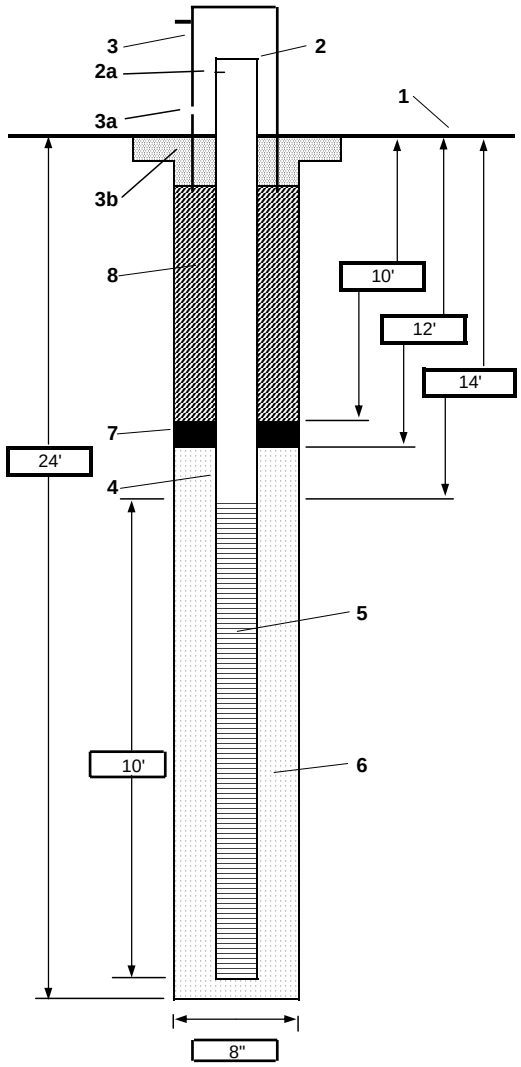
WELL COMPLETION DIAGRAM

PROJECT : St. Juliens Creek Annex — LOCATION : Site 2

DRILLING CONTRACTOR : Parratt Wolff — NORTHING: 3452419.353855 — EASTING: 12122530.087428

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" Hollow Stem Auger

WATER LEVELS : DTW = not measured — START : 6/1/2007 — END: 6/1/2007 — LOGGER : A. Jones



1-	Ground elevation at well	5 ft amsl
2-	Top of casing elevation (ft AMSL)	7.31 ft amsl
	a) vent hole?	not applicable
3-	Wellhead protection cover type	stick-up
	a) weep hole?	no
	b) concrete pad dimensions	~2 feet by 2 feet
4-	Dia./type of well casing	2 " PVC Sch. 40
5-	Type/slot size of screen	2" PVC Sch. 40 10 slot
6-	Type screen filter	DSI # 1 Filter Sand
	a) Quantity used	not available
7-	Type of seal	bentonite, 3/8" chips
	a) Quantity used	not available
8-	Grout	
	a) Grout mix used	Bentonite Cement Grout
	b) Method of placement	pour
	c) Vol. of well casing grout	not available
	Development method	Whale Pump
	Development time	approximately 60 minutes
	Estimated purge volume	approximately 12 gallons
	Comments	Well ran dry several times during development

Appendix F
Site 2 Sediment Technical Memorandum

Site 2 Outfall Sediment Investigation Results and Development of Reference Sediment Data in St. Juliens Creek

St. Juliens Creek Annex, Chesapeake, Virginia

PREPARED FOR: St. Juliens Creek Annex Tier I Partnering Team:
Mr. Bob Schirmer/NAVFAC MID LANT
Mr. Stephen Garth/ NAVFAC MID LANT
Mr. Todd Richardson/EPA
Ms. Debbie Miller/VDEQ
Ms. Valerie Walker/CNRMA
Mr. William Friedmann/CH2M HILL

PREPARED BY: Kim Henderson/ CH2M HILL

DATE: January 14, 2005

Introduction

This memorandum summarizes the sediment investigation performed as part of the Site 2 Expanded Remedial Investigation (ERI) at St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. The purpose of the ERI for Site 2 was to fill data gaps identified in the *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment (RI/HHRA/ERA) Report for Site 2* (CH2M HILL, 2004). The objective of the sediment investigation was to establish reference sample locations in St. Juliens Creek, upstream from Site 2 to evaluate the potential impacts from the Site 2 inlet to St. Juliens Creek.

This tech memo presents a current site description and history, the ERI field activities, a summary of all existing sediment data collected at Site 2 and in St. Juliens Creek, statistical analysis of the reference data, analytical results of the Site 2 data, conceptual model, and conclusions and recommendations for a path forward.

The information in this technical memorandum will be incorporated into the addendum to the RI/HHRA/ERA for Site 2, following additional groundwater delineation tentatively scheduled for fall 2004.

Site History and Description

The SJCA facility is situated at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake, located in southeastern Virginia (Figure 1).

Site 2 is an unlined waste disposal area located at the corner of St. Juliens Drive and Cradock Street in the southern portion of the facility (Figure 2). It is estimated that Site 2

covers approximately 1.5 acres. Operations at Site 2 began in 1921 and continued until sometime after 1947. Initially, refuse was burned openly onsite and was used to fill in the adjacent inlet. In 1942, an incinerator was installed and replaced the open burning practices. Garbage, acids, waste ordnance, and abrasive blast media (ABM) were reportedly disposed of at Site 2. The total volume of waste prior to burning is reported to have been approximately 35,185 cubic yards.

In the center of Site 2 is a water body surrounded by brush, trees, and grass that is directly connected to St. Juliens Creek. This inlet is tidally influenced and drains surface water from adjoining land into the creek. The Site 2 topography is generally level, sloping towards the inlet and St. Juliens Creek. Groundwater flow mimics the topography and flows towards the inlet and creek. Construction debris (concrete and brick), as well as ABM, is visible at the site. Two to three feet (ft) deep grassed drainage ditches are located along Cradock Street. An underground storm drainage system also originates approximately 1,000 ft northeast of the Site 2 area and outlets to the northernmost culvert to the inlet. Surface runoff from an adjacent parking lot to the northwest of the inlet drains directly into the inlet.

Field Investigation Activities

The ERI field investigation was conducted on January 6, 2004 in accordance with the *Final Work Plan for the Expanded Remedial Investigation Work Plan at Sites 2 and 5* (CH2M HILL, 2003). Sediment samples were collected from 11 locations within St. Juliens Creek, upstream of Site 2, and just outside of the Site 2 inlet to determine if there is significant communication between the inlet and St. Juliens Creek. Two transects of four samples each (including a sediment sample collected previously during the RI/HHRA/ERA) were collected at the confluence of the Site 2 inlet and St. Juliens Creek as inlet outfall samples. Five samples were collected upstream of Site 2 in St. Juliens Creek as reference sample locations. The sample locations are shown on Figure 3.

The reference sample locations were based on field identification by a field biologist based on the likeness of physical properties (apparent sediment grain size and organic content) as compared to inlet outfall sediment.

The sediment samples were collected from 0 to 6 inches below sediment surface with a stainless steel hand auger. Water quality parameters (pH, temperature, conductivity, salinity, dissolved oxygen, turbidity, and oxidation reduction potential [ORP]) of the overlying surface water were collected and are included on Table 1. The sediment samples were submitted to an offsite laboratory (Mitkem) and analyzed for Target Compound List (TCL) semivolatile organic compounds (SVOCs), TCL pesticides/ polychlorinated biphenyls (PCBs), Target Analyte List (TAL) inorganics, total organic carbon (TOC), and grain size based on the risk drivers identified in the RI/HHRA/ERA for Site 2. Quality assurance/quality control (QA/QC) samples were collected to ensure credibility of the analytical results, and included field blanks, equipment blanks, trip blanks, duplicates, matrix spike/matrix spike duplicates (MS/MSD) samples, and laboratory blanks. The complete analytical results are included in Appendix A.

Hard copies and electronic versions of the analytical data report were submitted to Environmental Data Quality, Inc. for third-party validation. Validation procedures

established by the Region III Modification to the National Functional Guidelines for Organic (EPA, 1994) and Inorganic Analyses (EPA, 1993) were adhered to during the validation process.

Data Summary

The following subsections describe the existing sediment data that has been collected at Site 2 and in St. Juliens Creek.

Inlet Sediment Data

Fourteen sediment samples (SJS02-SD01 through SD14) were collected from the Site 2 inlet (Figure 3) during the RI/HHRA/ERA. The field activities were conducted in three phases; the first and second phases were conducted from June to November 1997 and from April to October 1999, respectively and the third phase was conducted from June to August 2001. The sediment samples were collected from 0 to 6 inches below sediment surface. SJS02-SD01 through SD09 were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL inorganics, nitramines, phosphorus, TOC, and grain size; and SJS02-SD10 through SD14 were analyzed for dioxins (Appendix A).

Outfall Transect Data

Six samples (SJS02-SD15 through SD20) were collected at the confluence of the Site 2 inlet and St. Juliens Creek during the ERI in January 2004. One sample (SJS02-SD08) was collected during the RI (Figure 3). The outfall sediment samples were collected from 0 to 6 inches below sediment surface and analyzed for TCL SVOCs, TCL pesticides/PCBs, TAL inorganics, TOC, and grain size (Appendix A).

Background Data

Seven background sediment samples were collected in St. Juliens Creek in April and October 1999 (Figure 3). Four of the sediment samples (SJSBK-SD03 through SD06) were collected upstream of Site 2. Two samples (SJSBK-SD01 and SD12) were collected downstream of Site 2 and one sample (SJSBK-SD02) was located adjacent to Site 2. The background sediment samples were collected from 0 to 6 inches below sediment surface and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL inorganics, TOC, and percent solids (Appendix A).

Reference Data

Five reference (SJREF-SD01 through SD05) sediment samples were collected in St. Juliens Creek during the ERI in January 2004 (Figure 3). The reference sediment samples were collected from 0 to 6 inches below sediment surface and analyzed for analyzed for TCL SVOCs, TCL pesticides/PCBs, TAL inorganics, TOC, and grain size (Appendix A).

St. Juliens Creek Hazard Ranking System Data

In 1999, a Hazard Ranking System (HRS) plan was developed to evaluate SJCA (Tetra Tech, 1999). Potential sources, including Site 2, that may have released contaminants were identified. Five sediment samples (SD9 and SD11 through SD14) were collected in St. Juliens Creek in February 1999 and analyzed for TAL and TCL constituents (Figure 3).

Several of the sediment samples collected in St. Juliens Creek were adjacent to Site 2. The relevant data are presented in Tables 2 and 3 from the HRS (Tetra Tech, 2000). In the samples collected adjacent to Site 2, organic and inorganic concentrations met the HRS criteria for observed releases and the presence of contaminants in St. Juliens Creek were partially attributable to Site 2.

Data Evaluation

Statistical Analysis

The reference sample areas were chosen as representative of anthropogenic conditions based on their isolation from site-related sources of contamination as compared to the inlet outfall location. The reference locations are primarily adjacent to residential areas as identified from aerial photographs and were selected in upstream/isolated areas believed to receive a reduced degree of point and non-point source inputs. These reference areas are expected to receive different non-site related contributions (e.g., urban and residential runoff) than sample locations immediately adjacent to the inlet outfall, with chemical concentrations levels reflective of typical urban watershed environments.

With the exception of the background sample location SJSBK-SDS02, the background sediment samples were collected in similar conditions as the reference sediment samples. The TOC and grain size data (Appendix A) from the reference and background sediment were evaluated and determined to be comparable to the inlet and outfall sediment. Therefore, the background data were combined with the reference data to generate reference upper tolerance limits (UTLs) for St. Juliens Creek sediment and will be referred to collectively as reference data from this point forward. SJSBK-SD02 was excluded from the data set based on the proximity to Site 2, elevated constituent concentrations, and location in a potentially depositional environment. From this point forward, SJSBK-SD02 will be incorporated with the Site 2 sediment data.

Complete data tables, provided in Appendix A, list analytical results for all constituents analyzed in the reference sediment samples.

Distribution

Making an appropriate distributional assumption for the data is an important prerequisite for statistical analyses. A distributional assumption is the best estimate of the distribution of the parent (or target) population. The key determination of the data distribution was based on the results of the Shapiro-Wilk test (see Gilbert, 1987 or EPA, 2000 for methodology and examples).

A significance level of 0.05 was used for these tests. If the p-value for the Shapiro-Wilk test was greater than or equal to 0.05, the distributional assumption was chosen to be normal. If the number of samples was too small for the test or if the p-value was below 0.05, then the data was treated nonparametrically. Distributional assumptions for detected constituents and p-values are shown on Table 4.

Calculation of Reference Upper Tolerance Limits (UTLs)

A 95 confidence/95 coverage background UTL is an upper bound (with 95% confidence) of the background 95th percentile. The calculation of the UTLs depends on the distributional assumption. When appropriate, the normal UTL was calculated using the following equation:

$$UTL = \bar{x} + (K \times s),$$

where $\bar{x}$ is the sample mean;
K is the tolerance factor; and
s is the sample standard deviation.

For data sets that were not normally distributed, nonparametric UTLs were calculated. A nonparametric UTL is computed by first ranking the concentrations and then choosing the lowest ranked detected concentration that provides a coverage of 95% with 95% confidence. For data sets with less than 59 concentrations (n < 59), 95% coverage is not possible with 95% confidence, even when the maximum concentration is assigned as the UTL. This was the case for the data in this study, so the estimated percentile (95th or lower) associated with the maximum concentration (assuming the magnitude of the maximum concentration appears defensible) was reported. This percentile is calculated using the following equation:

$$p = B_{0.95,n,1}$$

where B is a beta distribution defined by n (the number of sample results) and 1 (since the highest ranked concentration is being used). Calculated percentiles and reference UTLs are shown on Table 4. The complete data set of statistical plots are included in Appendix B.

Outliers

Outlier analysis was performed for each parameter's sediment data. Per EPA guidance (EPA, 2000), and the available sample size (less than 25 samples in each case) Dixon's Extreme Value test was used. If sample sizes of 25 or more were available, Rosner's test would have been applied. The outlier tests were applied to the highest five concentrations for each parameter. While Rosner's handles potential multiple outliers directly, the Extreme Value does not, but it was nevertheless applied sequentially for each elevated value. These outlier tests were performed with a significance level of 0.05.

These outlier tests are based on an assumption that the remaining concentrations represent a normal distribution (after the potential outlier is excluded). This assumption was typically not true, based on the Shapiro-Wilk test using a significance level of 0.05. Since the tests of normality for the non-outlier concentrations did not typically support assumptions of normality, the data were transformed as suggested by guidance (EPA, 2000). Three different transformations were conducted for each potential outlier; these were the square root transformation, the cubic root transformation, and the natural logarithmic transformation. The logarithmic transformation is a standard transformation in environmental applications, while the square root and cubic root offer options appropriate for intermediate levels of skewness in the data.

The transformation offering the greatest p-value for normality was chosen for each individual case. Using data thus transformed, the Dixon's Extreme Value test was

performed to determine which elevated concentrations should be excluded from the background data set. These exclusions are presented in Table 5. Also, on the plots (Appendix B) these excluded concentrations are indicated by an "X" symbol. For some volatiles, these include some proxy concentrations for non-detected results. While these non-detect proxies would not be eligible to serve as nonparametric UTLs, they would be included in any potential central tendency comparisons between background and site concentrations. These central tendency comparisons would probably either be two-sample t tests (when both the background and site concentrations appear to be normally distributed) or the nonparametric Wilcoxon Rank Sum tests in all other cases. All of the concentrations identified as outliers listed in Table 5 should be excluded from such calculations.

Identification and removal of these elevated concentrations was performed to help ensure that the established reference data set was suitably conservative to characterize background conditions.

Summary of Analytical Results

Complete data tables, provided in Appendix A, list analytical results for all constituents analyzed in the sediment samples. Table 6 shows constituents that were detected in one or more samples compared to the reference UTLs and risk-based screening values. A shaded cell indicates that the parameter exceeds the reference UTL. An outlined cell indicates that the parameter exceeds the Biological Technical Assistance Group (BTAG) sediment screening values. Bold text indicates the parameter exceeds the adjusted residential soil RBC (adjusted x10 for sediment). Potential risk drivers in sediment identified in the baseline HHRA and screening ERA and Step 3 of the ERA process (CH2M HILL, 2004a) are also indicated on Table 6. The distribution of constituents exceeding the reference UTLs are shown on Figure 4.

The inorganic constituents calcium, magnesium, potassium, phosphorous, and sodium are not typical in waste streams characteristic of the activities conducted at Site 2. These common inorganic constituents are essential nutrients, are not considered potential site-related compounds, do not pose human health or ecological risks, and therefore do not warrant detailed attention or discussion.

Semivolatile Organic Compounds. Eighteen SVOCs were detected in Site 2 sediment samples. Five of the SVOCs detected [benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, phenanthrene, and pyrene] were identified as potential ecological risk drivers in the RI/HHRA/ERA. These SVOCs were present at concentrations exceeding reference UTLs at inlet sediment location SJS02-SD05 and/or outfall sediment location SJS02-SD20.

Bis(2-ethylhexyl)phthalate was detected at concentrations that exceeded the reference UTLs at inlet sediment location SJS02-SD09 and outfall transect sediment locations SJS02-SD15, SD16, and SD18. Indeno(1,2,3-cd)pyrene was also detected above the reference UTL at outfall sediment location SJS02-SD20.

No SVOCs were identified as human health risk drivers in the RI/HHRA/ERA and were not present at concentrations exceeding the adjusted residential soil RBCs in either inlet or outfall sediment.

Pesticides and Polychlorinated Biphenyls. Eight pesticides/PCBs were detected in Site 2 sediment samples. 4,4′-DDD, 4,4′-DDE, and 4,4′-DDT were detected above the reference UTLs in both the inlet and outfall sediment locations but were not identified as potential ecological risk drivers in the RI/HHRA/ERA.

No reference UTLs were established for the potential ecological risk drivers (aroclor-1260, alpha-chlordane, and gamma-chlordane) identified in the RI/HHRA/ERA because these constituents were not detected in the reference data set. Aroclor-1260, alpha-chlordane, and gamma-chlordane were detected above the BTAG screening values within the inlet and at the inlet outfall (SJS02-SD08 and SD20) only.

No pesticides/PCBs were identified as human health risk drivers in the RI/HHRA/ERA and were not present at concentrations exceeding the adjusted residential soil RBCs.

Inorganics. All 24 TAL inorganics were detected in the Site 2 sediment. Eight of the inorganics detected (arsenic, barium, cadmium, chromium, copper, cyanide, lead, and zinc) were identified as potential ecological risk drivers in the RI/HHRA/ERA. Concentrations of barium, cadmium, chromium, copper, cyanide, lead, and zinc also exceeded the reference UTLs in both the inlet and outfall transect sediment and the highest concentrations occurred in the inlet sediment. The outfall transect sediment samples contained significantly lower inorganic concentrations with the highest concentrations occurring at the outfall locations (SJS02-SD08 and SD20).

Non-risk driver exceedances of the reference UTLs included aluminum, antimony, cobalt, iron, manganese, nickel, and vanadium; detected in both the inlet and outfall transect sediment, but primarily in the inlet sediment.

Arsenic and chromium were also identified as human health risk drivers in the RI/HHRA/ERA and were present at concentrations exceeding the adjusted residential soil RBCs (4.3 mg/kg and 230 mg/kg, respectively) in both inlet and outfall sediment. Chromium concentrations were also above the reference UTL (43.2 mg/kg), the highest concentrations occurred in the inlet sediment. All the arsenic concentrations were below the reference UTL (30.4 mg/kg).

Total Organic Carbon. In the inlet sediment, TOC values ranged from 2,050 mg/kg to 71,000 mg/kg. The lowest TOC concentrations occurred in the western drainage ditch to the inlet at SJS02-SD01 and SD04 (2,050 mg/kg and 2,270 mg/kg, respectively). Consequently, very few inorganics were found at elevated concentrations in these samples. Higher TOC concentrations (35,000 to 44,000 mg/kg) were detected in the central portion of the inlet. The highest TOC and inorganic concentrations (57,200 mg/kg and 71,000 mg/kg) were found in the depositional areas (SJS02-SD07 and SD03, respectively).

The outfall transect sediment TOC concentrations ranged from 15,000 mg/kg to 63,000 mg/kg. Higher concentrations of inorganics were generally detected at locations with higher TOC concentrations.

Grain Size. Grain size analyses were performed on the outfall transect sediment and the results are included as Appendix C. As anticipated, the coarser materials (sand and gravel) were found in sediment collected at the outfall and an increasing amount of silts and clays, a

fining outward sequence, were found in sediment away from the inlet towards the main channel of St. Juliens Creek.

Conceptual Model

Chemicals could enter onsite surface water bodies via surficial runoff from soil. Transport of chemicals in suspended inlet sediment to St. Juliens Creek via tidal flux through the low-flow culvert. The configuration of the creek shoreline and the low-flow culvert between the Site 2 inlet and St. Juliens Creek creates a relatively low energy environment minimizing the potential for suspension of sediment except during extreme storm events.

The inlet generally contains surface water and is expected to maintain a variety of aquatic biota. Accordingly, chemicals originating from Site 2 have the potential to adversely affect aquatic life within the inlet area. It is recognized, however, St. Juliens Creek receives chemical inputs from multiple sources unrelated to Site 2, including other SJCA activities and off-site developed areas to the south and west of SJCA. Non-site-related chemicals in the sediments and surface water of the main body of St. Juliens Creek could also be transported by tidal flux into the inlet where aquatic life could be exposed to these non-site-related chemicals.

Chemicals could also partition to sediment following discharge to surface water. In general, chemical concentrations in sediment resulting from this transport pathway are a function of distance from the source(s), chemical fate properties, sediment type, and water velocity. The water velocity associated with Site 2 is expected to be relatively low, and the onsite aquatic habitats are expected to constitute depositional sinks where many chemicals would adsorb and precipitate to sediments. Chemicals may be remobilized and transported from these sinks by various physical events and chemical processes (e.g., storm events, tidal forces).

Ecological Risk Considerations

The Screening ERA (SERA) and Step 3 of the ERA process for Site 2 (CH2M HILL, 2004) indicated a potential for adverse effects to benthic-dwelling organisms from the presence of chemicals in the Site 2 inlet sediments and a limited potential for adverse effects to avian piscivores and reptiles from the presence of mercury in sediment. The ERA indicated the possibility that chemicals in the Site 2 inlet area sediments could be transported to the main body of St. Juliens Creek. The additional data presented in this memorandum indicates only a localized area of potential impact in St. Juliens Creek, at a location that is immediately adjacent to where the inlet discharges to St. Juliens Creek. Based on this very localized area of potential impact, the overall potential for chemicals originating from the Site 2 inlet drainage to impact ecological receptors in St. Juliens Creek is considered low and does not warrant further detailed investigation.

Presumptive remedies (removal/soil cover) have been recommended for Site 2 soils. These remedies would reduce or eliminate the potential for chemicals associated with Site 2 soils to impact inlet sediments in the future. However, there remains the potential for chemicals in the Site 2 inlet drainage sediments, including the point where the inlet discharges to St. Juliens Creek, to adversely affect benthic-dwelling organisms. As discussed in the Site 2 SERA and Step 3 ERA conclusions (CH2M HILL, 2004), limited bioassays are recommended to further

characterize the toxicity of these sediments to benthic-dwelling organisms. Additional sediment chemical analytical data collected as part of this bioassay investigation could also be used to further investigate the low level risks that were indicated to avian piscivores reptiles from the presence of mercury in Site 2 sediments.

Conclusions

Potential human health and ecological risks from exposure to Site 2 inlet sediment were identified in the RI/HHRA/ERA. The RI/HHRA/ERA data were compared to the reference UTLs generated as part of this technical memorandum. Several SVOCs, pesticides, and inorganics were present in the inlet sediment at elevated concentrations, indicating that these chemicals are site-related. The potential source of these chemicals to the inlet is from surface water runoff and erosion of constituents in surface soils that deposit as sediment.

The Expanded RI data indicated that although several constituent concentrations exceeded the reference UTLs in the outfall transect sediment, the highest concentrations occurred within the inlet and at the outfall locations (SJS02-SD08 and SD20). Only a few inorganics, pesticides, and bis(2-ethylhexyl)phthalate occurred in the outfall transect sediment at concentrations above the reference UTLs and with the exception of and bis(2-ethylhexyl)phthalate, these concentrations were significantly lower than the inlet sediment. Although Site 2 is potentially contributing, or has historically contributed, chemicals to St. Juliens Creek via tidal influx through the low-flow culvert, significant site-related effects are only indicated in a localized area directly at the outfall location.

Removal and/or soil cover have been recommended to reduce or eliminate the potential for chemicals associated with Site 2 soils to impact inlet sediments in the future. However, there remains the potential for chemicals in the inlet sediments, including the point where the inlet discharges to St. Juliens Creek, to adversely affect benthic-dwelling organisms. As concluded in the ERA, limited bioassays are recommended to further characterize the toxicity of the inlet sediments to benthic-dwelling organisms. Additional sediment chemical analytical data collected as part of this bioassay investigation could also be used to further investigate the low level risks that were indicated to avian piscivores reptiles from the presence of mercury in inlet sediments.

The contents of this technical memorandum will be incorporated into the addendum to the RI/HHRA/ERA for Site 2, following additional groundwater delineation tentatively scheduled for fall 2004. Following the Site 2 RI/HHRA/ERA addendum and recommended bioassay investigation, the Navy will develop remedial action objectives (RAOs) to address potential risks to human health and the environment and an FS will be developed to evaluate remedial action alternatives at Site 2. Remedial alternatives for all Site 2 media will need to be evaluated and implemented in a logical sequence to prevent recontamination of media.

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Table 1
Overlying Surface Water Field Parameters Collected at Sediment Sample Locations
Site 2
St. Juliens Creek Annex, Chesapeake, Virginia

	Reference Sediment Locations				Outfall Transect Sediment Locations					
Station ID	SJREF-SD01-00	SJREF-SD02-00	SJREF-SD04-00	SJREF-SD05-00	SJS02-SD15-00	SJS02-SD16-00	SJS02-SD17-00	SJS02-SD18-00	SJS02-SD19-00	SJS02-SD20-00
Sample ID	SJREF-SD01-00-04A	SJREF-SD02-00-04A	SJREF-SD04-00-04A	SJREF-SD05-00-04A	SJS02-SD15-00-04A	SJS02-SD16-00-04A	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A
Sample Date	01/06/2004	01/06/2004	01/06/2004	01/06/2004	01/06/2004	01/06/2004	01/06/2004	01/06/2004	01/06/2004	01/06/2004
Field Parameters										
Dissolved Oxygen (MG/L)	9.29	0	8.53	8.74	10.2	10.27	10.57	9.7	9.2	9.43
Oxidation Reduction Potential (mV)	121	261	116	125	129	155	97	112	119	88
pH (pH)	7.12	6.67	6.95	7	7.31	7.31	7.15	7.29	7.33	7.12
Salinity (%)	1.09	0.2	0.94	0.91	1.22	1.57	1.17	1.28	1.28	1.08
Specific Conductance (ms/cm)	18.6	3.28	1.62	17.5	20.5	26	20.4	21.4	21.4	18.3
Temperature (C)	13.61	13.4	13.4	13.4	13.4	11.9	13.4	13.5	13.7	13.1
Turbidity (NTU)	0	14.9	0	0	0	0	0	0	0	0

Table 2
Observed Inorganic Releases from the Hazard Ranking System
Site 2
St. Juliens Creek Annex, Chesapeake, Virginia

Tetra Tech Sample No.			SD-9	SD-11	SD-12	SD-13	SD-13	SD-14
CLP Sample No.			MCHWH20	MCWJ22	MCWJ23	MCWJ24	MCWY90	MCWJ25
Date Sampled			02/04/1999	02/04/1999	02/04/1999	02/04/1999	02/04/1999	02/04/1999
% Solids	**Units**	**CRDL**	80.3	75.4	76.1	58.8	60.9	44.3
Inorganics								
Copper	MG/KG	5	7.30	**28.60**	**30.20**	**55.30**	**42.40**	**72.20**
Lead	MG/KG	0.6	7.30	**21.90**	20.20	**53.80**	**73.60**	**97.20**
Magnesium	MG/KG	1000	(1110.00)	(1200.00)	2730.00	2640.00	**6000.00**	3050.00
Manganese	MG/KG	3	20.20	24.60	33.70	**66.20**	**110.00**	**110.00**
Nickel	MG/KG	8	(3.60)	(3.90)	(3.80)	(8.20)	(9.00)	**(16.50)**
Selenium	MG/KG	1	ND	ND	**1.6 K**	UL	**2.00 K**	**(1.80) K**
Thallium	MG/KG	2	ND	ND	(1.10)	(1.60) L	**(2.40)**	ND
Zinc	MG/KG	4	15.20	**131.00**	**91.50 L**	**188.00**	**219.00**	**241.00**

Notes:

B	Not detected substantially above the level reported in laboratory field blanks.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not detected, quantitation limit is probably higher.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
BOLD	Concentration meets criteria for observed release as given in HRS.
CRDL	Contract Required Detection Limit
MG/KG	Milligrams per kilogram
SD	Sediment
( )	Analyte present. As values approached the instrument Detection Limit (IDL) the quantitation limit may not be accu

Table 3
Observed Organic Releases from the Hazard Ranking System
Site 2
St. Juliens Creek Annex, Chesapeake, Virginia

Tetra Tech Sample No.			SD-9	SD-13	SD-14
CLP Sample No.			CTB96	CTH00	CTH01
Date Sampled			02/04/1999	02/04/1999	02/04/1999
% Moisture	**Units**	**CRQL**	20	36	70
Base Neutral Acids					
Acenaphthylene	UG/KG	330	ND	**600**	190 J
Phenanthrene	UG/KG	330	ND	**1800**	320 J
Anthracene	UG/KG	330	ND	**1400**	290 J
Fluoranthene	UG/KG	330	ND	**9200***	**2500**
Pyrene	UG/KG	330	ND	**8100***	**1900**
Benzo(a)anthracene	UG/KG	330	ND	**4400***	**1200**
Chyrsene	UG/KG	330	ND	**4400***	**1500**
Benzo(b)fluoranthene	UG/KG	330	ND	**4800***	**2100**
Benzo(k)fluoranthene	UG/KG	330	ND	**2500**	**1900**
Benzo(a)pyrene	UG/KG	330	ND	**2700**	**1400**
Indeno(1,2,3-cd)pyrene	UG/KG	330	ND	**1400**	550 J
Dibenz(a,h)anthracene	UG/KG	330	ND	**670**	180 J
Benzo(g,h,i)perylene	UG/KG	330	ND	**780**	340 J
Pesticides an Polychlorinated Biphenyls					
4,4'-DDE	UG/KG	3.3	ND	**16**	**70**
Endosulfan sulfate	UG/KG	3.3	ND	ND	**93**
4,4'-DDT	UG/KG	3.3	ND	ND	34 J
4,4'-DDD	UG/KG	3.3	ND	**20**	ND

Notes:

B	Not detected substantially above the level reported in laboratory field blanks.
BOLD	Concentration meets criteria for observed release as given in HRS.
CRQL	Contract Required Quantitation Limit
UG/KG	Micrograms per kilogram
J	Analyte present. Reported value may not be accurate or precise.
ND	Not Detected
*	Results reported from a diluted analysis
SD	Sediment

Table 4
Reference Summary Statistics
St. Juliens Creek
St. Juliens Creek Annex, Chesapeake, Virginia

Parameter	Units	Reference UTL	Assumed Distribution for UTL	Percentile Estimated	Mean	Median	Strandard Deviation	Frequency of Detects	Minimum	Minimum Flag	Maximum Detect	Maximum Detect Flag	Normality p-value	Lognormality p-value
Aluminum	MG/KG	20,700	Nonparametric	84	7,850	5,510	7,100	17/17	469		20,700		0.007	0.338
Arsenic	MG/KG	30.4	Nonparametric	84	7.63	6.2	7.58	17/17	0.96	J	30.4		0.002	0.747
Barium	MG/KG	68.4	Normal	95	24.1	24.9	17.8	16/17	4	J	58.9	J	0.077	0.024
Beryllium	MG/KG	2.1	Nonparametric	84	0.496	0.44	0.497	16/17	0.09	J	2.1		0.001	0.534
Cadmium	MG/KG	1.4	Nonparametric	84	0.359	0.19	0.405	15/17	0.08	J	1.4	J	0.000	0.478
Calcium	MG/KG	5,200	Nonparametric	84	1,670	1,520	1,440	16/17	281	J	5,200		0.031	0.001
Chromium	MG/KG	43.2	Nonparametric	84	18.8	14	15	17/17	0.99	K	43.2	K	0.036	0.159
Cobalt	MG/KG	9.5	Nonparametric	84	3.41	2.5	3.05	15/17	0.75	J	9.5	J	0.034	0.018
Copper	MG/KG	122	Nonparametric	84	36.8	26.1	32.8	17/17	0.8	J	122		0.035	0.158
Iron	MG/KG	32,700	Nonparametric	84	12,400	8,140	11,000	17/17	599		32,700		0.017	0.284
Lead	MG/KG	128	Normal	95	46.8	37	32.6	17/17	3.7	K	104	K	0.078	0.088
Magnesium	MG/KG	6,380	Nonparametric	84	2,300	1,510	2,180	16/17	108	J	6,380		0.009	0.002
Manganese	MG/KG	202	Nonparametric	84	71	38.2	68.9	17/17	2.4	K	202		0.006	0.448
Mercury	MG/KG	1.4	Nonparametric	84	0.304	0.2	0.361	16/17	0.03	L	1.4	L	0.001	0.920
Nickel	MG/KG	24.2	Normal	95	8.07	6	6.5	16/17	1.5	J	19.9		0.066	0.012
Potassium	MG/KG	3,490	Nonparametric	84	1,140	684	1,200	17/17	44.9	J	3,490		0.001	0.584
Selenium	MG/KG	1.5	Nonparametric	84	0.54	0.395	0.378	5/17	0.54	J	1.5	J	0.001	0.070
Sodium	MG/KG	9,410	Nonparametric	84	3,390	1,930	3,030	15/17	36.7	J	9,410		0.047	0.005
Vanadium	MG/KG	57	Normal	95	19.3	15.3	15.1	17/17	1.8	J	55.9		0.066	0.485
Zinc	MG/KG	418	Normal	95	141	116	111	16/17	30.3		422		0.119	0.000
4,4'-DDD	MG/KG	0.0072	Nonparametric	78	0.00334	0.00295	0.00138	4/12	0.0026	L	0.0072	L	0.002	0.077
4,4'-DDE	MG/KG	0.1	Nonparametric	84	0.0193	0.0064	0.0265	12/17	0.004	J	0.1		0.000	0.131
4,4'-DDT	MG/KG	0.013	Nonparametric	83	0.0054	0.00403	0.00358	9/16	0.0013	J	0.013	L	0.040	0.916
Methoxychlor	MG/KG	0.3	Nonparametric	74	0.0639	0.0173	0.0964	3/10	0.06		0.3		0.000	0.015
Acenaphthene	MG/KG	0.071	Nonparametric	72	0.295	0.305	0.109	1/9	0.071	J	0.071	J	0.328	0.006
Acenaphthylene	MG/KG	0.31	Nonparametric	72	0.226	0.245	0.103	4/9	0.061	L	0.31	J	0.614	0.140
Anthracene	MG/KG	0.492	Normal	95	0.204	0.24	0.102	6/11	0.045	L	0.29	J	0.746	0.242
Benzo(a)anthracene	MG/KG	1.3	Nonparametric	79	0.401	0.245	0.393	12/13	0.054	J	1.3	L	0.018	0.741
Benzo(a)pyrene	MG/KG	1.1	Nonparametric	79	0.395	0.27	0.352	11/13	0.05	J	1.1	L	0.027	0.516
Benzo(b)fluoranthene	MG/KG	3.3	Nonparametric	79	0.715	0.32	0.923	12/13	0.074	J	3.3		0.001	0.646
Benzo(g,h,i)perylene	MG/KG	0.672	Normal	95	0.292	0.245	0.139	8/12	0.13	L	0.55	L	0.226	0.613
Benzo(k)fluoranthene	MG/KG	1.4	Nonparametric	79	0.346	0.24	0.356	10/13	0.059	L	1.4		0.001	0.805
Carbazole	MG/KG	0.644	Normal	95	0.271	0.275	0.128	2/10	0.048	L	0.079	J	0.255	0.008
Chrysene	MG/KG	1.5	Nonparametric	81	0.453	0.228	0.457	13/14	0.062	J	1.5	L	0.009	0.469
Dibenz(a,h)anthracene	MG/KG	0.41	Nonparametric	72	0.221	0.24	0.121	5/9	0.05	L	0.41	J	0.558	0.132
Diethylphthalate	MG/KG	0.608	Normal	95	0.286	0.275	0.111	2/10	0.05	L	0.22	L	0.337	0.002
Fluoranthene	MG/KG	2.6	Nonparametric	81	0.691	0.375	0.752	13/14	0.069	L	2.6	L	0.004	0.823
Indeno(1,2,3-cd)pyrene	MG/KG	0.624	Normal	95	0.256	0.245	0.137	10/13	0.053	L	0.51	L	0.451	0.498
Phenanthrene	MG/KG	0.92	Nonparametric	78	0.314	0.278	0.223	7/12	0.062	L	0.92		0.015	0.716
Pyrene	MG/KG	1.9	Nonparametric	81	0.528	0.3	0.549	13/14	0.065	L	1.9	L	0.003	0.904
bis(2-ethylhexyl)phthalate	MG/KG	0.44	Normal	95	0.155	0.135	0.0977	3/10	0.044	J	0.15	J	0.137	0.208
2-Butanone	MG/KG	0.0175	Normal	95	0.00891	0.0075	0.00305	4/11	0.005	J	0.012	J	0.166	0.840
4-Methyl-2-pentanone	MG/KG	0.016	Normal	95	0.0075	0.00725	0.00312	5/12	0.003	J	0.008	J	0.109	0.388
Carbon disulfide	MG/KG	0.006	Nonparametric	79	0.00681	0.0065	0.00336	5/13	0.002	J	0.006	J	0.025	0.223
Chloromethane	MG/KG	0.009	Nonparametric	76	0.00773	0.0075	0.00268	2/11	0.002	J	0.009	J	0.039	0.001
Toluene	MG/KG	0.0188	Normal	95	0.00721	0.00725	0.00424	4/12	0.002	J	0.005	J	0.202	0.219
Total Organic Carbon (TOC)	MG/KG	89,900	Nonparametric	84	25,600	16,000	24,000	17/17	1,820		89,900		0.013	0.399

Notes:

p-value = probability that the observed differences would occur purely by chance

Table 5
Statistical Outliers Excluded from Reference Data Set
St. Juliens Creek
St. Juliens Creek Annex, Chesapeake, Virginia

Parameter	Sample ID	Validation Flag	Result (MG/KG)
Aluminum	SJREF-SD01-00-04A		20,700
Aluminum	SJREF-SD03-00-04A-P		19,200
Aluminum	SJREF-SD05-00-04A		18,000
Aluminum	SJREF-SD04-00-04A		17,400
Aluminum	SJSBK-SD05-001	K	14,100
Arsenic	SJSBK-SD05-001		30.4
Beryllium	SJSBK-SD05-001		2.1
Cadmium	SJSBK-SD05-001	J	1.4
Cadmium	SJSBK-SD02-002	J	1.1
Cadmium	SJSBK-SD02-001	J	1
Calcium	SJSBK-SD12-001		5,200
Cyanide	SJREF-SD05-00-04A		4.5
Cyanide	SJREF-SD03-00-04A-P		2
Mercury	SJSBK-SD04-002	L	1.4
Mercury	SJREF-SD01-00-04A		0.74
Mercury	SJREF-SD05-00-04A		0.61
Mercury	SJREF-SD03-00-04A-P		0.6
Potassium	SJREF-SD01-00-04A		3,490
Potassium	SJREF-SD04-00-04A		3,190
Potassium	SJREF-SD03-00-04A-P		2,950
Potassium	SJREF-SD05-00-04A		2,940
Selenium	SJSBK-SD05-001	J	1.5
Selenium	SJSBK-SD02-002	J	1.3
Selenium	SJSBK-SD05-002	J	1
Selenium	SJSBK-SD02-001	J	0.74
Silver	SJREF-SD01-00-04A	J	1.8
Silver	SJREF-SD05-00-04A	J	1.5
Silver	SJREF-SD03-00-04A-P	J	1.5
Silver	SJREF-SD04-00-04A	J	1.4
Silver	SJSBK-SD12-001	J	0.22
4,4'-DDD	SJSBK-SD05-001		0.092
4,4'-DDD	SJSBK-SD02-002	L	0.039
4,4'-DDD	SJSBK-SD12-001	L	0.016
4,4'-DDD	SJSBK-SD04-002P		0.012
4,4'-DDD	SJSBK-SD05-002	L	0.0088
4,4'-DDE	SJSBK-SD05-001		0.1
4,4'-DDE	SJSBK-SD05-002	L	0.06
4,4'-DDE	SJSBK-SD12-001	L	0.046
Methoxychlor	SJREF-SD01-00-04A		0.3
Methoxychlor	SJREF-SD03-00-04A-P		0.17
Methoxychlor	SJREF-SD05-00-04A		0.06
Benzo(b)fluoranthene	SJREF-SD01-00-04A		3.3
Benzo(b)fluoranthene	SJREF-SD03-00-04A-P		1.6
Benzo(b)fluoranthene	SJREF-SD05-00-04A		1.4
Benzo(k)fluoranthene	SJREF-SD01-00-04A		1.4
Benzo(k)fluoranthene	SJSBK-SD02-002	L	0.58
Benzo(k)fluoranthene	SJREF-SD03-00-04A-P	J	0.52
Benzo(k)fluoranthene	SJREF-SD05-00-04A	J	0.46
Fluoranthene	SJSBK-SD02-002	L	2.6
Fluoranthene	SJREF-SD01-00-04A		1.6
Fluoranthene	SJSBK-SD04-002P		1.6
Phenanthrene	SJSBK-SD04-002P		0.92
Pyrene	SJSBK-SD02-002	L	1.9
Pyrene	SJSBK-SD04-002P		1.5
2-Butanone	SJSBK-SD05-002	J	0.093
2-Butanone	SJSBK-SD05-001	UJ	0.016
4-Methyl-2-pentanone	SJSBK-SD02-002	U	0.0135
Acetone	SJSBK-SD04-002P	J	0.34
Acetone	SJSBK-SD05-002	J	0.24
Acetone	SJSBK-SD03-002		0.157

Table 5
Statistical Outliers Excluded from Reference Data Set
St. Juliens Creek
St. Juliens Creek Annex, Chesapeake, Virginia

Parameter	Sample ID	Validation Flag	Result (MG/KG)
Acetone	SJSBK-SD05-001	J	0.032
Carbon disulfide	SJSBK-SD05-001	UJ	0.016
Chloromethane	SJSBK-SD05-001	U	0.016
Chloromethane	SJSBK-SD02-002	U	0.0135
Total Organic Carbon (TOC)	SJSBK-SD05-002		89900
Carbon disulfide	SJSBK-SD05-001	UJ	0.016
Chloromethane	SJSBK-SD05-001	U	0.016
Chloromethane	SJSBK-SD02-002	U	0.0135
Methylene chloride	SJSBK-SD05-001	B	0.032
Methylene chloride	SJSBK-SD02-002	B	0.027
Methylene chloride	SJSBK-SD05-002	B	0.026
Trichloroethene	SJSBK-SD05-001	UJ	0.016
Trichloroethene	SJSBK-SD02-002	U	0.0135
Trichloroethene	SJSBK-SD04-001	B	0.013
Total Organic Carbon (TOC)	SJSBK-SD05-002		89,900

Notes:

B - Analyte not detected above associated blank

J - Reported value is estimated

K - Reported value may be biased high

L - Reported value may be biased low

U - Analyte not detected

Table 6
Inlet and Outfall Transect Sediment Exceedances of Reference UTLs
Site 2
St. Juliens Creek Annex, Chesapeake, Virginia

				Inlet Sediment								Outfall Transect Sediment								Former Background Sediment Location	
Station ID	**Soil Residential RBC (Adjusted X 10)**	**BTAG-Sediment Flora/Fauna**	**Reference UTL**	SJS02-SD01	SJS02-SD02	SJS02-SD03[1]	SJS02-SD04	SJS02-SD05	SJS02-SD06	SJS02-SD07	SJS02-SD09	SJS02-SD08		SJS02-SD15	SJS02-SD16[1]	SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20	SJSBK-SD02	
Sample ID				SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD06-001	SJS02-SD07-001	SJS02-SD09	SJS02-SD08-001	SJS02-SD08-002	SJS02-SD15-00-04A	SJS02-SD16-00-04A	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A	SJSBK-SD02-001	SJSBK-SD02-002
Sample Date				07/14/97	07/14/97	06/26/97	04/16/99	04/16/99	04/16/99	04/16/99	07/18/01	04/14/99	10/27/99	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	04/14/99	10/27/99
Chemical Name																					
Semivolatile Organic Compounds (UG/KG)																					
Acenaphthylene	--	44	310	330 U	9,100 UJ	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	550 UJ	NA	96 J	180 J	80 J	180 J	640 U	220 J	610 U	NA
Anthracene	23,000,000	85.3	492	330 U	9,100 UJ	130 L	480 UJ	170 J	100 J	930 UJ	440 U	550 UJ	NA	83 J	140 J	81 J	120 J	640 U	410 J	610 U	170 L
Benzo(a)anthracene	8,700	261	1,300	87 J	9,100 UJ	440 L	480 UJ	1,300 J	380 J	930 UJ	100 J	86 J	160 L	250 J	540 J	250 J	470 J	99 J	1,100	300 J	1,300 L
Benzo(a)pyrene	870	430	1,100	79 J	9,100 UJ	660 L	480 UJ	910 J	360 J	930 UJ	100 J	91 J	100 L	610 J	880	520	1,100	84 J	1,600	270 J	1,100 L
Benzo(b)fluoranthene	8,700	3,200	3,300	160 J	1,200 J	1,300 L	480 UJ	1,200 J	460 J	930 UJ	110 J	170 J	260 L	1,200	1,600	870	1,700	230 J	2,800	500 J	NA
Benzo(g,h,i)perylene	2,300,000	670	672	86 J	9,100 UJ	580 L	480 UJ	690 J	230 J	930 UJ	440 U	83 J	130 L	700 U	88 J	280 J	560 J	640 U	760	190 J	550 L
Benzo(k)fluoranthene	87,000	240	1,400	59 J	9,100 UJ	470 J	480 UJ	420 J	170 J	930 UJ	60 J	77 J	130 L	340 J	630 J	340 J	580 J	78 J	970	160 J	580 L
Butylbenzylphthalate	16,000,000	63	--	47 J	9,100 UJ	1,300 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	550 UJ	NA	90 J	700 U	490 U	670 U	640 U	750 U	610 U	NA
Chrysene	870,000	384	1,500	130 J	9,100 UJ	680 L	480 UJ	1,400 J	360 J	930 UJ	120 J	120 J	550 L	350 J	610 J	370 J	680	82 J	1,800	360 J	1,500 L
Di-n-butylphthalate	7,800,000	1,400	--	41 B	9,100 UJ	1,300 UL	480 UJ	89 J	94 J	930 UJ	440 U	550 UJ	NA	700 U	700 U	490 U	670 U	640 U	750 U	610 U	NA
Dibenz(a,h)anthracene	870	63.4	410	330 U	9,100 UJ	1,300 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	550 UJ	NA	120 J	210 J	100 J	190 J	640 U	290 J	67 J	NA
Diethylphthalate	63,000,000	200	608	330 U	9,100 UJ	250 L	480 UJ	670 UJ	760 UJ	930 UJ	440 U	550 UJ	100 L	700 U	700 U	490 U	670 U	640 U	750 U	610 U	NA
Fluoranthene	3,100,000	600	2,600	330 U	930 J	850 L	480 UJ	2,200 J	880 J	930 UJ	190 J	150 J	240 L	440 J	860	350 J	700	130 J	2,300	560 J	2,600 L
Fluorene	3,100,000	19	--	330 U	9,100 UJ	1,300 UL	480 UJ	79 J	760 UJ	930 UJ	440 U	550 UJ	NA	700 U	700 U	490 U	670 U	640 U	750 U	610 U	NA
Indeno(1,2,3-cd)pyrene	8,700	600	624	84 J	9,100 UJ	530 L	480 UJ	500 J	180 J	930 UJ	440 U	78 J	100 L	330 J	470 J	270 J	500 J	640 U	750	170 J	510 L
Phenanthrene	2,300,000	240	920	47 J	9,100 UJ	190 L	480 UJ	1,100 J	530 J	930 UJ	150 J	550 UJ	160 L	700 U	110 J	57 J	76 J	640 U	190 J	220 J	420 L
Pyrene	2,300,000	665	1,900	230 J	1,200 J	1,100 L	48 J	3,100 J	850 J	930 UJ	220 J	130 J	230 L	580 J	1,100	460 J	890	120 J	1,800	440 J	1,900 L
bis(2-Ethylhexyl)phthalate	460,000	1,300	588	49 B	9,100 UJ	360 B	480 UJ	160 J	170 J	930 UJ	660	550 UJ	110 L	5,900	1,600	250 B	1,900	95 B	110 B	610 U	120 L
Pesticides/Polychlorinated Biphenyls (UG/KG)																					
4,4'-DDD	27,000	16	39	3.7 J	310 J	210	110 R	620 J	980 J	NA	57	12 J	91 L	7 U	7 U	22	10	6.4 U	93	6 B	39 L
4,4'-DDE	19,000	2.2	100	7.5 J	71 J	130 J	13 J	61 J	70 J	34 J	5.7 J	3.80 J	NA	7 U	7 U	9.2 J	6.5 J	6.4 U	200 J	6 B	12 L
4,4'-DDT	19,000	1.58	13	9.3	28 J	8.8 J	25 J	73 J	3,200 J	12 J	23	3.40 J	NA	7 U	7 U	3 J	6.7 U	6.4 U	11 J	6 UJ	13 L
Aroclor-1254	1,600	22.7	--	33 U	110 J	120 U	47 UJ	65 UJ	75 UJ	93 UJ	44 U	54 UJ	NA	70 U	70 U	49 U	67 U	64 U	75 U	60 U	NA
Aroclor-1260	3,200	22.7	--	33 U	110 UJ	69 J	47 UJ	65 UJ	75 UJ	93 UJ	44 U	54 UJ	NA	70 U	70 U	49 U	67 U	64 U	75 U	60 U	NA
Dieldrin	400	0.715	--	3.3 U	11 UJ	36	4.70 UJ	6.5 UJ	7.5 UJ	9.30 UJ	4.4 U	5.40 UJ	NA	7 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U	6 U	NA
alpha-Chlordane	18,000	0.5	--	1.7 U	7.3 J	28	2.40 UJ	79 J	40 J	7.70 J	2.2 U	0.820 J	NA	3.6 U	3.6 U	1.6 J	3.4 U	3.3 U	6.7 J	3 U	NA
gamma-Chlordane	18,000	0.5	--	1.7 U	9.8 J	29 J	2.40 UJ	96 J	58 J	12 J	2.2 U	1.5 J	NA	3.6 U	3.6 U	2.1 J	3.4 U	3.3 U	19 J	3 U	NA
Inorganics (MG/KG)																					
Aluminum	78,000	18,000	20,700	3,100	10,900	27,200	1,500	9,360	9,600	20,200	2,850	4,100	5,020	16,600	19,600	6,540	15,700	18,600	17,600	7,890 K	7,380
Antimony	31	150	1.2	0.42 UL	3.3 B	27.6 L	0.400 UL	1.20 L	1.80 L	1.70 L	2.4	0.650 U	0.75 U	0.8 UL	0.73 UL	0.58 UL	0.7 UL	0.76 UL	0.75 UL	0.7 U	0.77 UL
Arsenic	4.3	8.2	30.4	2.3	**5.4 K**	**19.4**	1.60 K	**7.5 K**	**9.60 K**	**12 K**	4	3.5	**4.7**	**13.7**	**14.2**	**5.4**	**13.4**	**7.6**	**10.4**	**6.2**	**7.8**
Barium	5,500	48	58.9	15.4 J	55.7 J	109 J	4.10 J	102	89.3	79.4 J	81.2	15.2 J	26 J	38.5 J	43.8 J	21.6 J	35.6 J	40 J	68.5 J	27.1 J	34.6 J
Beryllium	160	--	2.1	0.21 U	1.1 B	1.1 J	0.0700 J	0.590 J	0.620 J	0.900 J	0.3	0.300 J	0.370 J	0.7 J	0.83 J	0.32 J	0.69 J	0.74 J	0.83 J	0.44 J	0.55 J
Cadmium	78	1.2	1.4	0.14 J	4	2.5 J	0.530 J	8.20	7.30	4.60	9.2	1.10 J	1.5	0.08 U	0.073 U	0.78 J	0.14 J	0.076 U	4.5	1 J	1.1 J
Calcium	--	--	5,200	393 J	2,300 J	24,300 J	207 J	6,230	4,300	2,390 J	4,580	1,640	1,100 J	1,920 J	2,010	1,210 J	3,920	1,890 J	4,380	1,520	1,820
Chromium	230	5	43.2	6.5	**277**	**2,630**	11.6	**1,180**	**1,900**	**392**	55.9	67.1	84.1	32.5	36.7	61.8	47.6	30.1	**443**	42.4	43.2 K
Cobalt	1,600	10	9.5	1.67 U	4.06 U	10.7 J	0.660 J	5.10 J	6 J	7.80 J	4.3	2.40 J	2.80 J	6.6 J	7.9 J	3.1 J	6.2 J	6.9 J	8.7 J	3.8 J	4 J
Copper	3,100	34	122	4.4 J	344	2,620	18.2	1,200	2,030	494	160	94.8	115	92.6 K	47.8 K	111 K	79.6 K	10.1 K	461 K	86.2	122
Cyanide	1,600	0.1	0.67	0.54 U	1.4 U	2.1 U	0.584	0.417 U	0.524 U	0.549 U	NA	1.80 L	0.400 U	0.86 J	0.27 U	0.22 J	0.26 U	0.32 J	3	0.4 B	0.61 U
Iron	23,000	188,400	32,700	3,150	18,500	31,100	2,050	12,700	18,100	**28,000**	6,470	8,630	9,520	**28,000**	33,500	11,900	**27,900**	**28,900**	**28,100**	14,800 K	16,700
Lead	400	46.7	104	15.5	161	**545**	14.9	312	366	250	211	54.2	64.8	83.1	77	65.4	98.8	16.8	219	60.6 K	75.9 K
Magnesium	--	--	6,380	309 J	4,710	6,890 J	364 J	3,710	2,950	4,970	1,370	1,680	2,090	5,310	6,640	2,280	5,060	6,010	5,110	2,390	2,920
Manganese	1,600	260	202	16 K	105	235	8.30 K	174 K	204 K	148 K	125	51.6	58.2	178	223	77.8	165	211	181	85	89.8 K
Mercury	23	0.15	1.4	0.05 U	0.45	0.79	0.0400 J	0.620	0.470	0.690	0.39	0.220	0.25	0.6	0.46	0.29	0.6	0.085 U	0.46	0.27 L	0.37
Nickel	1,600	20.9	19.9	1.8 B	16.4 K	41.5	2 J	32.6	35.9	29.1	8.3	7.10 J	8.60 J	13.6 J	16.7	8.5 J	14.4	14.6 J	20	10.4	11.3
Potassium	--	--	3,490	228 J	2,000 J	3,830	207 J	1,270 J	1,280	3,050	403	734 J	744 J	2,900	3,580	1,100 J	2,690	3,390	2,880	1,180 L	1,210 J
Selenium	390	1	1.5	0.63 UL	1.52 U	2.22 U	0.390 U	0.770 U	0.710 K	1.5 K	1.3 U	0.630 U	0.840 U	0.8 U	0.73 U	0.58 U	0.7 U	0.76 U	0.75 U	0.74 J	1.3 J
Silver	390	1	--	0.21 U	0.51 U	1.5 B	0.130 U	0.680 J	0.770 J	0.870 J	1.3 U	0.220 U	0.25 J	1.4 J	1.6 J	0.71 J	1.5 J	1.3 J	1.8 J	0.23 U	0.19 U
Sodium	--	--	9,410	33.7 B	11,800	17,800	1,040	3,830	4,820	9,550	144	3,280	2,320	6,690	7,610	3,100	6,930	6,850	6,910	5,450	4,910
Thallium	5.5	--	--	0.42 U	1.02 U	2.2 K	0.480 U	0.950 U	0.760 U	1.70 U	1.5 U	0.770 U	1.40 U	0.8 U	0.73 U	0.58 U	0.7 U	0.76 U	0.75 U	0.83 UL	1.4 U
Vanadium	78	57	55.9	7.2 J	28.8	**115**	5 J	53	**96.5**	62.7	14.9	12.4	14.4	34.3	37.3	17.2	30.6	35.2	37	21.2	19.9
Zinc	23,000	150	422	19.2	416	1,400 L	42.8	888	1,120	539	405	173	203	249 K	173 K	225 K	251 K	61.6 K	609 K	195	281 K
Wet Chemistry																					
% Solids	--	--	78	NA	NA	NA	70.5	50.4	44.2	35.6	NA	61.2	NA	NA	NA	NA	NA	NA	NA	55.2	37.5
Phosphorus (MG/KG)	1.6	--	--	**10.5**	**13.5**	**20.2**	**102**	**370**	**177**	**164**	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--
Total organic carbon (TOC) (MG/KG)	--	--	89,900	2,050	44,000	71,000 L	2,270	41,900	35,000	57,200	NA	24,400	NA	63,000	37,000	15,000	34,000	32,000	32,000	2,340	63,300
pH	--	--	7.82	NA	NA	NA	7.49	7.45	7.39	7.20	NA	7.37	NA	NA	NA	NA	NA	NA	NA	7.19	7.17

Notes:

Exceeeds Reference UTLs	B - Analyte not detected above associated blank
Exceeds Soil Residential RBCs (Adjusted x10)	J - Reported value is estimated
Exceeds BTAG Sediment Flora/Fauna	K - Reported value may be biased high
Potential Ecological Risk Driver (CH2M HILL, 2004a)	L - Reported value may be biased low
Potential Human Health Risk Driver (CH2M HILL, 2004a)	R - Unreliable result, data rejected and not used for evaluation
Potential Human Health and Ecological Risk Driver (CH2M HILL, 2004a)	U - Analyte not detected
BTAG - Biological Technical Assitance Group	NA - Not analyzed
RBC - Risk-Based Concentration	

[1] A duplicate sample was collected for this sample and the results provided are the maximum concentration between the sample and the duplicate.

Table 6
Inlet and Outfall Transect Sediment Exceedances of Reference UTLs
Site 2
St. Juliens Creek Annex, Chesapeake, Virginia

Station ID	Soil Residential RBC (Adjusted X 10)	BTAG-Sediment Flora/Fauna	Reference UTL	Former Background Sediment Location	
Sample ID				SJSBK-SD02	
Sample ID				SJSBK-SD02-001	SJSBK-SD02-002
Sample Date				04/14/99	10/27/99
Chemical Name					
Semivolatile Organic Compounds (UG/KG)					
Acenaphthylene	--	44	310	610 U	NA
Anthracene	23,000,000	85.3	492	610 U	170 L
Benzo(a)anthracene	8,700	261	1,300	300 J	1,300 L
Benzo(a)pyrene	870	430	1,100	270 J	1,100 L
Benzo(b)fluoranthene	8,700	3,200	3,300	500 J	NA
Benzo(g,h,i)perylene	2,300,000	670	672	190 J	550 L
Benzo(k)fluoranthene	87,000	240	1,400	160 J	580 L
Butylbenzylphthalate	16,000,000	63	--	610 U	NA
Chrysene	870,000	384	1,500	360 J	1,500 L
Di-n-butylphthalate	7,800,000	1,400	--	610 U	NA
Dibenz(a,h)anthracene	870	63.4	410	67 J	NA
Diethylphthalate	63,000,000	200	608	610 U	NA
Fluoranthene	3,100,000	600	2,600	560 J	2,600 L
Fluorene	3,100,000	19	--	610 U	NA
Indeno(1,2,3-cd)pyrene	8,700	600	624	170 J	510 L
Phenanthrene	2,300,000	240	920	220 J	420 L
Pyrene	2,300,000	665	1,900	440 J	1,900 L
bis(2-Ethylhexyl)phthalate	460,000	1,300	588	610 U	120 L
Pesticides/Polychlorinated Biphenyls (UG/KG)					
4,4'-DDD	27,000	16	39	6 B	39 L
4,4'-DDE	19,000	2.2	100	6 B	12 L
4,4'-DDT	19,000	1.58	13	6 UJ	13 L
Aroclor-1254	1,600	22.7	--	60 U	NA
Aroclor-1260	3,200	22.7	--	60 U	NA
Dieldrin	400	0.715	--	6 U	NA
alpha-Chlordane	18,000	0.5	--	3 U	NA
gamma-Chlordane	18,000	0.5	--	3 U	NA
Inorganics (MG/KG)					
Aluminum	78,000	18,000	20,700	7,890 K	7,380
Antimony	31	150	1.2	0.7 U	0.77 UL
Arsenic	4.3	8.2	30.4	**6.2**	**7.8**
Barium	5,500	48	58.9	27.1 J	34.6 J
Beryllium	160	--	2.1	0.44 J	0.55 J
Cadmium	78	1.2	1.4	1 J	1.1 J
Calcium	--	--	5,200	1,520	1,820
Chromium	230	5	43.2	42.4	43.2 K
Cobalt	1,600	10	9.5	3.8 J	4 J
Copper	3,100	34	122	86.2	122
Cyanide	1,600	0.1	0.67	0.4 B	0.61 U
Iron	23,000	188,400	32,700	14,800 K	16,700
Lead	400	46.7	104	60.6 K	75.9 K
Magnesium	--	--	6,380	2,390	2,920
Manganese	1,600	260	202	85	89.8 K
Mercury	23	0.15	1.4	0.27 L	0.37
Nickel	1,600	20.9	19.9	10.4	11.3
Potassium	--	--	3,490	1,180 L	1,210 J
Selenium	390	1	1.5	0.74 J	1.3 J
Silver	390	1	--	0.23 U	0.19 U
Sodium	--	--	9,410	5,450	4,910
Thallium	5.5	--	--	0.83 UL	1.4 U
Vanadium	78	57	55.9	21.2	19.9
Zinc	23,000	150	422	195	281 K
Wet Chemistry					
% Solids	--	--	78	55.2	37.5
Phosphorus (MG/KG)	1.6	--	--	--	--
Total organic carbon (TOC) (MG/KG)	--	--	89,900	2,340	63,300
pH	--	--	7.82	7.19	7.17

Notes:

Exceeeds Reference UTLs
Exceeds Soil Residential RBCs (Adjusted x10)
Exceeds BTAG Sediment Flora/Fauna
Potential Ecological Risk Driver
Potential Human Health Risk Driver
Potential Human Health and Ecological Risk Driver
BTAG - Biological Technical Assitance Group
RBC - Risk-Based Concentration

B - Analyte not detected above
J - Reported value is estimated
K - Reported value may be bias
L - Reported value may be bias
R - Unreliable result, data reject
U - Analyte not detected
NA - Not analyzed

[1] A duplicate sample was collected for this sample and the results provided are the maximum concentration be

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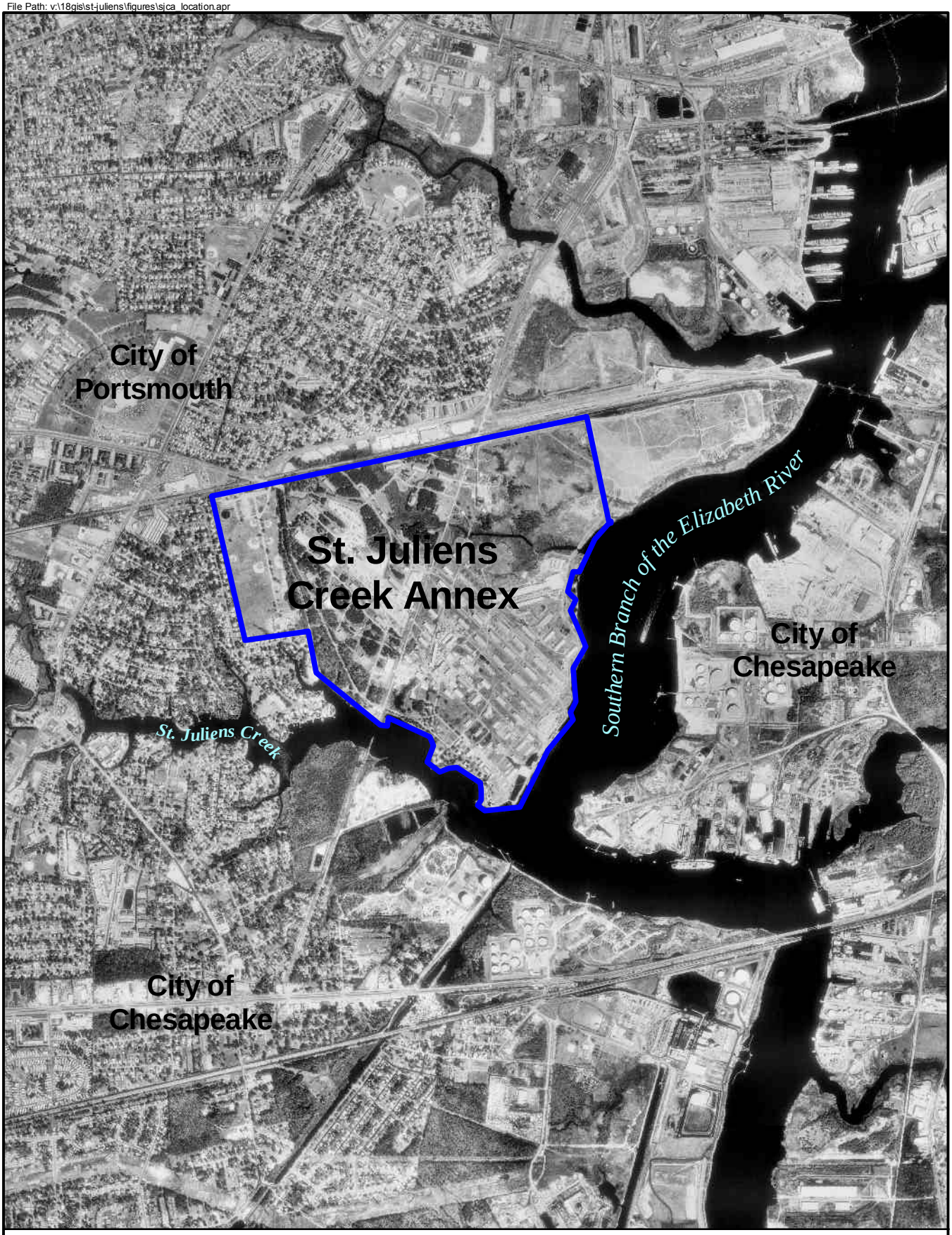

LEGEND

St. Juliens Creek Annex

N

0 1000 2000 3000 Feet

Figure 1
Location of St. Juliens Creek Annex
St. Juliens Creek Annex
Chesapeake, Virginia

CH2M HILL

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LEGEND

Site Boundary
Activity Boundary

N

0 500 1000 Feet

Figure 2
Location of Site 2
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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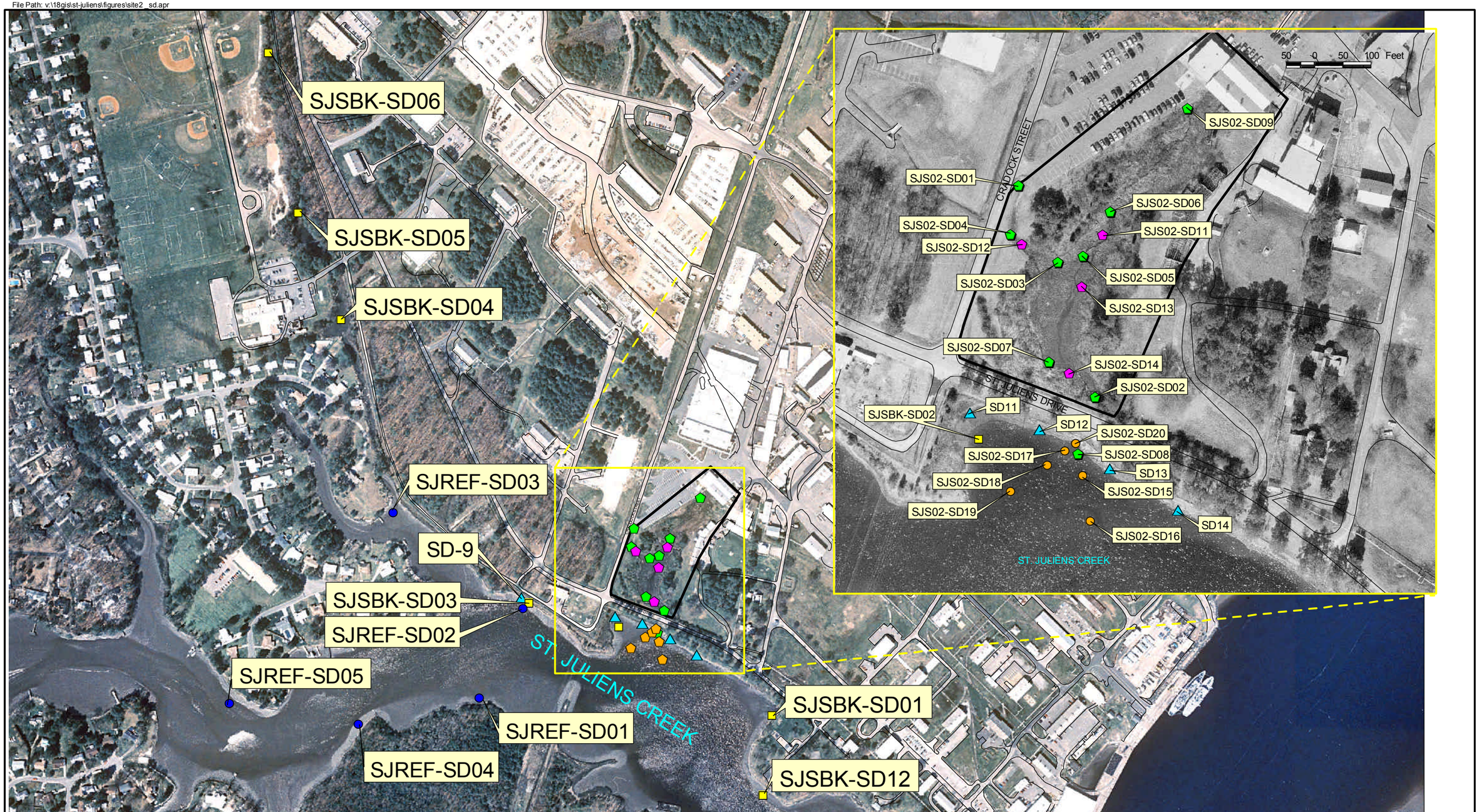

LEGEND

- Site 2 Boundary
- Background Sediment Samples
- Inlet Sediment Samples
- Inlet Sediment Samples (Dioxins only)
- Hazard Ranking System Sediment Samples
- Reference Sediment Samples
- Outfall Transect Sediment Samples

N

0 300 600 Feet

Figure 3
Sediment Sample Locations
Site 2
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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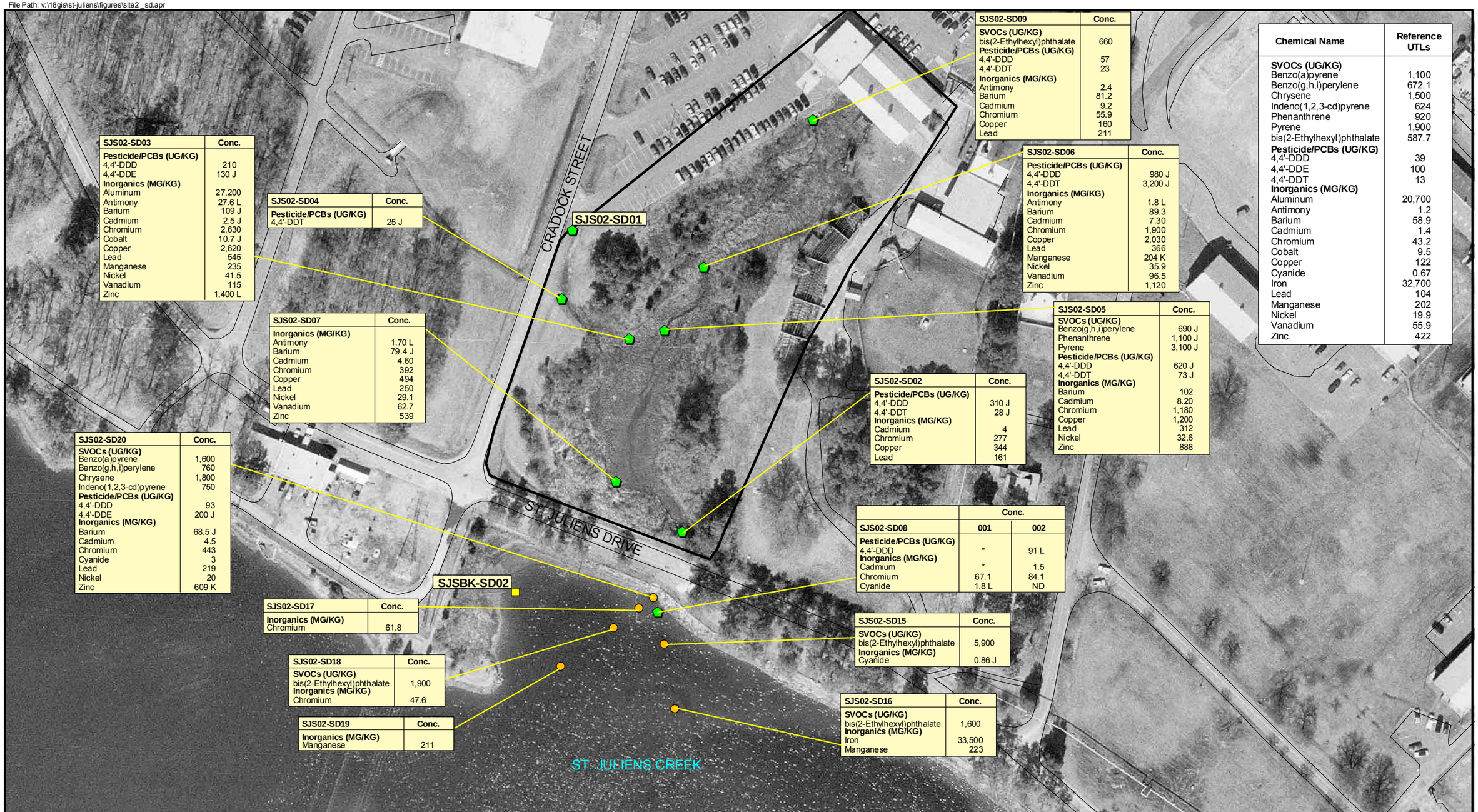

SJS02-SD03	Conc.
Pesticide/PCBs (UG/KG)	
4,4'-DDD	210
4,4'-DDE	130 J
Inorganics (MG/KG)	
Aluminum	27,200
Antimony	27.6 L
Barium	109 J
Cadmium	2.5 J
Chromium	2,630
Cobalt	10.7 J
Copper	2,620
Lead	545
Manganese	235
Nickel	41.5
Vanadium	115
Zinc	1,400 L

SJS02-SD04	Conc.
Pesticide/PCBs (UG/KG)	
4,4'-DDT	25 J

SJS02-SD07	Conc.
Inorganics (MG/KG)	
Antimony	1.70 L
Barium	79.4 J
Cadmium	4.60
Chromium	392
Copper	494
Lead	250
Nickel	29.1
Vanadium	62.7
Zinc	539

SJS02-SD20	Conc.
SVOCs (UG/KG)	
Benzo(a)pyrene	1,600
Benzo(g,h,i)perylene	760
Chrysene	1,800
Indeno(1,2,3-cd)pyrene	750
Pesticide/PCBs (UG/KG)	
4,4'-DDD	93
4,4'-DDE	200 J
Inorganics (MG/KG)	
Barium	68.5 J
Cadmium	4.5
Chromium	443
Cyanide	3
Lead	219
Nickel	20
Zinc	609 K

SJS02-SD17	Conc.
Inorganics (MG/KG)	
Chromium	61.8

SJS02-SD18	Conc.
SVOCs (UG/KG)	
bis(2-Ethylhexyl)phthalate	1,900
Inorganics (MG/KG)	
Chromium	47.6

SJS02-SD19	Conc.
Inorganics (MG/KG)	
Manganese	211

SJS02-SD09	Conc.
SVOCs (UG/KG)	
bis(2-Ethylhexyl)phthalate	660
Pesticide/PCBs (UG/KG)	
4,4'-DDD	57
4,4'-DDT	23
Inorganics (MG/KG)	
Antimony	2.4
Barium	81.2
Cadmium	9.2
Chromium	55.9
Copper	160
Lead	211

SJS02-SD06	Conc.
Pesticide/PCBs (UG/KG)	
4,4'-DDD	980 J
4,4'-DDT	3,200 J
Inorganics (MG/KG)	
Antimony	1.8 L
Barium	89.3
Cadmium	7.30
Chromium	1,900
Copper	2,030
Lead	366
Manganese	204 K
Nickel	35.9
Vanadium	96.5
Zinc	1,120

SJS02-SD05	Conc.
SVOCs (UG/KG)	
Benzo(g,h,i)perylene	690 J
Phenanthrene	1,100 J
Pyrene	3,100 J
Pesticide/PCBs (UG/KG)	
4,4'-DDD	620 J
4,4'-DDT	73 J
Inorganics (MG/KG)	
Barium	102
Cadmium	8.20
Chromium	1,180
Copper	1,200
Lead	312
Nickel	32.6
Zinc	888

SJS02-SD02	Conc.
Pesticide/PCBs (UG/KG)	
4,4'-DDD	310 J
4,4'-DDT	28 J
Inorganics (MG/KG)	
Cadmium	4
Chromium	277
Copper	344
Lead	161

	Conc.	
SJS02-SD08	001	002
Pesticide/PCBs (UG/KG)		
4,4'-DDD	*	91 L
Inorganics (MG/KG)		
Cadmium	*	1.5
Chromium	67.1	84.1
Cyanide	1.8 L	ND

SJS02-SD15	Conc.
SVOCs (UG/KG)	
bis(2-Ethylhexyl)phthalate	5,900
Inorganics (MG/KG)	
Cyanide	0.86 J

SJS02-SD16	Conc.
SVOCs (UG/KG)	
bis(2-Ethylhexyl)phthalate	1,600
Inorganics (MG/KG)	
Iron	33,500
Manganese	223

Chemical Name	Reference UTLs
SVOCs (UG/KG)	
Benzo(a)pyrene	1,100
Benzo(g,h,i)perylene	672.1
Chrysene	1,500
Indeno(1,2,3-cd)pyrene	624
Phenanthrene	920
Pyrene	1,900
bis(2-Ethylhexyl)phthalate	587.7
Pesticide/PCBs (UG/KG)	
4,4'-DDD	39
4,4'-DDE	100
4,4'-DDT	13
Inorganics (MG/KG)	
Aluminum	20,700
Antimony	1.2
Barium	58.9
Cadmium	1.4
Chromium	43.2
Cobalt	9.5
Copper	122
Cyanide	0.67
Iron	32,700
Lead	104
Manganese	202
Nickel	19.9
Vanadium	55.9
Zinc	422

LEGEND

- Site 2 Boundary
- Inlet Sediment Samples
- Outfall Transect Sediment Samples
- Background Sediment Samples

Notes:
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
* - Not detected above screening values
ND - Analyte not detected
PCBs - polychlorinated biphenyls
SVOCs - semivolatile organic compounds
UTL - Upper Tolerance Limit

N

0 100 200 Feet

Figure 4
Sediment Reference UTL Exceedances
Site 2
St. Juliens Creek Annex
Chesapeake, Virginia

Appendix A
Analytical Data

Table A-1
Inlet Sediment Analytical Results
Site 2
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD01	SJS02-SD02	SJS02-SD03		SJS02-SD04	SJS02-SD05	SJS02-SD06	SJS02-SD07	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample ID	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD06-001	SJS02-SD07-001	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample Date	07/14/97	07/14/97	06/26/97	06/26/97	04/16/99	04/16/99	04/16/99	04/16/99	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01
Chemical Name														
Volatile Organic Compounds (UG/KG)														
1,1,1-Trichloroethane	11 U	31 U	32 U	37 U	14 U	20 U	7 J	28 UJ	3.6 B	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
1,1-Dichloroethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
1,1-Dichloroethene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
1,2-Dichloroethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	11 U	31 U	32 U	9 J	14 U	20 U	23 U	3 J	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
2-Butanone	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
2-Hexanone	11 U	31 U	32 U	37 U	14 UJ	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	11 U	5 J	32 U	37 U	14 UJ	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Acetone	11 U	92 J	120	450	NA	21 J	37 J	28 UJ	13 U	NA	NA	NA	NA	NA
Benzene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Bromodichloromethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Bromoform	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Bromomethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	6.3 J	NA	NA	NA	NA	NA
Carbon disulfide	11 U	31 U	24 J	81	14 U	8 B	3 B	12 B	13 U	NA	NA	NA	NA	NA
Carbon tetrachloride	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Chlorobenzene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Chloroethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Chloroform	11 U	31 U	32 U	37 U	14 U	20 U	23 U	3 J	13 U	NA	NA	NA	NA	NA
Chloromethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Cumene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
Dibromochloromethane	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	13 UJ	NA	NA	NA	NA	NA
Ethylbenzene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
Methylene chloride	22 B	69 B	93 B	140 B	4 B	26 B	52 B	6 B	6.3 B	NA	NA	NA	NA	NA
Styrene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Tetrachloroethene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Toluene	11 U	31 U	32 U	37 U	4 J	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Trichloroethene	11 U	31 U	32 U	37 U	4 J	4 J	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA	13 UJ	NA	NA	NA	NA	NA
Vinyl chloride	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Xylene, total	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA

B - Not detected above associated blank
I - Ether interference
J - Estimated
K - May be biased high
L - May be biased low

N - Tentative identification
NA - Not analyzed
R - Unreliable result
U - Not detected

Table A-1
Inlet Sediment Analytical Results
Site 2
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD01	SJS02-SD02	SJS02-SD03		SJS02-SD04	SJS02-SD05	SJS02-SD06	SJS02-SD07	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample ID	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD06-001	SJS02-SD07-001	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample Date	07/14/97	07/14/97	06/26/97	06/26/97	04/16/99	04/16/99	04/16/99	04/16/99	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01
Chemical Name														
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	13 U	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	11 U	31 U	32 U	37 U	14 U	20 U	23 U	28 UJ	13 U	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)														
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	440 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	840 U	23,000 UJ	3,300 UL	3,600 UL	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2,4-Dichlorophenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2,4-Dimethylphenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	840 UJ	23,000 UJ	NA	3,600 UL	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2-Chloronaphthalene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2-Chlorophenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2-Methylnaphthalene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2-Methylphenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
2-Nitroaniline	840 U	23,000 UJ	3,300 UL	3,600 U	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
2-Nitrophenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	440 U	NA	NA	NA	NA	NA
3-Nitroaniline	840 U	23,000 UJ	3,300 UL	3,600 U	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	840 U	23,000 UJ	3,300 UL	3,600 UL	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
4-Chloroaniline	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
4-Methylphenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	NA	NA	NA	NA	NA	NA
4-Nitroaniline	840 U	23,000 UJ	3,300 UL	3,600 U	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
4-Nitrophenol	840 U	23,000 UJ	3,300 UL	3,600 UL	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
Acenaphthene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Acenaphthylene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	440 U	NA	NA	NA	NA	NA
Anthracene	330 U	9,100 UJ	130 L	1,400 U	480 UJ	170 J	100 J	930 UJ	440 U	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	440 U	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	440 U	NA	NA	NA	NA	NA
Benzo(a)anthracene	87 J	9,100 UJ	440 L	240 J	480 UJ	1,300 J	380 J	930 UJ	100 J	NA	NA	NA	NA	NA
Benzo(a)pyrene	79 J	9,100 UJ	660 L	370 J	480 UJ	910 J	360 J	930 UJ	100 J	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	160 J	1,200 J	1,300 L	740 J	480 UJ	1,200 J	460 J	930 UJ	110 J	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	86 J	9,100 UJ	580 L	310 J	480 UJ	690 J	230 J	930 UJ	440 U	NA	NA	NA	NA	NA

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Table A-1
Inlet Sediment Analytical Results
Site 2
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD01	SJS02-SD02	SJS02-SD03		SJS02-SD04	SJS02-SD05	SJS02-SD06	SJS02-SD07	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample ID	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD06-001	SJS02-SD07-001	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample Date	07/14/97	07/14/97	06/26/97	06/26/97	04/16/99	04/16/99	04/16/99	04/16/99	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01
Chemical Name														
Benzo(k)fluoranthene	59 J	9,100 UJ	440 L	470 J	480 UJ	420 J	170 J	930 UJ	60 J	NA	NA	NA	NA	NA
Butylbenzylphthalate	47 J	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	440 U	NA	NA	NA	NA	NA
Carbazole	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Chrysene	130 J	9,100 UJ	680 L	330 J	480 UJ	1,400 J	360 J	930 UJ	120 J	NA	NA	NA	NA	NA
Di-n-butylphthalate	41 B	9,100 UJ	1,300 UL	1,400 U	480 UJ	89 J	94 J	930 UJ	440 U	NA	NA	NA	NA	NA
Di-n-octylphthalate	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Dibenzofuran	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Diethylphthalate	330 U	9,100 UJ	250 L	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Dimethyl phthalate	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Fluoranthene	330 U	930 J	850 L	510 J	480 UJ	2,200 J	880 J	930 UJ	190 J	NA	NA	NA	NA	NA
Fluorene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	79 J	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Hexachlorobenzene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Hexachlorobutadiene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	330 UJ	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Hexachloroethane	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	84 J	9,100 UJ	530 L	260 J	480 UJ	500 J	180 J	930 UJ	440 U	NA	NA	NA	NA	NA
Isophorone	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Naphthalene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Nitrobenzene	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Pentachlorophenol	840 U	23,000 UJ	3,300 UL	3,600 UL	1,200 UJ	1,700 UJ	1,900 UJ	2,300 UJ	1,100 U	NA	NA	NA	NA	NA
Phenanthrene	47 J	9,100 UJ	190 L	1,400 U	480 UJ	1,100 J	530 J	930 UJ	150 J	NA	NA	NA	NA	NA
Phenol	330 U	9,100 UJ	1,300 UL	1,400 UL	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Pyrene	230 J	1,200 J	1,100 L	600 J	48 J	3,100 J	850 J	930 UJ	220 J	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	49 B	9,100 UJ	360 B	230 B	480 UJ	160 J	170 J	930 UJ	660	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	330 U	9,100 UJ	1,300 UL	1,400 U	480 UJ	670 UJ	760 UJ	930 UJ	440 U	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls (UG/KG)														
4,4'-DDD	3.7 J	310 J	NA	210	110 R	620 J	980 J	NA	57	NA	NA	NA	NA	NA
4,4'-DDE	7.5 J	71 J	130 J	110 J	13 J	61 J	70 J	34 J	5.7 J	NA	NA	NA	NA	NA
4,4'-DDT	9.3	28 J	12 U	8.8 J	25 J	73 J	3,200 J	12 J	23	NA	NA	NA	NA	NA
Aldrin	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
Aroclor-1016	33 U	110 UJ	120 U	130 U	47 UJ	65 UJ	75 UJ	93 UJ	44 U	NA	NA	NA	NA	NA
Aroclor-1221	67 U	210 UJ	240 U	270 U	95 UJ	130 UJ	150 UJ	190 UJ	88 U	NA	NA	NA	NA	NA
Aroclor-1232	33 U	110 UJ	120 U	130 U	47 UJ	65 UJ	75 UJ	93 UJ	44 U	NA	NA	NA	NA	NA
Aroclor-1242	33 U	110 UJ	120 U	130 U	47 UJ	65 UJ	75 UJ	93 UJ	44 U	NA	NA	NA	NA	NA
Aroclor-1248	33 U	110 UJ	120 U	130 U	47 UJ	65 UJ	75 UJ	93 UJ	44 U	NA	NA	NA	NA	NA
Aroclor-1254	33 U	110 J	120 U	130 U	47 UJ	65 UJ	75 UJ	93 UJ	44 U	NA	NA	NA	NA	NA
Aroclor-1260	33 U	110 UJ	120 U	69 J	47 UJ	65 UJ	75 UJ	93 UJ	44 U	NA	NA	NA	NA	NA
Dieldrin	3.3 U	11 UJ	36	30 J	4.70 UJ	6.5 UJ	7.5 UJ	9.30 UJ	4.4 U	NA	NA	NA	NA	NA
Endosulfan I	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
Endosulfan II	3.3 U	11 UJ	12 U	13 U	4.70 UJ	6.5 UJ	7.5 UJ	9.30 UJ	4.4 U	NA	NA	NA	NA	NA
Endosulfan sulfate	3.3 U	11 UJ	12 U	13 U	4.70 UJ	6.5 UJ	7.5 UJ	9.30 UJ	4.4 U	NA	NA	NA	NA	NA

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Site 2
St. Juliens Annex, Chesapeake, Virginia

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Sample ID	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD06-001	SJS02-SD07-001	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample Date	07/14/97	07/14/97	06/26/97	06/26/97	04/16/99	04/16/99	04/16/99	04/16/99	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01
Chemical Name														
Endrin	3.3 U	11 UJ	12 U	13 U	4.70 UJ	6.5 UJ	7.5 UJ	9.30 UJ	4.4 U	NA	NA	NA	NA	NA
Endrin aldehyde	3.3 U	11 UJ	12 U	13 U	4.70 UJ	6.5 UJ	7.5 UJ	9.30 UJ	4.4 U	NA	NA	NA	NA	NA
Endrin ketone	3.3 U	11 UJ	12 U	13 U	4.70 UJ	6.5 UJ	7.5 UJ	9.30 UJ	4.4 U	NA	NA	NA	NA	NA
Heptachlor	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
Heptachlor epoxide	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
Methoxychlor	17 U	54 UJ	60 U	68 U	24 UJ	33 UJ	37 UJ	46 UJ	22 U	NA	NA	NA	NA	NA
Toxaphene	170 U	540 UJ	600 U	680 U	240 UJ	330 UJ	370 UJ	460 UJ	220 U	NA	NA	NA	NA	NA
alpha-BHC	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
alpha-Chlordane	1.7 U	7.3 J	28	18	2.40 UJ	79 J	40 J	7.70 J	2.2 U	NA	NA	NA	NA	NA
beta-BHC	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
delta-BHC	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	1.7 U	5.4 UJ	6 U	6.8 U	2.40 UJ	3.30 UJ	3.70 UJ	4.60 UJ	2.2 U	NA	NA	NA	NA	NA
gamma-Chlordane	1.7 U	9.8 J	29 J	21 J	2.40 UJ	96 J	58 J	12 J	2.2 U	NA	NA	NA	NA	NA
Dioxin/Furans (UG/KG)														
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.42 J	0.13 J	0.34 J	0.016 J	0.19 J	0.094 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.23 J	0.056 J	0.087 J	0.0025 J	0.048 J	0.014 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.021 J	0.0044 J	0.0063 J	1.30E-04 UJ	0.0036 J	7.70E-04 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.0085 J	0.0023 J	0.0051 J	3.00E-04 J	0.0029 J	0.0024 J
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.025 J	0.0099 J	0.019 J	7.40E-04 J	0.0082 J	0.0049 I
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.018 J	0.0058 J	0.015 J	6.00E-04 J	0.008 J	0.004 J
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.06 J	0.0064 I	0.0094 J	5.00E-04 J	0.0044 J	7.60E-04 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.016 J	0.0047 J	0.013 J	0.0011 J	0.008 J	0.0047 J
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.002 J	1.00E-03 J	0.0023 J	1.50E-04 UJ	2.50E-04 UJ	4.00E-04 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.0036 J	0.0012 J	0.0028 J	1.70E-04 UJ	0.0012 J	0.0012 J
1,2,3,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.0043 J	0.0011 J	0.0027 J	2.40E-04 UJ	0.0014 J	0.0011 J
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.0093 J	0.0033 J	0.0068 J	3.60E-04 J	0.0024 J	1.00E-03 J
2,3,4,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.007 J	0.003 J	0.0061 J	4.30E-04 J	0.002 J	0.0016 J
2,3,7,8-TCDD (dioxin)	NA	NA	NA	NA	NA	NA	NA	NA	5.80E-04 J	3.40E-04 J	9.60E-04 J	1.30E-04 UJ	4.30E-04 J	3.20E-04 J
2,3,7,8-Tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.0082 NJ	0.0034 J	0.0097 J	7.10E-04 NJ	0.0032 J	0.0037 J
Total heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.75 J	0.26 J	0.9 J	0.051 J	0.52 J	0.28 J
Total heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.25 J	0.15 J	0.26 J	0.0046 J	0.13 J	0.014 J
Total hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.14 J	0.046 J	0.17 J	0.015 J	0.11 J	0.07 J
Total hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.3 J	0.091 J	0.19 J	0.0047 J	0.078 J	0.035 J
Total octachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	3.2 J	1.6 J	4.4 J	0.66 J	1.9 J	1.1 J
Total octachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.58 J	0.074 J	0.12 J	0.003 B	0.058 J	0.021 J
Total pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.011 J	0.0048 J	0.02 J	1.70E-04 UJ	0.0091 J	0.0097 J
Total pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.08 J	0.031 J	0.091 J	0.002 J	0.023 J	0.02 J
Total tetrachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	0.0067 J	0.0032 J	0.0066 J	3.70E-04 J	0.005 J	0.0029 J
Total tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	0.036 J	0.0056 J	0.024 J	0.0021 J	0.016 J	0.013 J
Nitramines (UG/KG)														
1,3,5-Trinitrobenzene	540 U	NA	2,000 U	2,200 U	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	540 U	NA	2,000 U	2,200 U	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	540 U	NA	2,000 U	2,200 U	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA

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St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD01	SJS02-SD02	SJS02-SD03		SJS02-SD04	SJS02-SD05	SJS02-SD06	SJS02-SD07	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample ID	SJS02-SD01-000	SJS02-SD02-000	SJS02-SD03-000	SJS02-SD03-000P	SJS02-SD04-001	SJS02-SD05-001	SJS02-SD06-001	SJS02-SD07-001	SJS02-SD09	SJS02-SD10	SJS02-SD11	SJS02-SD12	SJS02-SD13	SJS02-SD14
Sample Date	07/14/97	07/14/97	06/26/97	06/26/97	04/16/99	04/16/99	04/16/99	04/16/99	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01	07/18/01
Chemical Name														
2-Amino-4,6-dinitrotoluene	540 U	NA	2,000 U	2,200 U	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA
2-Nitrotoluene	540 U	NA	2,000 U	2,200 U	500 U	476 U	476 U	500 U	630 U	NA	NA	NA	NA	NA
3-Nitrotoluene	540 U	NA	2,000 U	2,200 U	500 U	476 U	476 U	500 U	630 U	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	540 U	NA	2,000 U	2,200 U	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA
4-Nitrotoluene	540 U	NA	2,000 U	2,200 U	500 U	476 U	476 U	500 U	630 U	NA	NA	NA	NA	NA
HMX	540 U	NA	2,000 U	2,200 U	500 U	476 U	476 U	500 U	630 U	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	250 U	238 U	238 U	250 U	630 U	NA	NA	NA	NA	NA
RDX	540 U	NA	2,000 U	2,200 U	500 U	476 U	476 U	500 U	630 U	NA	NA	NA	NA	NA
Tetryl	540 U	NA	2,000 U	2,200 U	500 U	476 U	476 U	500 U	630 U	NA	NA	NA	NA	NA
Inorganics (MG/KG)														
Aluminum	3,100	10,900	27,200	25,900	1,500	9,360	9,600	20,200	2,850	NA	NA	NA	NA	NA
Antimony	0.42 UL	3.3 B	16.3 L	27.6 L	0.400 UL	1.20 L	1.80 L	1.70 L	2.4	NA	NA	NA	NA	NA
Arsenic	2.3	5.4 K	13.1	19.4	1.60 K	7.5 K	9.60 K	12 K	4	NA	NA	NA	NA	NA
Barium	15.4 J	55.7 J	84.7 J	109 J	4.10 J	102	89.3	79.4 J	81.2	NA	NA	NA	NA	NA
Beryllium	0.21 U	1.1 B	0.87 J	1.1 J	0.0700 J	0.590 J	0.620 J	0.900 J	0.3	NA	NA	NA	NA	NA
Cadmium	0.14 J	4	2.5 J	2.1 J	0.530 J	8.20	7.30	4.60	9.2	NA	NA	NA	NA	NA
Calcium	393 J	2,300 J	24,300 J	11,600 J	207 J	6,230	4,300	2,390 J	4,580	NA	NA	NA	NA	NA
Chromium	6.5	277	1,640	2,630	11.6	1,180	1,900	392	55.9	NA	NA	NA	NA	NA
Cobalt	1.67 U	4.06 U	9.1 J	10.7 J	0.660 J	5.10 J	6 J	7.80 J	4.3	NA	NA	NA	NA	NA
Copper	4.4 J	344	1,700	2,620	18.2	1,200	2,030	494	160	NA	NA	NA	NA	NA
Cyanide	0.54 U	1.4 U	2.1 U	2 U	0.584	0.417 U	0.524 U	0.549 U	NA	NA	NA	NA	NA	NA
Iron	3,150	18,500	31,100	30,700	2,050	12,700	18,100	28,000	6,470	NA	NA	NA	NA	NA
Lead	15.5	161	396	545	14.9	312	366	250	211	NA	NA	NA	NA	NA
Magnesium	309 J	4,710	6,890 J	6,480 J	364 J	3,710	2,950	4,970	1,370	NA	NA	NA	NA	NA
Manganese	16 K	105	235	224	8.30 K	174 K	204 K	148 K	125	NA	NA	NA	NA	NA
Mercury	0.05 U	0.45	0.72	0.79	0.0400 J	0.620	0.470	0.690	0.39	NA	NA	NA	NA	NA
Nickel	1.8 B	16.4 K	41.5	40.9	2 J	32.6	35.9	29.1	8.3	NA	NA	NA	NA	NA
Potassium	228 J	2,000 J	3,830	3,380 J	207 J	1,270 J	1,280	3,050	403	NA	NA	NA	NA	NA
Selenium	0.63 UL	1.52 U	2.27 U	2.22 U	0.390 U	0.770 U	0.710 K	1.5 K	1.3 U	NA	NA	NA	NA	NA
Silver	0.21 U	0.51 U	1.8 B	1.5 B	0.130 U	0.680 J	0.770 J	0.870 J	1.3 U	NA	NA	NA	NA	NA
Sodium	33.7 B	11,800	17,800	16,300	1,040	3,830	4,820	9,550	144	NA	NA	NA	NA	NA
Thallium	0.42 U	1.02 U	1.52 U	2.2 K	0.480 U	0.950 U	0.760 U	1.70 U	1.5 U	NA	NA	NA	NA	NA
Vanadium	7.2 J	28.8	115	97.9	5 J	53	96.5	62.7	14.9	NA	NA	NA	NA	NA
Zinc	19.2	416	1,140 L	1,400 L	42.8	888	1,120	539	405	NA	NA	NA	NA	NA
Wet Chemistry														
% Solids	NA	NA	NA	NA	70.5	50.4	44.2	35.6	NA	NA	NA	NA	NA	NA
Phosphorus (MG/KG)	10.5	13.5	19.1	20.2	102	370	177	164	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (MG/KG)	2,050	44,000	71,000 L	64,600 L	2,270	41,900	35,000	57,200	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	7.49	7.45	7.39	7.20	NA	NA	NA	NA	NA	NA

Shaded cells indicate analyte detections

B - Not detected above associated blank
I - Ether interference
J - Estimated
K - May be biased high
L - May be biased low

N - Tentative identification
NA - Not analyzed
R - Unreliable result
U - Not detected

Table A-2
Outfall Transect Sediment Analytical Results
Site 2
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD08		SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20
Sample ID	SJS02-SD08-001	SJS02-SD08-002	SJS02-SD15-00-04A	SJS02-SD16-00-04A-P	SJS02-SD16-00-04A	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A
Sample Date	04/14/99	10/27/99	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04
Chemical Name									
Volatile Organic Compounds (UG/KG)									
1,1,1-Trichloroethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
2-Butanone	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Acetone	16 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Bromoform	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Bromomethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	16 UJ	4 J	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Chloroethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Chloroform	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Chloromethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	17 B	81 B	NA	NA	NA	NA	NA	NA	NA
Styrene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Toluene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	10 J	18 U	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Xylene, total	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	16 U	18 U	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)									
1,1-Biphenyl	NA	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
1,2,4-Trichlorobenzene	550 UJ	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	550 UJ	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	550 UJ	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	550 UJ	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U
2,4,6-Trichlorophenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2,4-Dichlorophenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2,4-Dimethylphenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2,4-Dinitrophenol	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U
2,4-Dinitrotoluene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2,6-Dinitrotoluene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

Table A-2
Outfall Transect Sediment Analytical Results
Site 2
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD08		SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20
Sample ID	SJS02-SD08-001	SJS02-SD08-002	SJS02-SD15-00-04A	SJS02-SD16-00-04A-P	SJS02-SD16-00-04A	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A
Sample Date	04/14/99	10/27/99	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04
Chemical Name									
2-Chloronaphthalene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2-Chlorophenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2-Methylnaphthalene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2-Methylphenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
2-Nitroaniline	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U
2-Nitrophenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
3,3'-Dichlorobenzidine	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
3-Nitroaniline	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U
4,6-Dinitro-2-methylphenol	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U
4-Bromophenyl-phenylether	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
4-Chloro-3-methylphenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
4-Chloroaniline	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
4-Chlorophenyl-phenylether	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
4-Methylphenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
4-Nitroaniline	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U
4-Nitrophenol	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U
Acenaphthene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Acenaphthylene	550 UJ	NA	96 J	94 J	180 J	80 J	180 J	640 U	220 J
Acetophenone	NA	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Anthracene	550 UJ	NA	83 J	84 J	140 J	81 J	120 J	640 U	410 J
Atrazine	NA	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Benzaldehyde	NA	NA	700 U	200 B	700 U	490 U	670 U	640 U	750 U
Benzo(a)anthracene	86 J	160 L	250 J	220 J	540 J	250 J	470 J	99 J	1,100
Benzo(a)pyrene	91 J	100 L	610 J	190 J	880	520	1,100	84 J	1,600
Benzo(b)fluoranthene	170 J	260 L	1,200	570 J	1,600	870	1,700	230 J	2,800
Benzo(g,h,i)perylene	83 J	130 L	700 U	690 U	88 J	280 J	560 J	640 U	760
Benzo(k)fluoranthene	77 J	130 L	340 J	210 J	630 J	340 J	580 J	78 J	970
Bis(2-chloro-1-methylethyl) ether	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Butylbenzylphthalate	550 UJ	NA	90 J	690 U	700 U	490 U	670 U	640 U	750 U
Caprolactam	NA	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Carbazole	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Chrysene	120 J	550 L	350 J	260 J	610 J	370 J	680	82 J	1,800
Di-n-butylphthalate	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Di-n-octylphthalate	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Dibenz(a,h)anthracene	550 UJ	NA	120 J	690 U	210 J	100 J	190 J	640 U	290 J
Dibenzofuran	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Diethylphthalate	550 UJ	100 L	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Dimethyl phthalate	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Fluoranthene	150 J	240 L	440 J	330 J	860	350 J	700	130 J	2,300
Fluorene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Hexachlorobenzene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Hexachlorobutadiene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Hexachlorocyclopentadiene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Hexachloroethane	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Indeno(1,2,3-cd)pyrene	78 J	100 L	330 J	110 J	470 J	270 J	500 J	640 U	750
Isophorone	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Naphthalene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Nitrobenzene	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Pentachlorophenol	1,400 UJ	NA	1,800 U	1,700 U	1,700 U	1,200 U	1,700 U	1,600 U	1,900 U

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B - Analyte not detected above associated blank
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K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

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Outfall Transect Sediment Analytical Results
Site 2
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD08		SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20
Sample ID	SJS02-SD08-001	SJS02-SD08-002	SJS02-SD15-00-04A	SJS02-SD16-00-04A-P	SJS02-SD16-00-04A	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A
Sample Date	04/14/99	10/27/99	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04
Chemical Name									
Phenanthrene	550 UJ	160 L	700 U	690 U	110 J	57 J	76 J	640 U	190 J
Phenol	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Pyrene	130 J	230 L	580 J	320 J	1,100	460 J	890	120 J	1,800
bis(2-Chloroethoxy)methane	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
bis(2-Chloroethyl)ether	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
bis(2-Ethylhexyl)phthalate	550 UJ	110 L	5,900	620 B	1,600	250 B	1,900	95 B	110 B
n-Nitroso-di-n-propylamine	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
n-Nitrosodiphenylamine	550 UJ	NA	700 U	690 U	700 U	490 U	670 U	640 U	750 U
Pesticides/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDD	12 J	91 L	7 U	6.9 U	7 U	22	10	6.4 U	93
4,4'-DDE	3.80 J	NA	7 U	6.9 U	7 U	9.2 J	6.5 J	6.4 U	200 J
4,4'-DDT	3.40 J	NA	7 U	6.9 U	7 U	3 J	6.7 U	6.4 U	11 J
Aldrin	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
Aroclor-1016	54 UJ	NA	70 U	69 U	70 U	49 U	67 U	64 U	75 U
Aroclor-1221	110 UJ	NA	140 U	140 U	140 U	99 U	140 U	130 U	150 U
Aroclor-1232	54 UJ	NA	70 U	69 U	70 U	49 U	67 U	64 U	75 U
Aroclor-1242	54 UJ	NA	70 U	69 U	70 U	49 U	67 U	64 U	75 U
Aroclor-1248	54 UJ	NA	70 U	69 U	70 U	49 U	67 U	64 U	75 U
Aroclor-1254	54 UJ	NA	70 U	69 U	70 U	49 U	67 U	64 U	75 U
Aroclor-1260	54 UJ	NA	70 U	69 U	70 U	49 U	67 U	64 U	75 U
Dieldrin	5.40 UJ	NA	7 U	6.9 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U
Endosulfan I	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
Endosulfan II	5.40 UJ	NA	7 U	6.9 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U
Endosulfan sulfate	5.40 UJ	NA	7 U	6.9 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U
Endrin	5.40 UJ	NA	7 U	6.9 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U
Endrin aldehyde	5.40 UJ	NA	7 U	6.9 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U
Endrin ketone	5.40 UJ	NA	7 U	6.9 U	7 U	4.9 U	6.7 U	6.4 U	7.5 U
Heptachlor	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
Heptachlor epoxide	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
Methoxychlor	27 UJ	NA	36 U	35 U	36 U	25 U	34 U	33 U	39 U
Toxaphene	270 UJ	NA	360 U	350 U	360 U	250 U	340 U	330 U	390 U
alpha-BHC	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
alpha-Chlordane	0.820 J	NA	3.6 U	3.5 U	3.6 U	1.6 J	3.4 U	3.3 U	6.7 J
beta-BHC	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
delta-BHC	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
gamma-BHC (Lindane)	2.70 UJ	NA	3.6 U	3.5 U	3.6 U	2.5 U	3.4 U	3.3 U	3.9 U
gamma-Chlordane	1.5 J	NA	3.6 U	3.5 U	3.6 U	2.1 J	3.4 U	3.3 U	19 J
Explosives (UG/KG)									
1,3,5-Trinitrobenzene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	500 U	480 U	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	500 U	480 U	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

Table A-2
Outfall Transect Sediment Analytical Results
Site 2
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJS02-SD08		SJS02-SD15	SJS02-SD16		SJS02-SD17	SJS02-SD18	SJS02-SD19	SJS02-SD20
Sample ID	SJS02-SD08-001	SJS02-SD08-002	SJS02-SD15-00-04A	SJS02-SD16-00-04A-P	SJS02-SD16-00-04A	SJS02-SD17-00-04A	SJS02-SD18-00-04A	SJS02-SD19-00-04A	SJS02-SD20-00-04A
Sample Date	04/14/99	10/27/99	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04
Chemical Name									
4-Nitrotoluene	500 U	480 U	NA	NA	NA	NA	NA	NA	NA
HMX	500 U	480 U	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	250 U	240 U	NA	NA	NA	NA	NA	NA	NA
RDX	500 U	480 U	NA	NA	NA	NA	NA	NA	NA
Tetryl	500 U	480 U	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)									
Aluminum	4,100	5,020	16,600	16,200	19,600	6,540	15,700	18,600	17,600
Antimony	0.650 U	0.75 U	0.8 UL	0.69 UL	0.73 UL	0.58 UL	0.7 UL	0.76 UL	0.75 UL
Arsenic	3.5	4.7	13.7	14.2	13.7	5.4	13.4	7.6	10.4
Barium	15.2 J	26 J	38.5 J	38.2 J	43.8 J	21.6 J	35.6 J	40 J	68.5 J
Beryllium	0.300 J	0.370 J	0.7 J	0.73 J	0.83 J	0.32 J	0.69 J	0.74 J	0.83 J
Cadmium	1.10 J	1.5	0.08 U	0.069 U	0.073 U	0.78 J	0.14 J	0.076 U	4.5
Calcium	1,640	1,100 J	1,920 J	2,010	222	1,210 J	3,920	1,890 J	4,380
Chromium	67.1	84.1	32.5	32.8	36.7	61.8	47.6	30.1	443
Cobalt	2.40 J	2.80 J	6.6 J	6.7 J	7.9 J	3.1 J	6.2 J	6.9 J	8.7 J
Copper	94.8	115	92.6 K	47.8 K	35 K	111 K	79.6 K	10.1 K	461 K
Cyanide	1.80 L	0.400 U	0.86 J	0.29 U	0.27 U	0.22 J	0.26 U	0.32 J	3
Iron	8,630	9,520	28,000	29,200	33,500	11,900	27,900	28,900	28,100
Lead	54.2	64.8	83.1	77	58.1	65.4	98.8	16.8	219
Magnesium	1,680	2,090	5,310	5,490	6,640	2,280	5,060	6,010	5,110
Manganese	51.6	58.2	178	181	223	77.8	165	211	181
Mercury	0.220	0.25	0.6	0.39	0.46	0.29	0.6	0.085 U	0.46
Nickel	7.10 J	8.60 J	13.6 J	14 J	16.7	8.5 J	14.4	14.6 J	20
Potassium	734 J	744 J	2,900	2,850	3,580	1,100 J	2,690	3,390	2,880
Selenium	0.630 U	0.840 U	0.8 U	0.69 U	0.73 U	0.58 U	0.7 U	0.76 U	0.75 U
Silver	0.220 U	0.25 J	1.4 J	1.5 J	1.6 J	0.71 J	1.5 J	1.3 J	1.8 J
Sodium	3,280	2,320	6,690	7,000	7,610	3,100	6,930	6,850	6,910
Thallium	0.770 U	1.40 U	0.8 U	0.69 U	0.73 U	0.58 U	0.7 U	0.76 U	0.75 U
Vanadium	12.4	14.4	34.3	30.9	37.3	17.2	30.6	35.2	37
Zinc	173	203	249 K	173 K	144 K	225 K	251 K	61.6 K	609 K
Wet Chemistry									
% Solids	61.2	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (MG/KG)	24,400	NA	63,000	35,000	37,000	15,000	34,000	32,000	32,000
pH	7.37	NA	NA	NA	NA	NA	NA	NA	NA

Shaded cells indicate analyte detections

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

Table A-3
Reference and Background Sediment Analytical Results
St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJREF-SD01	SJREF-SD02	SJREF-SD03		SJREF-SD04	SJREF-SD05	SJSBK-SD01		SJSBK-SD02		SJSBK
Sample ID	SJREF-SD01-00-04A	SJREF-SD02-00-04A	SJREF-SD03-00-04A	SJREF-SD03-00-04A-P	SJREF-SD04-00-04A	SJREF-SD05-00-04A	SJSBK-SD01-001	SJSBK-SD01-002	SJSBK-SD02-001	SJSBK-SD02-002	SJSBK-SD03-001
Sample Date	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	04/14/99	10/27/99	04/14/99	10/27/99	04/14/99
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
2-Butanone	NA	NA	NA	NA	NA	NA	15 U	10 J	18 U	10 J	14 U
2-Hexanone	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	3 J	15 U	4 J	27 U	14 U
Acetone	NA	NA	NA	NA	NA	NA	15 U	15 B	18 U	27 B	14 U
Benzene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Bromodichloromethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Bromoform	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Bromomethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Carbon disulfide	NA	NA	NA	NA	NA	NA	15 B	2 J	18 B	6 J	14 U
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Chlorobenzene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Chloroethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Chloroform	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Chloromethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Dibromochloromethane	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Ethylbenzene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Methylene chloride	NA	NA	NA	NA	NA	NA	15 B	15 B	18 B	27 B	14 B
Styrene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Tetrachloroethene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Toluene	NA	NA	NA	NA	NA	NA	15 U	3 J	18 U	27 U	14 U
Trichloroethene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Vinyl chloride	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Xylene, total	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	15 U	15 U	18 U	27 U	14 U
Semivolatile Organic Compounds (UG/KG)											
1,1-Biphenyl	870 U	680 U	720 U	730 U	750 U	750 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	490 U	NA	610 U	NA	480 U
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	490 U	NA	610 U	NA	480 U
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	490 U	NA	610 U	NA	480 U
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	490 U	NA	610 U	NA	480 U
2,4,5-Trichlorophenol	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	1,200 U	1,500 U	2,200 U	1,200 U
2,4,6-Trichlorophenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
2,4-Dichlorophenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
2,4-Dimethylphenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
2,4-Dinitrophenol	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	1,200 U	1,500 U	2,200 U	1,200 U
2,4-Dinitrotoluene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
2,6-Dinitrotoluene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected

Table A-3
Reference and Background Sediment Analytical Results
St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJREF-SD01	SJREF-SD02	SJREF-SD03		SJREF-SD04	SJREF-SD05	SJSBK-SD01		SJSBK-SD02		SJSBK
Sample ID	SJREF-SD01-00-04A	SJREF-SD02-00-04A	SJREF-SD03-00-04A	SJREF-SD03-00-04A-P	SJREF-SD04-00-04A	SJREF-SD05-00-04A	SJSBK-SD01-001	SJSBK-SD01-002	SJSBK-SD02-001	SJSBK-SD02-002	SJSBK-SD03-001
Sample Date	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	04/14/99	10/27/99	04/14/99	10/27/99	04/14/99
Chemical Name											
2-Chloronaphthalene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
2-Chlorophenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
2-Methylnaphthalene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
2-Methylphenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
2-Nitroaniline	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	NA	1,500 U	NA	1,200 U
2-Nitrophenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
3,3'-Dichlorobenzidine	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
3-Nitroaniline	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	NA	1,500 U	NA	1,200 U
4,6-Dinitro-2-methylphenol	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	1,200 U	1,500 U	2,200 U	1,200 U
4-Bromophenyl-phenylether	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
4-Chloro-3-methylphenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
4-Chloroaniline	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
4-Chlorophenyl-phenylether	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
4-Methylphenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
4-Nitroaniline	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	NA	1,500 U	NA	1,200 U
4-Nitrophenol	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	1,200 U	1,500 U	2,200 U	1,200 U
Acenaphthene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Acenaphthylene	310 J	680 U	110 J	130 J	750 U	120 J	490 U	NA	610 U	NA	480 U
Acetophenone	870 U	680 U	720 U	730 U	750 U	750 U	NA	NA	NA	NA	NA
Anthracene	290 J	680 U	89 J	110 J	750 U	99 J	490 U	NA	610 U	170 L	480 U
Atrazine	870 U	680 U	720 U	730 U	750 U	750 U	NA	NA	NA	NA	NA
Benzaldehyde	870 U	680 U	720 U	730 U	750 U	750 U	NA	NA	NA	NA	NA
Benzo(a)anthracene	950	260 J	370 J	580 J	110 J	380 J	490 U	NA	300 J	1,300 L	54 J
Benzo(a)pyrene	430 J	170 J	360 J	970	280 J	810	490 U	NA	270 J	1,100 L	480 U
Benzo(b)fluoranthene	3,300	670 J	1,200	1,600	420 J	1,400	490 U	100 L	500 J	NA	77 J
Benzo(g,h,i)perylene	870 U	680 U	720 U	470 J	140 J	400 J	490 U	NA	190 J	550 L	480 U
Benzo(k)fluoranthene	1,400	260 J	450 J	520 J	130 J	460 J	490 U	NA	160 J	580 L	480 U
Bis(2-chloro-1-methylethyl) ether	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Butylbenzylphthalate	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Caprolactam	870 U	680 U	720 U	730 U	750 U	750 U	NA	NA	NA	NA	NA
Carbazole	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Chrysene	1,200	280 J	500 J	700 J	170 J	540 J	490 U	71 L	360 J	1,500 L	67 J
Di-n-butylphthalate	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Di-n-octylphthalate	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Dibenz(a,h)anthracene	410 J	680 U	140 J	190 J	750 U	170 J	490 U	NA	67 J	NA	480 U
Dibenzofuran	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Diethylphthalate	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Dimethyl phthalate	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Fluoranthene	1,600	460 J	630 J	1,000	190 J	620 J	490 U	69 L	560 J	2,600 L	91 J
Fluorene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Hexachlorobenzene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Hexachlorobutadiene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Hexachlorocyclopentadiene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Hexachloroethane	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Indeno(1,2,3-cd)pyrene	320 J	110 J	260 J	480 J	150 J	390 J	490 U	NA	170 J	510 L	480 U
Isophorone	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	880 U	480 U
Naphthalene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Nitrobenzene	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Pentachlorophenol	2,200 U	1,700 U	1,800 U	1,800 U	1,900 U	1,900 U	1,200 U	1,200 U	1,500 U	2,200 U	1,200 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected

Table A-3
Reference and Background Sediment Analytical Results
St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJREF-SD01	SJREF-SD02	SJREF-SD03		SJREF-SD04	SJREF-SD05	SJSBK-SD01		SJSBK-SD02		SJSBK
Sample ID	SJREF-SD01-00-04A	SJREF-SD02-00-04A	SJREF-SD03-00-04A	SJREF-SD03-00-04A-P	SJREF-SD04-00-04A	SJREF-SD05-00-04A	SJSBK-SD01-001	SJSBK-SD01-002	SJSBK-SD02-001	SJSBK-SD02-002	SJSBK-SD03-001
Sample Date	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	04/14/99	10/27/99	04/14/99	10/27/99	04/14/99
Chemical Name											
Phenanthrene	130 J	120 J	720 U	90 J	750 U	750 U	490 U	NA	220 J	420 L	480 U
Phenol	870 U	680 U	720 U	730 U	750 U	750 U	490 U	490 U	610 U	880 U	480 U
Pyrene	570 J	250 J	460 J	840	240 J	620 J	490 U	65 L	440 J	1,900 L	76 J
bis(2-Chloroethoxy)methane	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
bis(2-Chloroethyl)ether	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
bis(2-Ethylhexyl)phthalate	140 B	87 B	110 B	140 B	510 B	110 B	490 U	NA	610 U	120 L	480 U
n-Nitroso-di-n-propylamine	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
n-Nitrosodiphenylamine	870 U	680 U	720 U	730 U	750 U	750 U	490 U	NA	610 U	NA	480 U
Pesticides/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDD	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	2.9 J	4.90 B	7.20 L	6 B	39 L	4.70 B
4,4'-DDE	8.6 U	6.8 U	5.1 J	7.3 U	7.5 U	4 J	4.90 B	16 L	6 B	12 L	4.70 B
4,4'-DDT	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	7.5 U	4.90 UJ	12 L	6 UJ	13 L	4.70 UJ
Aldrin	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
Aroclor-1016	86 U	68 U	72 U	73 U	75 U	75 U	49 U	NA	60 U	NA	47 U
Aroclor-1221	170 U	140 U	150 U	150 U	150 U	150 U	99 U	NA	120 U	NA	95 U
Aroclor-1232	86 U	68 U	72 U	73 U	75 U	75 U	49 U	NA	60 U	NA	47 U
Aroclor-1242	86 U	68 U	72 U	73 U	75 U	75 U	49 U	NA	60 U	NA	47 U
Aroclor-1248	86 U	68 U	72 U	73 U	75 U	75 U	49 U	NA	60 U	NA	47 U
Aroclor-1254	86 U	68 U	72 U	73 U	75 U	75 U	49 U	NA	60 U	NA	47 U
Aroclor-1260	86 U	68 U	72 U	73 U	75 U	75 U	49 U	NA	60 U	NA	47 U
Dieldrin	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	7.5 U	4.90 U	NA	6 U	NA	4.70 U
Endosulfan I	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
Endosulfan II	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	7.5 U	4.90 U	NA	6 U	NA	4.70 U
Endosulfan sulfate	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	7.5 U	4.90 U	NA	6 U	NA	4.70 U
Endrin	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	7.5 U	4.90 U	NA	6 U	NA	4.70 U
Endrin aldehyde	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	7.5 U	4.90 U	NA	6 U	NA	4.70 U
Endrin ketone	8.6 U	6.8 U	7.2 U	7.3 U	7.5 U	7.5 U	4.90 U	NA	6 U	NA	4.70 U
Heptachlor	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
Heptachlor epoxide	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
Methoxychlor	300	35 U	37 U	170	39 U	60	25 U	NA	30 U	NA	24 U
Toxaphene	440 U	350 U	370 U	370 U	390 U	390 U	250 U	NA	300 U	NA	240 U
alpha-BHC	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
alpha-Chlordane	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
beta-BHC	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
delta-BHC	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
gamma-BHC (Lindane)	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
gamma-Chlordane	4.4 U	3.5 U	3.7 U	3.7 U	3.9 U	3.9 U	2.5 U	NA	3 U	NA	2.40 U
Inorganics (MG/KG)											
Aluminum	20,700	20,500	17,300	19,200	17,400	18,000	4,660 K	2,310	7,890 K	7,380	1,620 K
Antimony	0.92 UL	0.72 UL	0.72 UL	0.79 UL	0.75 UL	0.83 UL	0.470 U	0.430 B	0.700 U	0.770 UL	0.75 U
Arsenic	15.4	12.1	12.8	13.1	9.1	15	3.70	2.10	6.20	7.80	1.10 J
Barium	48.6 J	41.7 J	39.3 J	42 J	36.8 J	40.4 J	15.4 J	6.5 J	27.1 J	34.6 J	4.60 J
Beryllium	0.89 J	0.76 J	0.77 J	0.78 J	0.72 J	0.78 J	0.310 J	0.150 J	0.440 J	0.550 J	0.100 J
Cadmium	0.17 J	0.072 U	0.11 J	0.079 U	0.075 U	0.083 U	0.410 J	0.170 J	1 J	1.10 J	0.220 J
Calcium	2,520	2,920	2,040	2,120	4,370	2,280	879	446 J	1,520	1,820	304 L
Chromium	39.9	32.2	32.5	32.6	30	32.4	14	8.20 K	42.4	43.2 K	4.60
Cobalt	8.1 J	7.7 J	6.8 J	6.6 J	6.7 J	6.6 J	2.5 J	1.10 J	3.80 J	4 J	0.960 J

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Table A-3
Reference and Background Sediment Analytical Results
St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	SJREF-SD01	SJREF-SD02	SJREF-SD03		SJREF-SD04	SJREF-SD05	SJSBK-SD01		SJSBK-SD02		SJSBK
Sample ID	SJREF-SD01-00-04A	SJREF-SD02-00-04A	SJREF-SD03-00-04A	SJREF-SD03-00-04A-P	SJREF-SD04-00-04A	SJREF-SD05-00-04A	SJSBK-SD01-001	SJSBK-SD01-002	SJSBK-SD02-001	SJSBK-SD02-002	SJSBK-SD03-001
Sample Date	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	01/06/04	04/14/99	10/27/99	04/14/99	10/27/99	04/14/99
Chemical Name											
Copper	70.1 K	24.2 K	55.2 K	47.4 K	26.1 K	48.9 K	29.3	15.7	86.2	122	11.9
Cyanide	0.38 U	0.28 U	0.3 U	2	0.33 U	4.5	0.360 B	0.330 U	0.400 B	0.610 U	0.240 B
Iron	32,700	31,300	27,700	28,300	27,600	27,600	8,140 K	3,860	14,800 K	16,700	3,050
Lead	85.9	47.8	77.6	80.6	31	78.1	37 K	20.6 K	60.6 K	75.9 K	13.9 K
Magnesium	6,380	6,360	5,340	5,590	5,870	5,340	1,510	758 J	2,390	2,920	562 J
Manganese	202	219	165	161	194	160	48.1	20.8 K	84.6	89.8 K	15.5
Mercury	0.74	0.12 J	0.55	0.6	0.21	0.61	0.0300 L	0.0600	0.270 L	0.370	0.0400 L
Nickel	17.8 J	15.9	15.1	15.1 J	15.3	14.5 J	6 J	2.70 J	10.4	11.3	1.90 J
Potassium	3,490	3,580	2,840	2,950	3,190	2,940	795 L	341 J	1,180 L	1,210 J	297 L
Selenium	0.92 U	0.72 U	0.72 U	0.79 U	0.75 U	0.83 U	0.450 U	0.470 U	0.740 J	1.30 J	0.720 U
Silver	1.8 J	1.6 J	1.5 J	1.5 J	1.4 J	1.5 J	0.160 U	0.110 U	0.230 U	0.190 U	0.25 U
Sodium	9,410	7,070	7,380	7,770	7,440	6,530	4,720	1,390 K	5,450	4,910	1,550 L
Thallium	0.92 U	0.72 U	0.72 U	0.79 U	0.75 U	0.83 U	0.550 UL	0.800 U	0.830 UL	1.40 U	0.890 U
Vanadium	38	38.7	31.6	33.1	33.9	33.7	13.3	6.20 J	21.2	19.9	5 J
Zinc	254 K	110 K	218 K	184 K	116 K	191 K	125	65.2 K	195	281 K	45.7
Wet Chemistry											
% Solids	NA	NA	NA	NA	NA	NA	67.6	68.4	55.2	37.5	70
Total organic carbon (TOC) (MG/KG)	41,000	61,000	31,000	43,000	34,000	39,000	2,860	12,300	2,340	63,300	8,380
pH	NA	NA	NA	NA	NA	NA	7.11	7.17	7.19	7.17	7.45

Shaded cells indicate analyte detections

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Table A-3
Reference and Background Sediment Analytical Results
St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	-SD03	SJSBK-SD04			SJSBK-SD05		SJSBK-SD06		SJSBK-SD12
Sample ID	SJSBK-SD03-002	SJSBK-SD04-001	SJSBK-SD04-002	SJSBK-SD04-002P	SJSBK-SD05-001	SJSBK-SD05-002	SJSBK-SD06-001	SJSBK-SD06-002	SJSBK-SD12-001
Sample Date	10/27/99	04/14/99	12/05/99	12/05/99	04/14/99	10/26/99	04/14/99	10/26/99	10/27/99
Chemical Name									
Volatile Organic Compounds (UG/KG)									
1,1,1-Trichloroethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
1,1,2,2-Tetrachloroethane	15 U	13 U	NA	NA	32 UJ	26 U	15 UJ	13 U	16 U
1,1,2-Trichloroethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
1,1-Dichloroethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
1,1-Dichloroethene	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
1,2-Dichloroethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
1,2-Dichloroethene (total)	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
1,2-Dichloropropane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
2-Butanone	15 U	13 U	NA	NA	32 UJ	93 J	15 U	5 J	12 J
2-Hexanone	15 U	13 U	NA	NA	32 UJ	26 U	15 UJ	13 U	16 U
4-Methyl-2-pentanone	15 U	5 J	NA	NA	8 J	26 U	7 J	13 U	16 U
Acetone	157	13 U	340 J	340 J	32 J	240 J	15 U	13 B	16 B
Benzene	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Bromodichloromethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Bromoform	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Bromomethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Carbon disulfide	15 U	13 U	5 J	5 J	32 UJ	5 J	15 U	13 U	3 J
Carbon tetrachloride	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Chlorobenzene	15 U	13 U	NA	NA	32 UJ	26 U	15 UJ	13 U	16 U
Chloroethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Chloroform	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Chloromethane	15 U	13 U	NA	NA	32 U	9 J	15 U	2 J	16 U
Dibromochloromethane	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Ethylbenzene	15 U	13 U	NA	NA	32 UJ	26 U	15 UJ	13 U	16 U
Methylene chloride	15 B	13 B	NA	170 B	32 B	26 B	15 B	13 B	16 B
Styrene	15 U	13 U	NA	NA	32 UJ	26 U	15 UJ	13 U	16 U
Tetrachloroethene	15 U	13 U	NA	NA	32 UJ	26 U	15 UJ	13 U	16 U
Toluene	15 U	13 U	NA	NA	32 UJ	5 J	15 UJ	2 J	2 J
Trichloroethene	15 U	13 B	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Vinyl chloride	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Xylene, total	15 U	13 U	NA	NA	32 UJ	26 U	15 UJ	13 U	16 U
cis-1,3-Dichloropropene	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
trans-1,3-Dichloropropene	15 U	13 U	NA	NA	32 UJ	26 U	15 U	13 U	16 U
Semivolatile Organic Compounds (UG/KG)									
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
1,2-Dichlorobenzene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
1,3-Dichlorobenzene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
1,4-Dichlorobenzene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
2,4,5-Trichlorophenol	1,200 U	2,200 R	NA	NA	13,000 R	NA	1,200 U	1,100 U	NA
2,4,6-Trichlorophenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
2,4-Dichlorophenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
2,4-Dimethylphenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
2,4-Dinitrophenol	1,200 U	2,200 R	NA	NA	13,000 R	NA	1,200 U	1,100 U	NA
2,4-Dinitrotoluene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
2,6-Dinitrotoluene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA

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Table A-3
Reference and Background Sediment Analytical Results
St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	-SD03	SJSBK-SD04			SJSBK-SD05		SJSBK-SD06		SJSBK-SD12
Sample ID	SJSBK-SD03-002	SJSBK-SD04-001	SJSBK-SD04-002	SJSBK-SD04-002P	SJSBK-SD05-001	SJSBK-SD05-002	SJSBK-SD06-001	SJSBK-SD06-002	SJSBK-SD12-001
Sample Date	10/27/99	04/14/99	12/05/99	12/05/99	04/14/99	10/26/99	04/14/99	10/26/99	10/27/99
Chemical Name									
2-Chloronaphthalene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
2-Chlorophenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
2-Methylnaphthalene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
2-Methylphenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
2-Nitroaniline	NA	2,200 R	NA	NA	13,000 R	NA	1,200 U	NA	NA
2-Nitrophenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
3,3'-Dichlorobenzidine	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
3-Nitroaniline	NA	2,200 R	NA	NA	13,000 R	NA	1,200 U	NA	NA
4,6-Dinitro-2-methylphenol	1,200 U	2,200 R	NA	NA	13,000 R	NA	1,200 U	1,100 U	NA
4-Bromophenyl-phenylether	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
4-Chloro-3-methylphenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
4-Chloroaniline	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
4-Chlorophenyl-phenylether	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
4-Methylphenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
4-Nitroaniline	NA	2,200 R	NA	NA	13,000 R	NA	1,200 U	NA	NA
4-Nitrophenol	1,200 U	2,200 R	NA	NA	13,000 R	NA	1,200 U	1,100 U	NA
Acenaphthene	NA	880 R	71 J	71 J	5,400 R	NA	490 U	NA	NA
Acenaphthylene	NA	880 R	NA	NA	5,400 R	NA	490 U	61 L	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	880 R	120 J	120 J	5,400 R	NA	490 U	45 L	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	92 L	130 R	800	800	5,400 R	NA	67 J	210 L	130 L
Benzo(a)pyrene	69 L	91 R	480 J	480 J	5,400 R	NA	50 J	110 L	80 L
Benzo(b)fluoranthene	130 L	160 R	870	870	5,400 R	NA	74 J	260 L	320 L
Benzo(g,h,i)perylene	NA	880 R	290 J	290 J	5,400 R	NA	490 U	170 L	130 L
Benzo(k)fluoranthene	59 L	880 R	210 J	210 J	5,400 R	NA	490 U	130 L	120 L
Bis(2-chloro-1-methylethyl) ether	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Butylbenzylphthalate	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	880 R	79 J	79 J	5,400 R	NA	490 U	48 L	NA
Chrysene	120 L	110 R	880	880	5,400 R	NA	62 J	210 L	210 L
Di-n-butylphthalate	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Di-n-octylphthalate	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Dibenz(a,h)anthracene	NA	880 R	NA	NA	5,400 R	NA	490 U	50 L	NA
Dibenzofuran	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Diethylphthalate	NA	4,700 R	NA	NA	17,000 R	NA	490 U	50 L	220 L
Dimethyl phthalate	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Fluoranthene	190 L	170 R	1,600	1,600	5,400 R	NA	160 J	450 L	300 L
Fluorene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Hexachlorobenzene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Hexachlorobutadiene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Hexachlorocyclopentadiene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Hexachloroethane	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Indeno(1,2,3-cd)pyrene	53 L	880 R	260 J	260 J	5,400 R	NA	490 U	150 L	120 L
Isophorone	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Naphthalene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Nitrobenzene	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Pentachlorophenol	1,200 U	2,200 R	NA	NA	13,000 R	NA	1,200 U	1,100 U	NA

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Table A-3
Reference and Background Sediment Analytical Results
St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	-SD03	SJSBK-SD04			SJSBK-SD05		SJSBK-SD06		SJSBK-SD12
Sample ID	SJSBK-SD03-002	SJSBK-SD04-001	SJSBK-SD04-002	SJSBK-SD04-002P	SJSBK-SD05-001	SJSBK-SD05-002	SJSBK-SD06-001	SJSBK-SD06-002	SJSBK-SD12-001
Sample Date	10/27/99	04/14/99	12/05/99	12/05/99	04/14/99	10/26/99	04/14/99	10/26/99	10/27/99
Chemical Name									
Phenanthrene	NA	880 R	920	920	5,400 R	NA	110 J	310 L	62 L
Phenol	500 U	880 R	NA	NA	5,400 R	NA	490 U	430 U	NA
Pyrene	190 L	130 R	1,500	1,500	5,400 R	NA	110 J	340 L	260 L
bis(2-Chloroethoxy)methane	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
bis(2-Chloroethyl)ether	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
bis(2-Ethylhexyl)phthalate	NA	880 R	NA	NA	5,400 R	NA	150 J	44 J	NA
n-Nitroso-di-n-propylamine	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
n-Nitrosodiphenylamine	NA	880 R	NA	NA	5,400 R	NA	490 U	NA	NA
Pesticides/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDD	3.20 L	4.40 B	12	12	92	8.80 L	4.90 B	2.60 L	16 L
4,4'-DDE	4.5 L	6.40	20	20	100	60 L	29	9 L	46 L
4,4'-DDT	1.80 L	1.30 J	9 J	9 J	6.40 J	9.10 L	5	5.60 L	NA
Aldrin	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
Aroclor-1016	NA	44 U	NA	NA	110 U	NA	49 U	NA	NA
Aroclor-1221	NA	87 U	NA	NA	210 U	NA	97 U	NA	NA
Aroclor-1232	NA	44 U	NA	NA	110 U	NA	49 U	NA	NA
Aroclor-1242	NA	44 U	NA	NA	110 U	NA	49 U	NA	NA
Aroclor-1248	NA	44 U	NA	NA	110 U	NA	49 U	NA	NA
Aroclor-1254	NA	44 U	NA	NA	110 U	NA	49 U	NA	NA
Aroclor-1260	NA	44 U	NA	NA	110 U	NA	49 U	NA	NA
Dieldrin	NA	4.40 U	NA	NA	11 U	NA	4.90 U	NA	NA
Endosulfan I	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
Endosulfan II	NA	4.40 U	NA	NA	11 U	NA	4.90 U	NA	NA
Endosulfan sulfate	NA	4.40 U	NA	NA	11 U	NA	4.90 U	NA	NA
Endrin	NA	4.40 U	NA	NA	11 U	NA	4.90 U	NA	NA
Endrin aldehyde	NA	4.40 U	NA	NA	11 U	NA	4.90 U	NA	NA
Endrin ketone	NA	4.40 U	NA	NA	11 U	NA	4.90 U	NA	NA
Heptachlor	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
Heptachlor epoxide	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
Methoxychlor	NA	22 U	NA	NA	53 U	NA	24 U	NA	NA
Toxaphene	NA	220 U	NA	NA	530 U	NA	240 U	NA	NA
alpha-BHC	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
alpha-Chlordane	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
beta-BHC	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
delta-BHC	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
gamma-BHC (Lindane)	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
gamma-Chlordane	NA	2.20 U	NA	NA	5.30 U	NA	2.40 U	NA	NA
Inorganics (MG/KG)									
Aluminum	2,670	1,400 K	2,550	2,400	14,100 K	6,020	1,520 K	469	5,510
Antimony	0.670 UL	0.5 U	0.73 UL	NA	1.20 B	0.890 B	0.440 U	0.610 B	0.570 B
Arsenic	3.10	1.40 J	2.40 J	2.20 J	30.4	9.30	2.5	0.960 J	6.20
Barium	7.30 J	4.70 J	8.3 B	9.30 B	58.9 J	34.4 J	14.3 J	4 J	24.9 J
Beryllium	0.180 J	0.0900 J	0.210 J	0.210 J	2.10	0.5 J	0.160 J	0.0400 U	0.450 J
Cadmium	0.190 J	0.130 J	0.270 J	0.230 J	1.40 J	0.170 J	0.210 J	0.0800 J	0.390 J
Calcium	513 J	281 J	950 J	950 J	2,320	2,190	648 J	6.80 B	5,200
Chromium	6.90 K	3.10	7.40	6.80	20.2	9.90 K	3.10	0.990 K	20.7 K
Cobalt	1.20 J	0.75 J	0.880 J	0.840 J	9.5 J	1.40 J	0.0800 B	0.170 U	3.60 J

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St. Juliens Creek
St. Juliens Annex, Chesapeake, Virginia

Station ID	-SD03	SJSBK-SD04			SJSBK-SD05		SJSBK-SD06		SJSBK-SD12
Sample ID	SJSBK-SD03-002	SJSBK-SD04-001	SJSBK-SD04-002	SJSBK-SD04-002P	SJSBK-SD05-001	SJSBK-SD05-002	SJSBK-SD06-001	SJSBK-SD06-002	SJSBK-SD12-001
Sample Date	10/27/99	04/14/99	12/05/99	12/05/99	04/14/99	10/26/99	04/14/99	10/26/99	10/27/99
Chemical Name									
Copper	18.8	5.5	14.7	14.7	38.5	20.2	6.20	0.800 J	55.4
Cyanide	0.370 U	0.25 B	0.28 U	NA	0.670 B	0.630 U	0.300 B	0.320 U	0.370 U
Iron	4,850	2,200	3,640	3,330	18,500 K	4,720	1,660	599	12,000
Lead	19 K	8.20 K	23.2	23.2	104 K	73.8 K	12.8 K	3.70 K	66.5 K
Magnesium	934 J	319 J	739 J	739 J	1,630 J	1,200 J	108 J	5.70 B	2,840
Manganese	25.1 K	11.3	20.3	19.4	38.2	31.3 K	6.70	2.40 K	91.1 K
Mercury	0.0900	0.0700	1.40 L	0.990 L	0.270 L	0.160	0.0400 L	0.0200 U	0.200
Nickel	2.80 J	1.70 J	2.60 J	2.5 J	19.9	5.40 J	1.5 J	0.200 U	8.20
Potassium	419 J	170 L	261 J	250 J	684 L	467 J	104 L	44.9 J	846 J
Selenium	0.740 U	0.540 J	0.81 U	NA	1.5 J	1 J	0.430 U	0.670 U	0.630 U
Silver	0.170 U	0.170 U	0.18 U	NA	0.380 U	0.220 U	0.150 U	0.150 U	0.220 J
Sodium	1,670 K	652 J	1,050 B	1,310 B	1,930 J	893 J	36.7 J	44.3 B	2,640
Thallium	1.20 U	0.590 UL	1.4 U	NA	1.40 UL	1.60 U	0.520 UL	1.10 U	1.10 U
Vanadium	7.10 J	5 J	10 J	8.60 J	55.9	23.2	6.10 J	1.80 J	15.3
Zinc	66.9 K	30.3	54.2	48.7	422	96.2 K	38.8	0.150 B	191 K
Wet Chemistry									
% Solids	67.3	76.1	69.1	64.6	31	39.5	68	78	61.9
Total organic carbon (TOC) (MG/KG)	20,900	11,500	12,000	4,880	16,000	89,900	9,940	1,820	26,200
pH	6.77	7.35	7.65	7.65	6.97	6.60	6.03	6.5	7.82

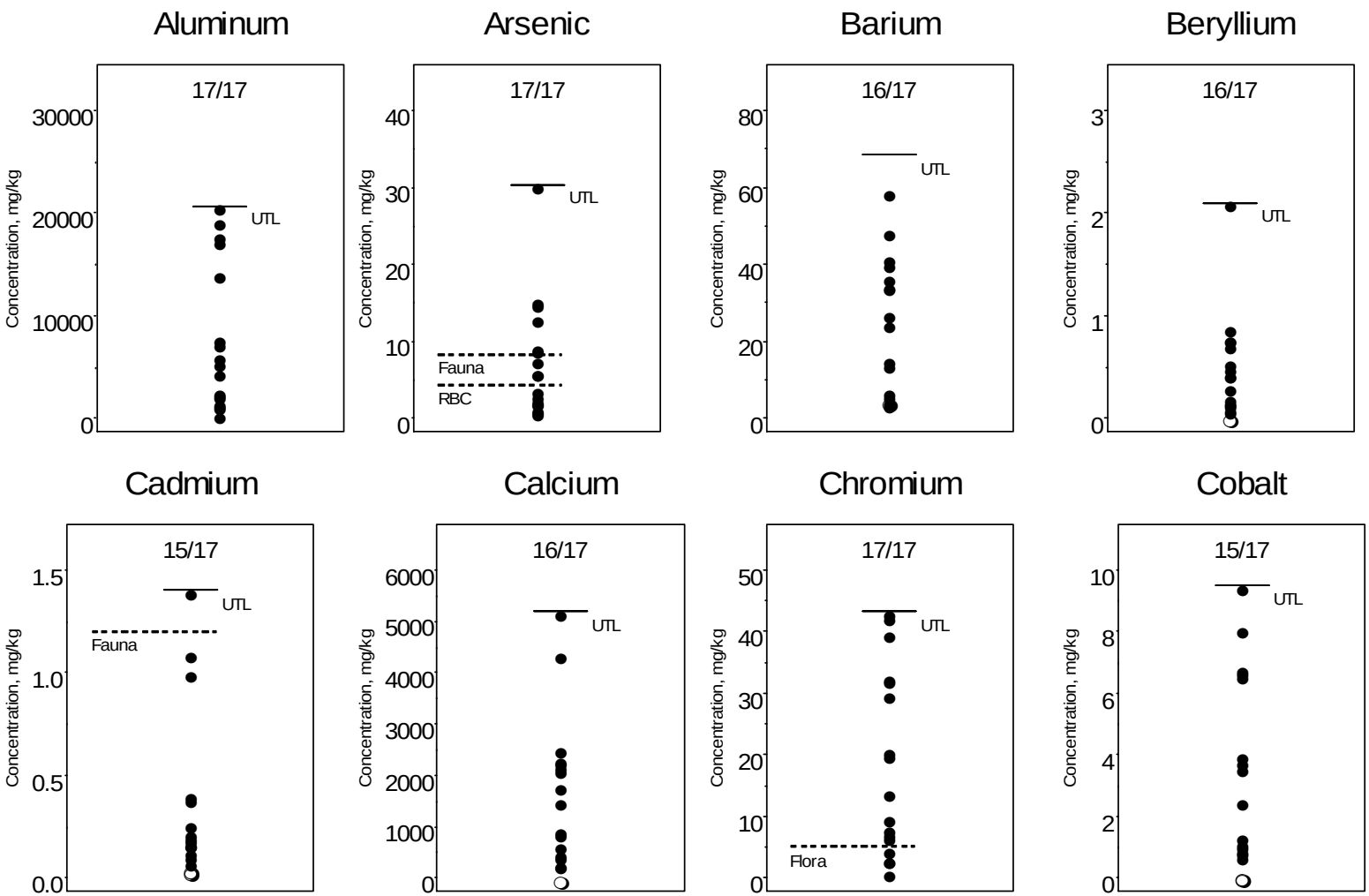
Shaded cells indicate analyte detections

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected

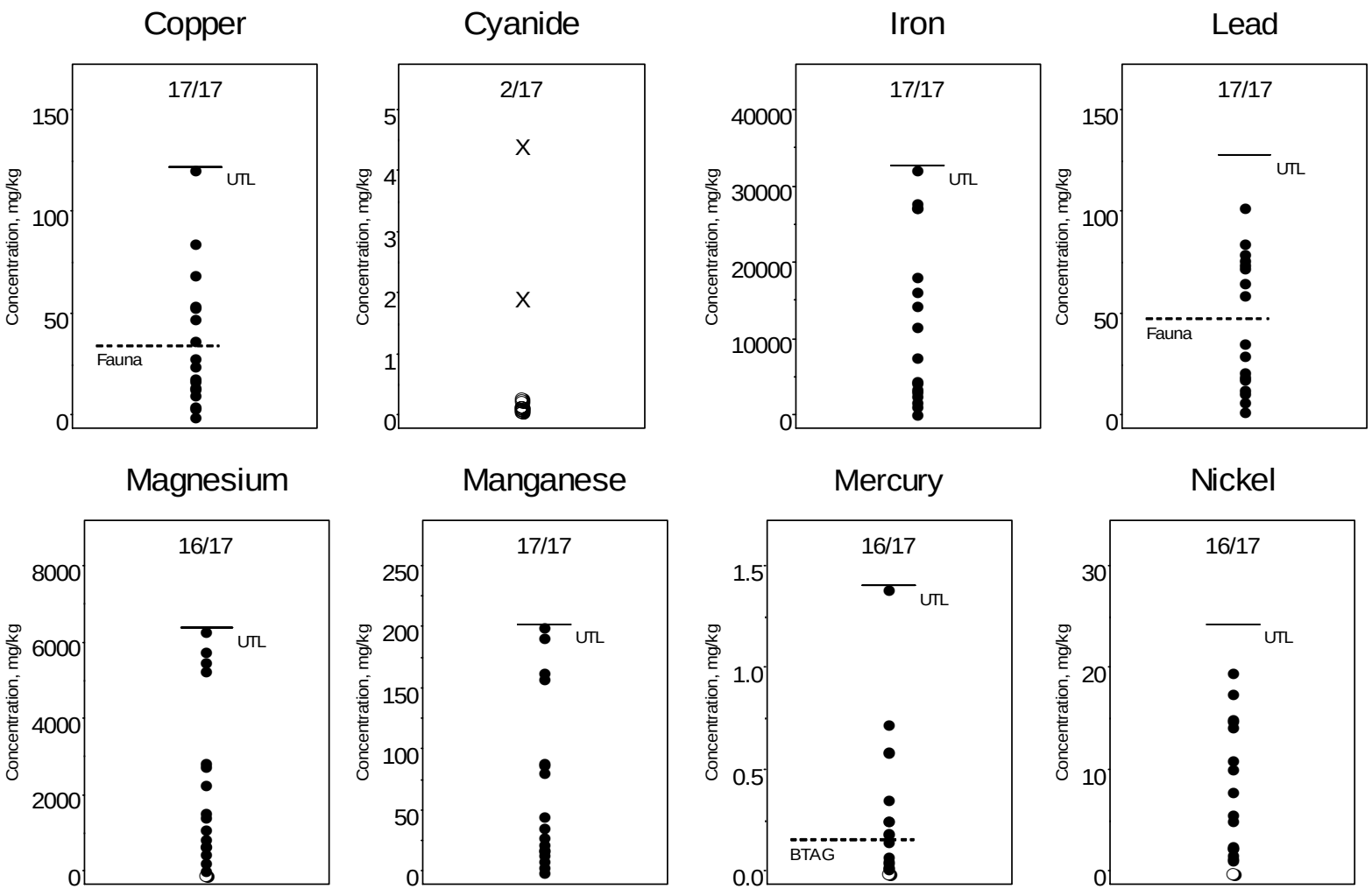
Appendix B
Statistical Plots

Figure 1: Scatter Plots for Detected Inorganics



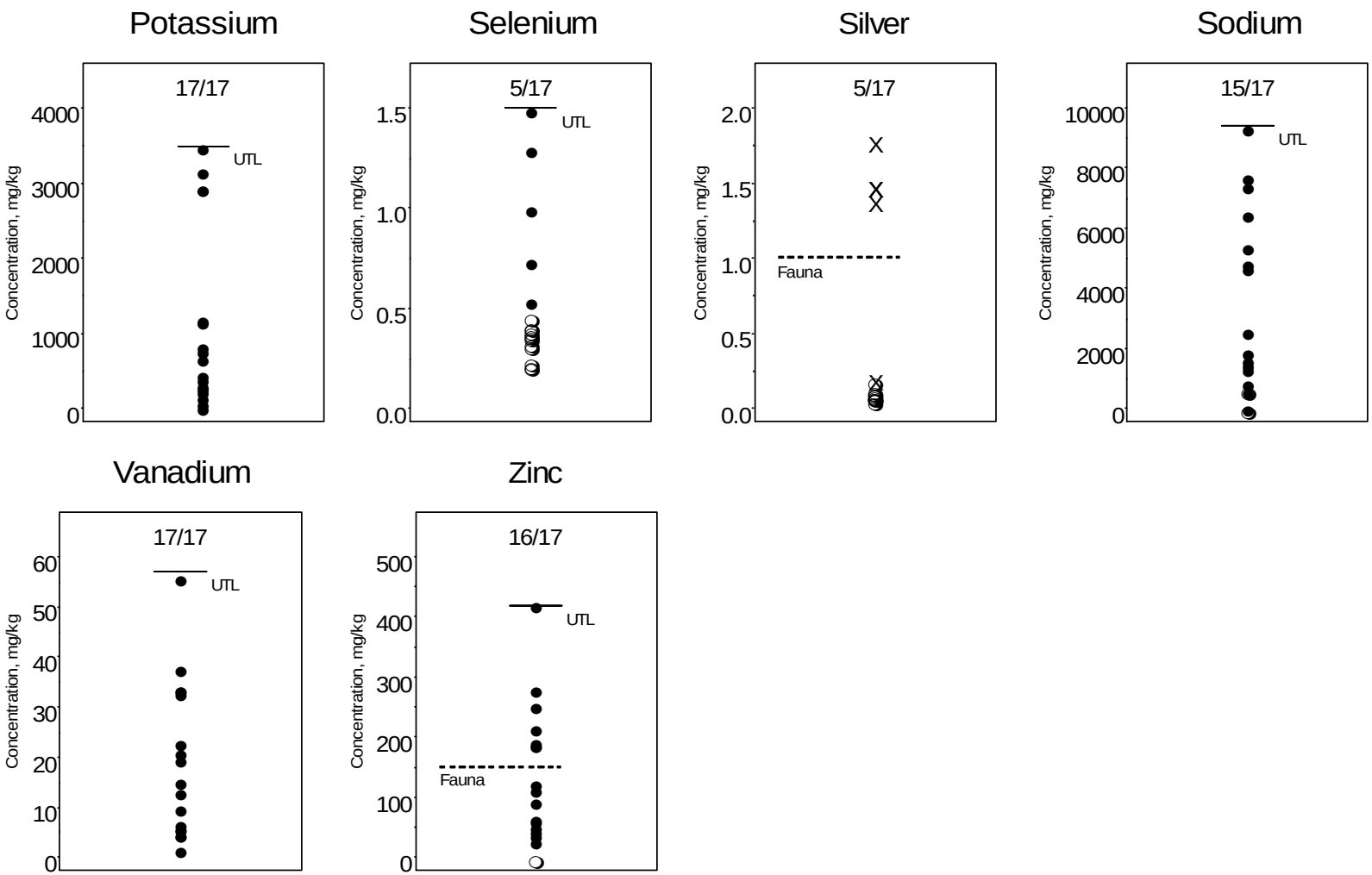
Open Symbol Represents Nondetected Value; Frequency of Detection Provided at Top of Plots
X represents calculated outlier (Xnd for non-detect proxy)

Figure 1: Scatter Plots for Detected Inorganics



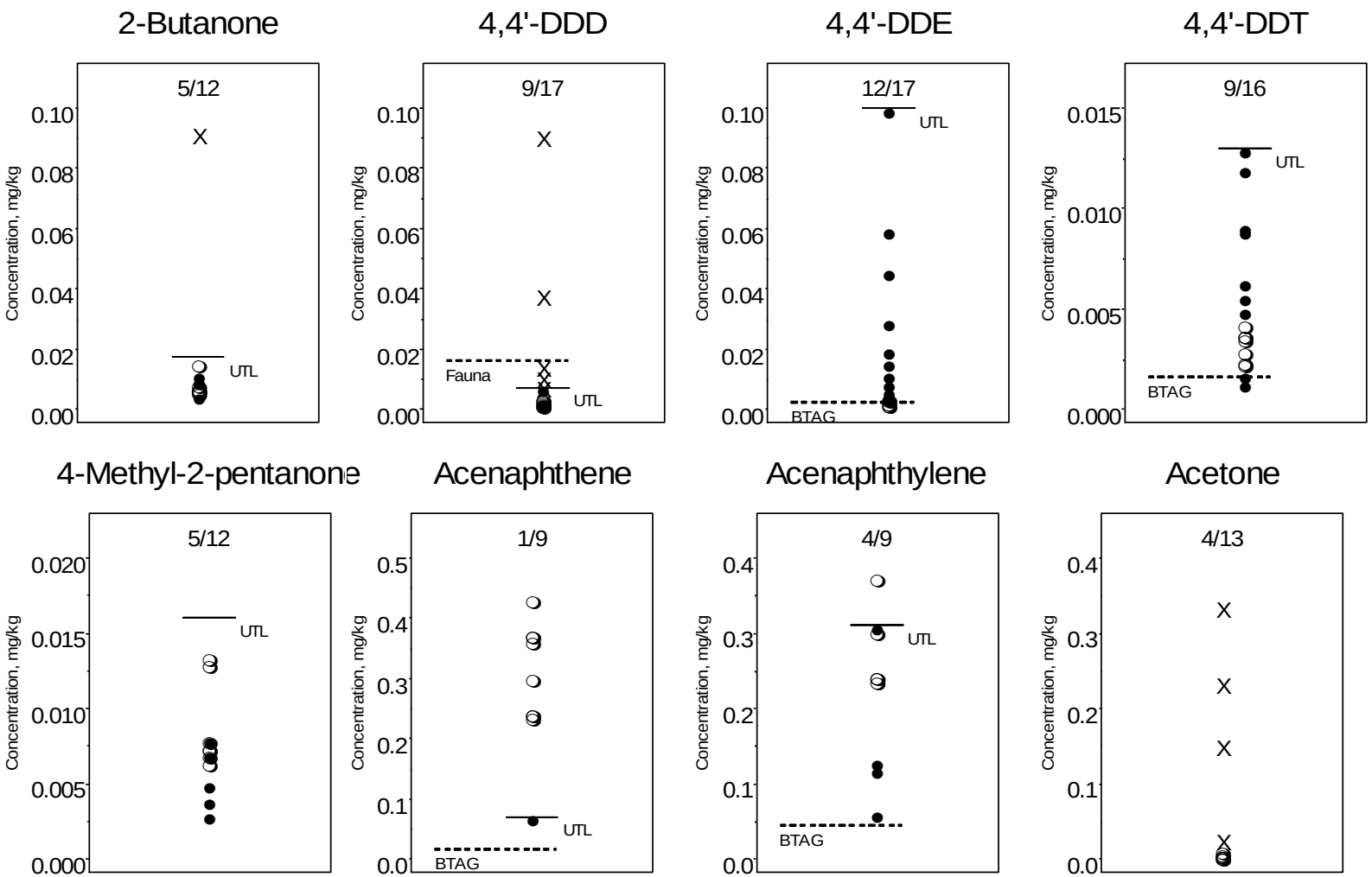
Open Symbol Represents Nondetected Value; Frequency of Detection Provided at Top of Plots
X represents calculated outlier (Xnd for non-detect proxy)

Figure 1: Scatter Plots for Detected Inorganics



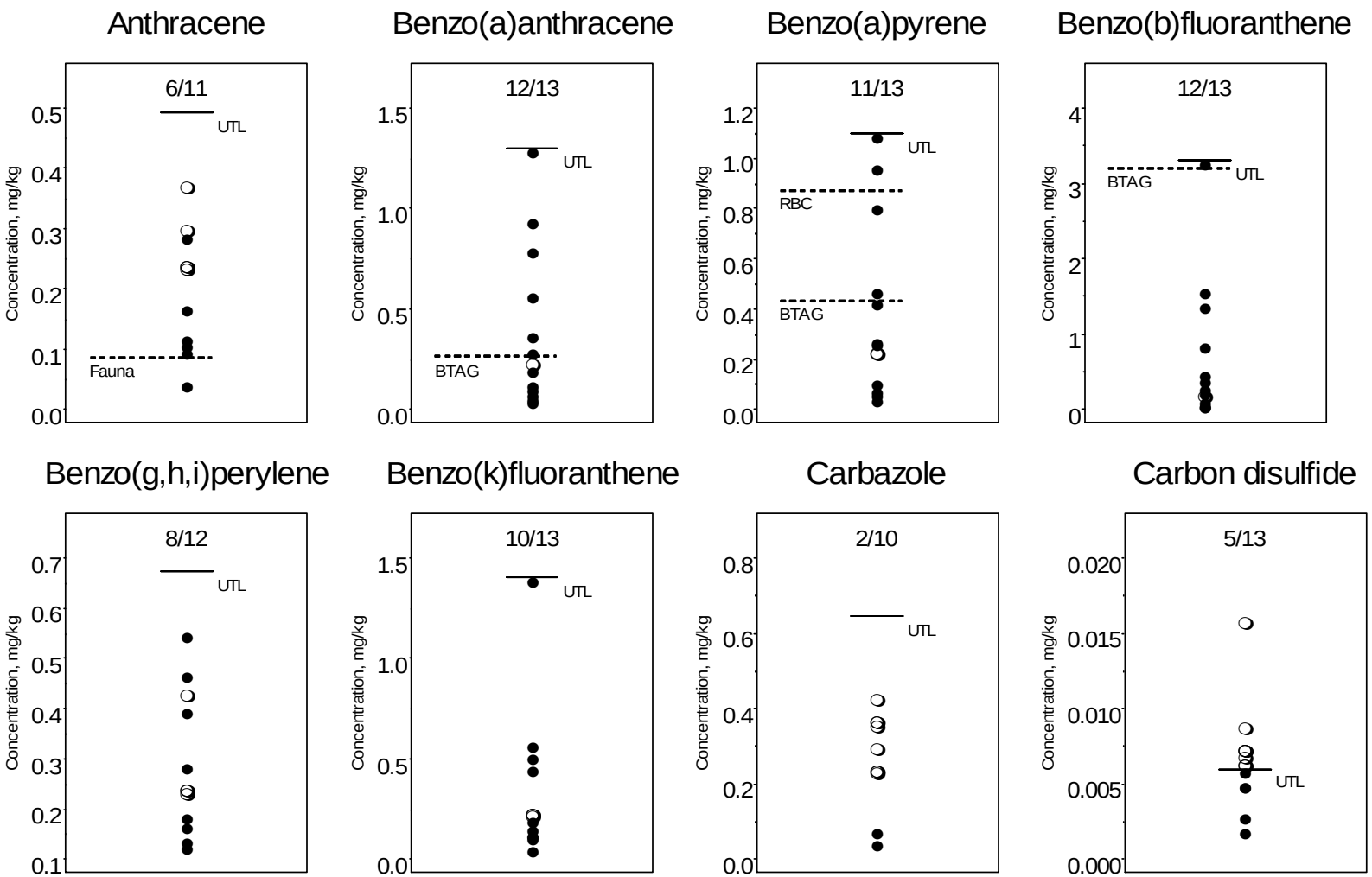
Open Symbol Represents Nondetected Value; Frequency of Detection Provided at Top of Plots
X represents calculated outlier (Xnd for non-detect proxy)

Figure 2: Scatter Plots for Detected Organics



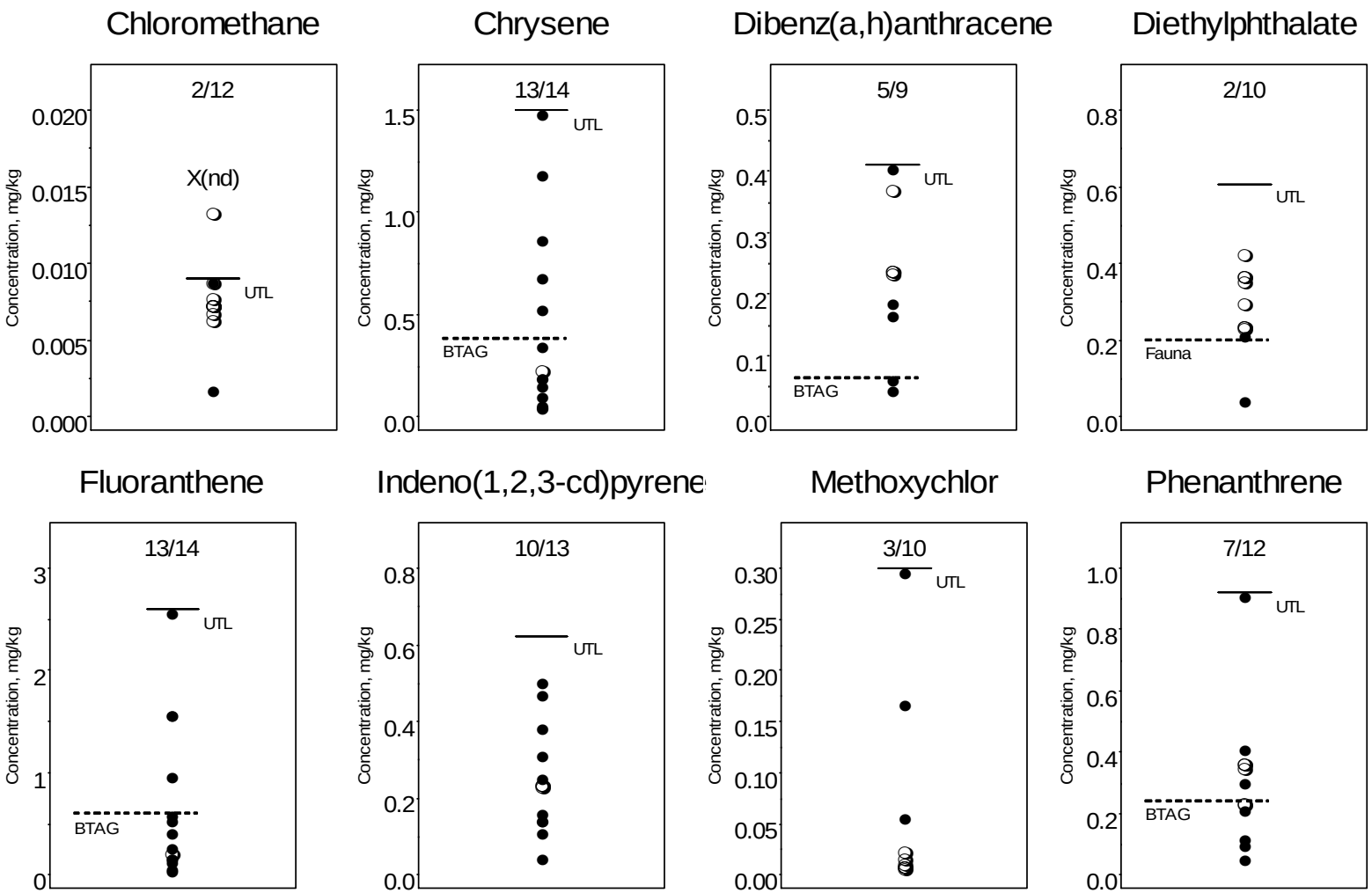
Open Symbol Represents Nondetected Value; Frequency of Detection Provided at Top of Plots
X represents calculated outlier (Xnd for non-detect proxy)

Figure 2: Scatter Plots for Detected Organics



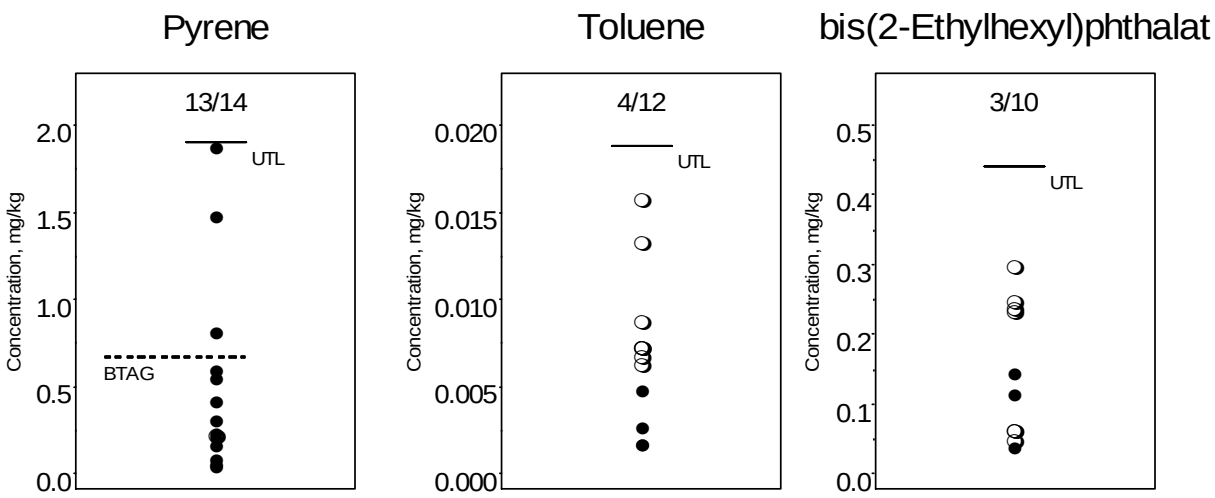
Open Symbol Represents Nondetected Value; Frequency of Detection Provided at Top of Plots
X represents calculated outlier (Xnd for non-detect proxy)

Figure 2: Scatter Plots for Detected Organics



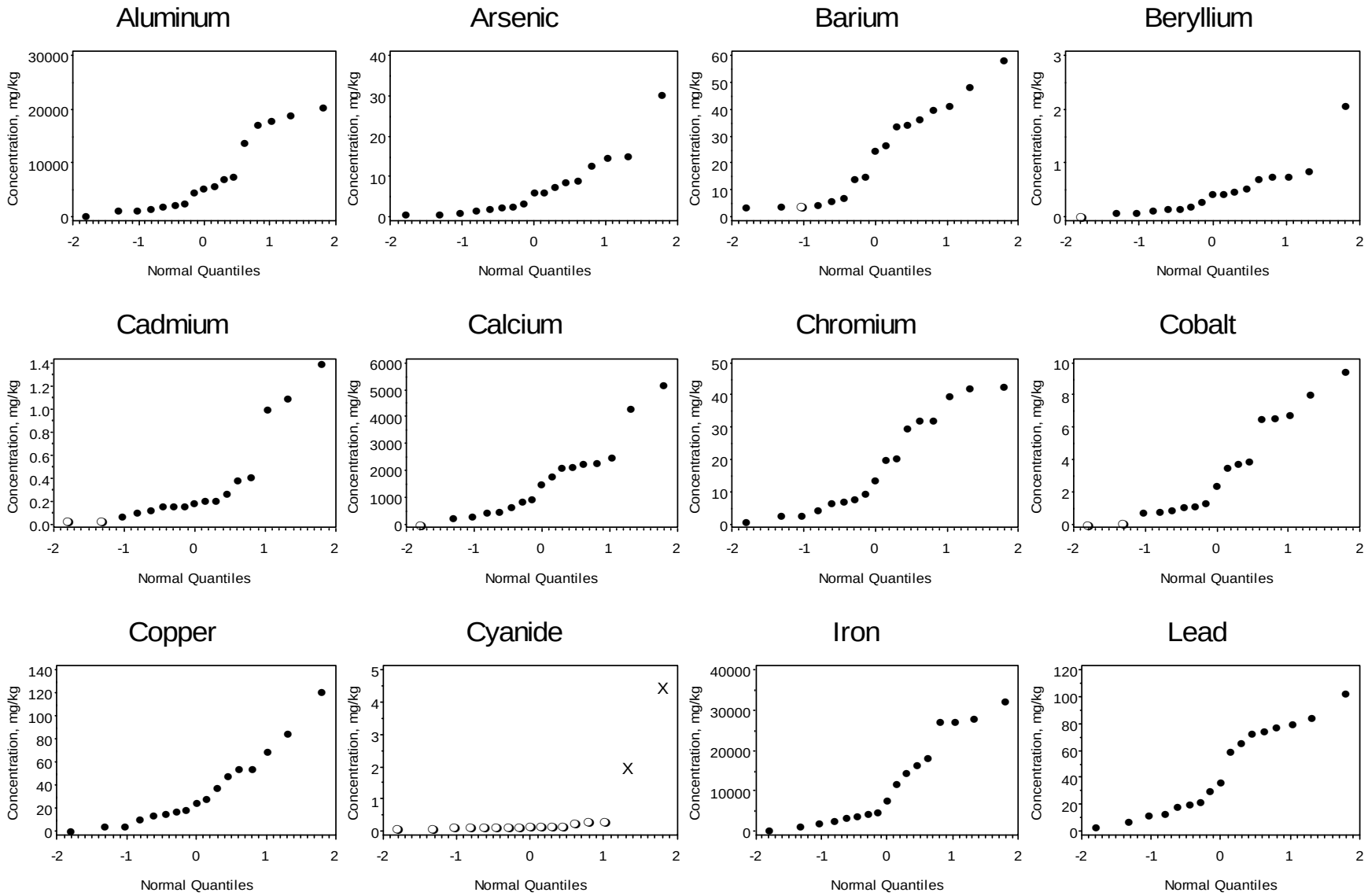
Open Symbol Represents Nondetected Value; Frequency of Detection Provided at Top of Plots
X represents calculated outlier (Xnd for non-detect proxy)

Figure 2: Scatter Plots for Detected Organics



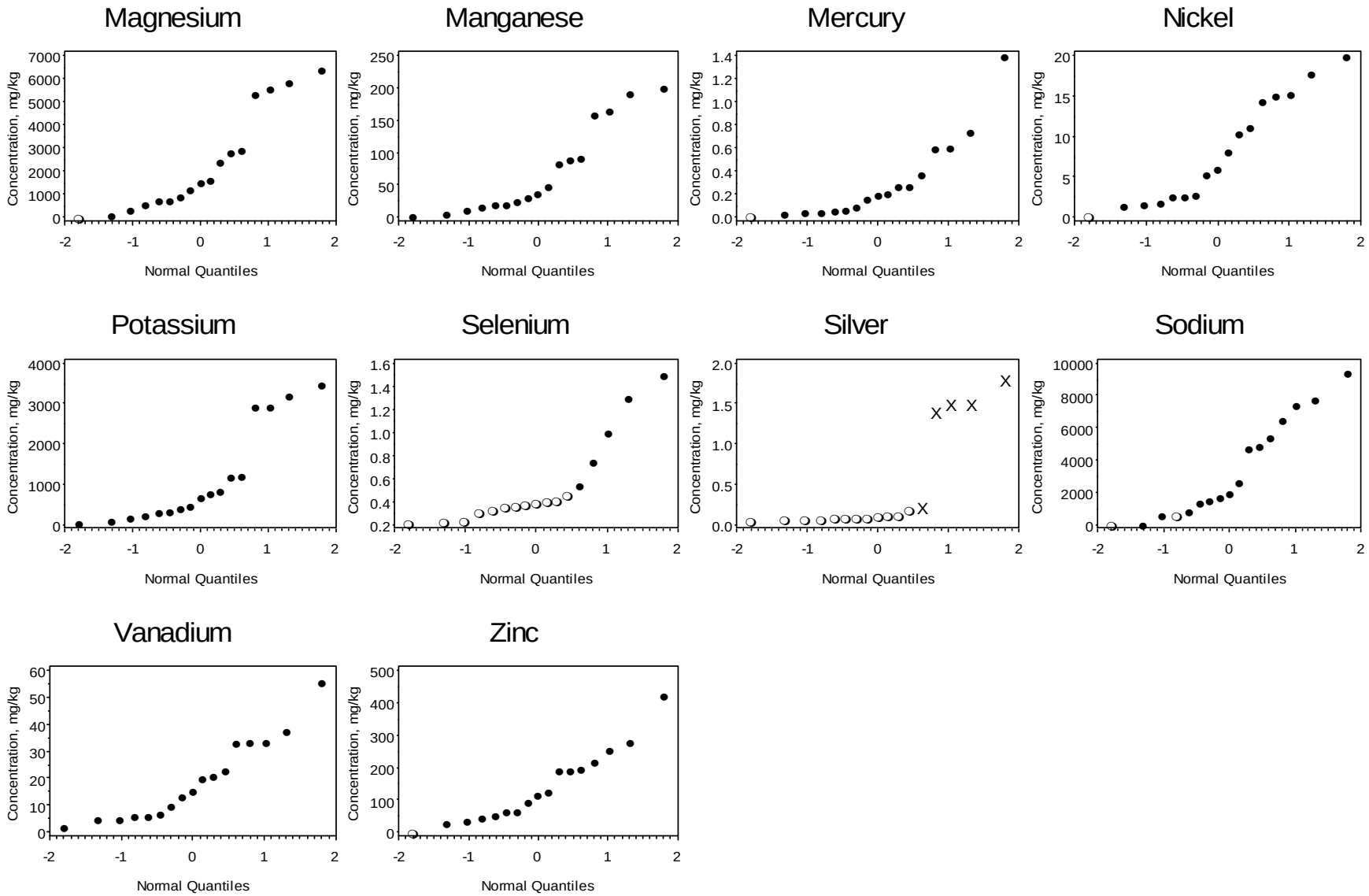
Open Symbol Represents Nondetected Value; Frequency of Detection Provided at Top of Plots
X represents calculated outlier (Xnd for non-detect proxy)

Figure 3: Probability Plots for Detected Inorganics



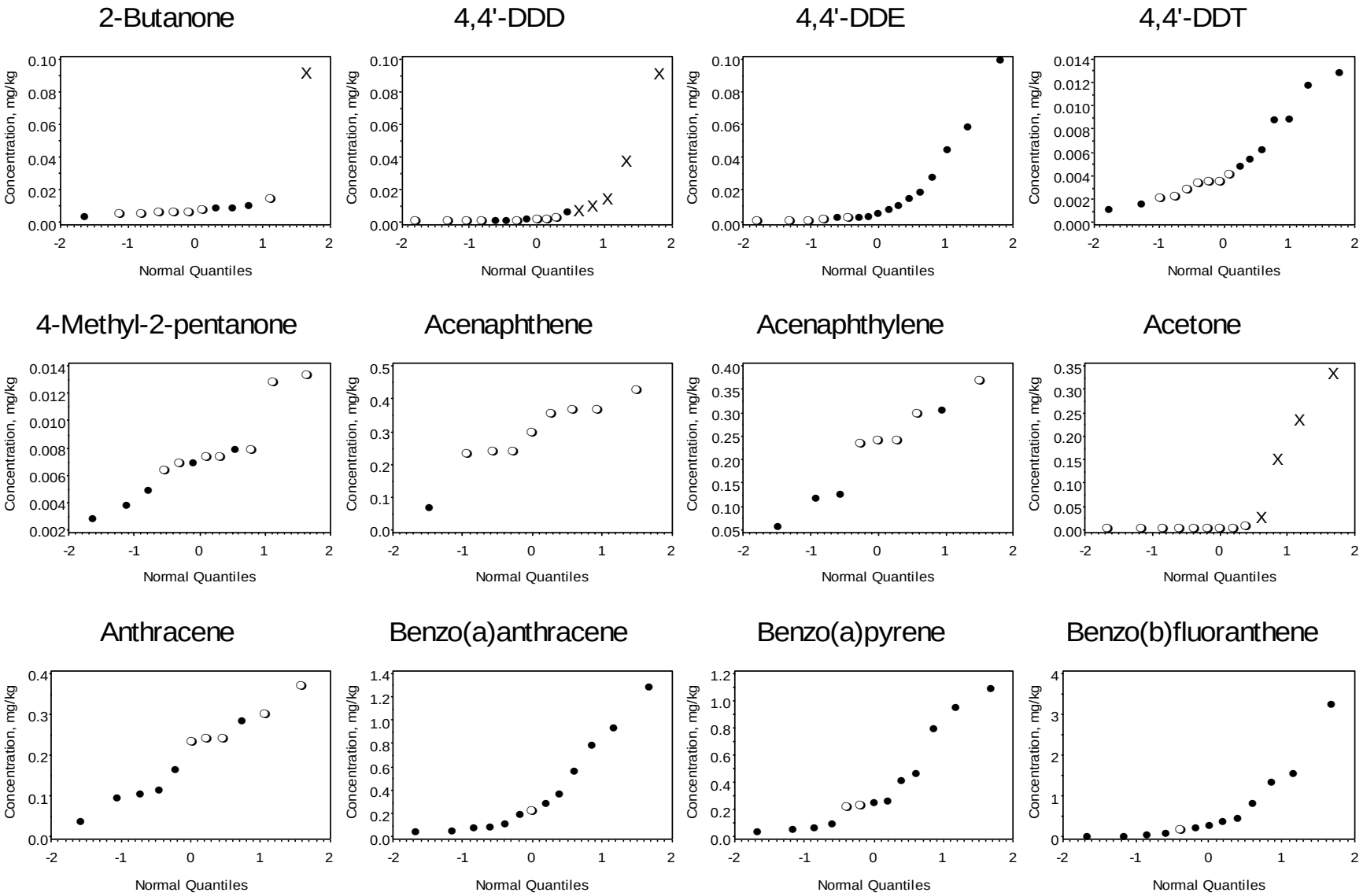
Open Symbol Represents Nondetected Value
X represents calculated outlier (Xnd for non-detect proxy)

Figure 3: Probability Plots for Detected Inorganics



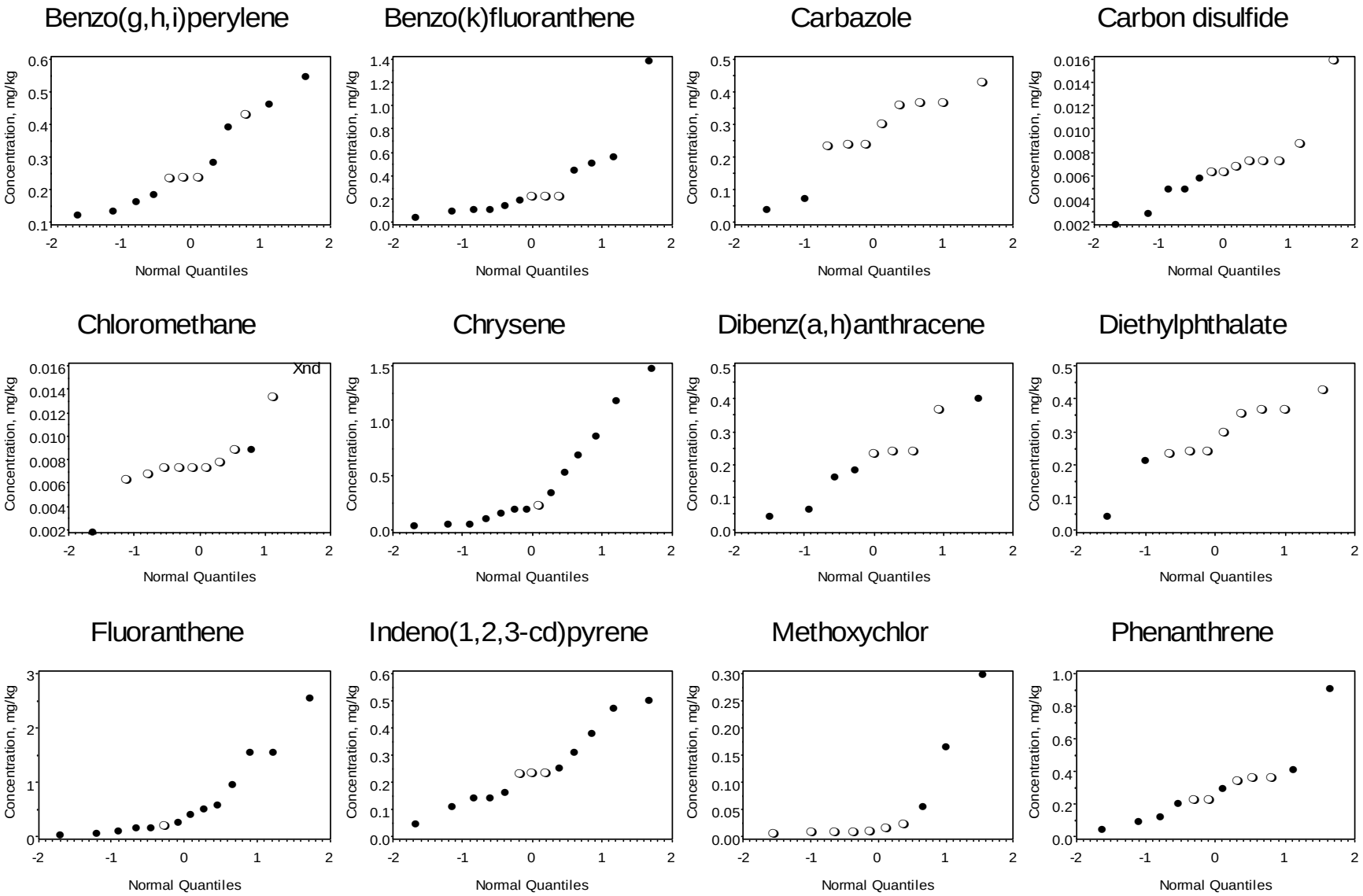
Open Symbol Represents Nondetected Value
X represents calculated outlier (Xnd for non-detect proxy)

Figure 4: Probability Plots for Detected Organics



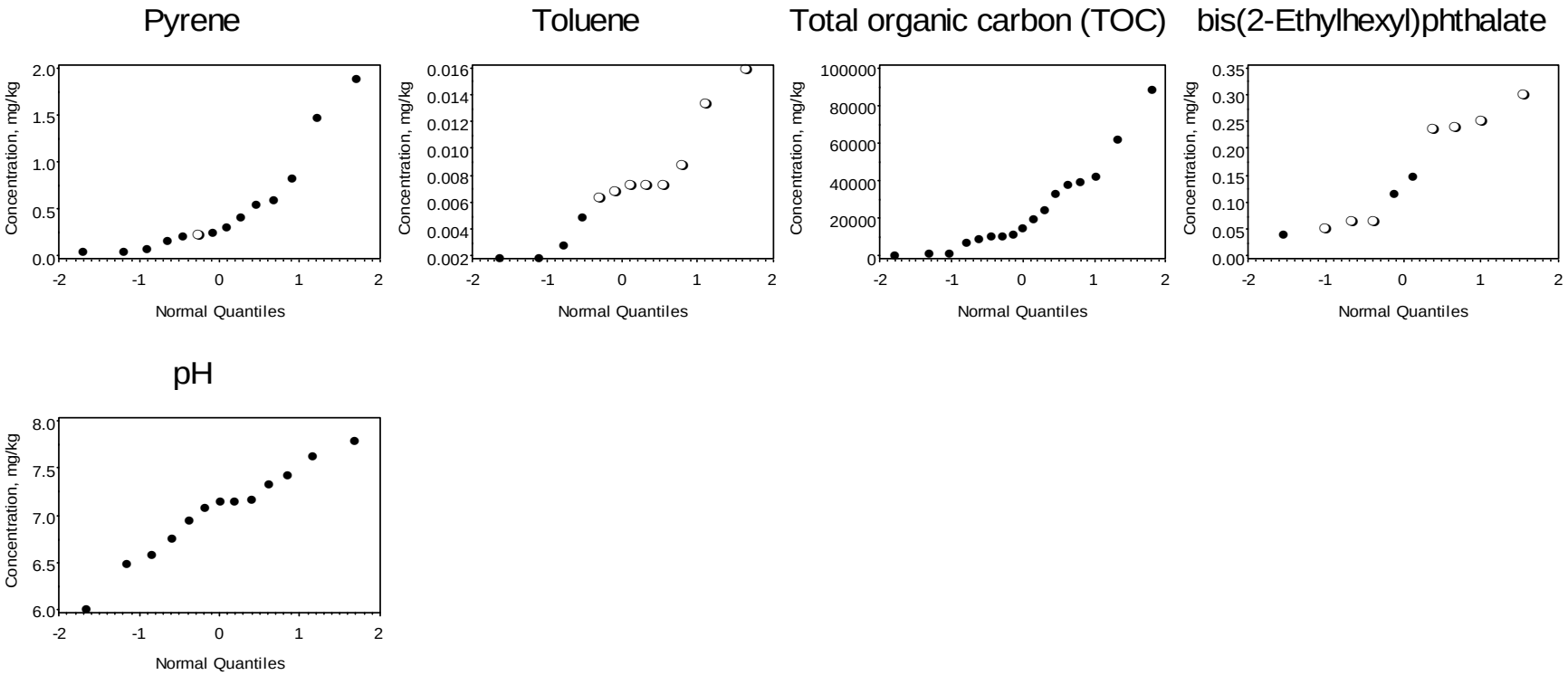
Open Symbol Represents Nondetected Value
X represents calculated outlier (Xnd for non-detect proxy)

Figure 4: Probability Plots for Detected Organics



Open Symbol Represents Nondetected Value
X represents calculated outlier (Xnd for non-detect proxy)

Figure 4: Probability Plots for Detected Organics



Open Symbol Represents Nondetected Value
X represents calculated outlier (Xnd for non-detect proxy)

Appendix C
Grain Size Data

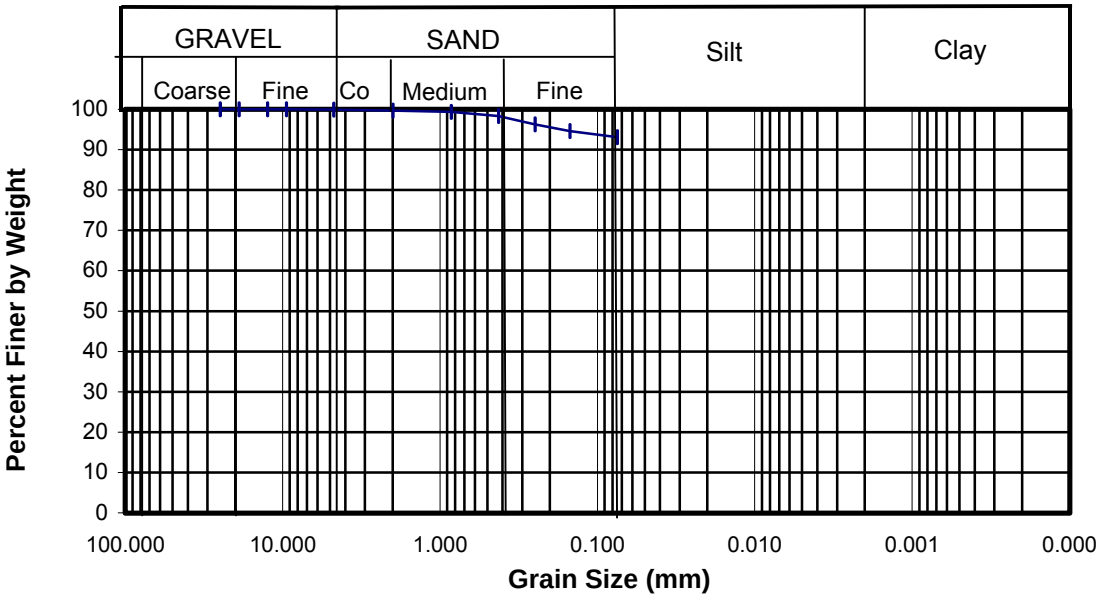
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJREF-SD01-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, Trace Fine Sand, Shell Fragments and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	99.9
10	99.7
20	99.4
40	98.4
60	96.3
100	94.6
200	93.1



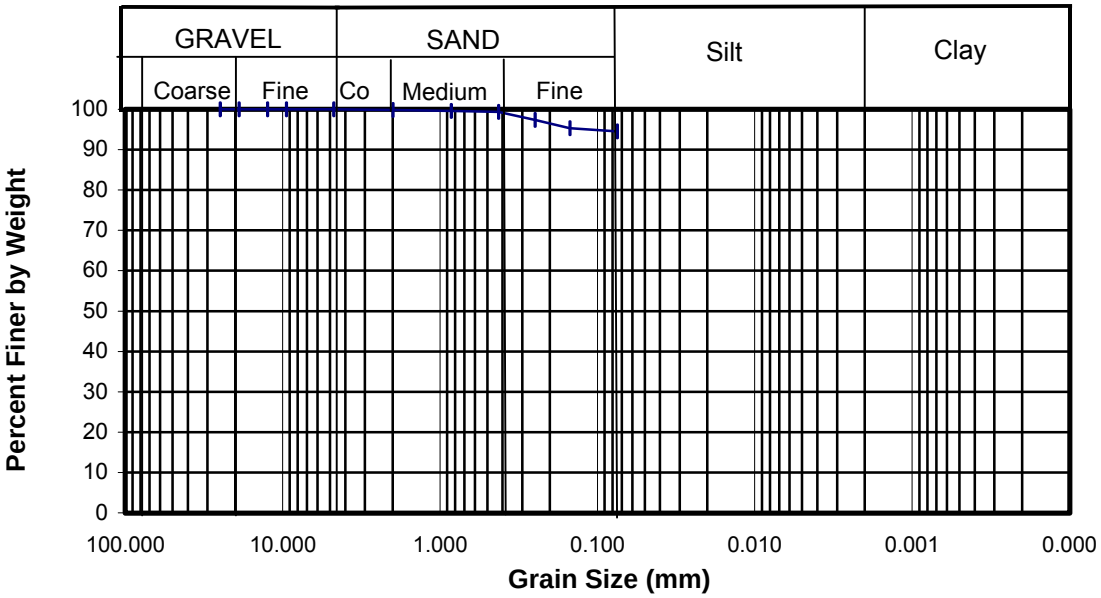
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJREF-SD02-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, Trace Fine Sand and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.9
20	99.6
40	99.3
60	97.4
100	95.3
200	94.5



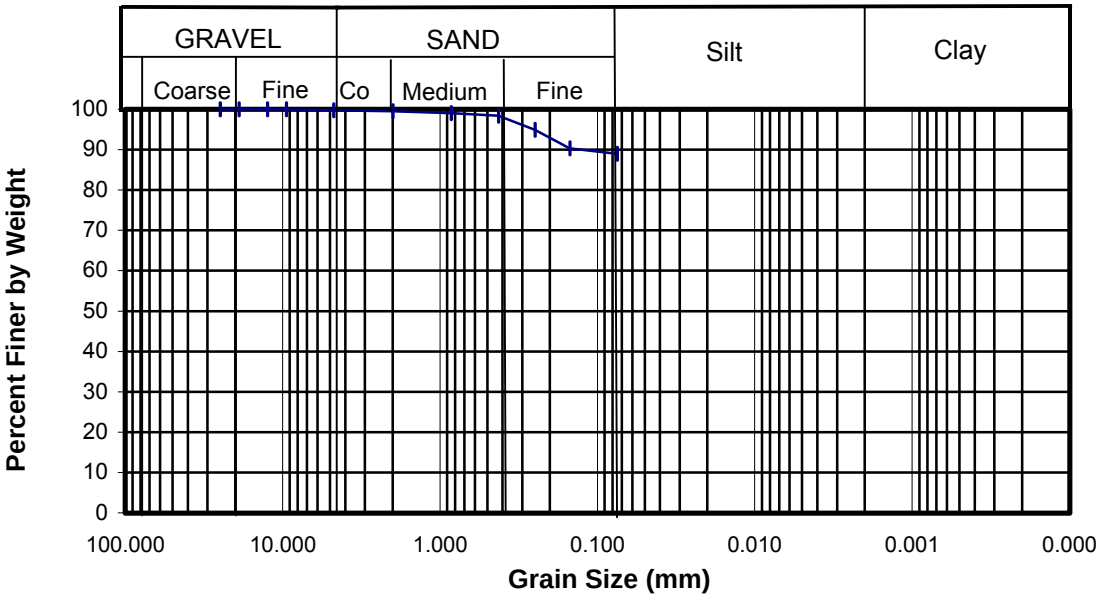
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJREF-SD03-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, Trace Fine Sand and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	99.8
10	99.5
20	99.0
40	98.4
60	94.9
100	90.4
200	89.0



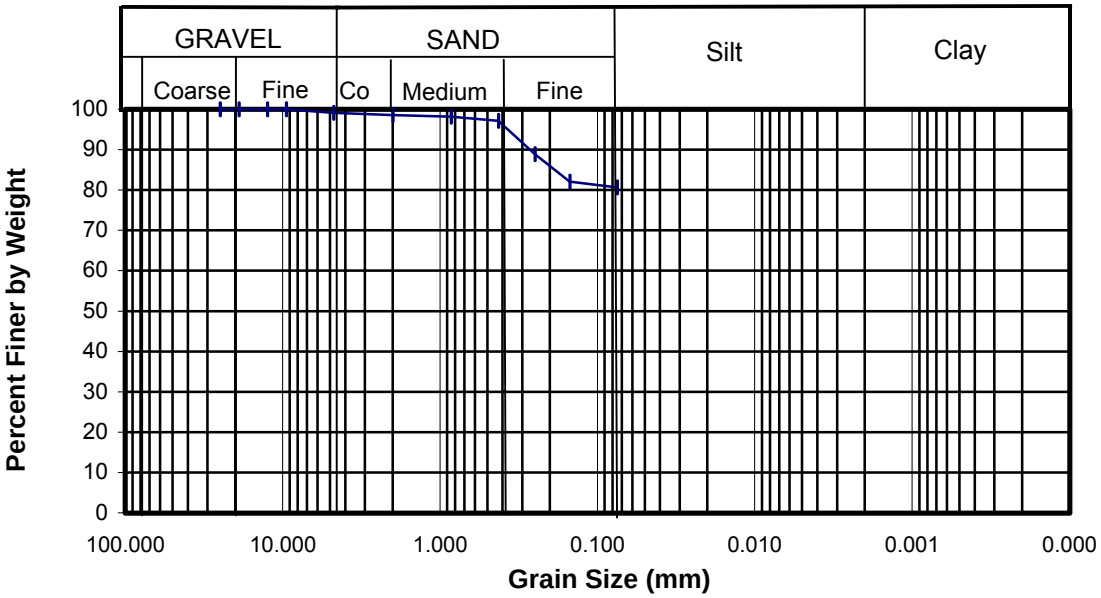
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJREF-SD04-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, with Fine Sand, Shell Fragments and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	99.1
10	98.6
20	98.1
40	97.1
60	88.9
100	82.1
200	80.7



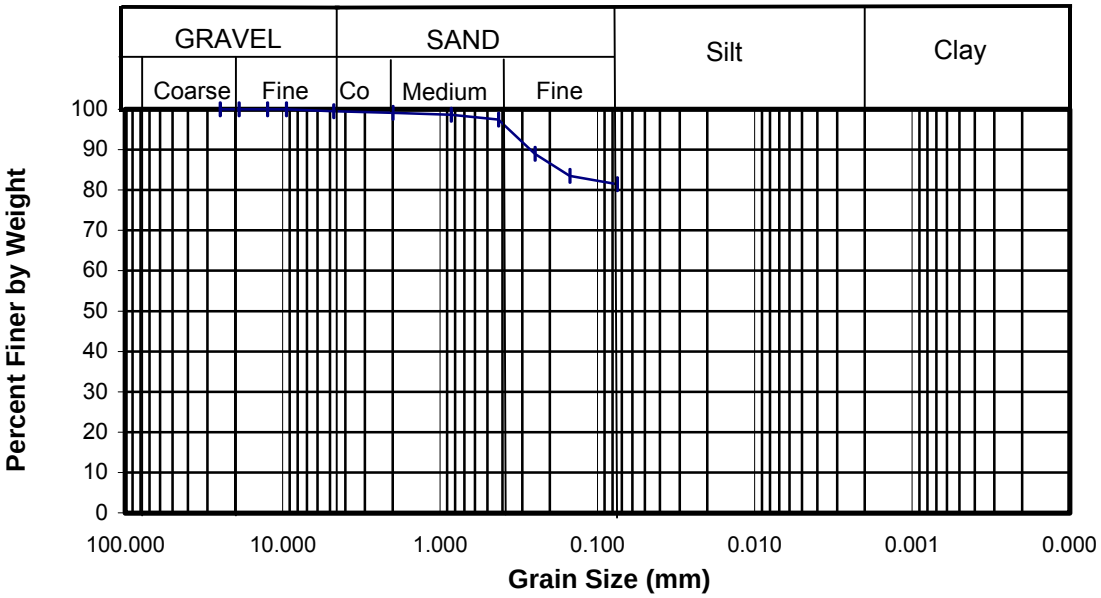
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJREF-SD05-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, with Fine Sand, Shell Fragments and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	99.6
10	99.1
20	98.7
40	97.5
60	88.9
100	83.5
200	81.5



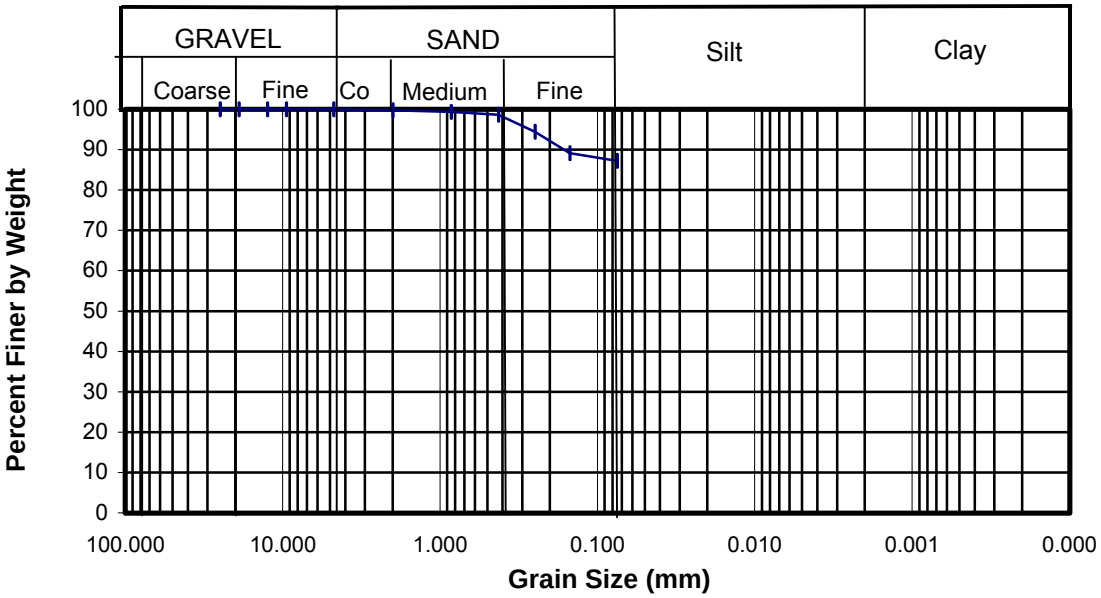
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJSO2-SD15-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, with Fine Sand and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.8
20	99.4
40	98.7
60	94.5
100	89.2
200	87.2



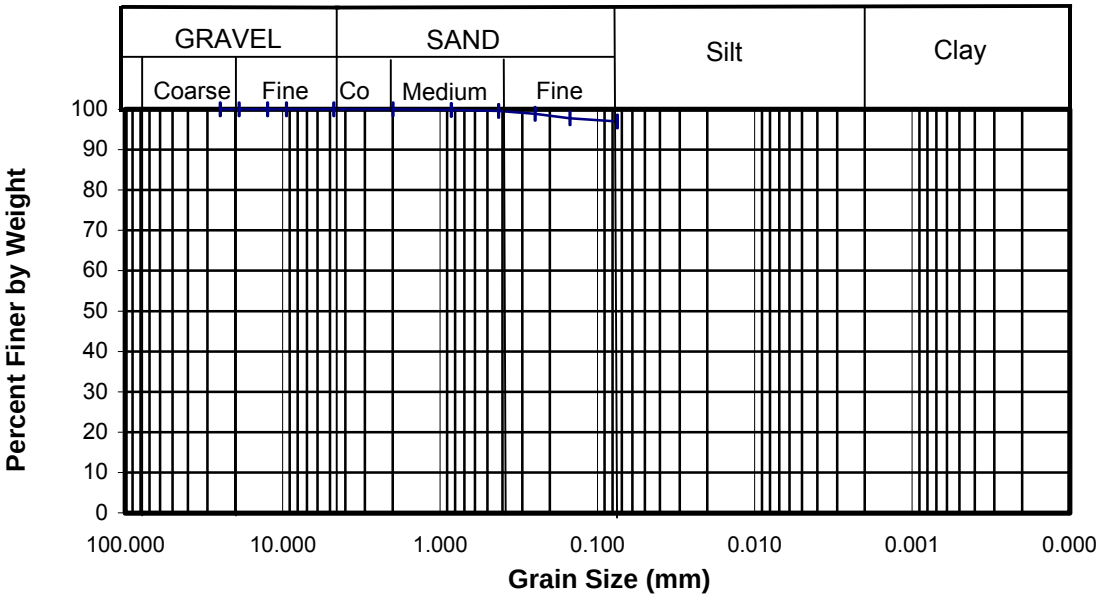
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJSO2-SD16-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, Trace Fine Sand and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	100.0
20	99.8
40	99.6
60	98.9
100	97.8
200	97.0



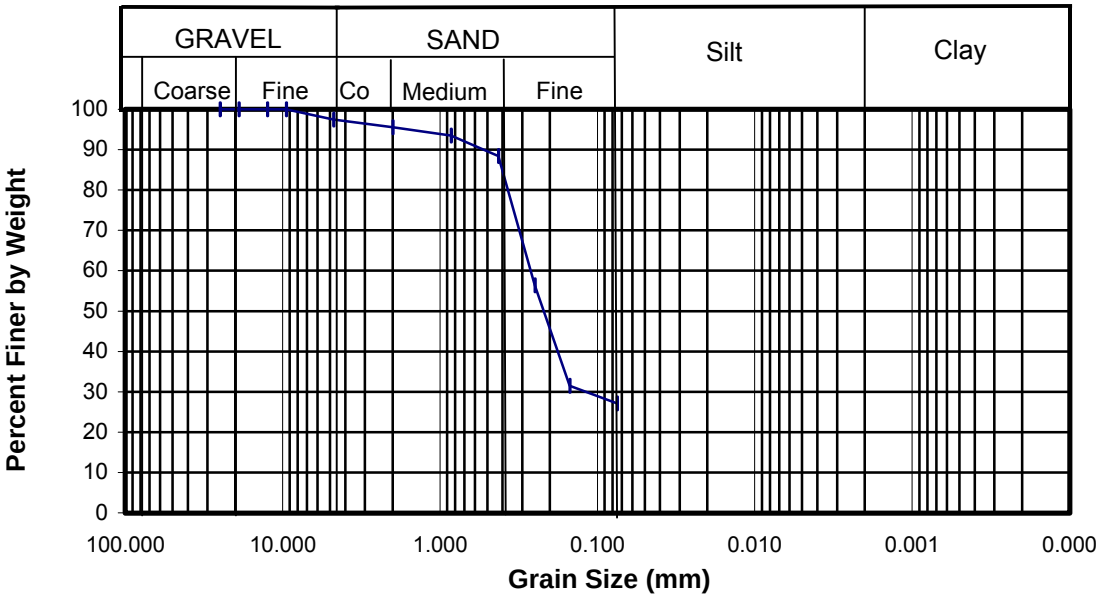
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJSO2-SD17-00-04A
Sample Type: Sediment
Sample Description: Silty SAND (SM), Dark Brown and Gray, Fine to Coarse, Trace Clay, Trace Fine Gravel, Shell Fragments and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	97.5
10	95.6
20	93.5
40	88.4
60	56.4
100	31.5
200	27.1



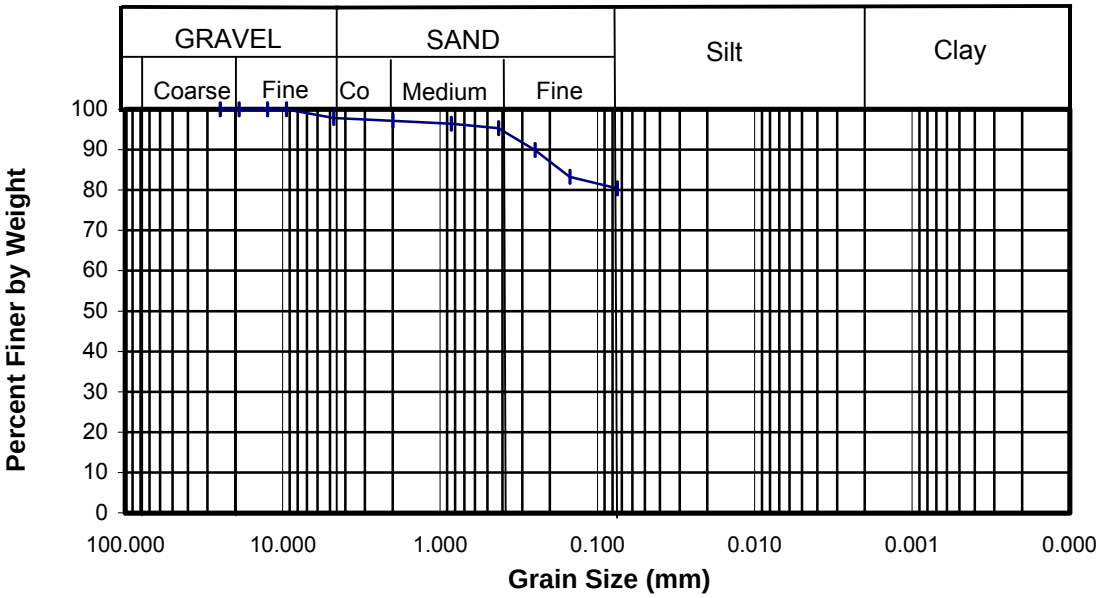
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJSO2-SD18-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, Trace Fine to Coarse Sand, Trace Fine Gravel, Shell Fragments and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	97.8
10	97.1
20	96.4
40	95.3
60	89.9
100	83.3
200	80.4



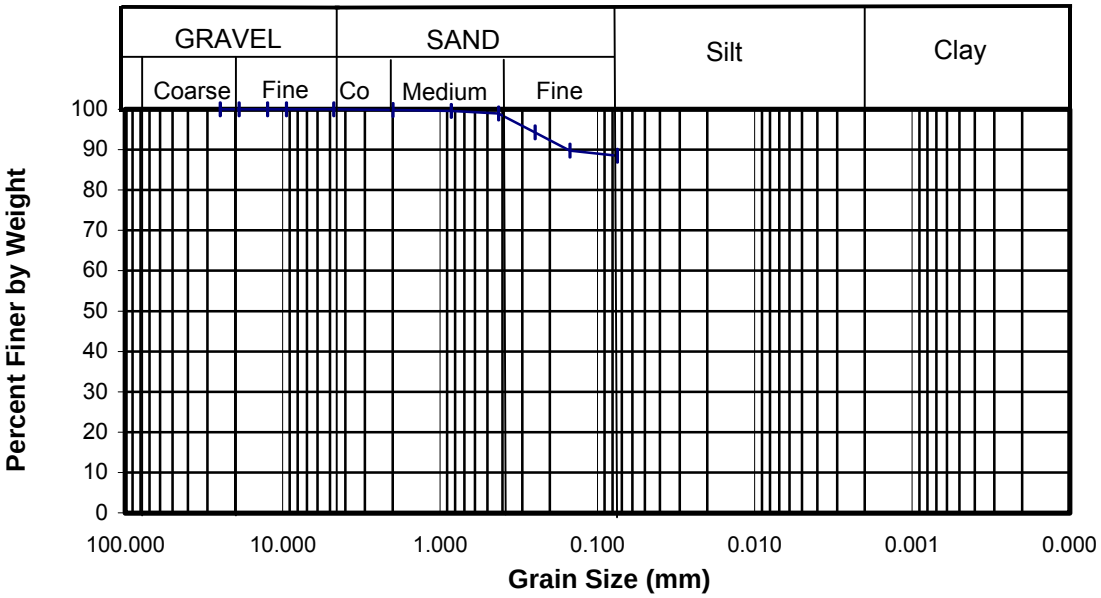
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJSO2-SD19-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, with Fine Sand, Shell Fragments and Organics
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.9
20	99.6
40	99.0
60	94.3
100	89.8
200	88.5



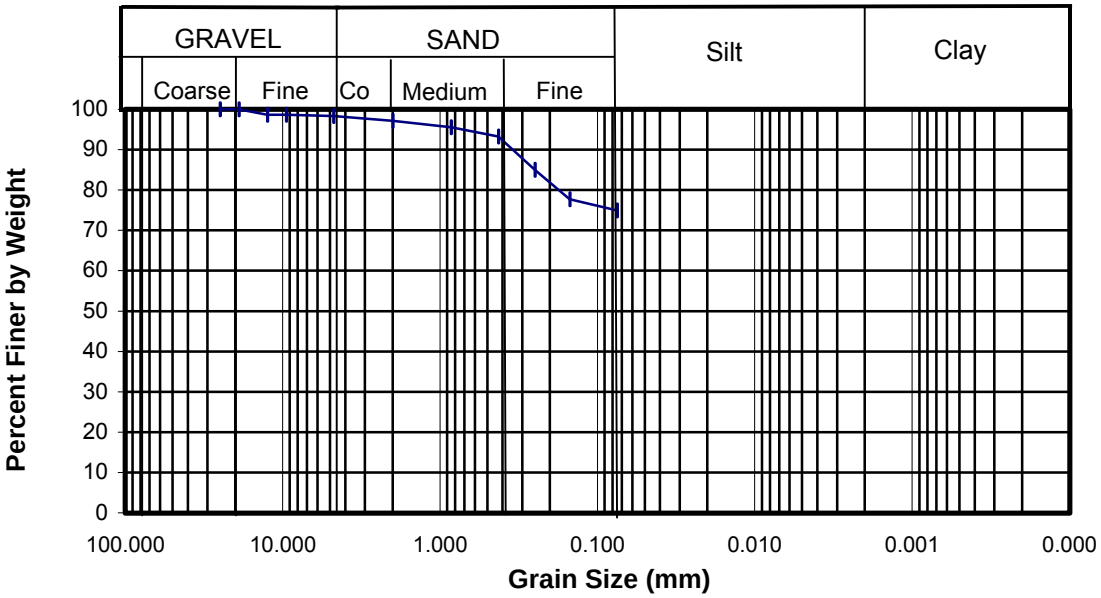
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing**
Project Number: CTO-29
Number: 3167-110
Sample Number: SJSO2-SD20-00-04A
Sample Type: Sediment
Sample Description: Silty CLAY (CH), Dark Brown and Gray, with Fine to Medium Sand, Trace Shell Fragments, Wood and Organic Fragments
Test Method: ASTM D 422

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	98.6
4	98.4
10	97.1
20	95.5
40	93.2
60	85.0
100	77.7
200	75.0



Appendix G
Data Validation Reports

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1906
Fraction: Inorganic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

- X • Data Completeness
- X • Chain of Custody Documentation
- X • Holding Times
- X • Initial and Continuing Calibrations
- X • ICP Interference Check Sample Results
- X • Laboratory and Field Blank Analysis Results
- X • Matrix Spike Recoveries and Reproducibility
- X • Laboratory Duplicate Analysis Results
- • ICP Serial Dilution Results
- • Field Duplicate Analysis Results
- X • Laboratory Control Sample Results
- • GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
- X • Qualitative Identification
- X • Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2009
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Potassium	SJS05-SS44-00-03D
Sodium	SJS05-SS44-00-03D, SJS05-SS45-00-03D, SJS05-SS46-00-03D, SJS05-SS47-00-03D, SJS05-SS48-00-03D, SJS05-SS48-00-03DP, SJS05-SS50-00-03D, SJS05-SS50-00-03DP, SJS05-SS52-00-03D, SJS05-SS53-00-03D, SJS05-SS62-00-03D, SJS05-SS63-00-03D, SJS05-SS64-00-03D, SJS05-SS65-00-03D

7.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

The nondetected results for antimony for the samples have been rejected and should be considered suspect. The associated matrix spike/matrix spike recoveries were less than 30 percent for this analyte. The poor recoveries indicate the presence of severe interferences for samples of similar matrix. The nondetected results have bee marked "R" to indicate that they are suspect.

Positive results for antimony, for the samples are biased low quantitative estimates and may be higher than reported. Positive and nondetected selenium results are also biased low. The associated matrix spike recoveries were below the acceptance limit for these analytes. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive antimony and selenium results have been marked "L" to indicate that they are biased low. Detection limits for selenium are marked "UL".

8.0 *LABORATORY DUPLICATE RESULTS*

The positive calcium results reported for the samples are quantitative estimates. The laboratory duplicate precision criterion was exceeded for this analyte. This lack of precision may be due to sample heterogeneity. The positive calcium results have been marked with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

9.0 *ICP SERIAL DILUTION RESULTS*

The positive copper results for the samples should be considered quantitative estimates. The ICP serial dilution criterion was exceeded for this element. The lack of precision may be due to interferences in samples of similar matrix. The positive copper results for the samples have been marked with "J" qualifiers to indicate that they are quantitative estimates.

10.0 *FIELD DUPLICATE RESULTS*

Duplicate sample pairs SJS05-SS48-00-03D and SJS05-SS48-00-03D-P, and SJS05-SS50-00-03D and SJS05-SS50-00-03D were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or ± two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 *LABORATORY CONTROL SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

12.0 *GFAA POST-DIGESTION SPIKE/DUPLICATE BURN*

This parameter is not applicable to the analyses performed.

13.0 *QUALITATIVE IDENTIFICATION*

All criteria were met. No qualifiers were applied.

14.0 *QUANTITATION/REPORTING LIMITS*

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Table 3 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS05-SS50-00-03D and SJS05-SS50-00-03D-P

Analyte	SJS05-SS50-00-03D (mg/Kg)		SJS05-SS50-00-03D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	16700		19400		15.0	
Arsenic	10.3		11		6.6	
Barium	118		121		2.5	
Beryllium	0.48	J	0.43	J	11.0	
Calcium	2280	J	2350	J	3.0	
Chromium	30.7		35.3		13.9	
Cobalt	4	J	4.7	J	16.1	
Copper	148	J	76.8	J	63.3	
Cyanide	0.21	J	ND		NC	
Iron	29000		31300		7.6	
Lead	135		157		15.1	
Magnesium	3000		3600		18.2	
Manganese	107		121		12.3	
Mercury	0.37		0.52		33.7	
Nickel	10.9		13.7		22.8	
Potassium	2280		2620		13.9	
Silver	4.3		4.7		8.9	
Vanadium	48.6		53.9		10.3	
Zinc	104		114		9.2	

Table 2 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS05-SS48-00-03D and SJS05-SS48-00-03D-P

Analyte	SJS05-SS48-00-03D (mg/Kg)		SJS05-SS48-00-03D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	8630		9870		13.4	
Antimony	0.54	L	1.7	L	103.6	
Arsenic	8.3		10.4		22.5	
Barium	466		717		42.4	*
Beryllium	0.36	J	0.36	J	0.0	
Cadmium	3.1		4.1		27.8	
Calcium	9170	J	8530	J	7.2	
Chromium	27.3		26.4		3.4	
Cobalt	4	J	3.8	J	5.1	
Copper	88	J	92.4	J	4.9	
Cyanide	0.21	J	ND		NC	
Iron	13700		15000		9.1	
Lead	214		259		19.0	
Magnesium	1810		1790		1.1	
Manganese	236		255		7.7	
Mercury	0.09	J	0.074	J	19.5	
Nickel	8.4	J	8.7	J	3.5	
Potassium	1150		1160	J	0.9	
Silver	2.2	J	2.4		8.7	
Thallium	0.52	J	ND		NC	
Vanadium	19		19.7		3.6	
Zinc	345		469		30.5	

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: C0015
Fraction: Organic
Matrix: Sediment
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for sediment samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for semivolatile organic compounds, and pesticide/PCB constituents. The sample analyses were performed in accordance with the procedures outlined in the OLM03 USEPA Contract Laboratory Program (CLP) Statement of Work for Organic) Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawnic M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete. Analyses for polychlorinated dibenzodioxins/polychlorinated dibenzofurans were completed by Severn Trent Laboratories, Knoxville, Tennessee. Data validation for these analyses is discussed in a separate report.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

The chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INSTRUMENT PERFORMANCE*

All criteria were met. No qualifiers were applied.

5.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

- The positive results reported for the compounds presented below are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as methylene chloride, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

Compound	Samples With Qualified Results
Benzaldehyde	SJS02-SD16-00-04A-P
Bis-(2-Ethylhexyl)phthalate	SJS02-SD16-00-04A-P, SJS02-SD17-00-04A, SJS02-SD19-00-04A, SJS02-SD20-00-04A, SJSREF-SD01-00-04A, SJSREF-SD02-00-04A, SJSREF-SD03-00-04A, SJSREF-SD03-00-04A-P, SJSREF-SD04-00-04A, SJSREF-SD05-00-04A

7.0 *SURROGATE COMPOUNDS*

All criteria were met. No qualifiers were applied.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate sample SJS05-SS48-00-03D and SJS05-SS48-00-03D-P, and SJS05-SS50-00-03D and SJS05-SS50-00-03D were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of thirty percent for volatile detected compounds (and 40 percent for extractable compounds) to evaluate soil field duplicate samples.

10.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

11.0 INTERNAL STANDARD PERFORMANCE

All criteria were met. No qualifiers were applied.

12.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

13.0 QUANTITATION/REPORTING LIMITS

The positive results reported for the pesticide/PCB constituents for the following samples should be considered quantitative estimates. Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for the pesticide/ PCB constituents have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS02-SD02-00-04D	5.0	4,4'-DDE

As required by EPA protocol, all compounds that were qualitatively identified at concentrations below their respective Contract Required Quantitation Limits (CRQLs) have been reported with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1917
Fraction: Organic
Matrix: Groundwater
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for groundwater samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for volatile organic compounds, semivolatile organic compounds, pesticide/PCB constituents, and explosive compound RDX. The sample analyses were performed in accordance with the procedures outlined in the OLM03 and OLC02 USEPA Contract Laboratory Program (CLP) Statements of Work for Organic Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
X	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

The chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INSTRUMENT PERFORMANCE*

All criteria were met. No qualifiers were applied.

5.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

The following positive results are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as acetone and methylene chloride, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Results for uncommon contaminants, such as chloromethane, present in samples at concentrations less than five times the blank level are also invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

Compound	Samples With Qualified Results
Acetone	SJS02-MW08S-00-03D-P
Chloromethane	SJS02-MW06S-00-03D, SJS02-MW08S-00-03D, SJS02-MW08S-00-03D-P, SJS02-MW09S-00-03D
Methylene Chloride	SJS02-MW06S-00-03D, SJS02-MW08S-00-03D, SJS02-MW08S-00-03D-P, SJS02-MW09S-00-03D

7.0 *SURROGATE COMPOUNDS*

Nondetected results for volatile compounds trifluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, acetone, methyl acetate, methyl-tert-butyl ether, 1,1-dichloroethane, 2-butanone, bromochloromethane, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, and 1,2-dichloroethane for sample SJS02-MW07S-03D have been rejected, and should be considered suspect. The associated deuterated monitoring compound recoveries were less than 20 percent. The low recoveries indicate the possibility of severe analytical inefficiencies for this sample. The results for the affected compounds have been marked "R" to indicate that they are suspect.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate sample SJS05-MW02S-00-03D and SJS05-MW02S-00-03D-P, and SJS05-MW08S-00-03D and SJS05-MW08S-00-03D were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of twenty percent for volatile

detected compounds (and 25 percent for extractable compounds) to evaluate groundwater field duplicate samples.

10.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

11.0 INTERNAL STANDARD PERFORMANCE

All criteria were met. No qualifiers were applied.

12.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

13.0 *QUANTITATION/REPORTING LIMITS*

The positive results reported for the pesticide/PCB constituents for the following samples should be considered quantitative estimates. Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for the pesticide/ PCB constituents have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Sample	Qualified Results
SJS02-MW08S-00-03D-P	Heptachlor Epoxide

Sample SJS02-MW07S-03D was re-analyzed at a 5000-fold dilution for volatile organic compounds. The dilution analysis was performed because the responses for cis-1, 2-dichloroethene and trichloroethene exceeded the linear range of the GC/MS instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for volatile organic compounds have been reported from the initial analyses.

Sample SJS02-MW07S-03D was re-analyzed at an 8.0-fold dilution for semivolatile organic compounds. The dilution analysis was performed because the response for naphthalene exceeded the linear range of the GC/MS instrument. The results for the affected compound have been reported from the diluted analysis. All other results for semivolatile organic compounds have been reported from the initial analyses.

The following samples were re-analyzed at dilutions for pesticide/PCB constituents. The dilution analyses were performed because pesticide/PCB constituents exceeded the linear range of the GC instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for pesticide/PCB constituents have been reported from the initial analyses.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS02-MW08S-00-03D	5.0	Heptachlor Epoxide
SJS02-MW08S-00-03D-P	5.0	Heptachlor Epoxide

Results for 1, 1-dichloroethene, and trans-1, 2-dichloroethene for sample SJS02-MW07S-03D should be considered quantitative estimates. The responses for these compounds exceeded the GC/MS instrument linear range for the volatile analysis for this sample. The subsequent dilution resulted in responses for these compounds that were below detectable levels. The results have been marked with "J" qualifiers to indicate that they are estimates.

As required by EPA protocol, all compounds that were qualitatively identified at concentrations below their respective Contract Required Quantitation Limits (CRQLs) have been reported with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1907
Fraction: Organic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for semivolatile organic compounds and pesticide/PCB constituents. The sample analyses were performed in accordance with the procedures outlined in the OLM03 USEPA Contract Laboratory Program (CLP) Statement of Work for Organic) Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 DATA COMPLETENESS

The data deliverables were complete.

2.0 CHAIN OF CUSTODY DOCUMENTATION

The chain of custody documentation was complete.

3.0 HOLDING TIMES

All criteria were met. No qualifiers were applied.

4.0 INSTRUMENT PERFORMANCE

All criteria were met. No qualifiers were applied.

5.0 INITIAL AND CONTINUING CALIBRATIONS

All criteria were met. No qualifiers were applied.

6.0 LABORATORY AND FIELD BLANK ANALYSIS RESULTS

All criteria were met. No qualifiers were applied.

7.0 SURROGATE COMPOUNDS

All criteria were met. No qualifiers were applied.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate samples SJS05-SS42-00-03D and SJS05-SS42-00-03D-P were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Table 2. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of thirty percent for volatile detected compounds (and 40 percent for extractable compounds) to evaluate soil field duplicate samples.

10.0 *LABORATORY CONTROL SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

11.0 *INTERNAL STANDARD PERFORMANCE*

All criteria were met. No qualifiers were applied.

12.0 *QUALITATIVE IDENTIFICATION*

All criteria were met. No qualifiers were applied.

13.0 *QUANTITATION/REPORTING LIMITS*

The positive results reported for the pesticide/PCB constituents for the following samples should be considered quantitative estimates. Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for the pesticide compounds have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Sample	Qualified Results
SJS05-SS41-00-03D	4, 4'-DDE, 4, 4'-DDT
SJS05-SS42-00-03D-P	4, 4'-DDT
SJS05-SS54-00-03D	4, 4'-DDD
SJS05-SS58-00-03D	4, 4'-DDE
SJS05-SS60-00-03D	4, 4'-DDT
SJS05-SS61-00-03D	4, 4'-DDD, 4, 4'-DDT

The following samples were re-analyzed for pesticide/PCB constituents. The dilution analyses were performed because pesticide/PCB constituents exceeded the linear range of the GC instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for pesticide/PCB constituents have been reported from the initial analyses.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS05-SS54-00-03D	5.0	4,4'-DDE
SJS05-SS60-00-03D	100	4,4'-DDT
SJS05-SS57-00-03D	5.0	4,4'-DDE, 4,4'-DDT
SJS05-SS59-00-03D	100	4,4'-DDE
SJS05-SS60-00-03D	5.0	4,4'-DDE
SJS05-SS61-00-03D	10.0	4,4'-DDE

As required by AFCEE protocol, all analytes that were qualitatively identified at concentrations below their respective reporting limit but above the method detection limit have been marked with "F" qualifiers to indicate that they are quantitative estimates.

METHODOLOGY REFERENCES

Analysis	Reference
Volatile Organic Compounds	Method 8260B, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997
Semivolatile Organic Compounds	Method 8270C, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997
Pesticide Compounds	Method 8081A, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997
Polychlorinated Biphenyl Constituents	Method 8082, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997

Table 2 Field Duplicate Sample Results for Organic Analyses
Duplicate Samples SJS05-SS42-00-03D and SJS05-SS42-00-03D-P

	SJS05-SS42-00-03D (µg/Kg)		SJS05-SS42-00-03D-P (µg/Kg)		RPD	Comments
Acenaphtylene	52	J	ND		NC	
Fluoranthene	75	J	61	J	20.6	
Pyrene	85	J	57	J	39.4	
Benzo (a) anthracene	96	J	56	J	52.6	
Chrysene	130	J	93	J	33.2	
Benzo (b) fluoranthene	200	J	120	J	50.0	
Benzo (k) fluoranthene	58	J	52	J	10.9	
Benzo (a) pyrene	120	J	ND			
Indeno (1, 2, 3-cd) pyrene	96	J	53	J	57.7	
4, 4'-DDE	110		18		143.8	
4, 4'-DDT	140		9.3	J	175.1	

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1906
Fraction: Organic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for semivolatile organic compounds, and pesticide/PCB constituents. The sample analyses were performed in accordance with the procedures outlined in the OLM03 USEPA Contract Laboratory Program (CLP) Statement of Work for Organic) Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete. Analyses for polychlorinated dibenzodioxins/polychlorinated dibenzofurans were completed by Severn Trent Laboratories, Knoxville, Tennessee. Data validation for these analyses is discussed in a separate report.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

The chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INSTRUMENT PERFORMANCE*

All criteria were met. No qualifiers were applied.

5.0 *INITIAL AND CONTINUING CALIBRATIONS*

The nondetected results for 4-chloroaniline for the samples should be considered biased low, and may be higher than reported. The recovery of the initial calibration verification standard was below the acceptance limits for this compound. The low recovery indicates nonlinearity of the calibration for this compound. The quantitation limits have been marked "UL" to indicate that they are biased low.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

All criteria were met. No qualifiers were applied.

7.0 *SURROGATE COMPOUNDS*

All criteria were met. No qualifiers were applied.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate sample SJS05-SS48-00-03D and SJS05-SS48-00-03D-P, and SJS05-SS50-00-03D and SJS05-SS50-00-03D were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of thirty percent for volatile detected compounds (and 40 percent for extractable compounds) to evaluate soil field duplicate samples.

10.0 *LABORATORY CONTROL SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

11.0 *INTERNAL STANDARD PERFORMANCE*

All criteria were met. No qualifiers were applied.

12.0 *QUALITATIVE IDENTIFICATION*

All criteria were met. No qualifiers were applied.

13.0 *QUANTITATION/REPORTING LIMITS*

The positive results reported for the pesticide/PCB constituents for the following samples should be considered quantitative estimates. Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for the pesticide/ PCB constituents have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Sample	Qualified Results
SJS05-SS44-00-03D	4, 4'-DDD
SJS05-SS47-00-03D	4, 4'-DDT
SJS05-SS49-00-03D	Endosulfan Sulfate, Endrin Ketone
SJS05-SS50-00-03D-P	4, 4'-DDT
SJS05-SS53-00-03D	Endosulfan Sulfate, 4, 4'-DDT
SJS05-SS66-00-03D	Endosulfan Sulfate

The following samples were re-analyzed for pesticide/PCB constituents. The dilution analyses were performed because pesticide/PCB constituents exceeded the linear range of the GC instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for pesticide/PCB constituents have been reported from the initial analyses.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS05-SS44-00-03D	10.0	4,4'-DDE, 4,4'-DDT
SJS05-SS45-00-03D	5.0	4,4'-DDE
SJS05-SS47-00-03D	20.0	4,4'-DDE
SJS05-SS49-00-03D	5.0	4,4'-DDE, 4,4'-DDT
SJS05-SS50-00-03D	10.0	4,4'-DDE, 4,4'-DDT
SJS05-SS50-00-03D-P	10.0	4,4'-DDE, 4,4'-DDT
SJS05-SS51-00-03D	5.0	4,4'-DDE
SJS05-SS62-00-03D	10.0	4,4'-DDE, 4,4'-DDT
SJS05-SS63-00-03D	5.0	4,4'-DDE, 4,4'-DDT
SJS05-SS65-00-03D	5.0	4,4'-DDE
SJS05-SS66-00-03D	5.0	4,4'-DDE
SJS05-SS67-00-03D	10.0	4,4'-DDE, 4,4'-DDT

As required by EPA protocol, all compounds that were qualitatively identified at concentrations below their respective Contract Required Quantitation Limits (CRQLs) have been reported with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

Table 2 Field Duplicate Sample Results for Organic Analyses
Duplicate Samples SJS05-SS48-00-03D and SJS05-SS48-00-03D-P

	SJS05-SS48-00-03D (µg/Kg)		SJS05-SS48-00-03D-P (µg/Kg)		RPD	Comments
Fluoranthene	49	J	ND		NC	
Pyrene	49	J	ND		NC	
Benzo (a) anthracene	42	J	ND		NC	
Chrysene	39	J	ND		NC	
Benzo (b) fluoranthene	55	J	53	J	3.7	
4, 4'-DDE	30		30		0.0	
4, 4'-DDT	6.7		6.6		1.5	

Table 3 Field Duplicate Sample Results for Organic Analyses
Duplicate Samples SJS05-SS50-00-03D and SJS05-SS50-00-03D-P

	SJS05-SS50-00-03D (µg/Kg)		SJS05-SS50-00-03D-P (µg/Kg)		RPD	Comments
Acenaphthylene	140	J	150	J	6.9	
Phenanthrene	250	J	220	J	12.8	
Anthracene	120		120	J	0.0	
Fluoranthene	600		610		1.7	
Pyrene	440	J	410	J	7.1	
Benzo (a) anthracene	410	J	400	J	2.5	
Chrysene	610		610		0.0	
Benzo (b) fluoranthene	810		840		3.6	
Benzo (k) fluoranthene	330	J	280	J	16.4	
Benzo (a) pyrene	410	J	410	J	0.0	
Indeno (1, 2, 3-cd)pyrene	380	J	360	J	5.4	
Dibenz (a, h) anthracene	140	J	140	J	0.0	
Benzo (g, h, i)perylene	380	J	370	J	2.7	
4, 4'-DDE	360		370		2.7	
4, 4'-DDD	21		23		9.1	
4, 4'-DDT	110		160		37.0	
Endrin Ketone	9.2		11		17.8	

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1898
Fraction: Organic
Matrix: Stormwater
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for stormwater samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for volatile organic compounds. The sample analyses were performed in accordance with the procedures outlined in the OLC02 USEPA Contract Laboratory Program (CLP) Statements of Work for Organic Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
X	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

The chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INSTRUMENT PERFORMANCE*

All criteria were met. No qualifiers were applied.

5.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

The methylene chloride results for samples SJS02-ST01-03D, SJS02-ST01-03D-P, SJS02-ST02-03D, SJS02-ST03-03D, SJS02-ST04-03D, SJS02-ST05-03D, SJS02-ST06-03D, and SJS02-SW10-03D are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as methylene chloride, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

7.0 *SURROGATE COMPOUNDS*

Positive results for cis-1, 2-dichloroethene for sample SJS02-ST05-03D should be considered a biased low quantitative estimate, and may be higher than reported. Nondetected results for volatile compounds trans-1, 2-dichloroethene has been rejected, and should be considered suspect. The associated reiterated monitoring compound recovery was less than 20 percent. The low recovery indicates the possibility of severe analytical inefficiencies for this sample. The trans-1, 2-dichloroethene quantitation limit has been have been marked "R" to indicate that it is suspect.

Nondetected results for volatile compounds trans-1, 2-dichloroethene for sample SJS02-ST01-03D-P should be considered estimates, and may be higher than reported. A low recovery was obtained for the associated deuterated monitoring. The low recoveries indicate the possibility of analytical inefficiencies for this sample. The quantitation limit for this compound has been marked "UJ" to indicate that it is an estimate.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate samples SJS02-ST01-03D and SJS02-ST01-03D-P were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Table 2. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of twenty percent for volatile detected compounds to evaluate stormwater field duplicate samples.

10.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

11.0 INTERNAL STANDARD PERFORMANCE

All criteria were met. No qualifiers were applied.

12.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

13.0 QUANTITATION/REPORTING LIMITS

The following samples were re-analyzed at dilutions for volatile organic compound. The dilution analyses were performed because volatile organic compound exceeded the linear range of the GC instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for volatile organic compound have been reported from the initial analyses.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS02-ST01-03D	10.0	Trichloroethene
SJS02-ST01-03D-P	10.0	Trichloroethene
SJS02-ST03-03D	10.0	Trichloroethene
SJS02-ST04-03D	5.0	Trichloroethene
SJS02-ST07-03D	2.0	Trichloroethene
SJS02-SW10-03D	10.0	Trichloroethene
SJS02-SW11-03D	2.0	Trichloroethene

As required by EPA protocol, all compounds that were qualitatively identified at concentrations below their respective Contract Required Quantitation Limits (CRQLs) have been reported with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: C0015
Fraction: Inorganic
Matrix: Sediment
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for sediment samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1), and total organic carbon by EPA method 415.1 (modified).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

- X • Data Completeness
- X • Chain of Custody Documentation
- X • Holding Times
- X • Initial and Continuing Calibrations
- X • ICP Interference Check Sample Results
- X • Laboratory and Field Blank Analysis Results
- X • Matrix Spike Recoveries and Reproducibility
- X • Laboratory Duplicate Analysis Results
- • ICP Serial Dilution Results
- • Field Duplicate Analysis Results
- X • Laboratory Control Sample Results
- • GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
- X • Qualitative Identification
- X • Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

All criteria were met. No qualifiers were applied.

7.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

Positive results and detection limits for antimony for the samples are biased low quantitative estimates and may be higher than reported. The associated matrix spike recovery was below the acceptance limit for this analyte. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive antimony results have been marked

"L" to indicate that they are biased low. Detection limits are marked "UL".

Positive results for copper and zinc for all samples should be considered biased high quantitative estimates and may be lower than reported. The associated matrix spike recovery was above the acceptance limit for this analyte. The high recovery indicates the presence of interferences for copper and zinc for samples of similar matrix. The positive results have been marked "K" to indicate that they are biased high quantitative estimates.

8.0 LABORATORY DUPLICATE RESULTS

The positive calcium results reported for the samples are quantitative estimates. The laboratory duplicate precision criterion was exceeded for this analyte. This lack of precision may be due to sample heterogeneity. The positive calcium results have been marked with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

9.0 ICP SERIAL DILUTION RESULTS

All criteria were met. No qualifiers were applied.

10.0 FIELD DUPLICATE RESULTS

Duplicate sample pairs SJS02-SD16-00-04D and SJS02-SD16-00-04D-P, and SJSREF-SD03-00-04D and SJSREF-SD03-00-04D were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or ± two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

12.0 GFAA POST-DIGESTION SPIKE/DUPLICATE BURN

This parameter is not applicable to the analyses performed.

13.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

14.0 QUANTITATION/REPORTING LIMITS

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Table 2 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS02-SD16-00-04D and SJS02-SD16-00-04D-P

Analyte	SJS02-SD16-00-04D (mg/Kg)		SJS02-SD16-00-04D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	19600		16200		19.0	
Arsenic	13.7		14.2		3.6	
Barium	43.8	J	38.2	J	13.7	
Beryllium	0.83	J	0.73	J	12.8	
Calcium	222		2010		160.2	*
Chromium	36.7		32.8		11.2	
Cobalt	7.9	J	6.7	J	16.4	
Copper	35	K	47.8	K	30.9	
Iron	33500		29200		13.7	
Lead	58.1		77		28.0	
Magnesium	6640		5490		19.0	
Manganese	223		181		20.8	
Mercury	0.46		0.39		16.5	
Nickel	16.7		14	J	17.6	
Potassium	3580		2850		22.7	
Silver	1.6	J	1.5	J	6.5	
Sodium	7610		7000		8.4	
Vanadium	37.3		30.9		18.8	
Zinc	144	K	173	K	18.3	

Table 3 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJSREF-SD03-00-04D and SJSREF-SD03-00-04D-P

Analyte	SJSREF-SD03-00-04D (mg/Kg)		SJSREF-SD03-00-04D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	17300		19200		10.4	
Arsenic	12.8		13.1		2.3	
Barium	39.3	J	42	J	6.6	
Beryllium	0.77	J	0.78	J	1.3	
Cadmium	0.11	J	ND		NC	
Calcium	2040		2120		3.8	
Chromium	32.5		32.6		0.3	
Cobalt	6.8	J	6.6	J	NC	
Copper	55.2	K	47.4	K	15.2	
Cyanide	ND		2.0		NC	
Iron	27700		28300		2.1	
Lead	77.6		80.6		3.8	
Magnesium	5340		5590		4.6	
Manganese	165		161		2.5	
Mercury	0.55		0.6		8.7	
Nickel	15.1		15.1	J	0.0	
Potassium	2840		2950		3.8	
Silver	1.5	J	1.5	J	0.0	
Sodium	7380		7770		5.1	
Vanadium	31.6		33.1		4.6	
Zinc	218	K	184	K	16.9	

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1917
Fraction: Inorganic
Matrix: Groundwater
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for groundwater samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

- X • Data Completeness
- X • Chain of Custody Documentation
- X • Holding Times
- X • Initial and Continuing Calibrations
- X • ICP Interference Check Sample Results
- X • Laboratory and Field Blank Analysis Results
- X • Matrix Spike Recoveries and Reproducibility
- X • Laboratory Duplicate Analysis Results
- X • ICP Serial Dilution Results
- X • Field Duplicate Analysis Results
- X • Laboratory Control Sample Results
- • GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
- X • Qualitative Identification
- X • Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawn M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

6.1 *TOTAL METALS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Iron	SJS02-MW03S-03D, SJS02-MW06S-03D, SJS02-MW07S-03D, SJS02-MW09S-03D
Nickel	SJS02-MW08S-03D
Zinc	SJS02-MW07S-03D,

6.2 *DISSOLVED METALS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Copper	SJS02-MW03S-03D, SJS02-MW06S-03D, SJS02-MW09S-03D
Lead	SJS02-MW06S-03D, SJS02-MW09S-03D
Zinc	SJS02-MW07S-03D

7.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

7.1 *TOTAL METAL*

Positive results and detection limits for selenium and cyanide for the samples are biased low quantitative estimates and may be higher than reported. Positive and nondetected selenium results are also biased low. The associated matrix spike recoveries were below the acceptance limit for these analytes. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive selenium and cyanide and

selenium results have been marked "L" to indicate that they are biased low. Detection limits for selenium are marked "UL".

8.0 *LABORATORY DUPLICATE RESULTS*

All criteria were met. No qualifiers were applied.

9.0 *ICP SERIAL DILUTION RESULTS*

9.1 *DISSOLVED METALS*

The positive iron, magnesium, and manganese results for the samples should be considered quantitative estimates. The ICP serial dilution criterion was exceeded for this element. The lack of precision may be due to interferences in samples of similar matrix. The positive iron, magnesium, and manganese results for the samples have been marked with "J" qualifiers to indicate that they are quantitative estimates.

10.0 *FIELD DUPLICATE RESULTS*

Duplicate sample pairs SJS05-MW02S-00-03D and SJS05-MW02S-00-03D-P, and SJS05-MW08S-00-03D and SJS05-MW08S-00-03D were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or ± two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 *LABORATORY CONTROL SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

12.0 *GFAA POST-DIGESTION SPIKE/DUPLICATE BURN*

This parameter is not applicable to the analyses performed.

13.0 *QUALITATIVE IDENTIFICATION*

All criteria were met. No qualifiers were applied.

14.0 *QUANTITATION/REPORTING LIMITS*

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1907
Fraction: Inorganic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

- X • Data Completeness
- X • Chain of Custody Documentation
- X • Holding Times
- X • Initial and Continuing Calibrations
- X • ICP Interference Check Sample Results
- X • Laboratory and Field Blank Analysis Results
- X • Matrix Spike Recoveries and Reproducibility
- X • Laboratory Duplicate Analysis Results
- • ICP Serial Dilution Results
- • Field Duplicate Analysis Results
- X • Laboratory Control Sample Results
- • GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
- X • Qualitative Identification
- X • Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawna M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Potassium	SJS05-SS40-00-03D, SJS05-SS55-00-03D, SJS05-SS58-00-03D, SJS05-SS59-00-03D, SJS05-SS60-00-03D
Sodium	SJS05-SS40-00-03D, SJS05-SS55-00-03D

7.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

Positive results and detection limits for antimony for the samples are biased low quantitative estimates and may be higher than reported. The associated matrix spike recovery was below the acceptance limit for this analyte. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive antimony results have been marked "L" to indicate that they are biased low. Detection limits are marked "UL".

Positive results for manganese for all samples should be considered biased high quantitative estimates and may be lower than reported. The associated matrix spike recovery was above the acceptance limit for this analyte. The high recovery indicates the presence of interferences for manganese for samples of similar matrix. The positive results have been marked "K" to indicate that they are biased high quantitative estimates.

8.0 *LABORATORY DUPLICATE RESULTS*

All criteria were met. No qualifiers were applied.

9.0 *ICP SERIAL DILUTION RESULTS*

The positive cobalt, copper, and zinc results for the samples should be considered quantitative estimates. The ICP serial dilution criterion was exceeded for this element. The lack of precision may be due to interferences in samples of similar matrix. The positive cobalt, copper,

and zinc results for the samples have been marked with "J" qualifiers to indicate that they are quantitative estimates.

10.0 FIELD DUPLICATE RESULTS

Duplicate sample pairs SJS05-SS42-00-03D and SJS05-SS42-00-03D-P were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Table 2. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or ± two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

12.0 GFAA POST-DIGESTION SPIKE/DUPLICATE BURN

This parameter is not applicable to the analyses performed.

13.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

14.0 QUANTITATION/REPORTING LIMITS

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Table 2 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS05-SS42-00-03D and SJS05-SS42-00-03D-P

Analyte	SJS05-SS42-00-03D (mg/Kg)		SJS05-SS42-00-03D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	7510		8410		11.3	
Arsenic	9.5		9.4		1.1	
Barium	39.3	J	46.6	J	17.0	
Beryllium	0.39	J	0.45	J	14.3	
Cadmium	0.057	U	0.05	U	13.1	
Calcium	1010	J	1100	J	8.5	
Chromium	11.8		13.8		15.6	
Cobalt	6.7	J	10.2	J	41.4	Already Qualified
Copper	13.6	J	14.8	J	8.5	
Iron	25800		20300		23.9	
Lead	27.6		36.9		28.8	
Magnesium	1910		2120		10.4	
Manganese	379	K	558	K	38.2	
Mercury	0.11	J	0.14	J	24.0	
Nickel	8.7	J	14.0		46.7	Already Qualified
Potassium	2160		1930		11.2	
Silver	3.5		2.7		46.7	Less than 5 X CRDL
Sodium	1710		1450		16.5	
Vanadium	18.6		26.4		34.7	
Zinc	78.2	J	93.7	J	18.0	

Project: St. Julien's Creek (CTO-24)
Laboratory: Severn Trent Laboratories, Knoxville, Tennessee
Sample Delivery Group: B1906
Fraction: Organic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for polychlorinated dibenzodioxin and polychlorinated dibenzofuran compounds (PCDD/PCDFs). The sample analyses were performed in accordance with the procedures outlined in method 8290, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94, and "Standard Operating Procedure for Dioxin/Furan Data Validation", DRAFT, March 1999. These documents specify procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

The following positive results are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as OCDD or OCDF, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Results for uncommon contaminants, such as the other PCDD/PCDFs, present at concentrations less than five times the level of an associated blank are also invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

Isomer	Qualified Results
2,3,7,8-TCDD	SJS05-SS44-00-03D, SJS05-SS50-00-03D, SJS05-SS50-00-03D-P SJS05-SS66-00-03D
1, 2, 3, 7, 8, 9-HxCDF	SJS05-SS50-00-03D, SJS05-SS50-00-03D-P, SJS05-SS53-00-03D, SJS05-SS66-00-03D
1, 2, 3, 4, 7, 8, 9-HpCDF	SJS05-SS50-00-03D, SJS05-SS53-00-03D, SJS05-SS66-00-03D

6.0 SURROGATE COMPOUNDS

All criteria were met. No qualifiers were applied.

7.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY

All criteria were met. No qualifiers were applied.

8.0 FIELD DUPLICATE RESULTS

There were no field duplicate samples included in this SDG.

9.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

10.0 INTERNAL STANDARD PERFORMANCE

The result for 2, 3, 7, 8-TCDD for sample SJS05-SS53-00-03D should be considered a biased low quantitative estimate, and may be higher than

reported. The recovery for the associated internal standard was below the acceptance criterion. The result has been marked with a "J" qualifier to indicate that it is a quantitative estimate.

11.0 *QUALITATIVE IDENTIFICATION*

The following results should be considered estimated maximum possible concentrations. The ion abundance ratios for these compounds were outside the method-specified criteria, but were within Region III expanded criterion of ± 25 percent. These substituted isomer are considered to be presents, and are qualified "J".

Sample Number	Parameter
SJS05-SS53-00-03D	2,3,7,8-TCDF, 1,2,3,4,7,8-HxCDD, 2,3,4,6,7,8-HxCDF

12.0 *QUANTITATION/REPORTING LIMITS*

The positive results reported for 2, 3, 7, 8-TCDF for samples SJS05-SS44-00-03D, SJS05-SS50-00-03D, SJS05-SS50-00-03D-P, and SJS05-SS66-00-03D should be considered quantitative estimates. Poor precision was observed for this isomer on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for 2, 3, 7, 8-TCDF have been marked with "J" qualifiers to indicate that they are quantitative estimates.

As required by USEPA protocol, all compounds, which were qualitatively identified at concentrations below their respective Quantitation Limits (QLs), have been marked with "J" qualifiers to indicate that they are quantitative estimates.

DATA VALIDATION SUMMARY REPORT

COMPANY:	CH2M HILL
SITE NAME:	CTO-150, St. Juliens Creek Annex, Site 2
CONTRACTED LAB:	GPL Laboratories, Inc.
PROJECT NUMBER:	157593.SA.SM
QA/QC LEVEL:	EPA Level IV
EPA SOW/METHOD:	EPA 1990 SOW
VALIDATION GUIDELINES:	*USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 1994, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 1994, Region III Modifications*
SAMPLE MATRICES:	Soil and Water
TYPES OF ANALYSES:	Semivolatile Organics (SVOA), Pesticides / Polychlorinated Ammonia, Sulfide, Total Organic Carbon (TOC)
SDG NUMBER:	410058

OVERVIEW

SAMPLES:

Client Lab Sample #	Sample #	Matrix	Pest/ SVOA	Total PCB	Metals
SJREF-SD01-00-04D	410058-001	Soil	X	X	X
SJREF-SD01-00-04P	410058-002	Soil	X	X	X
SJREF-SD04-00-04D	410058-003	Soil	X	X	X
SJREF-SD05-00-04D	410058-004	Soil	X	X	X
SJS02-EB100504	410058-005	Water	X	X	X
SJREF-SD05-00-04DMD	410058-005MD	Soil			X
SJREF-SD05-00-04DMS	410058-004MS	Soil	X	X	X
SJREF-SD05-00-04DMSD	410058-004MSD	Soil	X	X	

Client Lab Sample #	Sample #	SEM Matrix	Total Metals	Cyanide	Ammonia
SJREF-SD01-00-04D	410058-001	Soil	X	X	X
SJREF-SD01-00-04P	410058-002	Soil	X	X	X
SJREF-SD04-00-04D	410058-003	Soil	X	X	X

Client Lab Sample #	Sample #	SEM Matrix	Total Metals	Cyanide	Ammonia
SJREF-SD05-00-04D	410058-004	Soil	X	X	X
SJS02-EB100504	410058-005	Water		X	

Client Sample #	Lab Sample #	SEM Matrix	Total Metals	Cyanide	Ammonia
SJREF-SD05-00-04DMD	410058-005MD	Soil			X
SJREF-SD05-00-04DMS	410058-004MS	Soil	X	X	X
SJS02-EB100504MD	410058-005MD	Water		X	
SJS02-EB100504MS	410058-005MS	Water		X	

Client Sample #	Lab Sample #	Matrix	Sulfide	TOC
SJREF-SD01-00-04D	410058-001	Soil	X	X
SJREF-SD01-00-04P	410058-002	Soil	X	X
SJREF-SD04-00-04D	410058-003	Soil	X	X
SJREF-SD05-00-04D	410058-004	Soil	X	X
SJREF-SD05-00-04DMD	410058-005MD	Soil	X	X
SJREF-SD05-00-04DMS	410058-004MS	Soil		X

Suffix Codes: DL = DILUTION, EB = EQUIPMENT BLANK, MD = MATRIX DUPLICATE, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, P = FIELD DUPLICATE

DATA REVIEWERS: Amy L. Hogan, Kevin C. Harmon, Monalisa B. Beasley

RELEASE SIGNATURE:

DATA QUALIFICATION SUMMARY

GPL Laboratories, Inc. - 410058- Organics and Inorganics

SAMPLES: SJREF-SD01-00-04D, SJREF-SD01-00-04P, SJREF-SD04-00-04D, SJREF-SD05-00-04D, SJS02-EB100504

SEMIVOLATILE ORGANICS

SUMMARY

I.) General:

The analyses for semivolatile organics were performed by gas chromatography / mass spectroscopy (GC / MS) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for the standards analyzed on 11/05/04 on instrument H exceeded the 30% QC limit for atrazine at 37.0%. There were no positive results for atrazine in the SDG samples, so no action was required.

Continuing Calibration:

The Percent Difference (%D) for the standards run on 11/05/04 at 16:49 on instrument H was 44.9% for atrazine, which exceeded the 25% QC limit. Since the associated sample was an equipment blank, no action was required.

The Percent Differences (%D's) for the standards run on 11/06/04 at 12:13 on instrument H exceeded the 25% QC limit for the following compounds:

atrazine	48.7%
indeno(1,2,3-cd)pyrene	26.3%
benzo(g,h,i)perylene	29.4%

All positive results for these compounds in the soil SDG samples were flagged as estimated (J).

IV.) Blanks:

Method Blanks:

There were no detections in the method blanks associated with this SDG. No action was required.

Field Blanks:

Bis(2-ethylhexyl)phthalate and di-n-butylphthalate were detected at 1.8 ug/L and 1.5 ug/L, respectively, in equipment blank SJS02-EB100504. All positive results for these two compounds in the SDG samples were greater than 10X the blank amount, so no data qualification was required.

Tentatively Identified Compounds (TIC):

Hexadecanoic acid and octadecanoic acid were detected at 30 ug/L and 8 ug/L, respectively, in equipment blank SJS02-EB100504. All positive results for these two compounds in the SDG samples were greater than 10X the blank amount, so no action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Three LCSs were analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were performed on SDG sample SJREF-SD05-00-04D. All MS / MSD criteria were met. No action was required.

VIII.) Field Duplicates:

One set of field duplicate samples (SJREF-SD01-00-04D / SJREF-SD01-00-04P) was identified for this SDG. The calculable Relative Percent Differences (RPDs) were:

Compound	SJREF-SD01-00-04D	SJREF-SD01-00-04P	RPD
benzo(a)anthracene	94 mg/kg	70 mg/kg	29%
benzo(a)pyrene	170 mg/kg	120 mg/kg	34%
benzo(b)fluoranthene	300 mg/kg	190 mg/kg	45%

benzo(g,h,i)perylene	130 mg/kg	90 mg/kg	36%
benzo(k)fluoranthene	78 mg/kg	72 mg/kg	8.0%
chrysene	150 mg/kg	110 mg/kg	31%
fluoranthene	170 mg/kg	120 mg/kg	34%
indeno(1,2,3-cd)pyrene	110 mg/kg	77 mg/kg	35%
pyrene	170 mg/kg	130 mg/kg	27%

All RPDs were within the 60% QC limit for soil samples. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met. No action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

XII.) Tentatively Identified Compounds (TIC):

All TIC criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

PESTICIDES / PCBS

SUMMARY

I.) General:

The analyses for Pesticides / PCBs were performed by gas chromatography (GC) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems for this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Two LCSs were analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were performed on SDG sample SJREF-SD05-00-04D. All MS/MSD criteria were met. No action was required.

VIII.) Field Duplicates:

One set of field duplicate samples (SJREF-SD01-00-04D / SJREF-SD01-00-04P) was identified for this SDG. The calculable Relative Percent Differences (RPDs) were 101% for 4,4'-DDD and 96% for 4,4'-DDT, which exceeded the 60% QC limit for soil samples. Data qualification based on field duplicate criteria was not required. No action was taken.

IX.) Florisil Cleanup:

All Florisil Cleanup criteria were met. No action was required.

X.) GPC Cleanup:

The Percent Recoveries (%R's) were 113% for aldrin and 78% for dieldrin, which exceeded the 80-110% QC limits. Since there were no positive results for aldrin in the SDG samples, no action was required. Based on professional judgment, no action was taken for the dieldrin results in the soil SDG samples.

XI.) Pesticide / PCB Identification Summary (PIS):

The Column Percent Differences (%Ds) exceeded the 25% QC limit for the following samples:

Sample	Compound	%D
SJREF-SD01-00-04D	4,4'-DDE	35.7%
	4,4'-DDT	50.8%
SJRED-SD01-00-04P	4,4'-DDE	32.7%

The positive results for these compounds in the listed samples were flagged as estimated (J).

XII.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

TOTAL METALS

SUMMARY

I.) General:

The analyses for Total and Filtered Metals were performed using USEPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) CRDL Standards for ICP:

All CRDL criteria were met. No action was required.

IV.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank Type / ID#	Analyte	Max. Conc.	Action Level
CCB2	aluminum	31.9 ug/L	31.9 mg/kg
CCB2	barium	0.4 ug/L	0.4 mg/kg
CCB2	boron	3.2 ug/L	3.2 mg/kg
CCB2	cadmium	0.4 ug/L	0.4 mg/kg
SJS02-EB100504	calcium	151 ug/L	151 mg/kg
PBS	chromium	0.26 ug/L	0.26 mg/kg
CCB2	iron	37.4 ug/L	37.4 mg/kg
CCB5	magnesium	55.3 ug/L	55.3 mg/kg
SJS02-EB100504	manganese	2.4 ug/L	2.4 mg/kg
CCB2	nickel	1.6 ug/L	1.6 mg/kg
SJS02-EB100504	potassium	20.2 ug/L	20.2 mg/kg
PBS	silver	0.27 ug/L	0.27 mg/kg
SJS02-EB100504	zinc	21.7 ug/L	21.7 mg/kg

CCB = Continuing Calibration Blank, EB = Equipment Blank, PBS = Preparation Blank (Soil)

All associated sample results less than 5X the blank amounts were flagged as suspected blank contamination (B).

The negative results listed below were the highest absolute value negative result for the blanks associated with this SDG.

Blank Type / ID#	Analyte	Max. Conc.	Action Level
CCB1	beryllium	-0.2 ug/L	0.2 mg/kg
CCB4	copper	-1.4 ug/L	1.4 mg/kg
CCB5	sodium	-430 ug/L	430 mg/kg

All positive results for these analytes less than 5X the blank amounts, and all non-detect results, were flagged as potentially biased low (L) and (UL).

IV.) ICP Interference Check Sample Results:

All Interference Percent Recovery criteria were met. No action was required.

The following analytes were detected in the ICS Solution A with results greater than the IDL:

antimony	2 ug/L
arsenic	3 ug/L
barium	3 ug/L
beryllium	1 ug/L

boron	6 ug/L
cadmium	3 ug/L
cobalt	4 ug/L
copper	1 ug/L
manganese	13 ug/L
molybdenum	1 ug/L
nickel	4 ug/L
selenium	6 ug/L
silver	1 ug/L
sodium	94 ug/L
vanadium	1 ug/L
zinc	23 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration comparable to or greater than the respective concentration in ICS Solution A, data qualification was not required.

The following analytes had negative results in the ICS Solution A with the absolute value greater than the IDL:

lead	-2 ug/L
potassium	-10 ug/L
thallium	-8 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration comparable to or greater than the respective concentration in ICS Solution A, data qualification was not required.

V.) ICP Serial Dilution Analysis:

The Percent Differences (%Ds) of 15.7% for copper and 11.2% for iron in the water Serial Dilution Analysis exceeded the 10% QC limit. Since the associated SDG sample was an equipment blank, no action was taken.

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

MD analysis was performed on SDG sample SJREF-SD05-00-04D. The Percent Differences (%Ds) for calcium, at 158%, and zinc, at 37%, exceeded the 35% QC limit. All positive and non-detect results for calcium and zinc in the soil SDG samples were flagged as estimated (J) and (UJ).

Batch MD analyses were submitted for the water SDG samples. All MD criteria were met. No action was required.

VIII.) Matrix Spike (MS):

MS analysis was performed on SDG sample SJREF-SD05-00-04D. The Percent Recoveries (%Rs) of antimony, at 71.0%, and mercury, at 150%, were outside the 75-125% QC limits. All positive results for mercury in the SDG samples were flagged as potentially biased high (K) and all positive and non-detect results for antimony in the soil SDG samples were flagged as potentially biased low (L) and (UL).

Batch MS analyses were submitted for the water SDG samples. The Percent Recoveries (%R's) of aluminum, at 154%, and iron, at 130%, exceeded the 75-125% QC limits. Since the associated SDG sample was an equipment blank, no action was taken.

IX.) Field Duplicates:

One set of field duplicate samples (SREF-SD01-00-04D / SJREF-SD01-00-04P) was identified for this SDG. The calculable Relative Percent Differences (RPDs) were:

Analyte	SJREF-SD01-00-04D	SJREF-SD01-00-04DP	RPD
aluminum	7000 mg/kg	3730 mg/kg	3.9%
arsenic	6.4 mg/kg	4.7 mg/kg	31%
barium	17.8 mg/kg	13.6 mg/kg	27%
boron	7.0 mg/kg	4.3 mg/kg	48%
cadmium	0.73 mg/kg	0.49 mg/kg	39%
calcium	965 mg/kg	408 mg/kg	81%
chromium	17.4 mg/kg	14.5 mg/kg	18%
cobalt	4.8 mg/kg	4.9 mg/kg	2.1%
copper	33.1 mg/kg	26.2 mg/kg	23%
iron	12700 mg/kg	9440 mg/kg	29%
lead	32.4 mg/kg	27.4 mg/kg	17%
magnesium	1560 mg/kg	1080 mg/kg	36%
manganese	59.7 mg/kg	45.8 mg/kg	26%
molybdenum	1.4 mg/kg	1.4 mg/kg	0%
nickel	8.8 mg/kg	7.3 mg/kg	19%
potassium	823 mg/kg	693 mg/kg	17%
sodium	2090 mg/kg	1710 mg/kg	20%
vanadium	16.9 mg/kg	13.2 mg/kg	25%
zinc	169 mg/kg	113 mg/kg	40%

All RPDs were within the 60% QC limit for soil samples. No action was required.

X.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

XI.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

SEM METALS

SUMMARY

I.) General:

The analyses for SEM Metals were performed using USEPA Draft Method (Determination of Acid Volatile Sulfide in Sediment).

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) CRDL Standards for ICP:

All CRDL criteria were met. No action was required.

IV.) Blanks:

There were no detections in the blanks associated with this fraction of the SDG. No action was required.

IV.) ICP Interference Check Sample Results:

All Interference Percent Recovery criteria were met. No action was required.

The following analytes were detected in the ICS Solution A with results greater than the IDL:

nickel	2 ug/L
zinc	22 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration comparable to or greater than the respective concentration in ICS Solution A, data qualification was not required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution Analysis criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

MD analyses were performed on SDG samples SJREF-SD05-00-04D. The Percent Difference (%D) for lead was 28.3%, which exceeded the 20% QC limit. All positive and non-detect results for lead were flagged as estimated (J) and (UJ).

VIII.) Matrix Spike (MS):

MS analyses were performed on SDG sample SJREF-SD05-00-04D. All MS criteria were met. No action was required.

IX.) Field Duplicates:

One set of field duplicate samples (SJREF-SD01-00-04D / SJREF-SD01-00-04P) was identified for this SDG. The calculable Relative Percent Differences (RPDs) were:

Analyte	SJREF-SD01-00-04D	SJREF-SD01-00-04P	RPD
cadmium	10.5 ug/L	15.7 ug/L	40%
copper	348 ug/L	548 ug/L	45%
lead	501 ug/L	728 ug/L	37%
nickel	50.5 ug/L	48.4 ug/L	4.2%
zinc	2500 ug/L	3420 ug/L	31%

The RPDs for four of the analytes exceeded the 30% QC limit for water samples. Data qualification based on field duplicate criteria was not required. No action was taken.

X.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

XI.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

TOTAL CYANIDE

SUMMARY

I.) General:

The analyses for total cyanide were made using EPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this fraction of the SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analyses were performed on SDG samples SJS02-EB100504 and SJREF-SD05-00-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analyses were performed on SDG samples SJS02-EB100504 and SJREF-SD05-00-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJREF-SD01-00-04D / SJREF-SD01-00-04P) was identified for this fraction of the SDG. There was no calculable Relative Percent Difference (RPD). No action was required.

AMMONIA

SUMMARY

I.) General:

The analyses for Ammonia were made using USEPA Method 350.2.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJREF-SD05-00-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis was performed on SDG sample SJREF-SD05-00-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJREF-SD01-00-04D / SJREF-SD01-00-04P) was identified for this SDG. The calculable Relative Percent Difference (RPD) was 39%, which was within the 60% QC limit for soil samples. No action was required.

SULFIDE

SUMMARY

I.) General:

The analyses for Sulfide were made using USEPA Method 376.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJREF-SD05-00-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis criteria was not required for this fraction of the SDG. No action was taken.

VII.) Field Duplicates:

One set of field duplicate samples (SJREF-SD-01-00-04D / SJREF-SD01-00-04P) was identified for this SDG. The calculable Relative Percent Difference (RPD) was 34%, which was within the 60% QC limit for soil samples. No action was required.

TOC

SUMMARY

I.) General:

The analyses for TOC were performed using SW-846 Method 9060.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

LCS criteria was not required. No action was taken.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJREF-SD05-00-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analyses were performed on SDG sample SJREF-SD05-00-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJREF-SD01-00-04D / SJREF-SD01-00-04P) was identified for this SDG. The calculable Relative Percent Difference (RPD) was 59%, which was within the 60% QC limit for soil samples. No action was required.

DATA VALIDATION SUMMARY
REPORT

COMPANY:	CH2M HILL
SITE NAME:	CTO-150, St. Juliens Creek Annex, Site 2 GW
CONTRACTED LAB:	GPL Laboratories, Inc.
PROJECT NUMBER:	157593.SA.SM
QA/QC LEVEL:	EPA Level IV
EPA SOW/METHOD:	EPA 1990 SOW
VALIDATION GUIDELINES:	*USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 1994, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 1994, Region III Modifications*
SAMPLE MATRIX:	Water
TYPES OF ANALYSES:	Volatile Organics, Semivolatile Organics (SVOA), Pesticides / Polychlorinated Biphenyls (PCBs), Explosives, Total Metals, Filtered Metals, Total Cyanide, Total Alkalinity, Ferrous Iron, Nitrate/Nitrite, Sulfate, Total Organic Carbon
SDG NUMBER:	412040

OVERVIEW

SAMPLES:

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Pest/ SVOA	PCB
SJS02-FB120204	412040-001	Water	X	X	X
SJS02-MW11S-04D	412040-002	Water	X	X	X
SJS02-MW11S-04DDL	412040-002DL	Water	X		
SJS02-MW12S-04D	412040-004	Water	X	X	X
SJS02-EB120204	412040-006	Water	X	X	X
SJS02-MW07S-04D	412040-008	Water	X		
SJS02-MW07S-04DDL	412040-008DL	Water	X		
SJS02-MW13S-04D	412040-009	Water	X	X	X

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Pest/ SVOA	PCB
SJS02-MW13S-04DP	412040-011	Water	X	X	X
SJS02-TB120204	412040-014	Water	X		
SJS02-MW12S-04DMS	412040-004MS	Water	X	X	X
SJS02-MW12S-04DMSD	412040-004MSD	Water	X	X	X

Client Sample #	Lab Sample #	Matrix	Total Explosives	Filtered Metals	Metals
SJS02-FB120204	412040-001	Water	X	X	
SJS02-MW11S-04D	412040-002	Water	X	X	
SJS02-MW11S-04D	412040-003	Water			X
SJS02-MW12S-04D	412040-004	Water	X	X	
SJS02-MW12S-04D	412040-005	Water			X
SJS02-EB120204	412040-006	Water	X	X	
SJS02-EB120204	412040-007	Water			X
SJS02-MW13S-04D	412040-009	Water	X	X	
SJS02-MW13S-04D	412040-010	Water			X
SJS02-MW13S-04DP	412040-011	Water	X	X	
SJS02-MW13S-04DP	412040-12	Water			X
SJS02-MW12S-04DMD	412040-004MD	Water		X	
SJS02-MW12S-04DMS	412040-004MS	Water	X	X	
SJS02-MW12S-04DMSD	412040-004MSD	Water	X		
SJS02-MW12S-04DMD	412040-005MD	Water			X
SJS02-MW12S-04DMS	412040-005MS	Water			X

Client Sample #	Lab Sample #	Matrix	Total Cyanide	Total Ferrous Alkalinity	Iron
SJS02-FB120204	412040-001	Water	X	X	X
SJS02-MW11S-04D	412040-002	Water	X	X	X
SJS02-MW12S-04D	412040-004	Water	X	X	X
SJS02-EB120204	412040-006	Water	X	X	X
SJS02-MW07S-04D	412040-008	Water		X	X
SJS02-MW13S-04D	412040-009	Water	X	X	X
SJS02-MW13S-04DP	412040-011	Water	X	X	X
SJS02-MW10S-04D	412040-013	Water		X	X
SJS02-MW10D-04D	412040-016	Water		X	X
SJS02-MW12S-04DMD	412040-004MD	Water	X	X	X
SJS02-MW12S-04DMS	412040-004MS	Water	X		X

Client Sample #	Lab Sample #	Matrix	Nitrate/ Nitrite	Sulfate	TOC
SJS02-FB120204	412040-001	Water	X	X	X
SJS02-MW11S-04D	412040-002	Water	X	X	X
SJS02-MW12S-04D	412040-004	Water	X	X	X
SJS02-EB120204	412040-006	Water	X	X	
SJS02-MW07S-04D	412040-008	Water	X	X	X
SJS02-MW13S-04D	412040-009	Water	X	X	X
SJS02-MW13S-04DP	412040-011	Water	X	X	X
SJS02-MW10S-04D	412040-013	Water	X	X	
SJS02-MW10D-04D	412040-016	Water	X	X	
SJS02-MW12S-04DMD	412040-004MD	Water	X	X	
SJS02-MW12S-04DMS	412040-004MS	Water	X	X	X
SJS02-MW07S-04D	412040-008MS	Water			X

Suffix Codes: DL = DILUTION, EB = EQUIPMENT BLANK, FB = FIELD BLANK,
MD = MATRIX DUPLICATE, MS = MATRIX SPIKE,
MSD = MATRIX SPIKE DUPLICATE, P = FIELD DUPLICATE

DATA REVIEWERS: Amy L. Hogan, Kevin C. Harmon, Monalisa B. Beasley

RELEASE SIGNATURE:

DATA QUALIFICATION SUMMARY

GPL Laboratories, Inc. - 412040- Organics and Inorganics

SAMPLES: SJS02-FB120204, SJS02-MW11S-04D, SJS02-MW12S-04D, SJS-EB120204, SJS02-MW07S-04D, SJS02-MW13S-04D, SJS02-MW13S-04DP, SJS02-MW10S-04D, SJS02-MW10D-04D, SJS02-TB120204

VOLATILE ORGANICS

SUMMARY

I.) General:

The analyses for volatile organics were performed by gas chromatography / mass spectroscopy (GC / MS) using USEPA Method OLC03.2.

II.) Overall Assessment of Data:

All non-detect results for acetone, methyl acetate and 2-butanone in the SDG samples were rejected (R) based on extremely low Relative Response Factors in the Initial and Continuing Calibrations.

All non-detect results for sample SJS02-MW07S-04D were rejected (R) based on extremely low Surrogate Percent Recoveries (%Rs).

The TIC data sheet for samples SJS02-FB120204 and SJS02-EB120204 listed the wrong client sample ID. The client sample ID numbers were corrected on the Form I by the validator.

All other laboratory data were acceptable with qualification.

MAJOR ISSUES

Initial Calibration:

The Average Relative Response Factors (RRFs) for the standards analyzed on 10/31/04 on instrument E were below the 0.050 QC limit for the following compounds:

acetone	0.019
methyl acetate	0.045
2-butanone	0.025

The positive results for acetone in SDG samples SJS02-MW13S-04D and SJS02-MW13S-04DP were flagged as estimated (J), while all other results for these compounds in the SDG samples, which consisted entirely of non-detects, were rejected (R).

Continuing Calibrations:

The Relative Response Factors (RRFs) for the standards run on 12/08/04 at 14:36 on instrument E

were below the 0.050 QC limit for the following compounds:

acetone	0.022
2-butanone	0.030

All results for these compounds in the associated samples were previously flagged based on the Initial Calibration, so no further action was required.

The Relative Response Factors (RRFs) for the standards run on 12/09/04 at 11:28 on instrument E were below the 0.050 QC limit for the following compounds:

acetone	0.018
methyl acetate	0.041
2-butanone	0.023

All results for these compounds in the associated samples were previously flagged based on the Initial Calibration, so no further action was required.

The Relative Response Factors (RRFs) for the standards run on 12/10/04 at 13:06 on instrument E were below the 0.050 QC limit for the following compounds:

acetone	0.018
methyl acetate	0.046
2-butanone	0.025

All results for these compounds in the associated samples were previously flagged based on the Initial Calibration, so no further action was required.

Surrogate Recoveries:

All Percent Recoveries (%R's) listed below were outside their QC limits for sample SJS02-MW07S-04D:

Surrogate	%R	QC limits
benzene-d6	24%	78-121%
bromoform-d5	149%	76-135%
2-butanone-d5	0%	42-171%
toluene-d8	69%	77-120%
chloroethane-d5	434%	60-126%
chloroform-d14	317%	80-123%
1,2-dichloroethane-d4	438%	78-129%
trans-1,3-dichloropropene-d4	3%	80-128%
1,1-dichloroethene-d2	8619%	65-130%
1,2-dichloropropane-d4	179%	84-123%
vinyl chloride-d3	4836%	49-138%

Since more than one %R was less than 10%, all positive results for this sample were flagged as potentially biased low (L) and all non-detect results were rejected (R).

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) was 40.3% for methlyene chloride for the standards analyzed on 10/31/04 on instrument E, which exceeded the 30% QC limit. All positive results for methylene chloride in the SDG samples were flagged as estimated (J).

Continuing Calibration:

The Percent Differences (%D's) for the standards run on 12/08/04 at 14:36 on instrument E exceeded the 25% QC limit for the following compounds:

bromomethane	38.6%
carbon disulfide	25.2%
methyl acetate	182%

The results for methyl acetate in the associated SDG samples were previously flagged based on the Initial Calibration. The positive result for carbon disulfide in associated sample SJS02-MW11S-04D was flagged as estimated (J). There were no positive results for bromomethane in the associated samples, so no further action was required.

The Percent Difference (%D) of 27.4% for methylene chloride for the standards run on 12/09/04 at 11:28 on instrument E exceeded the 25% QC limit. Since the result for methlyene chloride in the associated sample was a non-detect, no action was required.

IV.) Blanks:

Method Blanks:

There were no detections in the method blanks associated with this SDG. No action was required.

Holding Blank:

Trichloroethene was detected at 0.37 ug/L in the Holding Blank for this SDG. All positive results for trichloroethene in the SDG samples less than 5X the blank amount were flagged as suspected blank contamination (B).

Field Blanks:

Carbon disulfide and methylene chloride were detected at 0.48 ug/L and 0.90 ug/L, respectively, in equipment blank SJS02-EB120204. All positive results for these two compounds in the SDG samples less than 5X carbon disulfide amount and 10X the methylene chloride amount were flagged as suspected blank contamination (B).
Methylene chloride was detected at 1.1 ug/L in field blank SJS02-FB120204. All positive results for methylene chloride in the SDG samples were previously flagged based on the equipment blank, so no further action was required.

Tentatively Identified Compounds (TIC):

There were no TIC detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of bromoform-d5, trans-1,3-dichlorobenzene-d4 and 1,1-dichloroethene-d2 were outside their 76-135%, 80-128% and 65-130% QC limits, respectively, for the following samples:

Sample Identification	bromoform-d5 %R	trans-1,3-dichlorobenzene-d5 %R	1,1-dichloroethene-d2 %R
BLK73467	54%		
SJS02-EB120204	72%		64%
SJS02-FB120204	75%		62%
BLK73468	64%		
Holding Blank	64%	75%	54%
BLK73469	67%		
SJS02-MW11S-04DDL	74%		
SJS02-MW13S-04D	70%		

All positive and non-detect results for samples SJS02-MW11S-04DDL and SJS02-MW13S-04D were flagged as estimated (J) and (UJ). Since the other samples were QC samples, no further action was required.

Please also see the Major Issues section for this fraction of the SDG.

VI.) Laboratory Control Samples (LCS):

Three LCSs were analyzed by the laboratory. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were performed on SDG sample SJS02-MW12S-04D. One Relative Percent Difference (RPD) and one Percent Recovery (%R) exceeded the QC limits. Data qualification based on MS / MSD criteria was not required. No action was taken.

VIII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for

this fraction of the SDG. The calculable Relative Percent Differences (RPDs) were:

Compound	SJS02-MW13S-04D	SJS02-MW13S-04DP	RPD
acetone	6.7 ug/L	6.9 ug/L	2.9%
cyclohexane	1.2 ug/L	1.3 ug/L	8.0%
trichloroethene	1.2 ug/L	0.63 ug/L	62%

The RPD for trichloroethene exceeded the 30% QC limit for water samples. Data qualification based on field duplicate criteria was not required. No action was taken.

IX.) Internal Standards Performance (ISTD):

The Percent Recovery (%R) of 1,4-difluorobenzene-d5 was 17.6% for sample SJS02-MW07S-04D, which was below the 50-200% QC limits. All results for this sample were previously qualified based on Surrogate Recovery criteria, so no further action was required.

X.) TCL Compound Identification:

The Retention Time Difference (delta RRT) exceeded the 0.06 minute QC limit for the following compounds:

Sample	Compound	Delta RRT
SJS02-MW12S-04D	chloromethane	0.11
SJS02-MW07S-04D	chloromethane	0.11
	chloroform	0.14
	tetrachloroethane	0.12
	toluene	0.23

Based on professional judgment, the result for chloromethane in SDG sample SJS02-MW12S-04D was flagged as estimated (J). The results for SJS02-MW07S-04D were previously qualified based on other criteria, so no further action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

The result for trichloroethene in the initial analysis of sample SJS02-MW11S-04D exceeded the linear calibration range. A dilution analysis was performed with all calibration criteria met. The result for trichloroethene in the initial analysis and the results for all compounds except trichloroethene in the dilution analysis were rejected (R) based on data redundancy.

The results for seven compounds in the initial analysis of sample SJS02-MW07S-04D exceeded the linear calibration range. A dilution analysis was performed with five of the compounds being diluted out. The results for trichloroethene and cis-1,2-dichloroethene in the initial analysis and the results for all compounds except trichloroethene and cis-1,2-dichloroethene in the dilution analysis were rejected (R) based on data redundancy. The over range results for 1,1-dichloroethene, methylene chloride, tetrachloroethylene, vinyl chloride and trans-1,2-dichloroethene in the initial analysis were flagged as estimated (J).

XII.) Tentatively Identified Compounds (TIC):

All TIC criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

SEMIVOLATILE ORGANICS

SUMMARY

I.) General:

The analyses for semivolatile organics were performed by gas chromatography / mass spectroscopy (GC / MS) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

All non-detect results for atrazine for SDG samples SJS02-MW12S-04D, SJS02-FB120204 and SJS02-MW11S-04D were rejected (R) based on an extremely low Relative Response Factor in the Continuing Calibrations.

All other laboratory data were acceptable with qualification.

MAJOR ISSUES

Continuing Calibration:

The Relative Response Factor (RRF) was 0.042 for atrazine for the standards run on 12/10/04 at 19:51 on instrument H, which was below the 0.050 QC limit. The non-detect results for atrazine in associated SDG samples SJS02-MW12S-04D, SJS02-FB120204 and SJS02-MW11S-04D were rejected (R).

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for the standards analyzed on 11/05/04 on instrument H exceeded the 30% QC limit for atrazine at 37.0%. There were no positive results for atrazine in the SDG samples, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) for the standards run on 12/10/04 at 19:51 on instrument H exceeded the 25% QC limit for the following compounds:

atrazine	66.7%
hexachlorobutadiene	39.8%
hexachlorocyclopentadiene	28.8%
2,4-dinitrophenol	44.1%
4,6-dinitro-2-methylphenol	31.3%
hexachlorobenzene	36.6%
3,3'-dichlorobenzidine	28.7%

The results for atrazine in the SDG samples were previously rejected. There were no positive results for the other compounds in the SDG samples, so no further action was required.

The Percent Difference (%D) for the standards run on 12/17/04 at 10:40 on instrument H was 27.8% for benzaldehyde, which exceeded the 25% QC limit. Since there were no positive results for benzaldehyde in the associated samples, no action was required.

IV.) Blanks:

Method Blanks:

There were no detections in the method blanks associated with this SDG. No action was required.

Field Blanks:

Bis(2-ethylhexyl)phthalate was detected at 1.6 ug/L in field blank SJS02-FB120204. All positive results for bis(2-ethylhexyl)phthalate in the SDG samples less than 10X the blank amount were flagged as suspected blank contamination (B).

Tentatively Identified Compounds (TIC):

There were no TIC detections in the method and field blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were performed on SDG sample SJS02-MW12S-04D. Five Percent Recoveries (%R's) exceeded their QC limits. Data qualification based on MS/MSD criteria was not

required. No action was taken.

VIII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. The calculable Relative Percent Difference (RPD) for phenol was 14%, which was within the 30% QC limit for water samples. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met. No action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

XII.) Tentatively Identified Compounds (TIC):

All TIC criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

PESTICIDES / PCBS

SUMMARY

I.) General:

The analyses for Pesticides / PCBs were performed by gas chromatography (GC) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems for this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) for decachlorobiphenyl were below the 60-150% QC limits for the following samples:

Sample	DCB, Col. 1	DCB, Col. 2
SJS02-EB120204	55%	58%
SJS02-FB120204	56%	52%
SJS02-MW11S-04D	42%	42%
SJS02-MW12S-04D	28%	33%
SJS02-MW12S-04DMS	36%	14%
SJS02-MW12S-04DMSD	14%	29%
SJS02-MW13S-04D		54%
SJS02-MW13S-04DP	55%	48%

All positive and non-detect results for samples SJS02-MW11S-04D, SJS02-MW12S-04D and SJS02-MW13S-04DP were flagged as estimated (J) and (UJ). Since only one %R was below the QC limits for sample SJS02-MW13S-04D, no action was required. No action was taken for the other samples, since they were QC samples.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were performed on SDG sample SJS02-MW12S-04D. All MS/MSD criteria were met. No action was required.

VIII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. The calculable Relative Percent Difference (RPD) of 15% for heptachlor was within the 30% QC limit for water samples. No action was required.

IX.) Florisil Cleanup:

All Florisil Cleanup criteria were met. No action was required.

X.) GPC Cleanup:
GPC Cleanup was not required for this SDG. No action was taken.

XI.) Pesticide / PCB Identification Summary (PIS):

The Column Percent Difference (%D) was 46.7% for heptachlor in SDG sample SJS02-MW12S-04D, which exceeded the 25% QC limit. The positive result for heptachlor in the sample was flagged as estimated (J).

XII.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

EXPLOSIVES

SUMMARY

I.) General:

The analyses for Explosives were performed by gas chromatography (GC) using SW-846 Method 8330.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

There were no major problems for this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were performed on SDG sample SJS02-MW12-04D. Two Percent Recoveries (%R's) exceeded the QC limits. Data qualification based on MS/MSD criteria was not required. No action was taken.

VIII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. There were no calculable Relative Percent Differences (RPDs). No action was required.

IX.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

X.) System Performance:

All System Performance criteria were met. No action was required.

TOTAL AND FILTERED METALS

SUMMARY

I.) General:

The analyses for Total and Filtered Metals were performed using USEPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:
All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) CRDL Standards for ICP:

All CRDL criteria were met. No action was required.

IV.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank Type / ID#	Analyte	Max. Conc.	Action Level
CCB3	aluminum	86.9 ug/L	430 ug/L
CCB6	arsenic	6.1 ug/L	31 ug/L
CCB2	barium	0.6 ug/L	3.0 ug/L
CCB2	boron	2.9 ug/L	15 ug/L
CCB5	cadmium	0.3 ug/L	1.5 ug/L
CCB3	calcium	136 ug/L	680 ug/L
CCB6	copper	1.5 ug/L	7.5 ug/L
CCB3	iron	53.6 ug/L	270 ug/L
CCB3	magnesium	135 ug/L	680 ug/L
CCB2	manganese	0.5 ug/L	2.5 ug/L
CCB2	molybdenum	4.9 ug/L	25 ug/L
CCB7	nickel	1.2 ug/L	6.0 ug/L
SJS02-EB120204	zinc	2.6 ug/L	13 ug/L

CCB = Continuing Calibration Blank, EB = Equipment Blank

All associated sample results less than 5X the blank amounts were flagged as suspected blank contamination (B).

The negative results listed below were the highest absolute value negative result for the blanks associated with this SDG.

Blank Type / ID#	Analyte	Max. Conc.	Action Level
CCB5	antimony	-8.9 ug/L	45 ug/L
CCB5	beryllium	-0.3 ug/L	1.5 ug/L
CCB5	chromium	-2.2 ug/L	11 ug/L
CCB5	cobalt	-1.8 ug/L	9.0 ug/L
CCB3	lead	-2.3 ug/L	12 ug/L
CCB5	potassium	-29.0 ug/L	150 ug/L
CCB8	selenium	-4.5 ug/L	23 ug/L
CCB5	silver	-2.0 ug/L	10 ug/L
CCB5	sodium	-1000 ug/L	5000 ug/L
CCB5	vanadium	-2.0 ug/L	10 ug/L

All positive results for these analytes less than 5X the blank amount, and all non-detect results, were flagged as suspected biased low (L) and (UL).

IV.) ICP Interference Check Sample Results:

All Interference Percent Recovery criteria were met. No action was required.

The following analytes were detected in the ICS Solution A with results greater than the IDL:

arsenic	3 ug/L
barium	3 ug/L
beryllium	1 ug/L
boron	4 ug/L
cadmium	3 ug/L
chromium	1 ug/L
cobalt	4 ug/L
copper	1 ug/L
lead	2 ug/L
manganese	13 ug/L
molybdenum	1 ug/L
nickel	3 ug/L
silver	2 ug/L
vanadium	2 ug/L
zinc	23 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration greater than the respective concentration in ICS Solution A, data qualification was not required.

The following analytes had negative results in the ICS Solution A with the absolute value greater than the IDL:

antimony	-4 ug/L
potassium	-32 ug/L
selenium	-6 ug/L
sodium	-530 ug/L

thallium	-9 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration greater than the respective concentration in ICS Solution A, data qualification was not required.

V.) ICP Serial Dilution Analysis:

The Percent Difference (%D) for boron was 10.5%, which exceeded the 10% QC limit. All positive results for boron in the SDG samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

MD analyses were performed on total and filtered SDG sample SJS02-MW12S-04D. The Percent Difference (%D) for total arsenic was 29.3%, which exceeded the 20% QC limit. All positive and non-detect results for total arsenic were flagged as estimated (J) and (UJ).

VIII.) Matrix Spike (MS):

MS analyses were performed on total and filtered SDG samples SJS02-MW12S-04D. All MS criteria were met. No action was required.

IX.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. The calculable Relative Percent Differences (RPDs) were:

Analyte	SJS02-MW13S-04D	SJS02-MW13S-04DP	RPD
total barium	163 ug/L	166 ug/L	1.8%
total boron	170 ug/L	169 ug/L	0.6%
total calcium	162000 ug/L	161000 ug/L	0.6%
total chromium	1.3 ug/L	1.3 ug/L	0%
total iron	36600 ug/L	36700 ug/L	0.3%
total magnesium	48300 ug/L	48300 ug/L	0%
total manganese	947 ug/L	953 ug/L	0.6%
total potassium	18300 ug/L	18500 ug/L	1.1%
total sodium	171000 ug/L	170000 ug/L	0.06%
filtered barium	161 ug/L	158 ug/L	1.9%
filtered boron	168 ug/L	166 ug/L	1.2%
filtered calcium	160000 ug/L	159000 ug/L	0.6%
filtered iron	35600 ug/l	35400 ug/L	0.6%
filtered magnesium	47200 ug/L	47000 ug/L	0.4%
filtered manganese	952 ug/L	944 ug/L	0.8%
filtered potassium	18400 ug/L	17900 ug/L	2.8%
filtered sodium	167000 ug/L	164000 ug/L	1.8%

All RPDs were within the 30% QC limit for water samples. No action was required.

X.) Total / Filtered:

The filtered metals result for potassium was greater than the total metals result in sample SJS02-MW11S-04D. The calculated Percent Difference (%D) was within the 15% QC limit, so no action was required.

The filtered metals results for barium, calcium, cobalt, iron, magnesium, manganese, potassium and sodium were greater than the total metals results in sample SJS02-MW12S-04D. The calculated Percent Differences (%Ds) for cobalt, at 92%, and sodium, at 27%, exceeded the 15% QC limit. The results for cobalt and sodium in the total and filtered analyses of sample SJS02-MW12S-04D were flagged as estimated (J).

The filtered metals results for manganese and potassium were greater than the total metals results in sample SJS02-MW13S-04D. The calculated Percent Differences (%Ds) were within the 15% QC limit, so no action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

TOTAL CYANIDE

SUMMARY

I.) General:

The analyses for total cyanide were performed using EPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this fraction of the SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJS02-MW12S-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis was performed on SDG sample SJS02-MW12S-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this fraction of the SDG. There was no calculable Relative Percent Difference (RPD). No action was required.

TOTAL ALKALINITY

SUMMARY

I.) General:

The analyses for Total Alkalinity were performed using USEPA Method 310.1.

II.) Overall Assessment of Data:

The laboratory incorrectly identified sample SJS02-MW10D-04D as AJA02-MW10D-04D. The incorrect number was lined out by the validator and replaced with the correct number.

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

Alkalinity was detected at 6.5 mg/L in equipment blank SJS02-EB120204. All positive results for alkalinity in the SDG samples were greater than 5X the blank amount, so no action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJS02-MW12S-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis was not submitted for this fraction of the SDG. All positive and non-detect results for total alkalinity in the SDG samples were flagged as estimated (J) and (UJ).

VII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. The calculable Relative Percent Difference (RPD) was 6.2%, which was within the 30% QC limit for water samples. No action was required.

FERROUS IRON

SUMMARY

I.) General:

The analyses for Ferrous Iron were performed using Standards Method 3500-Fe.

II.) Overall Assessment of Data:

The laboratory incorrectly identified sample SJS02-MW10D-04D as AJA02-MW10D-04D. The incorrect number was lined out by the validator and replaced with the correct number.

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJS02-MW12S-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis was performed on SDG sample SJS02-MW12S-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. There was no calculable Relative Percent Difference (RPD), so no action was required.

NITRATE/NITRITE

SUMMARY

I.) General:

The analyses for Nitrate/Nitrite were performed using USEPA Method 353.2.

II.) Overall Assessment of Data:

The laboratory incorrectly identified sample SJS02-MW10D-04D as AJA02-MW10D-04D. The incorrect number was lined out by the validator and replaced with the correct number.
All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJS02-MW12S-04D. All MD criteria were met.
No action was required.

VI.) Matrix Spike (MS):

MS analysis was performed on SDG sample SJS02-MW12S-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. There was no calculable Relative Percent Difference (RPD), so no action was required.

SULFATE

SUMMARY

I.) General:

The analyses for Sulfate were made using USEPA Method 375.4.

II.) Overall Assessment of Data:

The laboratory incorrectly identified sample SJS02-MW10D-04D as AJA02-MW10D-04D. The incorrect number was lined out by the validator and replaced with the correct number.

All laboratory data were acceptable with qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

Sulfate was detected at 1.8 mg/L in equipment blank SJS02-EB120204. All positive results for sulfate in the SDG samples less than 5X the blank amount were flagged as suspected blank contamination (B).

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJS02-MW12S-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis was performed on SDG sample SJS02-MW12S-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. The calculable Relative Percent Difference (RPD) was 35%, which exceeded the 30% QC limit for water samples. Data qualification based on field duplicate criteria was not required. No action was taken.

TOC

SUMMARY

I.) General:

The analyses for TOC were made using SW-846 Method 9060.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:
There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

LCS criteria was not required. No action was taken.

V.) Matrix Duplicate (MD):

MD criteria was not required. No action was taken.

VI.) Matrix Spike (MS):

MS analyses were performed on SDG samples SJS02-MW12S-04D and SJS02-MW07S-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples (SJS02-MW13S-04D / SJS02-MW13S-04DP) was identified for this SDG. The calculable Relative Percent Difference (RPD) was 8.0%, which was within the 30% QC limit for water samples. No action was required.

DATA VALIDATION SUMMARY
REPORT

COMPANY:	CH2M HILL
SITE NAME:	CTO-150, St. Juliens Creek Annex, Site 2 GW
CONTRACTED LAB:	GPL Laboratories, Inc.
PROJECT NUMBER:	157593.SA.SM
QA/QC LEVEL:	EPA Level IV
EPA SOW/METHOD:	EPA 1990 SOW
VALIDATION GUIDELINES:	*USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 1994, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 1994, Region III Modifications*
SAMPLE MATRICES:	Soil and Water
TYPES OF ANALYSES:	Volatile Organics

SDG NUMBER: 411165

OVERVIEW

SAMPLES:

Client Sample #	Lab Sample #	Matrix	Volatile Organics
SJS02-FB111804	411165-001	Water	X
SJS02-EB111804	411165-002	Water	X
SJS02-SD21-00-04D	411165-003	Soil	X
SJS02-SD21-00-04DDL	411165-003DL	Soil	X
SJS02-SD21-00-04DP	411165-004	Soil	X
SJS02-SD21-00-04DPDL	411165-004DL	Soil	X
SJS02-SD21-00-04DPDL2	411165-004DL2	Soil	X
SJS02-SD22-00-04D	411165-005	Soil	X
SJS02-SD22-00-04DRE	411165-005RE	Soil	X
SJS02-SD23-00-04D	411165-006	Soil	X
SJS02-SD23-00-04DRE	411165-006RE	Soil	X
SJS02-TB111804	411165-007	Water	X
SJS02-SD22-00-04DMS	411165-005MS	Soil	X
SJS02-SD22-00-04DMSD	411165-005MSD	Soil	X

Suffix Codes: DL = DILUTION, EB = EQUIPMENT BLANK, FB = FIELD BLANK, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, P = FIELD DUPLICATE, RE = REANALYSIS, TB = TRIP BLANK

DATA REVIEWERS: Amy L. Hogan, Kevin C. Harmon, Monalisa B. Beasley

RELEASE SIGNATURE:

DATA QUALIFICATION SUMMARY

GPL Laboratories, Inc. - 411165- Organics

SAMPLES: SJS02-FB111804, SJS02-EB111804, SJS02-SD21-00-04D, SJS02-SD21-00-04DP, SJS02-SD22-00-04D, SJS02-SD23-00-04D, SJS02-TB111804

VOLATILE ORGANICS

SUMMARY

I.) General:

The analyses for volatile organics were performed by gas chromatography / mass spectroscopy (GC / MS) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

Based on Surrogate Recovery and Internal Standards Performance criteria, the reanalyses of samples SJS02-SD22-00-04D and SJS02-SD23-00-04D were considered by the validator to be of preferable data quality to the initial analyses. The initial analyses of these two samples were rejected (R) based on data redundancy.

All other laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this SDG.

MINOR ISSUES

I.) Holding Times:

The 18 days between sampling date and analysis date for samples SJS02-SD21-00-04DDL and SJS02-SD21-00-04DDL2 exceeded the 14 day QC limit. All positive and non-detect results for these samples were flagged as estimated (J) and (UJ).

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSDs) were 55.2% for 4-methyl-2-pentanone and 41.1% for 2-hexanone for the standards analyzed on 9/03/04 on instrument A, which exceeded the

30% QC limit. All results for 4-methyl-2-pentanone in the SDG soil samples, which consisted entirely of non-detects, were flagged as estimated (UJ), since the %RSD exceeded 50%. Since there were no positive results for 2-hexanone in the soil SDG samples and the %RSD was less than 50%, no further action was required.

The Percent Relative Standard Deviation (%RSD) was 39.0% for 2-hexanone for the standards analyzed on 11/11/04 on instrument A, which exceeded the 30% QC limit. Since the associated samples were field and trip blanks, no action was required.

Continuing Calibration:

The Percent Differences (%D's) for the standards run on 11/22/04 at 06:56 on instrument A exceeded the 25% QC limit for the following compounds:

chloromethane	33.8%
2-hexanone	51.9%

Since the associated samples were field and trip blanks, no action was required.

The Percent Differences (%D's) for the standards run on 11/23/04 at 07:38 on instrument A exceeded the 25% QC limit for the following compounds:

acetone	64.4%
1,1-dichloroethane	30.0%
bromoform	27.6%
4-methyl-2-pentanone	61.5%
2-hexanone	50.8%
dichlorodifluoromethane	33.5%
freon 13	28.8%
trans-1,2-dichloroethene	26.1%
MTBE	29.7%
cis-1,2-dichloroethene	27.6%
1,2-dichloroethene	27.2%

All positive results for these compounds and the non-detect results for acetone, 4-methyl-2-pentanone and 2-hexanone in the associated samples were flagged as estimated (J) and (UJ). The associated samples were SJS02-SD21-00-04D, SJS02-SD21-00-04DP, SJS02-SD22-00-04 and SJS02-SD23-00-04.

The Percent Differences (%D's) for the standards run on 12/03/04 at 09:55 on instrument A exceeded the 25% QC limit for the following compounds:

chloromethane	28.8%
bromomethane	32.9%
chloroethane	29.0%
acetone	91.0%
4-methyl-2-pentanone	44.2%
2-hexanone	29.8%

The positive results for acetone in the associated samples were previously rejected based on the

Initial Calibration and there were no positive results for the other listed compounds, so no further action was required.

The Percent Differences (%Ds) for the standards run on 12/07/04 at 08:29 on instrument A exceeded the 25% QC limit for the following compounds:

acetone	82.3%
2-butanone	36.9%
4-methyl-2-pentanone	37.0%
methyl acetate	42.7%

The non-detect results for acetone in associated samples SJS02-SD21-00-04DDL and SJS02-SD21-00-04DPDL2 were flagged as estimated (UJ), since the %D for acetone was greater than 50%. There were no positive results for the other listed compounds in the associated samples, so no further action was required.

The Percent Differences (%D's) for the standards run on 12/08/04 at 10:49 on instrument A exceeded the 25% QC limit for the following compounds:

1,1-dichloroethene	33.8%
1,1-dichloroethane	25.4%
4-methyl-2-pentanone	48.1%
MTBE	25.7%
methyl acetate	29.7%

Since the associated sample was a QC sample, no action was required.

IV.) Blanks:

Method Blanks:

Methylene chloride was detected at 1.1 ug/kg in method blank BLK70459. There were no

positive results for methylene chloride in the associated samples less than 10X the blank amount, so no action was required.

Methylene chloride was detected at 1.5 ug/kg in method blank BLK70749. All positive results for methylene chloride in the associated samples less than 10X the blank amount were flagged as suspected blank contamination (B), unless previously rejected based on other criteria. The associated samples were SJS02-SD21-00-04DPDL1, SJS02-SD22-00-04DRE, SJS02-SD23-00-04DRE.

Methylene chloride was detected at 67 ug/kg in method blank BLK70767. The positive results for methylene chloride in the associated samples were previously rejected based on other criteria, so no action was required.

Field Blanks:

Acetone was detected at 7.9 ug/L in field blank SJS02-FB111804 and at 7.8 ug/L in equipment blank SJS02-EB111804. All positive results for acetone in the SDG samples less than 10X the field

blank amount were flagged as suspected blank contamination (B).

Trip Blank:

Methylene chloride was detected at 1.2 ug/L in trip blank SJS02-TB111804. All positive results for methylene chloride in the SDG samples were previously flagged based on the method blanks, so no further action was required.
Tentatively Identified Compounds (TIC):

There were no TIC detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of 4-bromofluorobenzene and toluene-d8 were outside their 59-113% and 84-138% QC limits, respectively, for the following samples:

Sample ID	4-bromofluorobenzene, %R	toluene-d8, %R
SJS02-SD21-00-04D	117%	
SJS02-SD21-00-04DP	117%	
SJS02-SD22-00-04D	117%	
SJS02-SD22-00-04DMS	119%	
SJS02-SD22-00-04DMSD	118%	
SJS02-SD23-00-04D	117%	
SJS02-SD23-00-04DRE	114%	
SJS02-SD21-00-04DPDL2	124%	78%
SJS02-SD21-00-04DDL1	130%	78%

All positive and non-detect results for these samples, except for the MS and MSD analyses, were flagged as estimated (J) and (UJ), unless previously flagged based on other criteria.

VI.) Laboratory Control Samples (LCS):

Five LCSs were analyzed by the laboratory. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were performed on SDG sample SJS02-SD22-00-04D. Two Percent Recoveries (%Rs) were below their QC limits. Data qualification based on MS / MSD criteria was not required. No action was taken.

VIII.) Field Duplicates:

One set of field duplicate samples (SJS02-SD21-00-04D / SJS02-SD21-00-04DP) was identified for this fraction of the SDG. The calculable Relative Percent Differences (RPDs) were:

Compound	SJS02-SD21-00-04D	SJS02-SD21-00-04DP	RPD
1,1-dichloroethene	15 mg/kg	34 mg/kg	78%
benzene	5.7 mg/kg	5.3 mg/kg	7.3%
carbon disulfide	14 mg/kg	15 mg/kg	6.9%
trichloroethene	7.4 mg/kg	9.8 mg/kg	28%

vinyl chloride	7700 mg/kg	9800 mg/kg	24%
cis-1,2-dichloroethene	620 mg/kg	2300 mg/kg	86%
trans-1,2-dichloroethene	20 mg/kg	38 mg/kg	62%

The RPDs for three compounds exceeded the 60% QC limit for soil samples. Data qualification based on field duplicate criteria was not required. No action was taken.

IX.) Internal Standards Performance (ISTD):
The Percent Recoveries (%Rs) were below the 50-200% QC limits for the following samples:

Sample	ISTD	%R
SJS02-SD21-00-04D	1,4-diflourobenzene	37.5%
	bromochloromethane	44.6%
	chlorobenzene-d5	29.0%
SJS02-SD21-00-04DP	1,4-diflourobenzene	35.5%
	bromochloromethane	48.1%
	chlorobenzene-d5	27.1%
SJS02-SD22-00-04D	1,4-diflourobenzene	39.6%
	bromochloromethane	48.6%
	chlorobenzene-d5	29.7%
SJS02-SD22-00-04DMS	1,4-diflourobenzene	40.7%
	chlorobenzene-d5	31.4%
SJS02-SD22-00-04DMSD	1,4-diflourobenzene	44.2%
	chlorobenzene-d5	36.2%
SJS02-SD23-00-04D	1,4-diflourobenzene	40.7%
	chlorobenzene-d5	33.2%
SJS02-SD21-00-04DPDL	1,4-diflourobenzene	39.7%
	chlorobenzene-d5	47.0%
SJS02-SD23-00-04DRE	1,4-diflourobenzene	48.9%
	chlorobenzene-d5	47.6%
SJS02-SD21-00-04DPDL2	1,4-diflourobenzene	44.5%
SJS02-SD21-00-04DDL	1,4-diflourobenzene	38.9%

All positive and non-detect results for the compounds quanititated against these ISTDs in the listed samples were flagged as estimated (J) and (UJ). No action was taken for the two QC samples.

X.) TCL Compound Identification:

The Retention Time Difference (delta RRT) exceeded the 0.06 minute QC limit for the following compounds:

Sample	Compound	Delta RRT
SJS02-SD21-00-04DP	acetone	0.08
	carbon disulfide	0.07
	1,1-dichloroethene	0.07
	trans-1,2-dichloroethene	0.07
	cis-1,2-dichloroethene	0.07
	trichloroethene	010
SJS02-SD21-00-04DPDL2	methyl acetate	0.12
	trans-1,3-dichloropropene	0.09

SJS02-SD22-00-04DRE	carbon disulfide	0.07
	1,2-dichloropropane	0.19
SJS02-SD23-00-04D	trichloroethene	0.07

Based on professional judgment, the results for these compounds were flagged as estimated (J), unless previously qualified based on other criteria.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

The result for vinyl chloride in the initial analysis of sample SJS02-SD21-00-04D exceeded the linear calibration range. A dilution analysis was performed with all calibration criteria met. The result for vinyl chloride in the initial analysis and the results for all compounds except vinyl chloride in the dilution analysis were rejected (R) based on data redundancy.

The results for vinyl chloride and cis-1,2-dichloroethene in the initial analysis of sample SJS02-SD21-00-04DP exceeded the linear calibration range. A total of two dilution analyses were performed for this sample. The results for vinyl chloride and cis-1,2-dichloroethene in the initial analysis, all results except for cis-1,2-dichloroethene in SJS02-SD21-00-04DPDL1 and the results for all compounds except vinyl chloride in analysis SJS02-SD21-00-04DPDL2 were rejected (R) based on data redundancy.

XII.) Tentatively Identified Compounds (TIC):

All TIC criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

DATA VALIDATION SUMMARY
REPORT

COMPANY:	CH2M HILL
SITE NAME:	CTO-150, St. Juliens Creek Annex, Site 2
CONTRACTED LAB:	GPL Laboratories, Inc.
PROJECT NUMBER:	157593.SA.SM
QA/QC LEVEL:	EPA Level IV
EPA SOW/METHOD:	EPA 1990 SOW
VALIDATION GUIDELINES:	*USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 1994, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 1994, Region III Modifications*
SAMPLE MATRIX:	Water
TYPES OF ANALYSES:	Semivolatile Organics (SVOA), Pesticides / Polychlorinated Total Cyanide, Ammonia, Sulfide, Total Organic Carbon (TOC)
SDG NUMBER:	410067

OVERVIEW

SAMPLES:

Client Sample #	Lab Sample #	Matrix	SVOA	Pest/ PCB	Explosives
SJS02-SD26-00-04D	410067-001	Soil	X	X	
SJS02-SD26-00-04DDL	410067-001DL	Soil		X	
SJS02-SD03-00-04D	410067-002	Soil	X	X	
SJS02-SD24-00-04D	410067-003	Soil	X	X	
SJS02-SD25-00-04D	410067-004	Soil	X	X	
SJS02-SD25-00-04DDL	410067-004DL	Soil	X	X	
SJS02-SD05-00-04D	410067-005	Soil	X	X	
SJS02-SD06-00-04D	410067-006	Soil	X	X	
SJS02-SD06-00-04DDL	410067-006DL	Soil		X	
SJS02-SD20-00-04D	410067-007	Soil	X	X	X
SJS02-FB100604	410067-008	Water	X	X	
SJS02-EB100604	410067-009	Water	X	X	
SJS02-SW12-04D	410067-010	Water	X	X	
SJS02-SW13-04D	410067-011	Water	X	X	

Client Sample #	Lab Sample #	Matrix	Total Metals	SEM Metals	Total Cyanide
SJS02-SD26-00-04D	410067-001	Soil	X	X	X
SJS02-SD03-00-04D	410067-002	Soil	X	X	X
SJS02-SD24-00-04D	410067-003	Soil	X	X	X
SJS02-SD25-00-04D	410067-004	Soil	X	X	X
SJS02-SD05-00-04D	410067-005	Soil	X	X	X
SJS02-SD06-00-04D	410067-006	Soil	X	X	X
SJS02-SD20-00-04D	410067-007	Soil	X		
SJS02-FB100604	410067-008	Water	X		X
SJS02-EB100604	410067-009	Water	X		X
SJS02-SW12-04D	410067-010	Water	X		
SJS02-SW13-04D	410067-011	Water	X		
SJS02-SD26-00-04DMD	410067-001MD	Soil		X	X
SJS02-SD26-00-04DMS	410067-001MS	Soil		X	X

Client Sample #	Lab Sample #	Matrix	Ammonia	Sulfide	TOC
SJS02-SD26-00-04D	410067-001	Soil	X	X	X
SJS02-SD03-00-04D	410067-002	Soil	X	X	X
SJS02-SD24-00-04D	410067-003	Soil	X	X	X
SJS02-SD25-00-04D	410067-004	Soil	X	X	X
SJS02-SD05-00-04D	410067-005	Soil	X	X	X
SJS02-SD06-00-04D	410067-006	Soil	X	X	X
SJS02-SD26-00-04DMD	410067-001MD	Soil		X	

Suffix Codes: DL = DILUTION, EB = EQUIPMENT BLANK, FB = FIELD BLANK, MD = MATRIX DUPLICATE, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWERS: Amy L. Hogan, Kevin C. Harmon, Monalisa B. Beasley

RELEASE SIGNATURE:

DATA QUALIFICATION SUMMARY

GPL Laboratories, Inc. - 410067 - Organics and Inorganics

SAMPLES: SJS02-SD26-00-04D, SJS02-SD03-00-04D, SJS02-SD24-00-04D, SJS02-SD25-00-04D, SJS02-SD05-00-04D, SJS02-SD06-00-04D, SJS02-SD20-00-04D, SJS02-FB100604, SJS02-EB100604, SJS02-SW12-04D, SJS02-SW13-04D

SEMIVOLATILE ORGANICS

SUMMARY

I.) General:

The analyses for semivolatile organics were performed by gas chromatography / mass spectroscopy (GC / MS) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for the standards analyzed on 11/05/04 on instrument H exceeded the 30% QC limit for atrazine at 37.0%. There were no positive results for atrazine in the SDG samples, so no action was required.

Continuing Calibration:

The Percent Difference (%D) for the standards run on 11/05/04 at 16:49 on instrument H was 44.9% for atrazine, which exceeded the 25% QC limit. Since there were no positive results for

atrazine in the associated samples, no action was required.

The Percent Differences (%D's) for the standards run on 11/06/04 at 12:13 on instrument H exceeded the 25% QC limit for the following compounds:

atrazine	48.7%
indeno(1,2,3-cd)pyrene	26.3%
benzo(g,h,i)perylene	29.4%

All positive results for these compounds in the associated samples were flagged as estimated (J). The associated samples were SJS02-SD20-00-04D, SJS02-SD26-00-04D, SJS02-SD03-00-04D, SJS02-SD24-00-04D, SJS02-SD05-00-04D, SJS02-SD25-00-04D and SJS02-SD06-00-04D.

The Percent Differences (%D's) for the standards run on 11/08/04 at 14:00 on instrument H exceeded the 25% QC limit for the following compounds:

atrazine	51.7%
pyrene	35.5%
3,3'-dichlorobenzidine	37.7%

The positive result for pyrene in associated sample SJS2-SD25-00-04DDL was flagged as estimated (J). The results for the other two compounds in the associated sample were rejected based on other criteria, so no further action was required.

IV.) Blanks:

Method Blanks:

There were no detections in the method blanks associated with this SDG. No action was required.

Field Blanks:

Bis(2-ethylhexyl)phthalate and di-n-butylphthalate were detected at 42 ug/L and 1.7 ug/L, respectively, in field blank SJS02-FB100604. All positive results for bis(2-ethylhexyl)phthalate and di-n-butylphthalate in the SDG samples less than 10X the blank amount were flagged as suspected blank contamination (B).

Bis(2-ethylhexyl)phthalate and di-n-butylphthalate were detected at 2.0 ug/L and 1.9 ug/L, respectively, in equipment blank SJS02-EB100604. All positive results for bis(2-ethylhexyl)phthalate and di-n-butylphthalate in the SDG samples were previously flagged based on the field blank, so no further action was required.

Tentatively Identified Compounds (TIC):

There were TIC detections in field blank SJS02-FB100604 for the following compounds:

hexadecanoic acid	33 ug/L
octadecanoic acid	10 ug/L
bis(2-ethylhexyl)hexadecanoic acid	13 ug/L

All positive results for these three compounds in the SDG samples less than 10X the blank amount were flagged as suspected blank contamination (B).

Hexadecanoic acid and butyl ether hexadecanoic acid were detected at 35 ug/L and 5 ug/L, respectively, in equipment blank SJS02-EB100604. All positive results for butyl ether hexadecanoic acid in the SDG samples less than 10X the blank amount were flagged as suspected blank contamination (B). The results for hexadecanoic acid were previously flagged based on the field blank, so no further action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Three LCSs were analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Batch MS / MSD analyses were submitted for this fraction of the SDG. All MS / MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met. No action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

The result for pyrene in the initial analysis of sample SJS02-SD25-00-04D exceeded the linear calibration range. A dilution analysis was performed with all calibration criteria met. The result for pyrene in the initial analysis and all results except for pyrene in the dilution analysis of this sample were rejected (R) based on data redundancy.

XII.) Tentatively Identified Compounds (TIC):

All TIC criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

PESTICIDES / PCBS

SUMMARY

I.) General:

The analyses for Pesticides / PCBs were performed by gas chromatography (GC) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems for this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) for decachlorobiphenyl were below the 60-150% QC limits for the following samples:

Sample	DCB, Col. 1	DCB, Col. 2
SJS02-SW12-04D	30%	26%
SJS02-SW13-04D	28%	29%

All positive and non-detect results for these two samples were flagged as estimated (J) and (UJ).

VI.) Laboratory Control Samples (LCS):

Four LCSs were analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Batch MS / MSD analyses were submitted for this fraction of the SDG. All MS/MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

IX.) Florisil Cleanup:

All Florisil Cleanup criteria were met. No action was required.

X.) GPC Cleanup:

The Percent Recoveries (%R's) of aldrin at 113% and dieldrin at 78% exceeded the 80-110% QC limits. All positive results aldrin in the soil SDG samples were flagged as potentially biased high (K). Based on professional judgment, no action was taken for the dieldrin results.

XI.) Pesticide / PCB Identification Summary (PIS):

The Column Percent Differences (%Ds) exceeded the 25% QC limit for the following samples:

Sample	Compound	%D
SJS02-SW12-04D	4,4'-DDT	41.0%
SJS02-SW13-04D	gamma chlordane	35.4%
	4,4'-DDE	46.7%
	4,4'-DDT	66.7%
SJS02-SD26-00-04D	4,4'-DDE	30.2%
	dieldrin	82.8%
	endrin ketone	36.4%
SJS02-SD26-00-04DDL	4,4'-DDE	41.2%
	dieldrin	50.0%
	endrin ketone	33.3%
SJS02-SD24-00-04D	alpha chlordane	100%
	dieldrin	44.4%
SJS02-SD25-00-04D	gamma chlordane	46.3%
	4,4'-DDE	29.2%
	dieldrin	175%
SJS02-SD25-00-04DDL	4,4'-DDE	31.0%
	dieldrin	123.8%
SJS02-SD05-00-04D	dieldrin	27.8%
SJS02-SD06-00-04D	gamma chlordane	29.0%
	dieldrin	100%
SJS02-SD06-00-04DDL	gamma chlordane	31.6%
	4,4'-DDE	28.6%

The positive results for these compounds in the samples listed were flagged as estimated (J), unless previously flagged based on other criteria.

XII.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

The result for 4,4'-DDE in the initial analysis of sample SJS02-SD26-00-04D exceeded the linear calibration range. A dilution analysis was performed with all calibration criteria met. The result for 4,4'-DDE in the initial analysis and the results for all compounds except 4,4'-DDE in the dilution analysis were rejected based on data redundancy.

The result for 4,4'-DDE in the initial analysis of sample SJS02-SD25-00-04D exceeded the linear calibration range. A dilution analysis was performed with all calibration criteria met. The result for 4,4'-DDE in the initial analysis and the results for all compounds except 4,4'-DDE in the dilution analysis were rejected based on data redundancy.

The result for 4,4'-DDE in the initial analysis of sample SJS02-SD06-00-04D exceeded the linear calibration range. A dilution analysis was performed with all calibration criteria met. The result for 4,4'-DDE in the initial analysis and the results for all compounds except 4,4'-DDE in the dilution analysis were rejected based on data redundancy.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

EXPLOSIVES

SUMMARY

I.) General:

The analyses for Explosives were performed by gas chromatography (GC) using SW846 Method 8330.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

There were no major problems for this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Batch MS / MSD analyses were submitted for this fraction of the SDG. All MS / MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

IX.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

X.) System Performance:

All System Performance criteria were met. No action was required.

TOTAL METALS

SUMMARY

I.) General:

The analyses for Total Metals were performed using USEPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) CRDL Standards for ICP:

All CRDL criteria were met. No action was required.

IV.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank Type / ID#	Analyte	Max. Conc.	Action Level	
CCB2	aluminum	63.5 ug/L	63.5 mg/kg	320 ug/L
CCB3	antimony	4.8 ug/L	4.8 mg/kg	24 ug/L
CCB2	barium	0.4 ug/L	0.4 mg/kg	2.0 ug/L
CCB2	boron	3.2 ug/L	3.2 mg/kg	16 ug/L
CCB2	cadmium	0.5 ug/L	0.5 mg/kg	2.5 ug/L
SJS02-EB100604	calcium	124 ug/L	124 mg/kg	620 ug/L
CCB3	chromium	0.9 ug/L	0.9 mg/kg	4.5 ug/L
PBS	chromium	0.26 mg/kg	1.3 mg/kg	
CCB7	cobalt	1.2 ug/L	1.2 mg/kg	6.0 ug/L
CCB2	iron	37.4 ug/L	37.4 mg/kg	190 ug/L
CCB2	magnesium	79.9 ug/L	79.9 mg/kg	400 ug/L
CCB2	manganese	0.4 ug/L	0.4 mg/kg	2.0 ug/L
CCB2	nickel	1.6 ug/L	1.6 mg/kg	8.0 ug/L
PBS	potassium	4.7 mg/kg	23.5 mg/kg	
CCB7	silver	1.4 ug/L	1.4 mg/kg	7.0 ug/L
PBS	silver	0.27 mg/kg	1.4 mg/kg	
CCB6	vanadium	1.2 ug/L	1.2 mg/kg	6.0 ug/L
SJS02-EB100604	zinc	1.1 ug/L	1.1 mg/kg	5.5 ug/L

CCB = Continuing Calibration Blank, EB = Equipment Blank, PBS = Preparation Blank (Soil)

All associated sample results, which were less than 5X the blank amount, were flagged as suspected blank contamination (B).

The negative results listed below were the highest absolute value negative result for the blanks associated with this SDG.

Blank Type / ID#	Analyte	Max. Conc.	Action Level	
CCB5	beryllium	-0.2 ug/L	0.2 mg/kg	1.0 ug/L
CCB4	copper	-1.4 ug/L	1.4 mg/kg	7.0 ug/L
CCB5	sodium	-430 ug/L	430 mg/kg	2200 ug/L

All positive results for these analytes less than 5X the blank amount, and all non-detect results, were flagged as potentially biased low (L) and (UL).

IV.) ICP Interference Check Sample Results:

All Interference Percent Recovery criteria were met. No action was required.

The following analytes were detected in the ICS Solution A with results greater than the IDL:

antimony	10 ug/L
barium	3 ug/L
beryllium	1 ug/L
boron	7 ug/L
cadmium	3 ug/L
chromium	1 ug/L
cobalt	4 ug/L
copper	1 ug/L
manganese	13 ug/L
molybdenum	1 ug/L
nickel	4 ug/L
selenium	4 ug/L
silver	1 ug/L
sodium	498 ug/L
vanadium	2 ug/L
zinc	23 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration comparable to or greater than the respective concentration in ICS Solution A, data qualification was not required.

The following analytes had negative results in the ICS Solution A with the absolute value greater than the IDL:

arsenic	-4 ug/L
lead	-2 ug/L
potassium	-10 ug/L
thallium	-9 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration comparable to or greater than the respective concentration in ICS Solution A, data qualification was not required.

V.) ICP Serial Dilution Analysis:

The Percent Differences (%D's) of copper at 15.7% and iron at 11.2% exceeded the 10% QC limit for the water Serial Dilution Analysis sample. All positive results for copper and iron in the water SDG samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

MD analysis was performed on water SDG sample SJS02-SW13-04D. All MD criteria were met. No action was required.

Batch MD analyses were submitted for the soil SDG samples. The Percent Differences (%D's) of 158% for calcium and 37% for zinc exceeded the 35% QC limit for soil samples. All positive and non-detect results for calcium and zinc in the soil SDG samples were flagged as estimated (J) and (UJ).

VIII.) Matrix Spike (MS):

MS analysis was performed on water SDG samples SJS02-SW13-04D. The Percent Recovery (%R) of aluminum, at 152%, and iron, at 129.8%, exceeded the 75-125% QC limits. All positive results for aluminum and iron in the water samples were flagged as potentially biased high (K).

Batch MS / MSD analyses were submitted for the soil SDG samples. The Percent Recoveries (%R's) of antimony at 71% and mercury at 150% were outside the 75-125% QC limits. All positive results for mercury in the soil SDG samples were flagged as potentially biased high (K). All positive and non-detect results for antimony in the soil SDG samples were flagged as potentially biased low (L) and (UL).

IX.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required. No action was required.

X.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

XI.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

SEM METALS

SUMMARY

I.) General:

The analyses for SEM Metals were performed using USEPA Draft Method (Determination of Acid Volatile Sulfide in Sediment).

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) CRDL Standards for ICP:

All CRDL criteria were met. No action was required.

IV.) Blanks:

Copper was detected at 14.1 ug/L in method blank PBLKSEM. All positive results for copper in the SEM Metals samples were greater than 5X the blank amount, so no action was required.

IV.) ICP Interference Check Sample Results:

All Interference Percent Recovery criteria were met. No action was required.

The following analytes were detected in the ICS Solution A with results greater than the IDL:

nickel	2 ug/L
zinc	22 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration greater than the respective concentration in ICS Solution A, data qualification was not required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution Analysis criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

MD analyses were performed on SDG sample SJS02-SD26-00-04D. All MD criteria were met. No action was required.

VIII.) Matrix Spike (MS):

The Percent Recovery (%R) of copper was 64.4%, which was below the 75-125% QC limits. All MS criteria were met. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

X.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

XI.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

TOTAL CYANIDE

SUMMARY

I.) General:

The analyses for total cyanide were made using EPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this fraction of the SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJS02-SD26-00-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis was performed on SDG sample SJS02-SD26-00-04D. All MS criteria were met. No action was required.

VII.) Field Duplicates:

There were no field duplicate samples identified for this fraction of the SDG. No action was required.

AMMONIA

SUMMARY

I.) General:

The analyses for Ammonia were made using USEPA Method 350.2.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

Batch MD analysis was submitted for this fraction of the SDG. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

Batch MS analysis was submitted for this fraction of the SDG. All MS criteria were met. No action was required.

VII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

SULFIDE

SUMMARY

I.) General:

The analyses for Sulfide were made using USEPA Method 376.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

MD analysis was performed on SDG sample SJS02-SD26-00-04D. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

MS analysis criteria was not required for this fraction of the SDG. No action was taken.

VII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

TOC

SUMMARY

I.) General:

The analyses for TOC were made using SW-846 Method 9060.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

LCS criteria was not required. No action was taken.

V.) Matrix Duplicate (MD):

Batch MD analysis was submitted for this fraction of the SDG. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

Batch MS analysis was submitted for this fraction of the SDG. All MS criteria were met. No action was required.

VII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

DATA VALIDATION SUMMARY
REPORT

COMPANY:	CH2M HILL
SITE NAME:	CTO-150, St. Juliens Creek Annex, Site 2 GW
CONTRACTED LAB:	GPL Laboratories, Inc.
PROJECT NUMBER:	157593.SA.SM
QA/QC LEVEL:	EPA Level IV
EPA SOW/METHOD:	EPA 1990 SOW
VALIDATION GUIDELINES:	*USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 1994, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 1994, Region III Modifications*
SAMPLE MATRIX:	Water
TYPES OF ANALYSES:	Volatile Organics, Semivolatile Organics (SVOA), Pesticides / Polychlorinated Biphenyls (PCBs), Explosives, Total Metals, Filtered Metals, Total Cyanide, Total Organic Carbon (TOC)
SDG NUMBER:	412042

OVERVIEW

SAMPLES:

Client Lab Sample #	Volatile Sample #	Matrix	Organics	Pest/ SVOA	PCB
SJS02-MW10D-04D	412042-001	Water	X	X	X
SJS02-MW10D-04DDL	412042-001DL	Water	X		
SJS02-MW10S-04D	412042-003	Water	X	X	X
SJS02-MW10S-04DDL	412042-003DL	Water	X	X	
SJS02-MW10S-04DDL2	412042-003DL2	Water	X		
SJS02-TB120304	412042-005	Water	X		

Client Lab Sample #	Sample #	Matrix	Total Explosives	Filtered Metals	Metals
SJS02-MW10D-04D	412042-001	Water	X	X	
SJS02-MW10D-04D	412042-002	Water			X
SJS02-MW10S-04D	412042-003	Water	X	X	
SJS02-MW10S-04D	412042-004	Water			X

Client Sample #	Lab Sample #	Matrix	Total Cyanide	TOC
SJS02-MW10D-04D	412042-001	Water	X	X
SJS02-MW10S-04D	412042-003	Water	X	X

Suffix Codes: DL = DILUTION, TB = TRIP BLANK

DATA REVIEWERS: Amy L. Hogan, Kevin C. Harmon, Monalisa B. Beasley

RELEASE SIGNATURE:

DATA QUALIFICATION SUMMARY

GPL Laboratories, Inc. - 412042- Organics and Inorganics

SAMPLES: SJS02-MW10D-04D, SJS02-MW10S-04D, SJS02-TB120304

VOLATILE ORGANICS

SUMMARY

I.) General:

The analyses for volatile organics were performed by gas chromatography / mass spectroscopy (GC / MS) using USEPA Method OLC03.2.

II.) Overall Assessment of Data:

All non-detect results for acetone, methyl acetate and 2-butanone in the SDG samples were rejected (R) based on extremely low Relative Response Factors in the Initial and Continuing Calibrations.

All non-detect results for sample SJS2-MW10S-04D were rejected (R) based on extremely low Surrogate Recoveries.

All other laboratory data were acceptable with qualification.

MAJOR ISSUES

Initial Calibration:

The Average Relative Response Factors (RRFs) for the standards analyzed on 10/31/04 on instrument E were below the 0.050 QC limit for the following compounds:

acetone	0.019
methyl acetate	0.045
2-butanone	0.025

The positive result for acetone in SDG sample SJS02-MW10D-04D was flagged as estimated (J), while all other results for these compounds in the SDG samples, which consisted entirely of non-detects, were rejected (R).

Continuing Calibrations:

The Relative Response Factors (RRFs) for the standards run on 12/07/04 at 11:32 on instrument E were below the 0.050 QC limit for the following compounds:

acetone	0.020
methyl acetate	0.047
2-butanone	0.029

All results for these compounds in the associated samples were previously flagged based on the Initial Calibration, so no further action was required.

The Relative Response Factors (RRFs) for the standards run on 12/09/04 at 11:28 on instrument E were below the 0.050 QC limit for the following compounds:

acetone	0.018
methyl acetate	0.041
2-butanone	0.023

All results for these compounds in the associated samples were previously flagged based on the Initial Calibration, so no further action was required.

Surrogate Recoveries:

All Percent Recoveries (%R's) listed below were outside their QC limits for sample SJS02-MW10S-04D:

Surrogate	%R	QC limits
benzene-d6	16%	78-121%
bromoform-d5	148%	76-135%
2-butanone-d5	0%	42-171%
toluene-d8	71%	77-120%
chloroethane-d5	556%	60-126%
chloroform-d14	483%	80-123%
1,2-dichloroethane-d4	156%	78-129%
trans-1,3-dichloropropene-d4	0%	80-128%
1,1-dichloroethene-d2	2106%	65-130%
1,2-dichloropropane-d4	204%	84-123%
2-hexanone-d5	1668%	37-169%
vinyl chloride-d3	5783%	49-138%

Since more than one %R was less than 10%, all positive results for this sample were flagged as potentially biased low (L) and all non-detect results were rejected (R).

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) was 40.3% for methlyene chloride for the standards analyzed on 10/31/04 on instrument E, which exceeded the 30% QC limit. The positive result for methylene chloride in SDG sample SJS02-MW10S-04D was flagged as based on other criteria, so no further action was required.
Continuing Calibration:

The Percent Differences (%D's) for the standards run on 12/07/04 at 11:32 on instrument E exceeded the 25% QC limit for the following compounds:

bromomethane	26.1%
methylene chloride	26.0%

The positive results for methylene chloride in the associated samples were flagged based on other criteria and there were no positive results for bromomethane in the associated SDG samples, so no action was required.

The Percent Difference (%D) for the standards run on 12/09/04 at 11:28 on instrument E was 27.4% for methylene chloride, which exceeded the 25% QC limit. Since the result for methylene chloride in the associated sample was non-detect, so no action was required.

IV.) Blanks:

Method Blanks:

There were no detections in the method blanks associated with this fraction of the SDG. No action was required.

Holding Blank:

Methylene chloride was detected at 0.76 ug/L in Holding Blank for this SDG. All positive results for methylene chloride in the SDG samples were flagged based on the trip blank, so no further action was taken.

Trip Blanks:

Carbon disulfide and methylene chloride were detected at 0.51 ug/L and 1.2 ug/L, respectively, in trip blank SJS02-TB120304. All positive results for carbon disulfide less than 5X the blank amount and all positive results for methylene chloride less than 10X the blank amount in the SDG samples were flagged as suspected blank contamination (B).

Tentatively Identified Compounds (TIC):

There were no TIC detections in the blanks associated with this fraction of the SDG. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of bromoform-d5, trans-1,3-dichlorobenzene-d4 and 1,1-dichloroethene-d2 were outside their 76-135%, 80-128% and 65-130% QC limits, respectively, for the following samples:

Sample Identification	bromoform-d5 %R	trans-1,3-dichlorobenzene-d5 %R	1,1-dichloroethene-d2 %R
SJS02-MW10S-04DDL	75%		60%
SJS02-TB120304	72%		
BLK73468	64%		
Holding Blank	69%	77%	48%
SJS02-MW10S-04DDL2	64%		

All positive and non-detect results for sample SJS02-MW10S04DDL were flagged as potentially biased low (L) and (UL), unless rejected based on other criteria. All positive and non-detect results for sample SJS02-MW10S-04DDL2 were flagged as estimated (J) and (UJ), unless rejected based on other criteria. Since the other samples were QC samples, no further action was required.

VI.) Laboratory Control Samples (LCS):

Two LCSs were analyzed by the laboratory. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Batch MS / MSD analyses were submitted for this SDG. One Relative Percent Difference (RPD) and one Percent Recovery (%R) exceeded the QC limits. Data qualification based on MS / MSD criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

The Percent Recovery (%R) of 1,4-difluorobenzene was 16% for sample SJS02-MW10S-04D was below the 50-200% QC limits. All positive and non-detect results for the compounds quantitated against this ISTD in the sample were previously flagged based on Surrogate Recovery criteria, so no further action was required.

X.) TCL Compound Identification:

The Retention Time Difference (delta RRT) exceeded the 0.06 minute QC limit for the following compounds:

Sample	Compound	Delta RRT
SJS02-MW10D-04D	trichloroethene	0.12
SJS02-MW10S-04D	chloroform	0.13
	1,1,2-trichloroethane	0.19
	tetrachloroethene	0.17
	toluene	0.27
	ethylbenzene	0.08
SJS02-MW10S-04DDL2	chloroethane	0.09

The result for tricloroethene in sample SJS02-MW10D-04D was flagged as estimated (J) based on professional judgment. The results for the compounds in the other listed samples were rejected based on other criteria, so no further action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

The result for trichloroethene in the initial analysis of sample SJS02-MW10D-04D exceeded the linear calibration range. A dilution analysis was performed with all calibration criteria met. The result for trichloroethene in the initial analysis and the results for all compounds except trichloroethene in the dilution analysis were rejected (R) based on data redundancy.

The results for eleven compounds in the initial analysis of sample SJS02-MW10S-04D exceeded the linear calibration range. Two dilution analyses were performed with all calibration criteria met. The result for vinyl chloride, cis-1,2-dichloroethene and trichloroethene in the initial analysis, the results for all compounds except for vinyl chloride and cis-1,2-dichloroethene and the results for all compounds except trichloroethene in the second dilution analysis were rejected (R) based on data redundancy. The results for 1,1,2-trichloroethene, 1,1-dichloroethene, chloroform, dibromochloromethane, tetrachloroethylene, toluene and total xylenes were reported from the initial analysis, since the results for these compounds were diluted out of the two dilution analyses. The results for these compounds in the initial analysis were flagged as potentially biased low (L) based on surrogate recovery criteria, so no further action was taken.

XII.) Tentatively Identified Compounds (TIC):

All TIC criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

SEMIVOLATILE ORGANICS

SUMMARY

I.) General:

The analyses for semivolatile organics were performed by gas chromatography / mass spectroscopy (GC / MS) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

The non-detect results for atrazine in SDG samples SJS02-MW10D-04D nd SJS02-MW10S-04D were rejected (R) based on an extremely low Relative Response Factor in the Continuing Calibration.

All other laboratory data were acceptable with qualification.

MAJOR ISSUES

Continuing Calibration:

The Relative Response Factor (RRF) was 0.042 for atrazine for the standards run on 12/10/04 at 19:51 on instrument H, which was below the 0.050 QC limit. The non-detect results for atrazine in the SDG samples were rejected (R).

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for the standards analyzed on 11/05/04 on instrument H exceeded the 30% QC limit for atrazine at 37.0%. There were no positive results for atrazine in the SDG samples, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) for the standards run on 12/10/04 at 19:51 on instrument H exceeded the 25% QC limit for the following compounds:

atrazine	66.7%
hexachlorobutadiene	39.8%
hexachlorocyclopentadiene	28.8%
2,4-dinitrophenol	44.1%
4,6-dinitro-2-methylphenol	31.3%
hexachlorobenzene	36.6%
3,3'-dichlorobenzidine	28.7%

The results for atrazine in the SDG samples were previously rejected. There were no positive results for the other compounds in the SDG samples, so no further action was required.

The Percent Difference (%D) for the standards run on 12/17/04 at 10:40 on instrument H was 27.8% for benzaldehyde, which exceeded the 25% QC limit. Since the result for benzaldehyde in the associated sample was non-detect, no action was required.

IV.) Blanks:

Method Blanks:

There were no detections in the method blanks associated with this SDG. No action was required.

Tentatively Identified Compounds (TIC):

There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

The Percent Recovery (%R) of 125% for 2,4,6-tribromophenol exceeded the 10-123% QC limits for sample SJS02-MW10S-04DDL. Since only one %R exceeded the QC limits for this sample, no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Batch MS / MSD analyses were submitted for this fraction of the SDG. Five Percent Recoveries (%R's) exceeded their QC limits. Data qualification based on MS/MSD criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met. No action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

The results for carbazole and naphthalene in the initial analysis of sample SJS02-MW10S-04D exceeded the linear calibration range. A dilution analysis was performed for this sample with all calibration criteria met. The results for carbazole and naphthalene in the initial analysis and the results for all compounds except for carbazole and naphthalene in the dilution analysis were rejected (R) based on data redundancy.

XII.) Tentatively Identified Compounds (TIC):

All TIC criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

PESTICIDES / PCBS

SUMMARY

I.) General:

The analyses for Pesticides / PCBs were performed by gas chromatography (GC) using USEPA Method OLM04.3.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems for this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) for decachlorobiphenyl were below the 60-150% QC limits for the following samples:

Sample	DCB, Col. 1	DCB, Col. 2
SJS02-MW10D-04-D	36%	26%
SJS02-MW10S-04D	39%	30%

All positive and non-detect results for these two samples were flagged as estimated (J) and (UJ).

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Batch MS / MSD analyses were submitted for this fraction of the SDG. All MS/MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

IX.) Florisil Cleanup:

All Florisil Cleanup criteria were met. No action was required.

X.) GPC Cleanup:

GPC Cleanup was not required for this SDG. No action was taken.

XI.) Pesticide / PCB Identification Summary (PIS):

The Column Percent Difference (%D) was 51.8% for heptachlor in sample SJS02-MW10D-04D, which exceeded the 25% QC limit. The result for heptachlor in the sample was flagged as estimated (J).

XII.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was required.

EXPLOSIVES

SUMMARY

I.) General:

The analyses for Explosives were performed by gas chromatography (GC) using SW-846 Method 8330.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

There were no major problems for this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

IV.) Blanks:
There were no detections in the blanks associated with this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory for this SDG. All LCS criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Batch MS / MSD analyses were submitted for this fraction of the SDG. Two Percent Recoveries (%R's) exceeded the QC limits. Data qualification based on MS/MSD criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

IX.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL):

All CRQL criteria were met. No action was required.

X.) System Performance:

All System Performance criteria were met. No action was required.

TOTAL AND FILTERED METALS

SUMMARY

I.) General:

The analyses for Total and Filtered Metals were performed using USEPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable with qualification.

MAJOR ISSUES

There were no major problems associated with this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) CRDL Standards for ICP:

All CRDL criteria were met. No action was required.

IV.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank Type / ID#	Analyte	Max. Conc.	Action Level
CCB8	aluminum	80.6 ug/L	400 ug/L
CCB2	barium	0.6 ug/L	3.0 ug/L
CCB8	beryllium	0.5 ug/L	2.5 ug/L
CCB8	cadmium	0.5 ug/L	2.5 ug/L
CCB8	calcium	179 ug/L	900 ug/L
CCB8	copper	2.1 ug/L	11 ug/L
CCB8	iron	58.1 ug/L	290 ug/L
CCB8	magnesium	147 ug/L	740 ug/L
CCB2	manganese	0.7 ug/L	3.5 ug/L
CCB2	molybdenum	3.3 ug/L	17 ug/L
PBW	zinc	1.2 ug/L	6.0 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All associated sample results, which were less than 5X the blank amount, were flagged as suspected blank contamination (B).

IV.) ICP Interference Check Sample Results:

All Interference Percent Recovery criteria were met. No action was required.

The following analytes were detected in the ICS Solution A with results greater than the IDL:

antimony	1 ug/L
barium	3 ug/L
beryllium	1 ug/L
boron	3 ug/L
cadmium	5 ug/L
chromium	1 ug/L
cobalt	4 ug/L
copper	2 ug/L
lead	2 ug/L
manganese	13 ug/L
nickel	2 ug/L
silver	1 ug/L
sodium	238 ug/L
vanadium	1 ug/L
zinc	23 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration comparable to or greater than the respective concentration in ICS Solution A, data qualification was not required.

The following analytes had negative results in the ICS Solution A with the absolute value greater than the IDL:

arsenic	-1 ug/L
molybdenum	-1 ug/L

potassium	-9 ug/L
selenium	-2 ug/L
thallium	-12 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected in any sample at a concentration comparable to or greater than the respective concentration in ICS Solution A, data qualification was not required.

V.) ICP Serial Dilution Analysis:

The Percent Difference (%D) for potassium was 13.3%, which exceeded the 10% QC limit. All positive results for potassium in the SDG samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Batch MD analysis was submitted for this fraction of the SDG. All MD criteria were met. No action was required.

VIII.) Matrix Spike (MS):

Batch MS analysis was submitted for this fraction of the SDG. The Percent Recovery (%R) of iron was 30.5%, which was below the 75-125% QC limits. All positive and non-detect results for iron in the SDG total metals samples were flagged as potentially biased low (L) and (UL).

IX.) Field Duplicates:

There were no field duplicate samples identified for this SDG. No action was required.

X.) Total / Filtered:

The filtered metals result for calcium and magnesium were greater than the total metals results in sample SJS02-MW10D-04D. The calculated Percent Differences (%Ds) were within the 15% QC limit, so no action was required.

The filtered metals result for cobalt was greater than the total metals results in sample SJS02-MW10S-04D. The calculated Percent Difference (%D) was within the 15% QC limit, so no action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

TOTAL CYANIDE

SUMMARY

I.) General:

The analyses for total cyanide were performed using EPA Method ILM04.1.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this fraction of the SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

V.) Matrix Duplicate (MD):

Batch MD analysis was submitted for this SDG. All MD criteria were met. No action was required.

VI.) Matrix Spike (MS):

Batch MS analysis was submitted for this SDG. All MS criteria were met. No action was required.

VII.) Field Duplicates:

There were no field duplicate samples identified for this fraction of the SDG. No action was required.

TOC

SUMMARY

I.) General:

The analyses for TOC were performed using SW-846 Method 9060.

II.) Overall Assessment of Data:

All laboratory data were acceptable without qualification.

MAJOR ISSUES

No major problems were observed in this fraction of the SDG.

MINOR ISSUES

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

There were no detections in the blanks associated with this SDG. No action was required.

IV.) Laboratory Control Samples (LCS):

LCS criteria was not required. No action was taken.

V.) Matrix Duplicate (MD):

MD criteria was not required. No action was taken.

VI.) Matrix Spike (MS):

Batch MS analyses were submitted for this SDG. All MS criteria were met. No action was required.

VII.) Field Duplicates:

There were no field duplicate samples identified for this fraction of the SDG. No action was required.

CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

August 9, 2006
SDG# 0605254, Empirical Laboratory
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Ms. Arroyo,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #0605254. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work OLM04.2; the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review). All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	VOA
SJS02-MW10D-06B	0605254-01	water	X
SJS02-MW10D-06B2	0605254-02	water	X
SJS02-MW10D-06B2P	0605254-03	water	X
SJS02-EB051806	0605254-04	water	X
SJS02-FB051806	0605254-05	water	X
SJS-TB051806	0605254-06	water	X
SB051906W	0605254-07	water	X
SJS02-MW10D-06B2MS	0605254-02MS	water	X
SJS02-MW10D-06B2MSD	0605254-02MSD	water	X

The following quality control samples were provided with this sample delivery group (SDG): Sample SJS02-FB0051806- field blank; Sample SJS02-TB0051806- trip blank; Sample SJS02-EB051806- equipment blank; Sample SJS02-MW10D-06B2P was the field duplicate of field sample SJS02-MW10D-06B2. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- GC/MS Performance *
- Initial/Continuing Calibrations *
- Blanks *
- Surrogate Recoveries *
- Laboratory Control Samples NA
- Matrix Spike Recoveries *
- Matrix Duplicate RPDs *

- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *
- Tentatively Identified Compounds *

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

There were no major issues found in the data validation of this data package.

Minor Problems

There were no minor issues found in the data validation of this data package.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 05/16-18/06 and samples were received at the laboratory 05/19/06. All sample preparation and analysis was performed within Region III holding time requirements.

Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff
President

Summary of Data Qualifications

Sample ID	Compound	Results	Q-Flag	Qualifier code
No qualifications were required.				

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

RL	Reporting limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

DataQual

Environmental Services, LLC

CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

August 9, 2006
SDG# 0606304, Empirical Laboratory
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Ms. Arroyo,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #0606304. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work OLC03.2; the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) and National Functional Guidelines for Low Concentration Organic Data Review, 6/2001. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	LC-VOA
SJS02-MW10D-06B3	0606304-01	water	X
SJS02-MW10D-06B3P	0606304-02	water	X
SJS02-FB062206	0606304-03	water	X
SJS02-TB062206	0606304-04	water	X
SB062606W	0606304-05	water	X
SJS02-MW10D-06B3MS	0606304-01 MS	water	X
SJS02-MW10D-06B3MSD	0606304-01 MSD	water	X

The following quality control samples were provided with this sample delivery group (SDG): Sample SJS02-FB062206- field blank; Sample SJS02-TB062206- trip blank; Sample SJS02-MW10D-06BP was the field duplicate of field sample SJS02-MW10D-06B. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- GC/MS Performance *
- Initial/Continuing Calibrations
- Blanks
- Surrogate Recoveries
- Laboratory Control Samples NA
- Matrix Spike Recoveries *
- Matrix Duplicate RPDs *
- Field Duplicates *

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- Identification/Quantitation *
- Reporting Limits *
- Tentatively Identified Compounds *

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

There were no major issues found in the data validation of this data package.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues is presented in the following paragraphs.

The continuing calibration associated with the samples exhibited high % D values for dichlorodifluoromethane, ethylbezene, isopropylbenzene and methylene chloride. All results for these compounds were qualified as estimated (J/UJ).

Blank contamination was noted in the method blank associated with the samples in this batch. Qualifications were added to the data.

Two samples exhibited low recovery for surrogate trans-1,3-dichloropropene-d4 which resulted in all associated compounds being qualified as estimated (J/UJ).

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 06/22/06 and samples were received at the laboratory 06/22/06. All sample preparation and analysis was performed within Region III holding time requirements.

Initial/Continuing Calibration

Calibration standards exhibited %Ds that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag	Qualifier code
CC 07/06/06	dichlorodifluoromethane ethylbezene isopropylbenzene methylene chloride	53.2% 32.7% 31.4% 41.5%	all samples (except MS/MSD)	J/UJ	CCH

Blanks

The associated method blank exhibited contamination as noted in the following table. Sample results are qualified as indicated.

Blank ID	Compound	Concentration	CRQL	Action Level
V5BLK0706	methylene chloride	0.45J ug/L	0.50 ug/L	4.5 ug/L

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag
SJS02-MW10D-06B3P	methylene chloride	B

Surrogates/DMC

Samples SB062606W and SJS02-FB0622 exhibited low recovery for DMC trans-1,3-dichloropropene-d4, with 79% and 76% recoveries, which resulted in qualifying all associated compounds as estimated (J/UJ), qualifier code, SSL.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff

Laura Maschhoff
President

Summary of Data Qualifications

Sample ID	Compound	Results	Q-Flag	Qualifier code
all samples	dichlorodifluoromethane ethylbezene isopropylbenzene methylene chloride	+/-	J/UJ	CCH
SJS02-MW10D-06B3P	methylene chloride	+	B	BL
SB062606W, SJS02-FB0622	all compounds associated with: trans-1,3-dichloropropene-d4	+/-	J/UJ	SSL

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

RL	Reporting limit
+	positive result
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QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
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ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
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LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

January 22, 2007
SDG# 11648, CompuChem
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Mr. Van Oosten,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #11648. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work OLC03.2; the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) and National Functional Guidelines for Low Concentration Organic Data Review, 6/2001. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	LC-VOA
SJS02-MW10D-06D	1164801	water	X
SJS02-MW10DP-06BD	1164802	water	X
SJS02-EB112806	1164804	water	X
SJS02-TB112806	1164805	water	X
SJS02-FB112806	1164803	water	X
SJS02-MW10D-06D MS	122032	water	X
SJS02-MW10D-06D MSD	122033	water	X

The following quality control samples were provided with this sample delivery group (SDG): Sample SJS02-EB112806- equipment blank; Sample SJS02-FB112806- field blank; Sample SJS02-TB112806- trip blank; Sample SJS02-MW10DP-06D was the field duplicate of field sample SJS02-MW10D-06D. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- GC/MS Performance *
- Initial/Continuing Calibrations
- Blanks
- Deuterated Monitoring Compounds
- Laboratory Control Samples NA
- Matrix Spike Recoveries *
- Matrix Duplicate RPDs *

- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *
- Tentatively Identified Compounds *

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

There were no major issues found in the data validation of this data package.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues is presented in the following paragraphs.

The continuing calibration associated with the samples exhibited a low RRF value for methyl acetate that resulted in qualifications for this compound.

Blank contamination was noted in the method, holding and QC blanks associated with the samples in this batch. Qualifications were added to the data.

Two samples exhibited low deuterated monitoring compound recoveries that resulted in qualifying some compound results as estimated.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 11/28/06 and samples were received at the laboratory 11/29/06. All sample preparation and analysis was performed within Region III holding time requirements.

Initial/Continuing Calibration

Calibration standards exhibited RRF values that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag	Qualifier code
CC 12/02/06	methyl acetate	0.047	all samples (except MS/MSD)	L/R	CCL

Blanks

The associated method, holding and QC blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table, see worksheets for full list. Sample results are qualified as indicated.

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKRQ	methylene chloride	0.14J	0.50	1.4
VHBLKXB	methylene chloride	0.55	0.50	5.5
SJS02-EB112806	methylene chloride	0.37J	0.50	3.7
	toluene	0.13J	0.50	0.65
SJS02-FB112806	methylene chloride	0.39J	0.50	3.9
	toluene	0.14J	0.50	0.7
SJS02-TB112806	methylene chloride	0.22J	0.50	2.2

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW10D-06D, SJS02-MW10DP-06D	methylene chloride	B	BL
SJS02-MW10D-06D, SJS02-MW10DP-06D	toluene	B	BL

Deuterated Monitoring Compounds

Sample SJS02-EB112806 exhibited low recovery for DMC trans-1,3-dichloropropene-d4 (78%) and sample SJS02-TB112806 exhibited low recovery for DMCs trans-1,3-dichloropropene-d4 (78%) and bromoform-d (72%) which resulted in qualifying all associated compounds as estimated (J/UJ), qualifier code, SSL.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff

President

Summary of Data Qualifications

Sample ID	Compound	Results	Q-Flag	Qualifier code
all samples	methyl acetate	+/-	L/R	CCL
SJS02-MW10D-06D, SJS02-MW10DP-06D	methylene chloride toluene	+	B	BL
SJS02-EB112806	all compounds associated with: trans-1,3-dichloropropene-d4	+/-	J/UJ	SSL
SJS02-TB112806	all compounds associated with: trans-1,3-dichloropropene-d4 bromoform-d	+/-	J/UJ	SSL

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

RL	Reporting limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

DataQual

Environmental Services, LLC

CH2M HILL-WDC
15010 Conference Center Drive
Suite 200
Chantilly, Virginia 20151

August 1, 2007
SDG# 13087, CompuChem
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Ms. Davenport,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #13087. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work OLC03.2; the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) and National Functional Guidelines for Low Concentration Organic Data Review, 6/2001. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	LC-VOA
SJS02-EB052907	1308706	water	X
SJS02-FB052907	1308705	water	X
SJS02-MW01D-07B	1308719	water	X
SJS02-MW01S-07B	1308718	water	X
SJS02-MW02S-07B	1308714	water	X
SJS02-MW03S-07B	1308715	water	X
SJS02-MW04S-07B	1308713	water	X
SJS02-MW05S-07B	1308709	water	X
SJS02-MW05S-07BP	1308710	water	X
SJS02-MW06S-07B	1308702	water	X
SJS02-MW08S-07B	1308701	water	X
SJS02-MW09S-07B	1308712	water	X
SJS02-MW12S-07B	1308708	water	X
SJS02-MW13S-07B	1308716	water	X
SJS02-TB052907	1308704	water	X
SJS02-TB053107	1308711	water	X
SJS02-TB060107	1308717	water	X
SJS02-TB060407-2	1308720	water	X

The following quality control samples were provided with this sample delivery group (SDG): Sample SJS02-EB052907 equipment blank; Sample SJS02-FB052907- field blank; Samples SJS02-TB052907, SJS02-TB053107, SJS02-TB060107 and SJS02-TB060407-2- trip blank; Sample SJS02-MW05S-07BP was the field duplicate of field sample SJS02-MW05S-07B. The samples were evaluated based on the following criteria:

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- Data Completeness *
- Technical Holding Times *
- GC/MS Performance *
- Initial/Continuing Calibrations *
- Blanks
- Deuterated Monitoring Compounds
- Laboratory Control Samples *
- Matrix Spike Recoveries NA
- Matrix Duplicate RPDs NA
- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *
- Tentatively Identified Compounds *

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

No issues requiring rejection of the analytical data were found in the validation of this SDG.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues is presented in the following paragraphs.

LC-VOA

Blank contamination was noted in the method, holding and QC blanks associated with the samples in this batch. Qualifications were added to the data.

Several samples exhibited non-compliant DMC recoveries that required qualifications to be added to the data.

Specific Evaluation of Data

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 05/29-06/04/07 and samples were received at the laboratory 05/30-06/05/07. All sample preparation and analysis was performed within Region III holding time requirements.

Blanks

LC-VOA

The associated method, holding and QC blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table, see worksheets for full list. Sample results are qualified as indicated.

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKKS	methylene chloride	0.19J	0.50	1.9
VBLKLV	methylene chloride	0.26J	0.50	2.6
VBLKLX	methylene chloride	0.30J	0.50	3.0
VHBLKXK	methylene chloride	0.22J	0.50	2.2
SJS02-TB052907	methylene chloride	0.36J	0.50	3.6
SJS02-TB0531-07	methylene chloride	1.9	0.50	19
SJS02-TB060107	methylene chloride	0.60	0.50	6.0
SJS02-TB060407-2	methylene chloride	0.48J	0.50	4.8
SJS02-FB052907	methylene chloride	0.65	0.50	6.5
SJS02-FB060507-2	methylene chloride	0.77	0.50	7.7
	chloromethane	0.11J	0.50	0.55
SJS02-EB052907	methylene chloride	0.94	0.50	9.4

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW01D-07D, SJS02-MW01S-07B, SJS02-MW02-07B, SJS02-MW03S-07B, SJS02-MW04S-07B, SJS02-MW05S-07B, SJS02-MW05S-07BP, SJS02-MW06S-07B, SJS02-MW08S-07B, SJS02-MW09S-07B, SJS02-MW12S-07B, SJS02-MW13S-07B	methylene chloride	B	BL
SJS02-MW01S-07B, SJS02-MW03S-07B, SJS02-MW09S-07B	chloromethane	B	BL

Deuterated Monitoring Compounds

LC-VOA

The following samples exhibited non-compliant DMCs for the compounds listed; qualifications were applied to the compounds associated with each DMC as stated in the table below.

Sample ID	Non-compliant DMC	%Rec	QC Limits	Q-flag	Q-Code
SJS02-MW09S-07B	chloroethane-d5	130	60-126	J	SSH
SJS02-MW13S-07B	chloroethane-d5	132	60-126		
SJS02-TB060107	1,2-dichloroethane-d4	140	78-129		
SJS02-MW01S-07B	chloroethane-d5	128	60-126		

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff

Laura Maschhoff
President

Summary of Data Qualifications

LC-VOA

Sample ID	Compound	Results	Q-Flag	Qualifier code
SJS02-MW01D-07D, SJS02-MW01S-07B, SJS02-MW02-07B, SJS02-MW03S-07B, SJS02-MW04S-07B, SJS02-MW05S-07B, SJS02-MW05S-07BP, SJS02-MW06S-07B, SJS02-MW08S-07B, SJS02-MW09S-07B, SJS02-MW12S-07B, SJS02-MW13S-07B	methylene chloride	+	B	BL
SJS02-MW01S-07B, SJS02-MW03S-07B, SJS02-MW09S-07B	chloromethane	+	B	BL
SJS02-MW09S-07B, SJS02-MW13S-07B, SJS02-MW01S-07B	compounds associated with: chloroethane-d5	+	J	SSH
SJS02-TB060107	compounds associated with: 1,2-dichloroethane-d4	+	J	SSH

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

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UJ	reported quantitation limit is qualified as estimated
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NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
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General Abbreviations

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QUALIFIER CODE REFERENCE

Qualifier	Description
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EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
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OT	Other - explained in data validation report

DataQual

Environmental Services, LLC

CH2M HILL-WDC
15010 Conference Center Drive
Suite 200
Chantilly, Virginia 20151

August 1, 2007
SDG# 13371, CompuChem
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Ms. Davenport,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #13371. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work OLC03.2; the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) and National Functional Guidelines for Low Concentration Organic Data Review, 6/2001. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	LC-VOA
SJS02-MW16S-07C	1337101	water	X
SJS02-MW16P-07C	1337102	water	X
SJS02-EB071307	1337103	water	X
SJS02-FB071307	1337104	water	X
SJS02-TB071307	1337105	water	X
SJS02-MW16S-07BS MS	145273	water	X
SJS02-MW16S-07BS MSD	145274	water	X

The following quality control samples were provided with this sample delivery group (SDG): Sample SJS02-EB071307- equipment blank; Sample SJS02-FB071307- field blank; Sample SJS02-TB071307-2- trip blank; Sample SJS02-MW16P-07C was the field duplicate of field sample SJS02-MW16S-07C. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- GC/MS Performance *
- Initial/Continuing Calibrations *
- Blanks
- Deuterated Monitoring Compounds *
- Laboratory Control Samples NA
- Matrix Spike Recoveries *
- Matrix Duplicate RPDs *

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- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *
- Tentatively Identified Compounds

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

No issues requiring rejection of the analytical data were found in the validation of this SDG.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues is presented in the following paragraphs.

LC-VOA

Blank contamination was noted in the method, holding and QC blanks associated with the samples in this batch. Qualifications were added to the data.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 07/13/07 and samples were received at the laboratory 07/14/07. All sample preparation and analysis was performed within Region III holding time requirements.

Blanks

LC-VOA

The associated method and QC blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table, see worksheets for full list. Sample results are qualified as indicated.

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
SJS02-TB071307	methylene chloride	0.30J	0.50	3.0
SJS02-EB071307	methylene chloride	0.47J	0.50	4.7
SJS02-FB071307	methylene chloride	0.51	0.50	5.1

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW16P-07C, SJS02-MW16S-07C	methylene chloride	B	BL

The associated blanks exhibited contamination for TICs. All B flagged TICs in the field samples are flagged B and crossed out in accordance with the Region III modifications to the National Functional Guidelines.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff

Laura Maschhoff
President

Summary of Data Qualifications

LC-VOA

Sample ID	Compound	Results	Q-Flag	Qualifier code
SJS02-MW16P-07C, SJS02-MW16S-07C	methylene chloride	+	B	BL
all samples	"B" flagged TICs	+	B	BL

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

RL	Reporting limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

Data Completeness

The data package was received complete and intact. Resubmissions were not required. (Method CLP OLC03.2 with Region III modifications.)

Holding Times

Sampling Date: 06/05-06/07
Received Date: 06/06-07/07
Analysis Dates: 06/08/07

Cooler Temp: 1.6-3.2°C

All holding time requirements were met.

Calibrations

Mass assignments were verified by the injection of BFB.

No qualifications required for the initial and continuing calibrations.

Internal Standards

All criteria were met.

Blank Summary

Blank qualification guidelines:

- No action is taken if a compound is found in the blank but not in the sample.
- Sample weight, volume or dilution factor must be taken into consideration when applying the 5X or 10X criteria.
- Apply the same data validation guidelines to any associated field QC blanks and all associated samples.
- Qualification/Action codes:

No Action -	The sample result is greater than the CRQL and greater than five times (5X) or ten times (10x) the blank value.
B -	The sample result is less than five times (5X) or ten times (10x) the blank value.

Contamination was exhibited in the method, holding and QC blanks, see table below. No qualifications were required for TICs. The QC blanks associated with these samples were: SJS02-TB060507, SJS02-TB060607, SJS02-EB-053107 and SJS02-FB060507-2. Per client request, the field QC blanks have not been qualified for method blank contamination.

Blank Contamination and Qualification Summaries

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKLX	acetone	4.5J	5.0	45
	methylene chloride	0.30J	0.50	3
	toluene	0.11J	0.50	0.55
	bromoform	0.26J	0.50	1.3
	1,2,4-trichlorobenzene	0.10J	0.50	0.5
	1,2,3-trichlorobenzene	0.11J	0.50	0.55
VHBLKXY	methylene chloride	0.15J	0.50	1.5
SJS02-TB060507	methylene chloride	0.52	0.50	5.2
SJS02-TB060607	methylene chloride	1.1	0.50	11
SJS02-FB060507-2	methylene chloride	0.77	0.50	7.7
	chloromethane	0.11J	0.50	0.55
SJS02-EB053107	methylene chloride	1J	0.50	10

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW10D-07B, SJS02-MW02D-07B, SJS02-MW05D-07B	methylene chloride	B	BL
SJS02-MW10D-07B, SJS02-MW10D-07BP, SJS02-MW05D-07B	chloromethane	B	BL

DMCs

All criteria were met.

Laboratory Control Sample

All criteria were met.

Matrix Spike/Spike Duplicate Samples

An MS/MSD was not submitted for this data package.

Field Duplicate Sample

Field duplicate was analyzed on sample SJS02-MW10D-07B- no qualifications were required.

Specific Comments:

All sample results were reported within the calibration range of the instruments. Detection limits were acceptable. Raw data and calculations were verified.

As requested, we have limited the supporting documentation, found with these worksheets, to those forms that indicate qualifications.

Reviewer Ilona Maschmeyer **Date:** 7/23/07

FIELD DUPLICATE SAMPLE SUMMARY

Sample ID: SJS02-MW10D-07B
Duplicate Sample ID: SJS02-MW10D-07BP

Water: RPD>30%
Soil: RPD>50%

Compound	Sample Conc.	Dup. Sample Conc.	%RPD
cis-1,2-dichloroethene	1.3	1.4	7
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
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			#DIV/0!

COMMENTS: No qualifications required.

* result below the CRQL

Initial Calibration Date: 6/6/2007

RRF and %RSD Calculations:

Compound Name: vinyl chloride
Lab Value: 0.691

Area of Compound	711182
Area of Internal STD	205834
Conc. of Internal STD	125
Conc. of Compound	625
Calculated RRF	0.691

Compound Name: ethylbenzene
Lab Value: 4.3

RRF of STD 1	2.187
RRF of STD 2	2.270
RRF of STD 3	2.097
RRF of STD 4	2.347
RRF of STD 5	2.280
Calculated % RSD	4.31

Continuing Calibration File ID: 6/8/2007

RRF and %D Calculations:

Compound Name: methylene chloride
Lab Value: 0.327

Area of Compound	66082
Area of Internal STD	201780
Conc. of Internal STD	125
Conc. of Compound	125
Calculated RRF	0.327

Compound Name: acetone
Lab Value: 28.6

Average RRF	0.091
Calibration Check RRF	0.065
Calculated % D	28.6

SAMPLE CALCULATION

Sample ID: SJS02-FB060507-2
Standard ID: 6/8/2007
Compound: methylene chloride
Concnetration: 0.77 ug/L

	Water (ug/L)	Soil (ug/Kg)	Soil ug/Kg)
Area of Compound	7663		
Area of Internal STD	151988		
Conc. of Internal (ng)	125	250	
RRF of Compound	0.327		
Dilution Factor	1	1	
Weight of Sample	NA	5.96	
Volume of Sample	25	NA	
% Moisture	NA		
Aliquot of methol	NA	NA	
Concentration	0.77	#DIV/0!	#DIV/0!

	RT of Internal STD	RT of Compound	RRT
Sample	9.795	7.118	0.7
Standard	9.789	7.112	0.7

DataQual

Environmental Services, LLC

CH2M HILL-WDC
15010 Conference Center Drive
Suite 200
Chantilly, Virginia 20151

August 1, 2007
SDG# 13113, CompuChem
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Ms. Davenport,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #13113. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work OLC03.2; the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) and National Functional Guidelines for Low Concentration Organic Data Review, 6/2001. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	LC-VOA
SJS02-FB060507-2	1311304	water	X
SJS02-MW10D-07B	1311306	water	X
SJS02-MW10D-07BP	1311307	water	X
SJS02-MW02D-07B	1311301	water	X
SJS02-MW05D-07B	1311302	water	X
SJS02-TB060507	1311303	water	X
SJS02-TB060607	1311308	water	X

The following quality control samples were provided with this sample delivery group (SDG): Sample SJS02-FB060507-2- field blank; Samples SJS02-TB060507 and SJS02-TB060607- trip blank; Sample SJS02-MW10D-07BP was the field duplicate of field sample SJS02-MW10D-07B. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- GC/MS Performance *
- Initial/Continuing Calibrations *
- Blanks
- Deuterated Monitoring Compounds *
- Laboratory Control Samples *
- Matrix Spike Recoveries NA
- Matrix Duplicate RPDs NA

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- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *
- Tentatively Identified Compounds *

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

No issues requiring rejection of the analytical data were found in the validation of this SDG.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues is presented in the following paragraphs.

LC-VOA

Blank contamination was noted in the method, holding and QC blanks associated with the samples in this batch. Qualifications were added to the data.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 06/05-06/07 and samples were received at the laboratory 06/06-07/07. All sample preparation and analysis was performed within Region III holding time requirements.

Blanks

LC-VOA

The associated method, holding and QC blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table, see worksheets for full list. Sample results are qualified as indicated.

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKLX	methylene chloride	0.30J	0.50	3
VHBLKXY	methylene chloride	0.15J	0.50	1.5
SJS02-TB060507	methylene chloride	0.52	0.50	5.2
SJS02-TB060607	methylene chloride	1.1	0.50	11
SJS02-FB060507-2	methylene chloride	0.77	0.50	7.7
	chloromethane	0.11J	0.50	0.55
SJS02-EB053107	methylene chloride	1J	0.50	10

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW10D-07B, SJS02-MW02D-07B, SJS02-MW05D-07B	methylene chloride	B	BL
SJS02-MW10D-07B, SJS02-MW10D-07BP, SJS02-MW05D-07B	chloromethane	B	BL

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff

Laura Maschhoff
President

Summary of Data Qualifications

LC-VOA

Sample ID	Compound	Results	Q-Flag	Qualifier code
SJS02-MW10D-07B, SJS02-MW02D-07B, SJS02-MW05D-07B	methylene chloride	+	B	BL
SJS02-MW10D-07B, SJS02-MW10D-07BP, SJS02-MW05D-07B	chloromethane	+	B	BL

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

RL	Reporting limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

Data Completeness

The data package was received complete and intact. Resubmissions were not required. (Method CLP OLM04.3 with Region III modifications.)

Holding Times

Sampling Date: 05/31-06/04-06/07
Received Date: 06/01-07/07
Analysis Dates: 06/01-12/07

Cooler Temp: 1.6-3.2°C

All holding time requirements were met.

Calibrations

Mass assignments were verified by the injection of BFB.

No qualifications required for the initial calibrations. The continuing calibration required qualifications due to high %Ds, see attached Form VII.

Internal Standards

All criteria were met.

Blank Summary

Blank qualification guidelines:

- No action is taken if a compound is found in the blank but not in the sample.
- Sample weight, volume or dilution factor must be taken into consideration when applying the 5X or 10X criteria.
- Apply the same data validation guidelines to any associated field QC blanks and all associated samples.
- Qualification/Action codes:

No Action -	The sample result is greater than the CRQL and greater than five times (5X) or ten times (10x) the blank value.
B -	The sample result is less than five times (5X) or ten times (10x) the blank value.

Contamination was exhibited in the method and QC blanks, see table below. Qualifications were required for TICs. The associated holding blanks exhibited no positive results. The QC blanks associated with these samples were: SJS-TB060407 (no positive results), SJS02-TB060507, SJS02-TB060607, SJS02-EB-053107 and SJS02-FB053107 (no positive results), SJS02-FB060507. Per client request, the field QC blanks have not been qualified for method blank contamination.

Blank Contamination and Qualification Summaries

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKLA	acetone	7.0	10	70
	toluene	0.8J	10	4.0
VBLKLG	acetone	7J	10	70
	2-butanone	2J	10	20
VBLKLI	methylene chloride	3J	10	30
SJS02-TB060507	methylene chloride	0.52	0.50	5.2
SJS02-TB060607	methylene chloride	1.1	0.50	11
SJS02-FB060507	methylene chloride	1J	10	10
SJS02-EB053107	methylene chloride	1J	10	10

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW07S-07B, SJS02-MW10S-07B, SJS02-MW14S-07B, SJS02-MW15S-07B	methylene chloride	B	BL

Surrogates

All criteria were met.

Laboratory Control Sample

All criteria were met.

Matrix Spike/Spike Duplicate Samples

An MS/MSD was not submitted for this data package.

Field Duplicate Sample

Field duplicate was not submitted for this data package.

Specific Comments:

All sample results were reported within the calibration range of the instruments. Dilutions were required for the following samples to obtain results within the calibration range: SJS02-MW07S-07B and SJS02-MW10S-07B. In order to obtain results within the calibration range for the highest concentrated compounds some of the lower elevated results were diluted out and therefore the results from the initial analysis were used, even though the result was above the calibration range. Therefore, for sample SJS02-MW07S-07B the initial analysis result for compounds 1,1-dichloroethene and trans-1,2-dichloroethene were used and qualified as estimated (J) since the result was above the calibration range, qualifier code: LR. Therefore, for sample SJS02-MW10S-07B the initial analysis result for compound trans-1,2-dichloroethene was used and qualified as estimated (J) since the result was above the calibration range, qualifier code: LR.

Detection limits were acceptable. Raw data and calculations were verified.

As requested, we have limited the supporting documentation, found with these worksheets, to those forms that indicate qualifications.

Reviewer L Mascello **Date:** 7/23/07

DataQual

Environmental Services, LLC

CH2M HILL-WDC
15010 Conference Center Drive
Suite 200
Chantilly, Virginia 20151

August 1, 2007
SDG# 13093, CompuChem
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Ms. Davenport,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #13093. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work OLM04.3; the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review). All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	VOA
SJS02-EB053107	1309302	water	X
SJS02-FB053107	1309301	water	X
SJS02-FB060507	1309309	water	X
SJS02-MW07S-07B	1309304	water	X
SJS02-MW10S-07B	1309310	water	X
SJS02-MW11S-07B	1309305	water	X
SJS02-MW14S-07B	1309311	water	X
SJS02-MW15S-07B	1309308	water	X
SJS02-MW16S-07B	1309307	water	X
SJS02-TB060407	1309306	water	X

The following quality control samples were provided with this sample delivery group (SDG): Sample SJS02-EB053107- equipment blank; Samples SJS02-FB053107 and SJS02-FB060507- field blank; Sample SJS02-TB060407- trip blank. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- GC/MS Performance *
- Initial/Continuing Calibrations
- Blanks
- Surrogates *
- Laboratory Control Samples *
- Matrix Spike Recoveries NA
- Matrix Duplicate RPDs NA
- Field Duplicates *

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- Identification/Quantitation
- Reporting Limits *
- Tentatively Identified Compounds

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

No issues requiring rejection of the analytical data were found in the validation of this SDG.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues is presented in the following paragraphs.

VOA

The associated calibrations exhibited high %Ds that resulted in qualifications to the data.

Blank contamination was noted in the method and QC blanks associated with the samples in this batch. Qualifications were added to the data.

Two samples required dilutions to obtain results within the calibration range. In order to obtain results within the calibration range for the highest concentrated compounds some of the lower elevated results were diluted out. Therefore the results from the initial analysis were used, even though the results were above the calibration range, these results were qualified as estimated.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 05/31-06/04-06/07 and samples were received at the laboratory 06/01-07/07. All sample preparation and analysis was performed within Region III holding time requirements.

Initial/Continuing Calibrations

VOA

Calibration standards exhibited high %Ds that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag	Qual code
CC 06/01/07	methylene chloride	41.4%	SJS02-EB053107	J	CCH
CC 06/11/07	vinyl chloride	26.8%	SJS02-MW07S-07BDL	J	CCH

Blanks

VOA

The associated method, holding and QC blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table, see worksheets for full list. Sample results are qualified as indicated.

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKLI	methylene chloride	3J	10	30
SJS02-TB060507	methylene chloride	0.52	0.50	5.2
SJS02-TB060607	methylene chloride	1.1	0.50	11
SJS02-FB060507	methylene chloride	1J	10	10
SJS02-EB053107	methylene chloride	1J	10	10

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW07S-07B, SJS02-MW10S-07B, SJS02-MW14S-07B, SJS02-MW15S-07B	methylene chloride	B	BL

The associated blanks exhibited contamination for TICs. All B flagged TICs in the field samples are flagged B and crossed out in accordance with the Region III modifications to the National Functional Guidelines.

Identification/Quantitation

VOA

Dilutions were required for the following samples to obtain results within the calibration range: SJS02-MW07S-07B and SJS02-MW10S-07B. In order to obtain results within the calibration range for the highest concentrated compounds some of the lower elevated results were diluted out and therefore the results from the initial analysis were used, even though the results were above the calibration range. Therefore, for sample SJS02-MW07S-07B the initial analysis result for compounds 1,1-dichloroethene and trans-1,2-dichloroethene were used and qualified as estimated (J) since the result was above the calibration range, qualifier code: LR. Therefore, for sample SJS02-MW10S-07B the initial analysis result for compound trans-1,2-dichloroethene was used and qualified as estimated (J) since the result was above the calibration range, qualifier code: LR.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff

Laura Maschhoff
President

Summary of Data Qualifications

VOA

Sample ID	Compound	Results	Q-Flag	Qualifier code
SJS02-EB053107	methylene chloride	+	J	CCH
SJS02-MW07S-07BDL	vinyl chloride	+	J	CCH
SJS02-MW07S-07B, SJS02-MW10S-07B, SJS02-MW14S-07B, SJS02-MW15S-07B	methylene chloride	+	B	BL
SJS02-MW07S-07B, SJS02-MW10S-07B	all E-flagged compound results	+	R	DL
SJS02-MW07S-07BDL, SJS02-MW10S-07BDL	all results except D-flagged compounds	+/-	R	DL
SJS02-MW07S-07B	1,1-dichloroethene, trans-1,2-dichloroethene	+	J	LR
SJS02-MW10S-07B	trans-1,2-dichloroethene	+	J	LR

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

RL	Reporting limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

Data Completeness

The data package was received complete and intact. Resubmissions were not required. (Method CLP OLC03.2 with Region III modifications.)

Holding Times

Sampling Date: 05/29-06/04/07
Received Date: 05/30-06/05/07
Analysis Dates: 06/05-08/07

Cooler Temp: 2.1-2.2°C

All holding time requirements were met.

Calibrations

Mass assignments were verified by the injection of BFB.

No qualifications required for the initial and continuing calibrations.

Internal Standards

All criteria were met.

Blank Summary

Blank qualification guidelines:

- No action is taken if a compound is found in the blank but not in the sample.
- Sample weight, volume or dilution factor must be taken into consideration when applying the 5X or 10X criteria.
- Apply the same data validation guidelines to any associated field QC blanks and all associated samples.
- Qualification/Action codes:

No Action -	The sample result is greater than the CRQL and greater than five times (5X) or ten times (10x) the blank value.
B -	The sample result is less than five times (5X) or ten times (10x) the blank value.

Contamination was exhibited in the method, holding and QC blanks, see table below. No qualifications were required for TICs. The QC blanks associated with these samples were: SJS02-TB052907, SJS02-TB053107, SJS02-TB060107, SJS-TB060407-2, SJS02-EB052907, SJS02-FB052907 and SJS2-FB060507-2. Per client request, the field QC blanks have not been qualified for method blank contamination.

Blank Contamination and Qualification Summaries

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKKR	acetone	7.2	5.0	72
	2-butanone	1.0J	5.0	10
	toluene	0.12J	0.50	0.6
	1,2,4-trichlorobenzene	0.12J	0.50	0.6
	1,2,3-trichlorobenzene	0.15J	0.50	0.75
VBLKKS	methylene chloride	0.19J	0.50	1.9
VBLKLV	methylene chloride	0.26J	0.50	2.6
	1,4-dichlorobenzene	0.12J	0.50	0.6
	1,2,4-trichlorobenzene	0.23J	0.50	1.15
VBLKLW	1,2,4-trichlorobenzene	0.13J	0.50	0.65
VBLKLX	methylene chloride	0.30J	0.50	3.0
	1,2,4-trichlorobenzene	0.10J	0.50	0.5
VHBLKXK	methylene chloride	0.22J	0.50	2.2
SJS02-TB052907	methylene chloride	0.36J	0.50	3.6
SJS02-TB0531-07	methylene chloride	1.9	0.50	19
SJS02-TB060107	methylene chloride	0.60	0.50	6.0
SJS02-TB060407-2	methylene chloride	0.48J	0.50	4.8
SJS02-FB052907	methylene chloride	0.65	0.50	6.5
SJS02-FB060507-2	methylene chloride	0.77	0.50	7.7
	chloromethane	0.11J	0.50	0.55
SJS02-EB052907	methylene chloride	0.94	0.50	9.4

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW01D-07D, SJS02-MW01S-07B, SJS02-MW02-07B, SJS02-MW03S-07B, SJS02-MW04S-07B, SJS02-MW05S-07B, SJS02-MW05S-07BP, SJS02-MW06S-07B, SJS02-MW08S-07B, SJS02-MW09S-07B, SJS02-MW12S-07B, SJS02-MW13S-07B	methylene chloride	B	BL
SJS02-MW01S-07B, SJS02-MW03S-07B, SJS02-MW09S-07B	chloromethane	B	BL

DMCs

All criteria were met with the exception of the following list in the table below.

Sample ID	Non-compliant DMC	%Rec	QC Limits	Q-flag	Q-Code
SJS02-MW09S-07B	chloroethane-d5	130	60-126	J	SSH
SJS02-MW13S-07B	chloroethane-d5	132	60-126		
SJS02-TB060107	1,2-dichloroethane-d4	140	78-129		
SJS02-MW01S-07B	chloroethane-d5	128	60-126		

Laboratory Control Sample

All criteria were met.

Matrix Spike/Spike Duplicate Samples

An MS/MSD was not submitted for this data package.

Field Duplicate Sample

Field duplicate was analyzed on sample SJS02-MW05S-07B- no qualifications were required.

Specific Comments:

All sample results were reported within the calibration range of the instruments. Detection limits were acceptable. Raw data and calculations were verified.

As requested, we have limited the supporting documentation, found with these worksheets, to those forms that indicate qualifications.

Reviewer L Marchioff **Date:** 7/23/07

Data Completeness

The data package was received complete and intact. Resubmissions were not required. (Method CLP OLC03.2 with Region III modifications.)

Holding Times

Sampling Date: 07/13/07
Received Date: 07/14/07
Analysis Dates: 07/16/07

Cooler Temp: 1.8°C

All holding time requirements were met.

Calibrations

Mass assignments were verified by the injection of BFB.

No qualifications required for the initial and continuing calibrations.

Internal Standards

All criteria were met.

Blank Summary

Blank qualification guidelines:

- No action is taken if a compound is found in the blank but not in the sample.
- Sample weight, volume or dilution factor must be taken into consideration when applying the 5X or 10X criteria.
- Apply the same data validation guidelines to any associated field QC blanks and all associated samples.
- Qualification/Action codes:

No Action -	The sample result is greater than the CRQL and greater than five times (5X) or ten times (10x) the blank value.
B -	The sample result is less than five times (5X) or ten times (10x) the blank value.

Contamination was exhibited in the method and QC blanks, see table below. Qualifications were required for TICs. The QC blanks associated with these samples were: SJS02-TB071307, SJS02-EB071307 and SJS02-FB071307. Per client request, the field QC blanks have not been qualified for method blank contamination.

Blank Contamination and Qualification Summaries

Blank ID	Compound	Concentration ug/L	CRQL ug/L	Action Level ug/L
VBLKAD	1,2,4-trichlorobenzene	0.12J	0.50	0.60
SJS02-TB071307	methylene chloride	0.30J	0.50	3.0
SJS02-EB071307	methylene chloride	0.47J	0.50	4.7
SJS02-FB071307	methylene chloride	0.51	0.50	5.1
	chlorobenzene	0.12J	0.50	1.2

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
SJS02-MW16P-07B2, SJS02-MW16S-07B2	methylene chloride	B	BL

DMCs

No qualifications were required.

Laboratory Control Sample

An LCS was not submitted for this data package.

Matrix Spike/Spike Duplicate Samples

An MS/MSD was submitted for sample SJS02-MW16S-07B2—no qualifications were required.

Field Duplicate Sample

Field duplicate was analyzed on sample SJS02-MW16S-07B2- no qualifications were required.

Specific Comments:

All sample results were reported within the calibration range of the instruments.

Detection limits were acceptable. Raw data and calculations were verified.

As requested, we have limited the supporting documentation, found with these worksheets, to those forms that indicate qualifications.

Reviewer L Maschoff **Date:** 7/30/07

DataQual

Environmental Services, LLC

CH2M HILL-WDC
15010 Conference Center Drive
Suite 200
Chantilly, Virginia 20151

August 3, 2007
Lab #s P0706148, P0706120 and P0706096
MicroSeeps, Incorporated
St. Juliens Creek Annex, Chesapeake, Virginia

Dear Ms. Davenport,

The following Data Validation report is provided as requested for the parameters noted in the table below for Lab #s P0706148, P0706120 and P0706096. The data validation was performed in accordance with the quality control requirements of the MicroSeeps SOP-AM20GAx Revision 7, 9/06. Also used in the validation of these samples was the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) as applicable. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	MEE
SJS02-MW10S-07C	P0706148-01	water	X
SJS02-MW14S-07C	P0706148-02	water	X
SJS02-TB060607-2	P0706148-03	water	X
SJS02-MW16S-07C	P0706120-01	water	X
SJS02-MW15S-07C	P0706120-02	water	X
SJS02-MW07S-07C	P0706096-01	water	X
SJS02-TB060407-3	P0706096-02	water	X

MEE – methane, ethane, and ethene

The following quality control samples were provided with this sample delivery group (SDG): samples SJS02-TB060607-2 and SJS02-TB060407-3-trip blanks. Please note that there was no trip blank associated with samples SJS02-MW16S-07C and SJS02-MW15S-07C based on client supplied QC blank tracking. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- GC Performance *
- Initial/Continuing Calibrations *
- Blanks
- Laboratory Control Samples *
- Matrix Spike Recoveries NA
- Matrix Duplicate RPDs NA

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- Field Duplicates NA
- Identification/Quantitation *
- Reporting Limits *

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

No issues requiring rejection of the analytical data were found in the validation of this SDG.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues is presented in the following paragraphs.

Specific Evaluation of Data

Data Completeness

Resubmissions were required for the submitted data packages. Raw data and calibration curve information were missing from the data package. The missing raw data, calibration-curve information and calculation examples were requested and received from the laboratory. Copies of all e-mail correspondence are included in these validation worksheets.

Technical Holding Times

According to chain of custody records, sampling was performed on 6/4-6/07 and samples were received at the laboratory 6/6-8/07. All sample preparation and analysis was performed within method holding time requirements.

Blanks

MEE by AM20GAx

One of the associated trip blanks exhibited contamination as noted in the following table.

Blank ID	Compound	Concentration	Action Level
SJS02-TB060607-2	ethane	0.170 ug/L	0.85 ug/L

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Q Code
SJS02-MW10S-07B	ethane	B	BL

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Jacqueline Cleveland

Jacqueline Cleveland
Vice-President

Summary of Data Qualifications

MEE by AM20Gax

Sample ID	Compound	Results	Q-Flag	Q code
SJS02-MW10S-07B	ethane	+	B	BL

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high
X	dioxins only: estimated maximum possible concentration

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

RL	Reporting limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report
%SOL	High moisture content

Data Completeness

The data package was received intact and complete. Resubmissions were not required. (Methane, Ethane and Ethene- AM20GAX SOP obtained from Microseeps (subcontractor of Empirical)) The report included carbon dioxide and hydrogen as target compounds. However, DataQual, ES LLC was contracted to validate only methane, ethane and ethene. Therefore, carbon dioxide and hydrogen were crossed off the Form 1s to eliminate any confusion.

Holding Times

Sampling Date: 6/4-6/07
Received Date: 6/6-8/07
Extraction Date: NA
Analysis Dates: 6/8-19-07

All holding time requirements were

Calibrations

A five-point calibration curve was analyzed for the target compounds methane, ethane and ethene. RFs and %RSDs were calculated using the external standard method. The laboratory processed the curves by plotting linear regression or quadratic curves. These curves met calibration criteria. Continuing calibration standards were analyzed per the method. All %Ds were within QC limits in the CCVs analyzed (+/-20% lab QC limit).

Blank Summary

Blank qualification guidelines:

- No action is taken if a compound is found in the blank but not in the sample.
- Any compound detected in the sample, and the associated blank, must be qualified by elevating the result to the limit of detection or by adjusting the limit of detection to the sample result, when the sample concentration is less than five (5) times the blank concentration.
- Sample weight, volume or dilution factor must be taken into consideration when applying the 5X criteria.
- Apply the same data validation guidelines to any associated rinse and field blanks and all associated samples.
- Qualification/Action codes:

U -	The sample result is greater than the RL and less than five times (5X) the blank value. Cross out the "B" flag and qualify the sample result with a "U".
RL -	The sample result is less than the RL and less than five times (5X) the blank value. Reject the sample result, cross out the "B" flag, and report the RL.
No Action -	The sample result is greater than the RL and greater than five times (5X) the blank value.
B -	The sample result is less than five times (5X) the blank value. (Region III)

Note: Compounds for which there was no action required are not included in the following tables.

The associated field QC for this data package was trip blanks SJS02-TB060407-3 & SJS02-TB060607-2. There was not a trip blank associated with all of the field samples (see submitted QC tracking from CH2M). Blanks were

associated based on client submitted QC tracking. All method blanks and instrument blanks were clean of contamination. One qualification was required based on trip blank contamination.

Blank Contamination and Qualification Summaries

Blank ID	Compound	Concentration	Action Level
SJS02-TB060607-2	ethane	0.170 ug/L	0.85 ug/L

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Q Code
SJS02-MW10S-07B	ethane	B	BL

Laboratory Control Sample

All LCS samples were acceptable.

Matrix Spike/Spike Duplicate Samples

There was no MS/MSD pair in this SDG.

Field Duplicate Sample Summary

There was no field duplicate pair submitted for the MEE fraction.

Specific Comments:

Detection limits were acceptable. Raw data and calculations were verified. All quantitation was performed by linear regression or quadratic curve. Raw data and calibration curve information were missing from the data package. The missing raw data, calibration-curve information and calculation examples were requested and received from the laboratory. Copies of all e-mail correspondence are included in these validation worksheets.

As requested we have limited the supporting documentation, found with these worksheets, to those forms that indicate qualifications were required.

Reviewer Jacqueline A Cleveland **Date:** 8/2/07

CH2M HILL
5700 Cleveland St.
Suite 101
Virginia Beach, Virginia 23462

July 19, 2007
SDG# IE30005, Shealy Environmental Services
St. Julien's Creek Site 4

Dear Mr. VanOosten

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #IE30005 for Select Metals by ICP-MS. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work ILM05.3 and the Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Data Review, 4/93, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) as applicable. Method QC limits were applied for QC standards (CRI and ICSA/ICSAB standards) because Region III doesn't have validation guidance for ILM05.3. The laboratory met site-specific detection limits. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided. Please note: In the body of the report the symbol TM is used to indicate total metals and the symbol DM is used to indicate dissolved metals.

Sample ID	**Lab ID**	**Matrix**	**Total Metals**	**Dissolved Metals**
SJS04-MW01S-07B	IE30005-001	water	X	X
SJS04-MW01S-07BMS	IE30005-001MS	water	X	X
SJS04-MW04S-07B	IE30005-001	water	X	X
SJS04-MW04S-07BMD	IE30005-001MD	water	X	
SJS04-MW04SP-07B	IE30005-002	water	X	X
SJS04-MW03S-07B	IE30005-003	water	X	X
SJS04-MW05S-07B	IE30005-004	water	X	X
SJS04-FB052907	IE30005-006	water	X	
SJS04-EB052907	IE30005-007	water		X

The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- Initial/Continuing Calibrations *
- CRI Standards *
- Interference Check Sample *
- Blanks
- Internal Standard Recoveries *

- Laboratory Control Samples *
- Matrix Spike Recoveries *
- Matrix Duplicate RPDs *
- Post Digestion Spike Recoveries *
- Serial Dilutions *
- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *

*- Indicates that no qualifications were required based on this criteria

The following quality control samples were used to validate this sample delivery group (SDG): sample SJS04-MW04SP-07B-field duplicate of SJS04-MW04S-07B. The field QC blanks were SJS04-EB052907 and SJS04-FB052907.

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

There were no major problems in the validation of this SDG. No data required rejection.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues for each fraction is presented in the following paragraphs. All results qualified as estimated J/UJ or biased high, K or biased low, L/UL, should be considered usable but estimated.

Total and Dissolved ICP-MS Metals

Blank contamination was noted in the laboratory blanks associated with the samples in this batch. Qualifications were added to the data. Specific information is provided below.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 5/29/07 and samples were received at the laboratory 5/30/07. All sample preparation and analysis was performed within Region III holding time requirements.

Blanks

Total and Dissolved ICP-MS Metals

Contamination was noted in the preparation and lab blanks. Qualification was required based on the lab blank contamination. Contamination and sample results qualifications are indicated in the following tables.

Blank ID	Analyte	Concentration	Action Level	Q Flag
ICB	lead	0.047J ug/L	0.235 ug/L	B
SJS04-FB052907	lead	0.18J ug/L	0.90 ug/L	B

The concentration noted for the ICB/CCB is the highest concentration in all the CCBs. However, when qualifying samples for CCB contamination, associated samples are those just prior to or just following a CCB. Therefore, not all analytes in all samples are flagged for CCB contamination.

Sample ID	analyte	Q Flag	Q Code
SJS04-MW04SP-07B DM, SJS04-MW03S-07B DM, SJS04-MW05S-07B TM, SJS04-MW03S-07B TM	lead	B+ up to action limit	BL

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Jacqueline Cleveland
Vice-President

Summary of Data Qualifications

Total and Dissolved ICP-MS Metals

Sample ID	Analyte	Results	Q Flag	Q code
SJS04-MW04SP-07B DM, SJS04-MW03S-07B DM, SJS04-MW05S-07B TM, SJS04-MW03S-07B TM	lead	+ up to action limit	B	BL

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

IDL	Instrument Detection Limit
MDL	Method Detection Limit
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
Q Code	Qualifier Code
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report
%SOL	High moisture content

Data Completeness

The data package was received complete and intact. Resubmissions were not required. (Method SW846 8260B with Region III modifications.)

Holding Times

Sampling Date: 05/14-24/07
Received Date: 05/14-24/07
Analysis Dates: 05/14-24/07

All holding time requirements were met.

Calibrations

Mass assignments were verified by the injection of BFB.

No qualifications required for the initial and continuing calibrations.

Internal Standards

All criteria were met.

Blank Summary

Blank qualification guidelines:

- No action is taken if a compound is found in the blank but not in the sample.
- Sample weight, volume or dilution factor must be taken into consideration when applying the 5X or 10X criteria.
- Apply the same data validation guidelines to any associated field QC blanks and all associated samples.
- Qualification/Action codes:

No Action -	The sample result is greater than the CRQL and greater than five times (5X) or ten times (10x) the blank value.
B -	The sample result is less than five times (5X) or ten times (10x) the blank value.

There was no contamination exhibited in the method and QC blanks. The QC blanks associated with these samples were: SJS02-FB051707 (no positive results), SJS02-EB051707 (no positive results) and SJS02-TB051707(no positive results). Per client request, the field QC blanks have not been qualified for method blank contamination.

Surrogates

All criteria were met.

Laboratory Control Sample

All criteria were met.

Matrix Spike/Spike Duplicate Samples

An MS/MSD was submitted for this data package for three samples. The MS/MSD for sample SJS02-PW14-07BP exhibited low results for chloroethane; however the sample exhibited results for this compound—no qualifications were required.

Field Duplicate Sample

Field duplicate was submitted for samples SJS02-PW06-07B and SJS02-PW13-07B. Sample SJS02-PW13-07B and duplicate sample SJS02-PW13-07BP did not exhibit comparable results for cis-1,2dichloroethene with 200%RPD; the results for this compound were qualified as estimated (J/UJ), qualifier code: FD.

Specific Comments:

All sample results were reported within the calibration range of the instruments.

Detection limits were acceptable. Raw data and calculations were verified.

The laboratory qualified positive results reported between the detection limit and the reporting limit as "UJ". The data validator has changed this qualifier to "J".

As requested, we have limited the supporting documentation, found with these worksheets, to those forms that indicate qualifications.

Reviewer Lynn Mascuno **Date:** 7/31/07

FIELD DUPLICATE SAMPLE SUMMARY

Sample ID: SJS02-PW06-07B
Duplicate Sample ID: SJS02-PW06-07BP

Water: RPD>30%
Soil: RPD>50%

Compound	Sample Conc.	Dup. Sample Conc.	%RPD
vinyl chloride	16	22	32
trans-1,2-dichloroethene **	0.57	0.63	10
cis-1,2-dichloroethene	45	41	9
trichloroethene	2.9	1.7	52
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!

COMMENTS: No qualifications required.

* result below the CRQL

FIELD DUPLICATE SAMPLE SUMMARY

Sample ID: SJS02-PW13-07B
Duplicate Sample ID: SJS02-PW13-07BP

Water: RPD>30%
Soil: RPD>50%

Compound	Sample Conc.	Dup. Sample Conc.	%RPD
vinyl chloride*		0.91	200
cis-1,2-dichloroethene		3.9	200
trichloroethene *		0.89	200
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!

COMMENTS: Qualifications cis-1,2dichloroethene as estimated.

* result below the CRQL

Initial Calibration Date: 5/11/2007

RRF and %RSD Calculations:

Compound Name: vinyl chloride
Lab Value: 0.349

Area of Compound	281757
Area of Internal STD	2015767
Conc. of Internal STD	50
Conc. of Compound	20
Calculated RRF	0.349

Compound Name: chloromethane
Lab Value: 14.68

RRF of STD 1	0.514
RRF of STD 2	0.454
RRF of STD 3	0.414
RRF of STD 4	0.392
RRF of STD 5	0.364
RRF of STD 6	0.349
RRF of STD 7	0.360
RRF of STD 8	0.350
Calculated % RSD	14.7

Continuing Calibration File ID: 5/17/2007

RRF and %D Calculations:

Compound Name: methylene chloride
Lab Value: 0.252

Area of Compound	475116
Area of Internal STD	1888890
Conc. of Internal STD	50
Conc. of Compound	50
Calculated RRF	0.252

Compound Name: chloroform
Lab Value: 6.9

Average RRF	0.452
Calibration Check RRF	0.483
Calculated % D	-6.9

SAMPLE CALCULATION

Sample ID: SJS02-PW06-07BP
Standard ID: 5/17/2007
Compound: vinyl chloride
Concnetration: 22 ug/L

	Water (ug/L)	Soil (ug/Kg)	Soil ug/Kg)
Area of Compound	307417		
Area of Internal STD	1941600		
Conc. of Internal (ng)	250	250	
RRF of Compound	0.352		
Dilution Factor	1	1	
Weight of Sample	NA	5.96	
Volume of Sample	5	NA	
% Moisture	NA		
Aliquot of methol	NA	NA	
Concentration	22.49	#DIV/0!	#DIV/0!

	RT of Internal STD	RT of Compound	RRT
Sample	8.310	2.350	0.3
Standard	8.310	2.350	0.3

Appendix H
Flux and Partitioning Calculations

Table H-1

Site 2 Area Mixing Zone Calculation

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex, Chesapeake, Virginia

Flow Tube Number	Wells in Flow Tube	Flow Tube Segment[1]	Gradient Calculation [6]	Flow tube area [A]			Flow Tube Gradient (ft/ft) [i] [3]	Hydraulic Conductivity (ft/d) [K] [4]	Groundwater Discharge [Q=KiA]		
				Saturated Thickness (ft)[3]	Width (ft)[1,5]	Area (ft2) [A]			(gal/d)	(cf/s)	(L/day)
1	MW-13S	C	0.016	14	168	2402	0.021	3.5	1,297	0.0020	4914
	MW-14S	A	0.026								
	MW-15S	B	0.020								
2	MW-7S	D	0.047	10	157	1512	0.026	3.5	1,037	0.0016	3932
	MW-10S	E	0.017								
	MW-12S	F	0.015								
3	MW-8S	G	0.027	9	224	2076	0.027	3.5	1,476	0.0023	5592
4	MW-9S	H	0.032	6	230	1265	0.032	3.5	1,070	0.0017	4055
5	MW-5S	J	0.017	8	330	2802	0.020	3.5	1,431	0.0022	5423
	MW-6S	I	0.022								
								Groundwater Discharge Total:	6,310	0.0098	23,917
								Total Groundwater Discharge from Site 2 (cf/s):			0.010
								Wetland and/or Tidal Flow into and out of the Site 2 inlet (cf/s):			
								Dilution Ratio [(Inlet discharge + groundwater discharge)/groundwater discharge]:			1

NOTE - add the surface water flow rate here to calculate the dilution ratio

NOTE - this number defaults to "1" when no value is used for the inlet portion of flow within the Site 2 inlet

Notes:

[1] See planview map and conceptual model for locations of flow tubes (based on Figure 4-10)

[2] Saturated thicknesses based on saturated thicknesses of the sand and silty sand in the cross section 4-9. For well tubes 1, 2 and 3 used a saturated thickness of 19 ft. Well tubes 4 and 5 use a saturated thickness of 17.

[3] Average of all segments within the flow tube

[4] The geometric mean of the hydraulic conductivity in the Columbia Aqufer of Site 2 was obtained from the Tb4-4 summary of slug test results

[5] The width of the discharge area for flow tubes 1, 2, and 5 was calculated along the 0 ft potentiometric elevation at the edge of the wetland boundary. The discharge width for flow tubes 3 and 4 was calcualted along the 1 ft elevation potentiometric isocontour. The locations of this width is shown in the Site 2 Planview figure

[6] The flow tube gradient is calculated between wells and potentiometric isocontours shown in the gradient calculation markup of Figure 4-10

cfs = cubic feet per second

Figure H-1
Site 2 Groundwater Discharge to Inlet Conceptual Model
Used as the basis for calculating the groundwater discharge to the Site 2 inlet
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex, Chesapeake, Virginia

NOTE - schematic diagram modified for the January 28, 2008 flow tube calculation. Revisions in **blue text**.

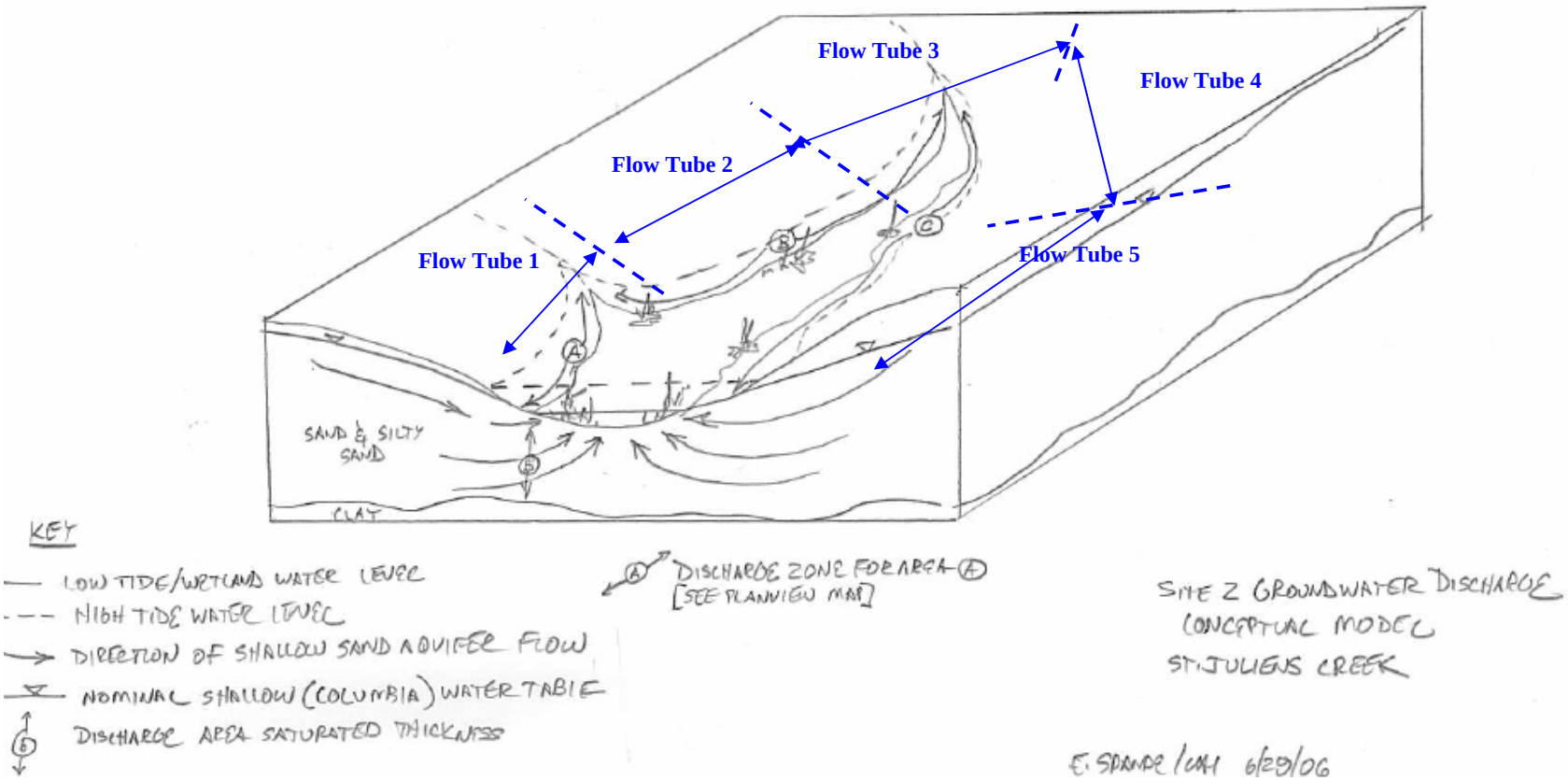


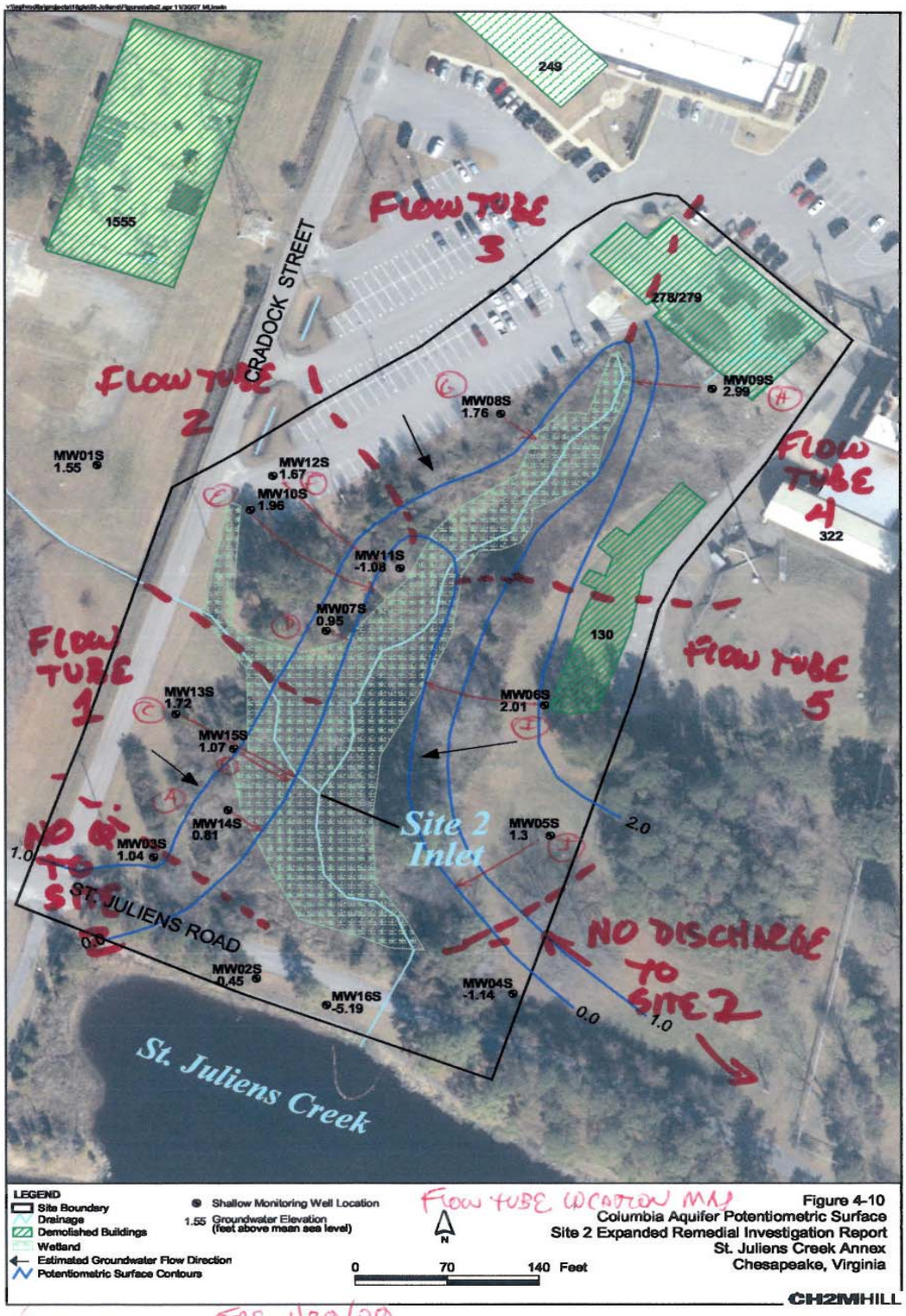
Figure H-2

Site 2 Groundwater Discharge Flow Tube Location Map

For unknown potentiometric surface

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex, Chesapeake, Virginia



EHS 11/28/08

Soil Saturation Limit Calculations

The following formula and definitions were taken from the *Soil Screening Guidance: Technical Background Document* (EPA, July 1996).

Derivation of the Soil Saturation Limit

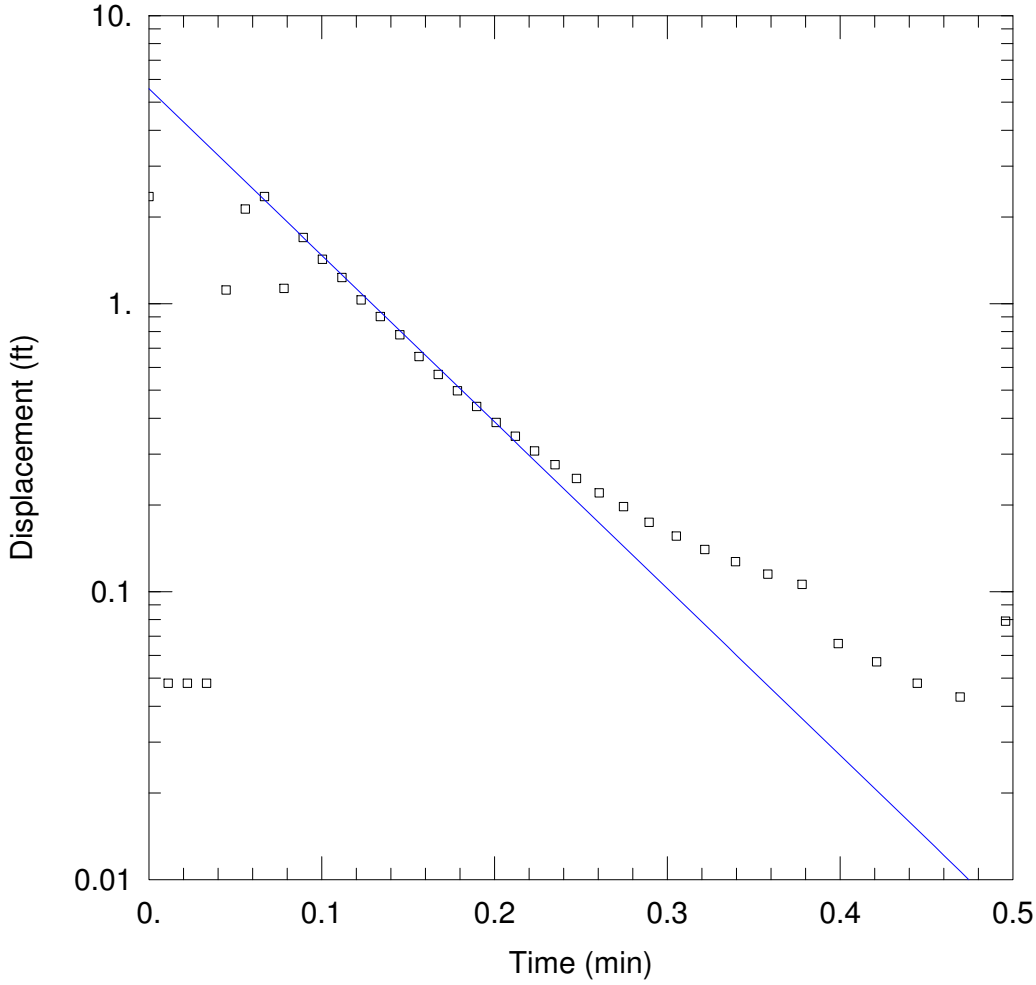
$$C_{sat} = \frac{S}{\rho_b}\left(K_d\,\rho_b + \theta_w + H'\,\theta_a\right)$$

Parameter/Definition (units)
C_{sat}/soil saturation concentration (mg/kg)
S/solubility in water (mg/L-water)
ρ_b/dry soil bulk density (kg/L)
K_d/soil-water partition coefficient (L/kg)
K_{oc}/soil organic carbon/water partition coefficient (L/kg)
f_{oc}/fraction organic carbon of soil (g/g)
θ_w/water-filled soil porosity (L_{water}/L_{soil})
H′/dimensionless Henry's law constant
H/Henry's law constant (atm-m^3/mol)
θ_a/air-filled soil porosity (L_{air}/L_{soil})
n/total soil porosity (L_{pore}/L_{soil})
ρ_s/soil particle density (kg/L)

	Chemical-Specific			Site-Specific											Calculations		
Parameter	S	Koc	H'	ρ_b	ρ_s	θa	θw	n	foc (min)	foc (max)	foc (ave)	Kd (min)	Kd (max)	Kd (ave)	Csat (min)	Csat (max)	Csat (ave)
PCE	200	155	0.754	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.155	11.315	3.1	71.0	2303	660
TCE	1100	166	0.422	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.166	12.118	3.32	403	13550	3872
111TCA	1330	110	0.705	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.11	8.03	2.2	412	10946	3192
cis12DCE	3500	35.5	0.167	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.0355	2.5915	0.71	824	9770	3185
11DCE	2250	58.9	1.07	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.0589	4.2997	1.178	583	10124	3101
11DCA	5030	31.6	0.23	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.0316	2.3068	0.632	1165	12609	4185
12DCA	8520	17.4	0.0401	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.0174	1.2702	0.348	1852	12526	4669
VC	2760	18.6	1.11	1.5	2.14	0	0.3	0.3	0.001	0.073	0.02	0.0186	1.3578	0.372	603	4300	1579

Notes:
1. Assume Soil is saturated with water.
2. Chemical-specific parameters from *Soil Screening Guidance: Technical Background Document* (EPA, July 1996).
3. Soil bulk density, total porosity, and fraction organic carbon are based on May 2007 soil data.

Appendix I
Slug Test Data



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW01D.aqt
Date: 08/08/05 Time: 12:22:08

AQUIFER DATA

Saturated Thickness: 145. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW01D)

Initial Displacement: 2.352 ft Static Water Column Height: 14. ft
Total Well Penetration Depth: 14. ft Screen Length: 10. ft
Casing Radius: 0.167 ft Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.01776 cm/sec y0 = 5.576 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:28:32
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-23 165012 02MW01DR .b
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: 02MW01DR

Test defined on: 11/23/04 16:49:45
Test started on: 11/23/04 16:50:12
Test stopped on: 11/23/04 16:52:59
Test extracted on: 11/23/04 18:58:02

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 66

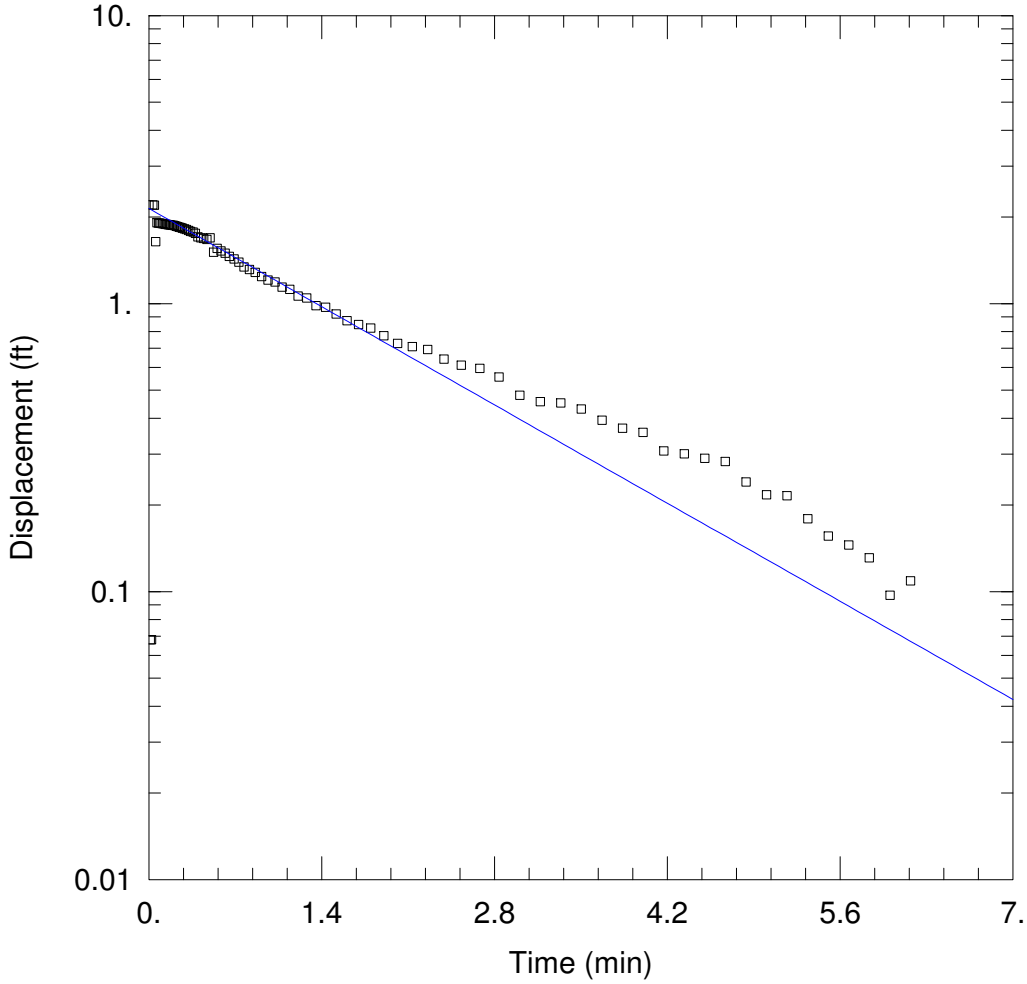
TOTAL DATA SAMPLES 66

Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 3.262 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 3.261 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/23/04	16:50:12	0.0000	3.262	29.970
11/23/04	16:50:12	0.0112	3.277	29.970
11/23/04	16:50:13	0.0223	3.277	29.972
11/23/04	16:50:14	0.0335	3.277	29.970
11/23/04	16:50:14	0.0447	3.602	29.972
11/23/04	16:50:15	0.0558	3.911	29.970
11/23/04	16:50:16	0.0670	3.979	29.970
11/23/04	16:50:16	0.0782	3.607	29.972
11/23/04	16:50:17	0.0893	3.779	29.970
11/23/04	16:50:18	0.1005	3.697	29.970
11/23/04	16:50:18	0.1117	3.638	29.970
11/23/04	16:50:19	0.1228	3.576	29.972
11/23/04	16:50:20	0.1340	3.537	29.970
11/23/04	16:50:20	0.1452	3.500	29.970
11/23/04	16:50:21	0.1563	3.462	29.970
11/23/04	16:50:22	0.1675	3.436	29.970
11/23/04	16:50:22	0.1787	3.414	29.970
11/23/04	16:50:23	0.1898	3.396	29.968
11/23/04	16:50:24	0.2010	3.380	29.970
11/23/04	16:50:24	0.2122	3.368	29.970
11/23/04	16:50:25	0.2233	3.356	29.968

11/23/04	16:50:26	0.2350	3.347	29.968
11/23/04	16:50:26	0.2475	3.338	29.970
11/23/04	16:50:27	0.2607	3.329	29.970
11/23/04	16:50:28	0.2747	3.323	29.970
11/23/04	16:50:29	0.2895	3.316	29.970
11/23/04	16:50:30	0.3052	3.310	29.970
11/23/04	16:50:31	0.3218	3.305	29.972
11/23/04	16:50:32	0.3395	3.301	29.972
11/23/04	16:50:33	0.3582	3.298	29.970
11/23/04	16:50:34	0.3780	3.295	29.970
11/23/04	16:50:35	0.3990	3.282	29.970
11/23/04	16:50:37	0.4212	3.280	29.968
11/23/04	16:50:38	0.4447	3.277	29.970
11/23/04	16:50:40	0.4695	3.276	29.970
11/23/04	16:50:41	0.4958	3.287	29.970
11/23/04	16:50:43	0.5238	3.253	29.970
11/23/04	16:50:45	0.5535	3.266	29.970
11/23/04	16:50:47	0.5848	3.262	29.968
11/23/04	16:50:49	0.6180	3.262	29.968
11/23/04	16:50:51	0.6532	3.258	29.970
11/23/04	16:50:53	0.6905	3.254	29.972
11/23/04	16:50:55	0.7300	3.254	29.970
11/23/04	16:50:58	0.7718	3.251	29.972
11/23/04	16:51:00	0.8162	3.249	29.970
11/23/04	16:51:03	0.8632	3.247	29.970
11/23/04	16:51:06	0.9130	3.243	29.970
11/23/04	16:51:09	0.9657	3.239	29.970
11/23/04	16:51:13	1.0215	3.241	29.968
11/23/04	16:51:16	1.0807	3.236	29.970
11/23/04	16:51:20	1.1433	3.230	29.968
11/23/04	16:51:24	1.2097	3.232	29.970
11/23/04	16:51:28	1.2800	3.230	29.970
11/23/04	16:51:33	1.3545	3.229	29.968
11/23/04	16:51:38	1.4335	3.225	29.968
11/23/04	16:51:43	1.5172	3.221	29.970
11/23/04	16:51:48	1.6057	3.220	29.968
11/23/04	16:51:53	1.6995	3.222	29.968
11/23/04	16:51:59	1.7988	3.215	29.970
11/23/04	16:52:06	1.9042	3.216	29.968
11/23/04	16:52:12	2.0157	3.218	29.970
11/23/04	16:52:20	2.1338	3.213	29.970
11/23/04	16:52:27	2.2590	3.216	29.966
11/23/04	16:52:35	2.3915	3.212	29.968
11/23/04	16:52:43	2.5320	3.209	29.968
11/23/04	16:52:52	2.6808	3.211	29.968



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW01S.aqt
Date: 08/08/05 Time: 12:19:50

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW01S)

Initial Displacement: 2.2 ft
Static Water Column Height: 12. ft
Total Well Penetration Depth: 12. ft
Screen Length: 10. ft
Casing Radius: 0.167 ft
Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0009257 cm/sec
y0 = 2.139 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:30:50
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-24 113018 02MW01SR2 .b
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: 21MW01SR2

Test defined on: 11/24/04 11:25:11
Test started on: 11/24/04 11:30:18
Test stopped on: 11/24/04 12:54:42
Test extracted on: 11/24/04 16:02:20

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 556

TOTAL DATA SAMPLES 556

Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 2.049 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 2.047 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/24/04	11:30:18	0.0000	2.054	29.848
11/24/04	11:30:18	0.0112	2.074	29.850
11/24/04	11:30:19	0.0223	2.074	29.850
11/24/04	11:30:20	0.0335	2.724	29.850
11/24/04	11:30:20	0.0447	2.724	29.848
11/24/04	11:30:21	0.0558	2.554	29.848
11/24/04	11:30:22	0.0670	2.635	29.848
11/24/04	11:30:22	0.0782	2.634	29.848
11/24/04	11:30:23	0.0893	2.633	29.846
11/24/04	11:30:24	0.1005	2.633	29.846
11/24/04	11:30:24	0.1117	2.631	29.848
11/24/04	11:30:25	0.1228	2.630	29.846
11/24/04	11:30:26	0.1340	2.628	29.848
11/24/04	11:30:26	0.1452	2.628	29.846
11/24/04	11:30:27	0.1563	2.627	29.848
11/24/04	11:30:28	0.1675	2.626	29.850
11/24/04	11:30:28	0.1787	2.625	29.846
11/24/04	11:30:29	0.1898	2.623	29.848
11/24/04	11:30:30	0.2010	2.624	29.850
11/24/04	11:30:30	0.2122	2.622	29.848
11/24/04	11:30:31	0.2233	2.620	29.846

11/24/04	11:30:32	0.2350	2.618	29.848
11/24/04	11:30:32	0.2475	2.616	29.848
11/24/04	11:30:33	0.2607	2.613	29.848
11/24/04	11:30:34	0.2747	2.611	29.848
11/24/04	11:30:35	0.2895	2.608	29.848
11/24/04	11:30:36	0.3052	2.605	29.848
11/24/04	11:30:37	0.3218	2.601	29.848
11/24/04	11:30:38	0.3395	2.597	29.846
11/24/04	11:30:39	0.3582	2.594	29.850
11/24/04	11:30:40	0.3780	2.589	29.846
11/24/04	11:30:41	0.3990	2.574	29.846
11/24/04	11:30:43	0.4212	2.569	29.846
11/24/04	11:30:44	0.4447	2.567	29.848
11/24/04	11:30:46	0.4695	2.563	29.846
11/24/04	11:30:47	0.4958	2.569	29.846
11/24/04	11:30:49	0.5238	2.513	29.848
11/24/04	11:30:51	0.5535	2.527	29.846
11/24/04	11:30:53	0.5848	2.518	29.848
11/24/04	11:30:55	0.6180	2.509	29.846
11/24/04	11:30:57	0.6532	2.498	29.846
11/24/04	11:30:59	0.6905	2.489	29.848
11/24/04	11:31:01	0.7300	2.478	29.846
11/24/04	11:31:04	0.7718	2.463	29.844
11/24/04	11:31:06	0.8162	2.454	29.848
11/24/04	11:31:09	0.8632	2.445	29.846
11/24/04	11:31:12	0.9130	2.432	29.846
11/24/04	11:31:15	0.9657	2.422	29.846
11/24/04	11:31:19	1.0215	2.416	29.848
11/24/04	11:31:22	1.0807	2.401	29.850
11/24/04	11:31:26	1.1433	2.395	29.848
11/24/04	11:31:30	1.2097	2.378	29.848
11/24/04	11:31:34	1.2800	2.372	29.848
11/24/04	11:31:39	1.3545	2.354	29.848
11/24/04	11:31:44	1.4335	2.350	29.850
11/24/04	11:31:49	1.5172	2.334	29.850
11/24/04	11:31:54	1.6057	2.320	29.848
11/24/04	11:31:59	1.6995	2.312	29.852
11/24/04	11:32:05	1.7988	2.305	29.852
11/24/04	11:32:12	1.9042	2.290	29.852
11/24/04	11:32:18	2.0157	2.276	29.852
11/24/04	11:32:26	2.1338	2.270	29.852
11/24/04	11:32:33	2.2590	2.265	29.852
11/24/04	11:32:41	2.3915	2.250	29.854
11/24/04	11:32:49	2.5320	2.240	29.854
11/24/04	11:32:58	2.6808	2.235	29.854
11/24/04	11:33:08	2.8383	2.223	29.854
11/24/04	11:33:18	3.0050	2.200	29.856
11/24/04	11:33:28	3.1717	2.193	29.856
11/24/04	11:33:38	3.3383	2.192	29.854
11/24/04	11:33:48	3.5050	2.185	29.858
11/24/04	11:33:58	3.6717	2.174	29.858
11/24/04	11:34:08	3.8383	2.166	29.856
11/24/04	11:34:18	4.0050	2.163	29.856
11/24/04	11:34:28	4.1717	2.148	29.856
11/24/04	11:34:38	4.3383	2.145	29.856
11/24/04	11:34:48	4.5050	2.142	29.856
11/24/04	11:34:58	4.6717	2.140	29.856
11/24/04	11:35:08	4.8383	2.127	29.856
11/24/04	11:35:18	5.0050	2.120	29.858
11/24/04	11:35:28	5.1717	2.119	29.856
11/24/04	11:35:38	5.3383	2.108	29.858
11/24/04	11:35:48	5.5050	2.101	29.858
11/24/04	11:35:58	5.6717	2.098	29.858
11/24/04	11:36:08	5.8383	2.094	29.856
11/24/04	11:36:18	6.0050	2.083	29.858
11/24/04	11:36:28	6.1717	2.087	29.856
11/24/04	11:36:38	6.3383	2.074	29.858
11/24/04	11:36:48	6.5050	2.065	29.858
11/24/04	11:36:58	6.6717	2.060	29.856
11/24/04	11:37:08	6.8383	2.062	29.856

11/24/04	11:37:18	7.0050	2.066	29.856
11/24/04	11:37:28	7.1717	2.067	29.858
11/24/04	11:37:38	7.3383	2.065	29.858
11/24/04	11:37:48	7.5050	2.072	29.856
11/24/04	11:37:58	7.6717	2.063	29.856
11/24/04	11:38:08	7.8383	2.062	29.856
11/24/04	11:38:18	8.0050	2.062	29.856
11/24/04	11:38:28	8.1717	2.061	29.856
11/24/04	11:38:38	8.3383	2.059	29.858
11/24/04	11:38:48	8.5050	2.056	29.854
11/24/04	11:38:58	8.6717	2.052	29.856
11/24/04	11:39:08	8.8383	2.057	29.856
11/24/04	11:39:18	9.0050	4.468	29.856
11/24/04	11:39:28	9.1717	4.468	29.856
11/24/04	11:39:38	9.3383	4.468	29.856
11/24/04	11:39:48	9.5050	4.468	29.854
11/24/04	11:39:58	9.6717	4.468	29.854
11/24/04	11:40:08	9.8383	4.468	29.856
11/24/04	11:40:18	10.0050	4.468	29.858
11/24/04	11:40:28	10.1717	4.468	29.858
11/24/04	11:40:38	10.3383	4.468	29.856
11/24/04	11:40:48	10.5050	4.468	29.858
11/24/04	11:40:58	10.6717	4.468	29.856
11/24/04	11:41:08	10.8383	4.468	29.854
11/24/04	11:41:18	11.0050	4.468	29.842
11/24/04	11:41:28	11.1717	4.468	29.846
11/24/04	11:41:38	11.3383	4.468	29.850
11/24/04	11:41:48	11.5050	4.468	29.852
11/24/04	11:41:58	11.6717	4.468	29.858
11/24/04	11:42:08	11.8383	4.468	29.860
11/24/04	11:42:18	12.0050	4.468	29.862
11/24/04	11:42:28	12.1717	4.468	29.866
11/24/04	11:42:38	12.3383	4.468	29.868
11/24/04	11:42:48	12.5050	4.468	29.868
11/24/04	11:42:58	12.6717	4.468	29.870
11/24/04	11:43:08	12.8383	4.468	29.872
11/24/04	11:43:18	13.0050	4.468	29.872
11/24/04	11:43:28	13.1717	4.468	29.874
11/24/04	11:43:38	13.3383	4.468	29.876
11/24/04	11:43:48	13.5050	4.468	29.878
11/24/04	11:43:58	13.6717	4.468	29.876
11/24/04	11:44:08	13.8383	4.468	29.876
11/24/04	11:44:18	14.0050	4.468	29.880
11/24/04	11:44:28	14.1717	4.468	29.876
11/24/04	11:44:38	14.3383	4.468	29.880
11/24/04	11:44:48	14.5050	4.468	29.882
11/24/04	11:44:58	14.6717	4.468	29.882
11/24/04	11:45:08	14.8383	4.468	29.882
11/24/04	11:45:18	15.0050	4.468	29.884
11/24/04	11:45:28	15.1717	4.468	29.882
11/24/04	11:45:38	15.3383	4.468	29.882
11/24/04	11:45:48	15.5050	4.468	29.880
11/24/04	11:45:58	15.6717	4.468	29.884
11/24/04	11:46:08	15.8383	4.468	29.882
11/24/04	11:46:18	16.0050	4.468	29.884
11/24/04	11:46:28	16.1717	4.468	29.882
11/24/04	11:46:38	16.3383	4.468	29.884
11/24/04	11:46:48	16.5050	4.468	29.882
11/24/04	11:46:58	16.6717	4.468	29.882
11/24/04	11:47:08	16.8383	4.468	29.884
11/24/04	11:47:18	17.0050	4.468	29.886
11/24/04	11:47:28	17.1717	4.468	29.884
11/24/04	11:47:38	17.3383	4.468	29.882
11/24/04	11:47:48	17.5050	4.468	29.884
11/24/04	11:47:58	17.6717	4.468	29.884
11/24/04	11:48:08	17.8383	4.468	29.884
11/24/04	11:48:18	18.0050	4.468	29.882
11/24/04	11:48:28	18.1717	4.468	29.884
11/24/04	11:48:38	18.3383	4.468	29.886
11/24/04	11:48:48	18.5050	4.468	29.884

11/24/04	11:48:58	18.6717	4.468	29.886
11/24/04	11:49:08	18.8383	4.468	29.886
11/24/04	11:49:18	19.0050	4.468	29.886
11/24/04	11:49:28	19.1717	4.468	29.884
11/24/04	11:49:38	19.3383	4.468	29.886
11/24/04	11:49:48	19.5050	4.468	29.886
11/24/04	11:49:58	19.6717	4.468	29.888
11/24/04	11:50:08	19.8383	4.468	29.886
11/24/04	11:50:18	20.0050	4.468	29.888
11/24/04	11:50:28	20.1717	4.468	29.886
11/24/04	11:50:38	20.3383	4.468	29.886
11/24/04	11:50:48	20.5050	4.468	29.888
11/24/04	11:50:58	20.6717	4.468	29.886
11/24/04	11:51:08	20.8383	4.468	29.888
11/24/04	11:51:18	21.0050	4.468	29.886
11/24/04	11:51:28	21.1717	4.468	29.884
11/24/04	11:51:38	21.3383	4.468	29.876
11/24/04	11:51:48	21.5050	4.468	29.872
11/24/04	11:51:58	21.6717	4.468	29.872
11/24/04	11:52:08	21.8383	4.468	29.870
11/24/04	11:52:18	22.0050	4.468	29.870
11/24/04	11:52:28	22.1717	4.468	29.868
11/24/04	11:52:38	22.3383	4.468	29.872
11/24/04	11:52:48	22.5050	4.468	29.882
11/24/04	11:52:58	22.6717	4.468	29.882
11/24/04	11:53:08	22.8383	4.468	29.878
11/24/04	11:53:18	23.0050	4.468	29.880
11/24/04	11:53:28	23.1717	4.468	29.880
11/24/04	11:53:38	23.3383	4.468	29.882
11/24/04	11:53:48	23.5050	4.468	29.870
11/24/04	11:53:58	23.6717	4.468	29.874
11/24/04	11:54:08	23.8383	4.468	29.874
11/24/04	11:54:18	24.0050	4.468	29.876
11/24/04	11:54:28	24.1717	4.468	29.876
11/24/04	11:54:38	24.3383	4.468	29.880
11/24/04	11:54:48	24.5050	4.468	29.882
11/24/04	11:54:58	24.6717	4.468	29.878
11/24/04	11:55:08	24.8383	4.468	29.878
11/24/04	11:55:18	25.0050	4.468	29.878
11/24/04	11:55:28	25.1717	4.468	29.878
11/24/04	11:55:38	25.3383	4.468	29.878
11/24/04	11:55:48	25.5050	4.468	29.880
11/24/04	11:55:58	25.6717	4.468	29.878
11/24/04	11:56:08	25.8383	4.468	29.878
11/24/04	11:56:18	26.0050	4.468	29.876
11/24/04	11:56:28	26.1717	4.468	29.876
11/24/04	11:56:38	26.3383	4.468	29.878
11/24/04	11:56:48	26.5050	4.468	29.876
11/24/04	11:56:58	26.6717	4.468	29.876
11/24/04	11:57:08	26.8383	4.468	29.876
11/24/04	11:57:18	27.0050	4.468	29.876
11/24/04	11:57:28	27.1717	4.468	29.878
11/24/04	11:57:38	27.3383	4.468	29.874
11/24/04	11:57:48	27.5050	4.468	29.874
11/24/04	11:57:58	27.6717	4.468	29.876
11/24/04	11:58:08	27.8383	4.468	29.876
11/24/04	11:58:18	28.0050	4.468	29.876
11/24/04	11:58:28	28.1717	4.468	29.876
11/24/04	11:58:38	28.3383	4.468	29.876
11/24/04	11:58:48	28.5050	4.468	29.876
11/24/04	11:58:58	28.6717	4.468	29.876
11/24/04	11:59:08	28.8383	4.468	29.876
11/24/04	11:59:18	29.0050	4.468	29.874
11/24/04	11:59:28	29.1717	4.468	29.874
11/24/04	11:59:38	29.3383	4.468	29.874
11/24/04	11:59:48	29.5050	4.468	29.876
11/24/04	11:59:58	29.6717	4.468	29.876
11/24/04	12:00:08	29.8383	4.468	29.876
11/24/04	12:00:18	30.0050	4.468	29.874
11/24/04	12:00:28	30.1717	4.468	29.874

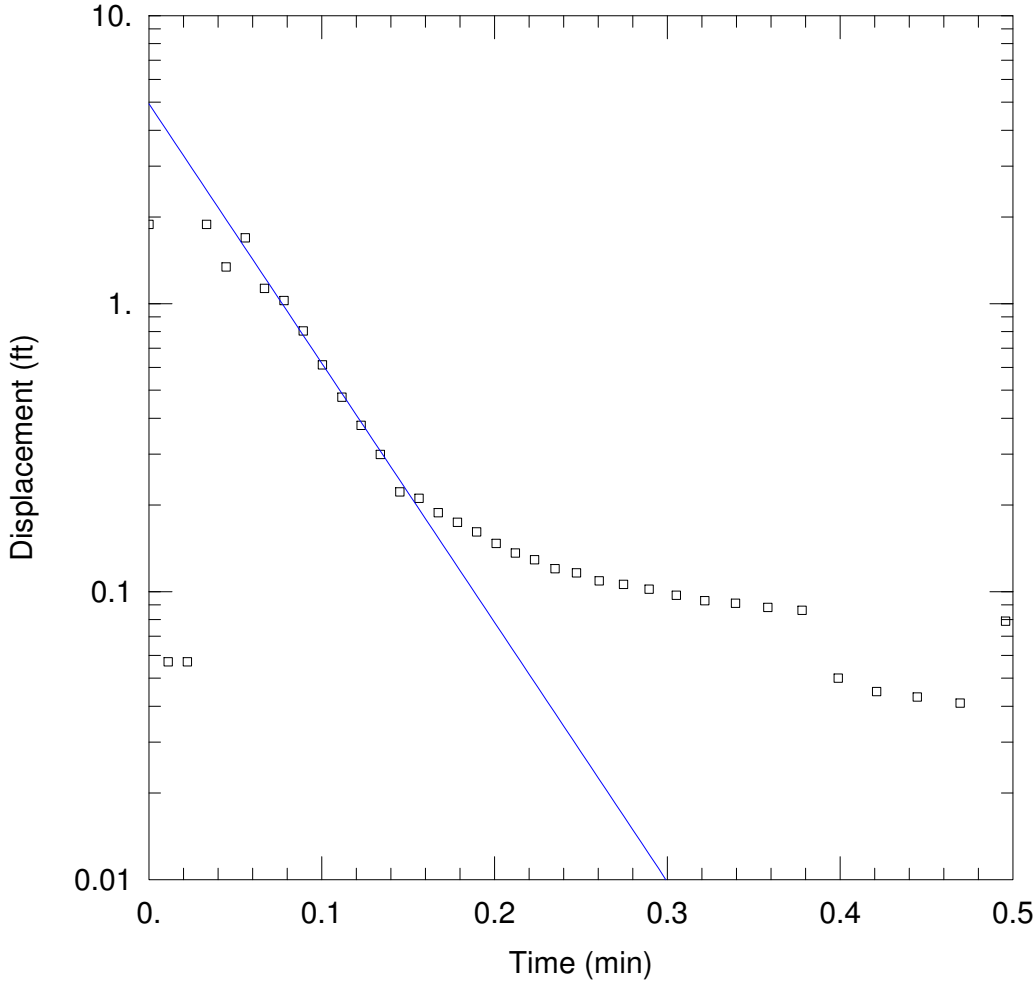
11/24/04	12:00:38	30.3383	4.468	29.876
11/24/04	12:00:48	30.5050	4.468	29.872
11/24/04	12:00:58	30.6717	4.468	29.872
11/24/04	12:01:08	30.8383	4.468	29.878
11/24/04	12:01:18	31.0050	4.468	29.872
11/24/04	12:01:28	31.1717	4.468	29.874
11/24/04	12:01:38	31.3383	4.468	29.874
11/24/04	12:01:48	31.5050	4.468	29.874
11/24/04	12:01:58	31.6717	4.468	29.874
11/24/04	12:02:08	31.8383	4.468	29.876
11/24/04	12:02:18	32.0050	4.468	29.878
11/24/04	12:02:28	32.1717	4.468	29.876
11/24/04	12:02:38	32.3383	4.468	29.876
11/24/04	12:02:48	32.5050	4.468	29.876
11/24/04	12:02:58	32.6717	4.468	29.876
11/24/04	12:03:08	32.8383	4.468	29.876
11/24/04	12:03:18	33.0050	4.468	29.876
11/24/04	12:03:28	33.1717	4.468	29.874
11/24/04	12:03:38	33.3383	4.468	29.876
11/24/04	12:03:48	33.5050	4.468	29.876
11/24/04	12:03:58	33.6717	4.468	29.876
11/24/04	12:04:08	33.8383	4.468	29.878
11/24/04	12:04:18	34.0050	4.468	29.876
11/24/04	12:04:28	34.1717	4.468	29.878
11/24/04	12:04:38	34.3383	4.468	29.874
11/24/04	12:04:48	34.5050	4.468	29.874
11/24/04	12:04:58	34.6717	4.468	29.874
11/24/04	12:05:08	34.8383	4.468	29.874
11/24/04	12:05:18	35.0050	4.468	29.876
11/24/04	12:05:28	35.1717	4.468	29.874
11/24/04	12:05:38	35.3383	4.468	29.874
11/24/04	12:05:48	35.5050	4.468	29.874
11/24/04	12:05:58	35.6717	4.468	29.876
11/24/04	12:06:08	35.8383	4.468	29.876
11/24/04	12:06:18	36.0050	4.468	29.874
11/24/04	12:06:28	36.1717	4.468	29.874
11/24/04	12:06:38	36.3383	4.468	29.874
11/24/04	12:06:48	36.5050	4.468	29.874
11/24/04	12:06:58	36.6717	4.468	29.874
11/24/04	12:07:08	36.8383	4.468	29.872
11/24/04	12:07:18	37.0050	4.468	29.874
11/24/04	12:07:28	37.1717	4.468	29.874
11/24/04	12:07:38	37.3383	4.468	29.874
11/24/04	12:07:48	37.5050	4.468	29.874
11/24/04	12:07:58	37.6717	4.468	29.874
11/24/04	12:08:08	37.8383	4.468	29.874
11/24/04	12:08:18	38.0050	4.468	29.876
11/24/04	12:08:28	38.1717	4.468	29.876
11/24/04	12:08:38	38.3383	4.468	29.874
11/24/04	12:08:48	38.5050	4.468	29.876
11/24/04	12:08:58	38.6717	4.468	29.872
11/24/04	12:09:08	38.8383	4.468	29.876
11/24/04	12:09:18	39.0050	4.468	29.872
11/24/04	12:09:28	39.1717	4.468	29.874
11/24/04	12:09:38	39.3383	4.468	29.874
11/24/04	12:09:48	39.5050	4.468	29.874
11/24/04	12:09:58	39.6717	4.468	29.872
11/24/04	12:10:08	39.8383	4.468	29.874
11/24/04	12:10:18	40.0050	4.468	29.874
11/24/04	12:10:28	40.1717	4.468	29.872
11/24/04	12:10:38	40.3383	4.468	29.874
11/24/04	12:10:48	40.5050	4.468	29.870
11/24/04	12:10:58	40.6717	4.468	29.874
11/24/04	12:11:08	40.8383	4.468	29.874
11/24/04	12:11:18	41.0050	4.468	29.872
11/24/04	12:11:28	41.1717	4.468	29.872
11/24/04	12:11:38	41.3383	4.468	29.872
11/24/04	12:11:48	41.5050	4.468	29.872
11/24/04	12:11:58	41.6717	4.468	29.870
11/24/04	12:12:08	41.8383	4.468	29.872

11/24/04	12:12:18	42.0050	4.468	29.872
11/24/04	12:12:28	42.1717	4.468	29.870
11/24/04	12:12:38	42.3383	4.468	29.870
11/24/04	12:12:48	42.5050	4.468	29.872
11/24/04	12:12:58	42.6717	4.468	29.872
11/24/04	12:13:08	42.8383	4.468	29.870
11/24/04	12:13:18	43.0050	4.468	29.872
11/24/04	12:13:28	43.1717	4.468	29.868
11/24/04	12:13:38	43.3383	4.468	29.868
11/24/04	12:13:48	43.5050	4.468	29.870
11/24/04	12:13:58	43.6717	4.468	29.868
11/24/04	12:14:08	43.8383	4.468	29.870
11/24/04	12:14:18	44.0050	4.468	29.868
11/24/04	12:14:28	44.1717	4.468	29.868
11/24/04	12:14:38	44.3383	4.468	29.868
11/24/04	12:14:48	44.5050	4.468	29.868
11/24/04	12:14:58	44.6717	4.468	29.868
11/24/04	12:15:08	44.8383	4.468	29.868
11/24/04	12:15:18	45.0050	4.468	29.868
11/24/04	12:15:28	45.1717	4.468	29.866
11/24/04	12:15:38	45.3383	4.468	29.866
11/24/04	12:15:48	45.5050	4.468	29.864
11/24/04	12:15:58	45.6717	4.468	29.866
11/24/04	12:16:08	45.8383	4.468	29.866
11/24/04	12:16:18	46.0050	4.468	29.866
11/24/04	12:16:28	46.1717	4.468	29.862
11/24/04	12:16:38	46.3383	4.468	29.866
11/24/04	12:16:48	46.5050	4.468	29.864
11/24/04	12:16:58	46.6717	4.468	29.866
11/24/04	12:17:08	46.8383	4.468	29.866
11/24/04	12:17:18	47.0050	4.468	29.864
11/24/04	12:17:28	47.1717	4.468	29.864
11/24/04	12:17:38	47.3383	4.468	29.864
11/24/04	12:17:48	47.5050	4.468	29.862
11/24/04	12:17:58	47.6717	4.468	29.862
11/24/04	12:18:08	47.8383	4.468	29.864
11/24/04	12:18:18	48.0050	4.468	29.862
11/24/04	12:18:28	48.1717	4.468	29.864
11/24/04	12:18:38	48.3383	4.468	29.862
11/24/04	12:18:48	48.5050	4.468	29.862
11/24/04	12:18:58	48.6717	4.468	29.862
11/24/04	12:19:08	48.8383	4.468	29.860
11/24/04	12:19:18	49.0050	4.468	29.862
11/24/04	12:19:28	49.1717	4.468	29.862
11/24/04	12:19:38	49.3383	4.468	29.862
11/24/04	12:19:48	49.5050	4.468	29.862
11/24/04	12:19:58	49.6717	4.468	29.862
11/24/04	12:20:08	49.8383	4.468	29.862
11/24/04	12:20:18	50.0050	4.468	29.860
11/24/04	12:20:28	50.1717	4.468	29.862
11/24/04	12:20:38	50.3383	4.468	29.860
11/24/04	12:20:48	50.5050	4.468	29.860
11/24/04	12:20:58	50.6717	4.468	29.860
11/24/04	12:21:08	50.8383	4.468	29.860
11/24/04	12:21:18	51.0050	4.468	29.860
11/24/04	12:21:28	51.1717	4.468	29.860
11/24/04	12:21:38	51.3383	4.468	29.860
11/24/04	12:21:48	51.5050	4.468	29.858
11/24/04	12:21:58	51.6717	4.468	29.858
11/24/04	12:22:08	51.8383	4.468	29.858
11/24/04	12:22:18	52.0050	4.468	29.860
11/24/04	12:22:28	52.1717	4.468	29.860
11/24/04	12:22:38	52.3383	4.468	29.860
11/24/04	12:22:48	52.5050	4.468	29.860
11/24/04	12:22:58	52.6717	4.468	29.858
11/24/04	12:23:08	52.8383	4.468	29.858
11/24/04	12:23:18	53.0050	4.468	29.860
11/24/04	12:23:28	53.1717	4.468	29.858
11/24/04	12:23:38	53.3383	4.468	29.860
11/24/04	12:23:48	53.5050	4.468	29.860

11/24/04	12:23:58	53.6717	4.468	29.858
11/24/04	12:24:08	53.8383	4.468	29.858
11/24/04	12:24:18	54.0050	4.468	29.858
11/24/04	12:24:28	54.1717	4.468	29.860
11/24/04	12:24:38	54.3383	4.468	29.858
11/24/04	12:24:48	54.5050	4.468	29.860
11/24/04	12:24:58	54.6717	4.468	29.858
11/24/04	12:25:08	54.8383	4.468	29.856
11/24/04	12:25:18	55.0050	4.468	29.856
11/24/04	12:25:28	55.1717	4.468	29.856
11/24/04	12:25:38	55.3383	4.468	29.858
11/24/04	12:25:48	55.5050	4.468	29.856
11/24/04	12:25:58	55.6717	4.468	29.856
11/24/04	12:26:08	55.8383	4.468	29.854
11/24/04	12:26:18	56.0050	4.468	29.854
11/24/04	12:26:28	56.1717	4.468	29.854
11/24/04	12:26:38	56.3383	4.468	29.854
11/24/04	12:26:48	56.5050	4.468	29.852
11/24/04	12:26:58	56.6717	4.468	29.852
11/24/04	12:27:08	56.8383	4.468	29.854
11/24/04	12:27:18	57.0050	4.468	29.852
11/24/04	12:27:28	57.1717	4.468	29.854
11/24/04	12:27:38	57.3383	4.468	29.854
11/24/04	12:27:48	57.5050	4.468	29.852
11/24/04	12:27:58	57.6717	4.468	29.850
11/24/04	12:28:08	57.8383	4.468	29.852
11/24/04	12:28:18	58.0050	4.468	29.852
11/24/04	12:28:28	58.1717	4.468	29.854
11/24/04	12:28:38	58.3383	4.468	29.854
11/24/04	12:28:48	58.5050	4.468	29.850
11/24/04	12:28:58	58.6717	4.468	29.852
11/24/04	12:29:08	58.8383	4.468	29.852
11/24/04	12:29:18	59.0050	4.468	29.854
11/24/04	12:29:28	59.1717	4.468	29.852
11/24/04	12:29:38	59.3383	4.468	29.854
11/24/04	12:29:48	59.5050	4.468	29.852
11/24/04	12:29:58	59.6717	4.468	29.854
11/24/04	12:30:08	59.8383	4.468	29.854
11/24/04	12:30:18	60.0050	4.468	29.854
11/24/04	12:30:28	60.1717	4.468	29.854
11/24/04	12:30:38	60.3383	4.468	29.854
11/24/04	12:30:48	60.5050	4.468	29.854
11/24/04	12:30:58	60.6717	4.468	29.852
11/24/04	12:31:08	60.8383	4.468	29.852
11/24/04	12:31:18	61.0050	4.468	29.852
11/24/04	12:31:28	61.1717	4.468	29.854
11/24/04	12:31:38	61.3383	4.468	29.856
11/24/04	12:31:48	61.5050	4.468	29.856
11/24/04	12:31:58	61.6717	4.468	29.850
11/24/04	12:32:08	61.8383	4.468	29.846
11/24/04	12:32:18	62.0050	4.468	29.844
11/24/04	12:32:28	62.1717	4.468	29.850
11/24/04	12:32:38	62.3383	4.468	29.850
11/24/04	12:32:48	62.5050	4.468	29.840
11/24/04	12:32:58	62.6717	4.468	29.848
11/24/04	12:33:08	62.8383	4.468	29.850
11/24/04	12:33:18	63.0050	4.468	29.852
11/24/04	12:33:28	63.1717	4.468	29.852
11/24/04	12:33:38	63.3383	4.468	29.852
11/24/04	12:33:48	63.5050	4.468	29.854
11/24/04	12:33:58	63.6717	4.468	29.852
11/24/04	12:34:08	63.8383	4.468	29.856
11/24/04	12:34:18	64.0050	4.468	29.860
11/24/04	12:34:28	64.1717	4.468	29.858
11/24/04	12:34:38	64.3383	4.468	29.854
11/24/04	12:34:48	64.5050	4.468	29.858
11/24/04	12:34:58	64.6717	4.468	29.858
11/24/04	12:35:08	64.8383	4.468	29.858
11/24/04	12:35:18	65.0050	4.468	29.858
11/24/04	12:35:28	65.1717	4.468	29.858

11/24/04	12:35:38	65.3383	4.468	29.860
11/24/04	12:35:48	65.5050	4.468	29.858
11/24/04	12:35:58	65.6717	4.468	29.858
11/24/04	12:36:08	65.8383	4.468	29.856
11/24/04	12:36:18	66.0050	4.468	29.854
11/24/04	12:36:28	66.1717	4.468	29.856
11/24/04	12:36:38	66.3383	4.468	29.856
11/24/04	12:36:48	66.5050	4.468	29.856
11/24/04	12:36:58	66.6717	4.468	29.858
11/24/04	12:37:08	66.8383	4.468	29.858
11/24/04	12:37:18	67.0050	4.468	29.856
11/24/04	12:37:28	67.1717	4.468	29.856
11/24/04	12:37:38	67.3383	4.468	29.856
11/24/04	12:37:48	67.5050	4.468	29.856
11/24/04	12:37:58	67.6717	4.468	29.854
11/24/04	12:38:08	67.8383	4.468	29.856
11/24/04	12:38:18	68.0050	4.468	29.858
11/24/04	12:38:28	68.1717	4.468	29.856
11/24/04	12:38:38	68.3383	4.468	29.856
11/24/04	12:38:48	68.5050	4.468	29.854
11/24/04	12:38:58	68.6717	4.468	29.858
11/24/04	12:39:08	68.8383	4.468	29.854
11/24/04	12:39:18	69.0050	4.468	29.856
11/24/04	12:39:28	69.1717	4.468	29.856
11/24/04	12:39:38	69.3383	4.468	29.856
11/24/04	12:39:48	69.5050	4.468	29.856
11/24/04	12:39:58	69.6717	4.468	29.856
11/24/04	12:40:08	69.8383	4.468	29.858
11/24/04	12:40:18	70.0050	4.468	29.854
11/24/04	12:40:28	70.1717	4.468	29.854
11/24/04	12:40:38	70.3383	4.468	29.854
11/24/04	12:40:48	70.5050	4.468	29.854
11/24/04	12:40:58	70.6717	4.468	29.858
11/24/04	12:41:08	70.8383	4.468	29.854
11/24/04	12:41:18	71.0050	4.468	29.852
11/24/04	12:41:28	71.1717	4.468	29.852
11/24/04	12:41:38	71.3383	4.468	29.854
11/24/04	12:41:48	71.5050	4.468	29.852
11/24/04	12:41:58	71.6717	4.468	29.854
11/24/04	12:42:08	71.8383	4.468	29.852
11/24/04	12:42:18	72.0050	4.468	29.852
11/24/04	12:42:28	72.1717	4.468	29.852
11/24/04	12:42:38	72.3383	4.468	29.852
11/24/04	12:42:48	72.5050	4.468	29.852
11/24/04	12:42:58	72.6717	4.468	29.852
11/24/04	12:43:08	72.8383	4.468	29.852
11/24/04	12:43:18	73.0050	4.468	29.852
11/24/04	12:43:28	73.1717	4.468	29.852
11/24/04	12:43:38	73.3383	4.468	29.850
11/24/04	12:43:48	73.5050	4.468	29.854
11/24/04	12:43:58	73.6717	4.468	29.852
11/24/04	12:44:08	73.8383	4.468	29.854
11/24/04	12:44:18	74.0050	4.468	29.854
11/24/04	12:44:28	74.1717	4.468	29.852
11/24/04	12:44:38	74.3383	4.468	29.852
11/24/04	12:44:48	74.5050	4.468	29.852
11/24/04	12:44:58	74.6717	4.468	29.852
11/24/04	12:45:08	74.8383	4.468	29.852
11/24/04	12:45:18	75.0050	4.468	29.850
11/24/04	12:45:28	75.1717	4.468	29.850
11/24/04	12:45:38	75.3383	4.468	29.850
11/24/04	12:45:48	75.5050	4.468	29.852
11/24/04	12:45:58	75.6717	4.468	29.852
11/24/04	12:46:08	75.8383	4.468	29.850
11/24/04	12:46:18	76.0050	4.468	29.850
11/24/04	12:46:28	76.1717	4.468	29.850
11/24/04	12:46:38	76.3383	4.468	29.850
11/24/04	12:46:48	76.5050	4.468	29.850
11/24/04	12:46:58	76.6717	4.468	29.850
11/24/04	12:47:08	76.8383	4.468	29.850

11/24/04	12:47:18	77.0050	4.468	29.848
11/24/04	12:47:28	77.1717	4.468	29.848
11/24/04	12:47:38	77.3383	4.468	29.848
11/24/04	12:47:48	77.5050	4.468	29.846
11/24/04	12:47:58	77.6717	4.468	29.848
11/24/04	12:48:08	77.8383	4.468	29.848
11/24/04	12:48:18	78.0050	4.468	29.848
11/24/04	12:48:28	78.1717	4.468	29.848
11/24/04	12:48:38	78.3383	4.468	29.848
11/24/04	12:48:48	78.5050	4.468	29.848
11/24/04	12:48:58	78.6717	4.468	29.848
11/24/04	12:49:08	78.8383	4.468	29.848
11/24/04	12:49:18	79.0050	4.468	29.848
11/24/04	12:49:28	79.1717	0.857	29.848
11/24/04	12:49:38	79.3383	0.860	29.846
11/24/04	12:49:48	79.5050	0.862	29.850
11/24/04	12:49:58	79.6717	0.865	29.848
11/24/04	12:50:08	79.8383	0.867	29.848
11/24/04	12:50:18	80.0050	0.869	29.848
11/24/04	12:50:28	80.1717	0.871	29.846
11/24/04	12:50:38	80.3383	0.873	29.848
11/24/04	12:50:48	80.5050	0.874	29.846
11/24/04	12:50:58	80.6717	0.876	29.848
11/24/04	12:51:08	80.8383	0.877	29.848
11/24/04	12:51:18	81.0050	0.873	29.850
11/24/04	12:51:28	81.1717	0.321	29.850
11/24/04	12:51:38	81.3383	0.381	29.846
11/24/04	12:51:48	81.5050	0.432	29.850
11/24/04	12:51:58	81.6717	0.479	29.848
11/24/04	12:52:08	81.8383	0.521	29.848
11/24/04	12:52:18	82.0050	0.557	29.846
11/24/04	12:52:28	82.1717	0.504	29.850
11/24/04	12:52:38	82.3383	0.517	29.842
11/24/04	12:52:48	82.5050	0.533	29.831
11/24/04	12:52:58	82.6717	0.552	29.825
11/24/04	12:53:08	82.8383	0.579	29.821
11/24/04	12:53:18	83.0050	0.603	29.815
11/24/04	12:53:28	83.1717	0.628	29.811
11/24/04	12:53:38	83.3383	0.645	29.807
11/24/04	12:53:48	83.5050	0.648	29.805
11/24/04	12:53:58	83.6717	0.668	29.803
11/24/04	12:54:08	83.8383	0.674	29.801
11/24/04	12:54:18	84.0050	0.689	29.799
11/24/04	12:54:28	84.1717	0.697	29.797
11/24/04	12:54:38	84.3383	0.712	29.795



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW05D.aqt
Date: 08/08/05 Time: 12:20:27

AQUIFER DATA

Saturated Thickness: 145. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW05D)

Initial Displacement: 1.882 ft Static Water Column Height: 13. ft
Total Well Penetration Depth: 13. ft Screen Length: 10. ft
Casing Radius: 0.167 ft Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.02724 cm/sec y0 = 4.937 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:29:56
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-24 103956 02MW05DR .b
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: 02MW05DR

Test defined on: 11/24/04 10:35:37
Test started on: 11/24/04 10:39:56
Test stopped on: 11/24/04 10:43:42
Test extracted on: 11/24/04 15:58:03

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 72

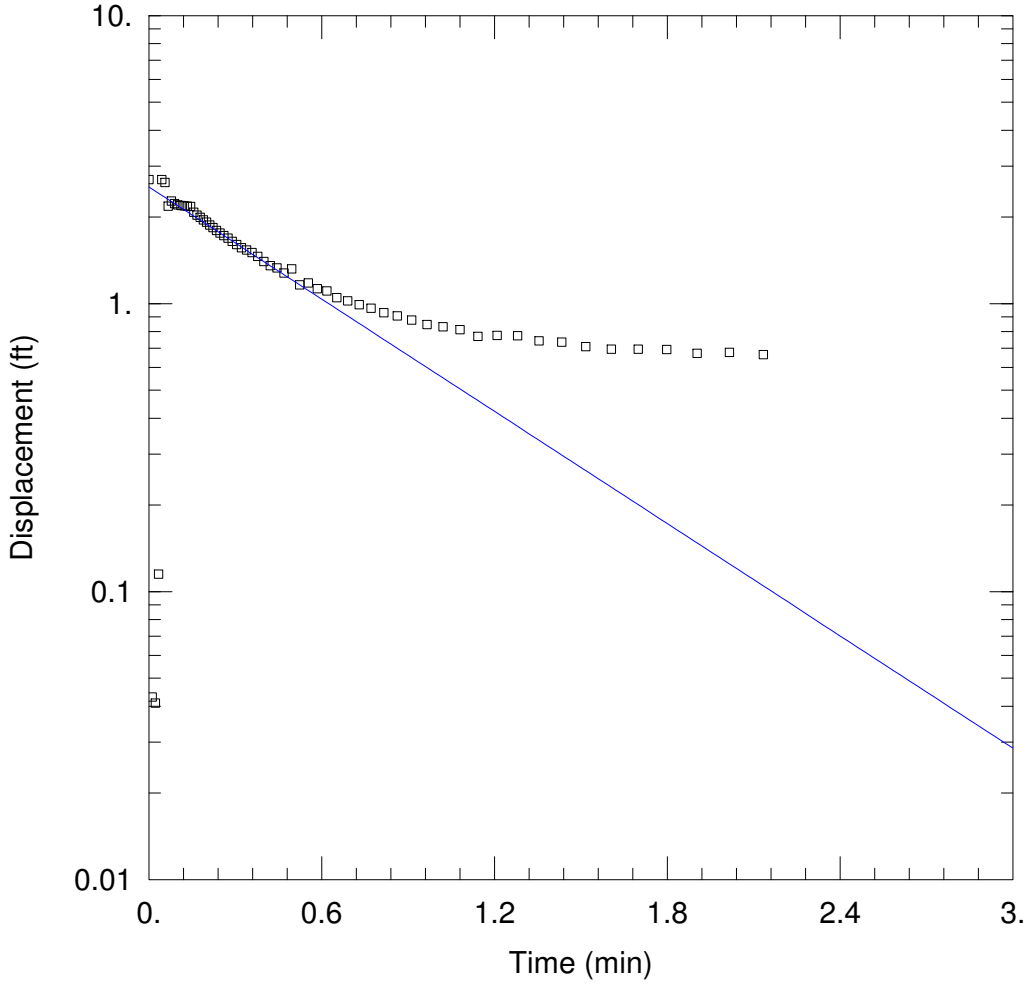
TOTAL DATA SAMPLES 72

Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 3.769 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 3.768 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/24/04	10:39:56	0.0000	3.769	29.893
11/24/04	10:39:56	0.0112	3.787	29.893
11/24/04	10:39:57	0.0223	3.787	29.893
11/24/04	10:39:58	0.0335	4.343	29.893
11/24/04	10:39:58	0.0447	4.178	29.893
11/24/04	10:39:59	0.0558	4.284	29.893
11/24/04	10:40:00	0.0670	4.113	29.895
11/24/04	10:40:00	0.0782	4.081	29.891
11/24/04	10:40:01	0.0893	4.014	29.893
11/24/04	10:40:02	0.1005	3.956	29.893
11/24/04	10:40:02	0.1117	3.914	29.895
11/24/04	10:40:03	0.1228	3.885	29.895
11/24/04	10:40:04	0.1340	3.860	29.891
11/24/04	10:40:04	0.1452	3.837	29.895
11/24/04	10:40:05	0.1563	3.834	29.893
11/24/04	10:40:06	0.1675	3.827	29.893
11/24/04	10:40:06	0.1787	3.822	29.893
11/24/04	10:40:07	0.1898	3.818	29.893
11/24/04	10:40:08	0.2010	3.814	29.895
11/24/04	10:40:08	0.2122	3.811	29.893
11/24/04	10:40:09	0.2233	3.809	29.893

11/24/04	10:40:10	0.2350	3.806	29.891
11/24/04	10:40:10	0.2475	3.805	29.893
11/24/04	10:40:11	0.2607	3.802	29.893
11/24/04	10:40:12	0.2747	3.802	29.893
11/24/04	10:40:13	0.2895	3.800	29.893
11/24/04	10:40:14	0.3052	3.799	29.893
11/24/04	10:40:15	0.3218	3.798	29.893
11/24/04	10:40:16	0.3395	3.797	29.893
11/24/04	10:40:17	0.3582	3.796	29.895
11/24/04	10:40:18	0.3780	3.796	29.891
11/24/04	10:40:19	0.3990	3.785	29.893
11/24/04	10:40:21	0.4212	3.783	29.893
11/24/04	10:40:22	0.4447	3.782	29.891
11/24/04	10:40:24	0.4695	3.782	29.893
11/24/04	10:40:25	0.4958	3.793	29.891
11/24/04	10:40:27	0.5238	3.749	29.893
11/24/04	10:40:29	0.5535	3.770	29.895
11/24/04	10:40:31	0.5848	3.767	29.893
11/24/04	10:40:33	0.6180	3.764	29.891
11/24/04	10:40:35	0.6532	3.759	29.893
11/24/04	10:40:37	0.6905	3.758	29.893
11/24/04	10:40:39	0.7300	3.751	29.893
11/24/04	10:40:42	0.7718	3.748	29.891
11/24/04	10:40:44	0.8162	3.744	29.895
11/24/04	10:40:47	0.8632	3.743	29.893
11/24/04	10:40:50	0.9130	3.740	29.893
11/24/04	10:40:53	0.9657	3.736	29.893
11/24/04	10:40:57	1.0215	3.737	29.895
11/24/04	10:41:00	1.0807	3.731	29.895
11/24/04	10:41:04	1.1433	3.733	29.897
11/24/04	10:41:08	1.2097	3.726	29.895
11/24/04	10:41:12	1.2800	3.732	29.897
11/24/04	10:41:17	1.3545	3.725	29.897
11/24/04	10:41:22	1.4335	3.726	29.899
11/24/04	10:41:27	1.5172	3.724	29.897
11/24/04	10:41:32	1.6057	3.724	29.899
11/24/04	10:41:37	1.6995	3.722	29.899
11/24/04	10:41:43	1.7988	3.722	29.897
11/24/04	10:41:50	1.9042	3.715	29.901
11/24/04	10:41:56	2.0157	3.718	29.899
11/24/04	10:42:04	2.1338	3.717	29.899
11/24/04	10:42:11	2.2590	3.724	29.901
11/24/04	10:42:19	2.3915	3.720	29.901
11/24/04	10:42:27	2.5320	3.719	29.901
11/24/04	10:42:36	2.6808	3.720	29.901
11/24/04	10:42:46	2.8383	3.724	29.901
11/24/04	10:42:56	3.0050	3.717	29.903
11/24/04	10:43:06	3.1717	3.725	29.903
11/24/04	10:43:16	3.3383	3.718	29.905
11/24/04	10:43:26	3.5050	3.715	29.905
11/24/04	10:43:36	3.6717	3.720	29.903



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW05S.aqt
Date: 08/08/05 Time: 12:20:45

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW05S)

Initial Displacement: 2.697 ft Static Water Column Height: 10. ft
Total Well Penetration Depth: 10. ft Screen Length: 10. ft
Casing Radius: 0.167 ft Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002126 cm/sec y0 = 2.54 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:29:01
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-24 101359 02MW05SR .b
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: 02MW05SR

Test defined on: 11/24/04 10:09:05
Test started on: 11/24/04 10:13:59
Test stopped on: 11/24/04 10:19:35
Test extracted on: 11/24/04 15:56:48

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 83

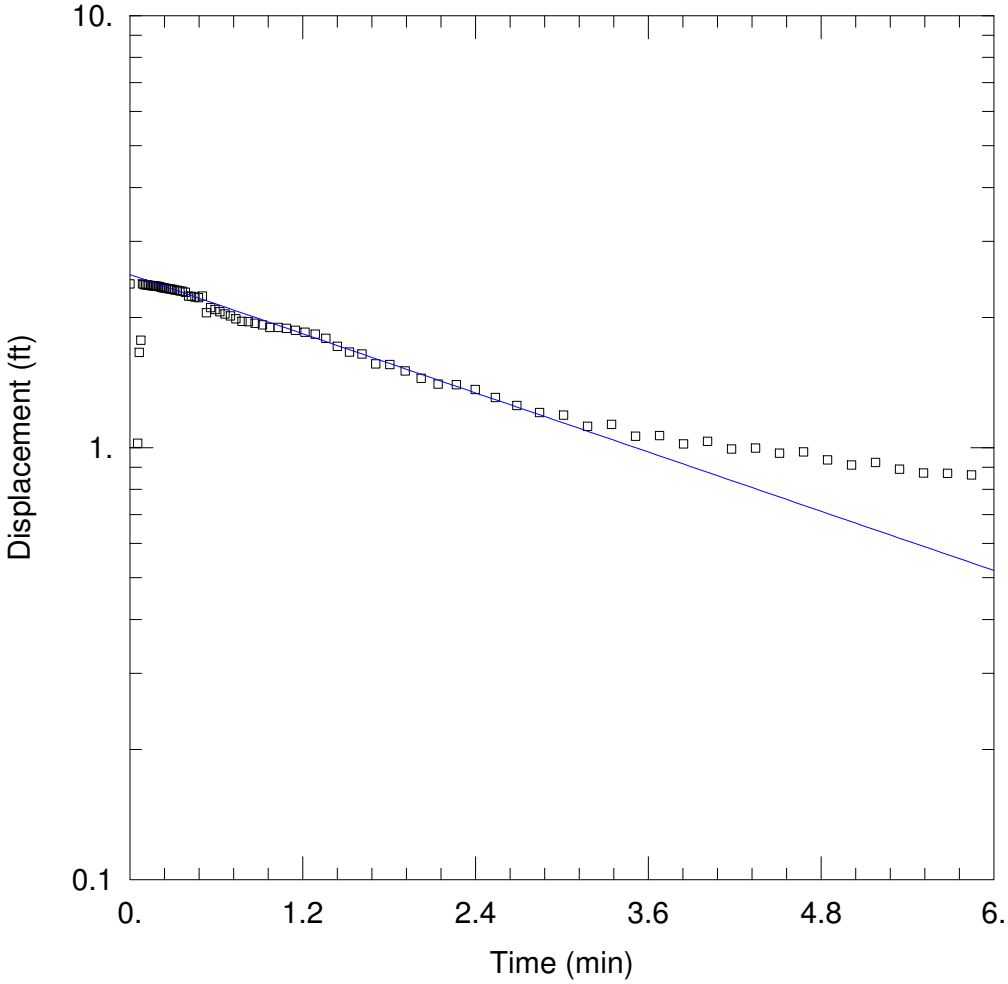
TOTAL DATA SAMPLES 83

Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 2.580 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 2.577 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/24/04	10:13:59	0.0000	2.582	29.891
11/24/04	10:13:59	0.0112	2.596	29.891
11/24/04	10:14:00	0.0223	2.595	29.891
11/24/04	10:14:01	0.0335	2.618	29.891
11/24/04	10:14:01	0.0447	3.404	29.891
11/24/04	10:14:02	0.0558	3.385	29.893
11/24/04	10:14:03	0.0670	3.247	29.891
11/24/04	10:14:03	0.0782	3.274	29.891
11/24/04	10:14:04	0.0893	3.260	29.893
11/24/04	10:14:05	0.1005	3.254	29.893
11/24/04	10:14:05	0.1117	3.251	29.893
11/24/04	10:14:06	0.1228	3.249	29.893
11/24/04	10:14:07	0.1340	3.247	29.891
11/24/04	10:14:07	0.1452	3.244	29.891
11/24/04	10:14:08	0.1563	3.215	29.891
11/24/04	10:14:09	0.1675	3.200	29.891
11/24/04	10:14:09	0.1787	3.189	29.891
11/24/04	10:14:10	0.1898	3.178	29.891
11/24/04	10:14:11	0.2010	3.167	29.893
11/24/04	10:14:11	0.2122	3.153	29.891
11/24/04	10:14:12	0.2233	3.142	29.891

11/24/04	10:14:13	0.2350	3.129	29.893
11/24/04	10:14:13	0.2475	3.118	29.893
11/24/04	10:14:14	0.2607	3.107	29.891
11/24/04	10:14:15	0.2747	3.096	29.891
11/24/04	10:14:16	0.2895	3.084	29.891
11/24/04	10:14:17	0.3052	3.071	29.893
11/24/04	10:14:18	0.3218	3.058	29.891
11/24/04	10:14:19	0.3395	3.050	29.891
11/24/04	10:14:20	0.3582	3.041	29.891
11/24/04	10:14:21	0.3780	3.027	29.891
11/24/04	10:14:22	0.3990	3.009	29.891
11/24/04	10:14:24	0.4212	2.996	29.891
11/24/04	10:14:25	0.4447	2.988	29.891
11/24/04	10:14:27	0.4695	2.972	29.893
11/24/04	10:14:28	0.4958	2.985	29.891
11/24/04	10:14:30	0.5238	2.936	29.893
11/24/04	10:14:32	0.5535	2.942	29.891
11/24/04	10:14:34	0.5848	2.926	29.891
11/24/04	10:14:36	0.6180	2.920	29.891
11/24/04	10:14:38	0.6532	2.902	29.893
11/24/04	10:14:40	0.6905	2.894	29.893
11/24/04	10:14:42	0.7300	2.885	29.891
11/24/04	10:14:45	0.7718	2.876	29.893
11/24/04	10:14:47	0.8162	2.866	29.891
11/24/04	10:14:50	0.8632	2.859	29.893
11/24/04	10:14:53	0.9130	2.849	29.891
11/24/04	10:14:56	0.9657	2.840	29.891
11/24/04	10:15:00	1.0215	2.836	29.895
11/24/04	10:15:03	1.0807	2.830	29.893
11/24/04	10:15:07	1.1433	2.817	29.893
11/24/04	10:15:11	1.2097	2.819	29.895
11/24/04	10:15:15	1.2800	2.818	29.895
11/24/04	10:15:20	1.3545	2.809	29.897
11/24/04	10:15:25	1.4335	2.807	29.899
11/24/04	10:15:30	1.5172	2.798	29.897
11/24/04	10:15:35	1.6057	2.794	29.901
11/24/04	10:15:40	1.6995	2.794	29.903
11/24/04	10:15:46	1.7988	2.794	29.901
11/24/04	10:15:53	1.9042	2.787	29.901
11/24/04	10:15:59	2.0157	2.789	29.901
11/24/04	10:16:07	2.1338	2.785	29.903
11/24/04	10:16:14	2.2590	2.785	29.903
11/24/04	10:16:22	2.3915	2.782	29.903
11/24/04	10:16:30	2.5320	2.781	29.903
11/24/04	10:16:39	2.6808	2.782	29.905
11/24/04	10:16:49	2.8383	2.782	29.905
11/24/04	10:16:59	3.0050	2.776	29.905
11/24/04	10:17:09	3.1717	2.778	29.907
11/24/04	10:17:19	3.3383	2.775	29.905
11/24/04	10:17:29	3.5050	2.776	29.905
11/24/04	10:17:39	3.6717	2.776	29.907
11/24/04	10:17:49	3.8383	2.774	29.907
11/24/04	10:17:59	4.0050	2.776	29.907
11/24/04	10:18:09	4.1717	2.774	29.905
11/24/04	10:18:19	4.3383	2.770	29.905
11/24/04	10:18:29	4.5050	2.769	29.907
11/24/04	10:18:39	4.6717	2.769	29.907
11/24/04	10:18:49	4.8383	2.766	29.907
11/24/04	10:18:59	5.0050	2.768	29.905
11/24/04	10:19:09	5.1717	2.766	29.907
11/24/04	10:19:19	5.3383	2.765	29.907
11/24/04	10:19:29	5.5050	2.767	29.905



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW07S.aqt
Date: 08/08/05 Time: 12:21:01

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW07S)

Initial Displacement: 2.393 ft Static Water Column Height: 12. ft
Total Well Penetration Depth: 12. ft Screen Length: 10. ft
Casing Radius: 0.167 ft Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0004338 cm/sec y0 = 2.515 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:32:26
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-24 140614 02MW07SR .b
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: 02MW07SR

Test defined on: 11/24/04 13:59:56
Test started on: 11/24/04 14:06:14
Test stopped on: 11/24/04 14:18:17
Test extracted on: 11/24/04 16:08:37

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 123

TOTAL DATA SAMPLES 123

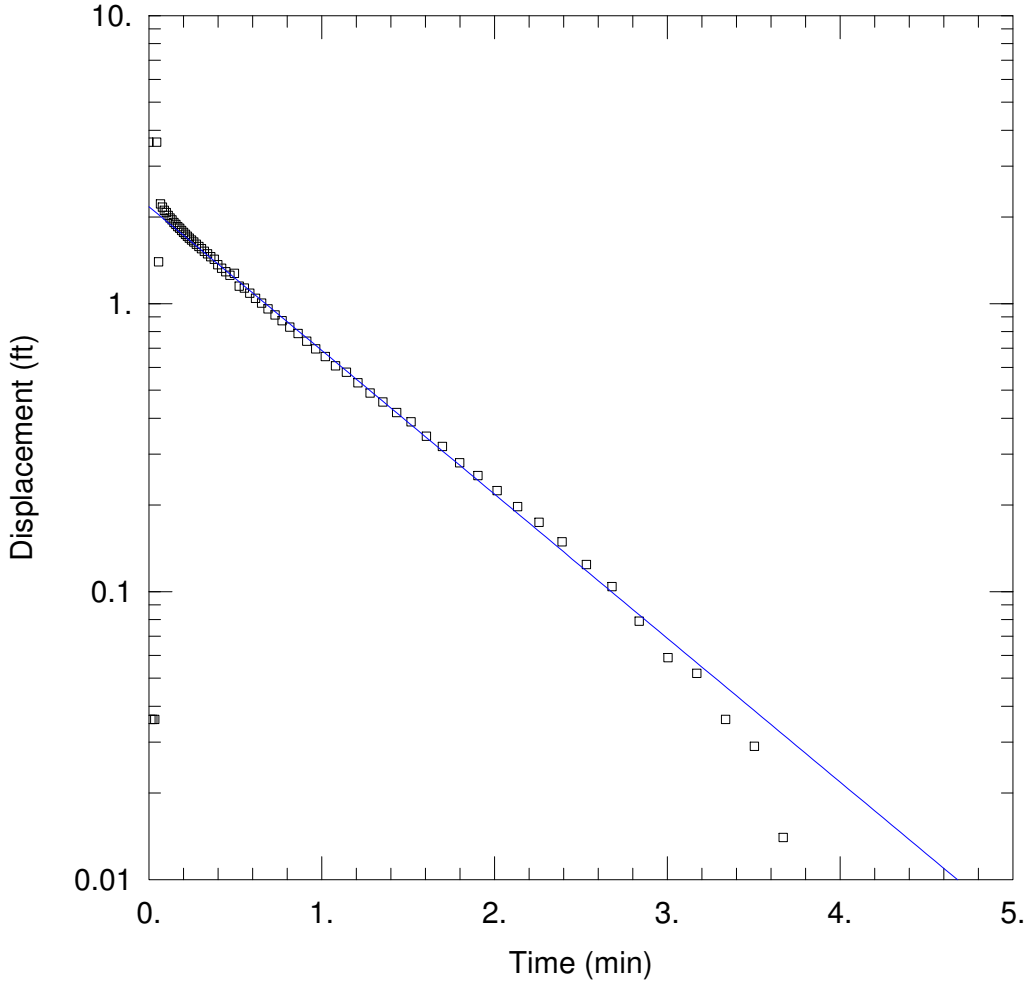
Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 2.290 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 2.293 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/24/04	14:06:14	0.0000	2.296	29.764
11/24/04	14:06:14	0.0110	2.324	29.762
11/24/04	14:06:15	0.0220	2.324	29.764
11/24/04	14:06:15	0.0330	2.324	29.762
11/24/04	14:06:16	0.0440	2.324	29.764
11/24/04	14:06:17	0.0550	2.608	29.762
11/24/04	14:06:17	0.0660	2.802	29.764
11/24/04	14:06:18	0.0770	2.837	29.762
11/24/04	14:06:19	0.0880	3.026	29.760
11/24/04	14:06:19	0.0990	3.023	29.762
11/24/04	14:06:20	0.1100	3.022	29.760
11/24/04	14:06:21	0.1210	3.021	29.762
11/24/04	14:06:21	0.1320	3.020	29.762
11/24/04	14:06:22	0.1430	3.019	29.762
11/24/04	14:06:23	0.1540	3.019	29.760
11/24/04	14:06:23	0.1650	3.018	29.760
11/24/04	14:06:24	0.1760	3.017	29.760
11/24/04	14:06:25	0.1870	3.017	29.760
11/24/04	14:06:25	0.1980	3.016	29.760
11/24/04	14:06:26	0.2090	3.014	29.762
11/24/04	14:06:27	0.2200	3.012	29.760

11/24/04	14:06:27	0.2310	3.010	29.760
11/24/04	14:06:28	0.2427	3.010	29.758
11/24/04	14:06:29	0.2552	3.008	29.762
11/24/04	14:06:30	0.2683	3.007	29.760
11/24/04	14:06:30	0.2823	3.006	29.760
11/24/04	14:06:31	0.2972	3.005	29.762
11/24/04	14:06:32	0.3128	3.003	29.762
11/24/04	14:06:33	0.3295	3.001	29.758
11/24/04	14:06:34	0.3472	2.999	29.762
11/24/04	14:06:35	0.3658	2.997	29.758
11/24/04	14:06:37	0.3857	2.994	29.760
11/24/04	14:06:38	0.4067	2.980	29.760
11/24/04	14:06:39	0.4288	2.979	29.760
11/24/04	14:06:41	0.4523	2.977	29.760
11/24/04	14:06:42	0.4772	2.974	29.762
11/24/04	14:06:44	0.5035	2.979	29.762
11/24/04	14:06:45	0.5315	2.921	29.762
11/24/04	14:06:47	0.5612	2.939	29.760
11/24/04	14:06:49	0.5925	2.932	29.760
11/24/04	14:06:51	0.6257	2.925	29.760
11/24/04	14:06:53	0.6608	2.917	29.760
11/24/04	14:06:55	0.6982	2.911	29.760
11/24/04	14:06:58	0.7377	2.902	29.760
11/24/04	14:07:00	0.7795	2.894	29.760
11/24/04	14:07:03	0.8238	2.892	29.760
11/24/04	14:07:06	0.8708	2.888	29.760
11/24/04	14:07:09	0.9207	2.883	29.760
11/24/04	14:07:12	0.9733	2.874	29.762
11/24/04	14:07:15	1.0292	2.874	29.760
11/24/04	14:07:19	1.0883	2.871	29.760
11/24/04	14:07:23	1.1510	2.866	29.760
11/24/04	14:07:27	1.2173	2.860	29.760
11/24/04	14:07:31	1.2877	2.855	29.762
11/24/04	14:07:35	1.3622	2.841	29.760
11/24/04	14:07:40	1.4412	2.819	29.758
11/24/04	14:07:45	1.5248	2.804	29.758
11/24/04	14:07:50	1.6133	2.798	29.758
11/24/04	14:07:56	1.7072	2.773	29.760
11/24/04	14:08:02	1.8065	2.770	29.760
11/24/04	14:08:08	1.9118	2.755	29.758
11/24/04	14:08:15	2.0233	2.737	29.758
11/24/04	14:08:22	2.1415	2.724	29.758
11/24/04	14:08:30	2.2667	2.722	29.758
11/24/04	14:08:37	2.3992	2.712	29.758
11/24/04	14:08:46	2.5397	2.694	29.758
11/24/04	14:08:55	2.6885	2.677	29.756
11/24/04	14:09:04	2.8460	2.664	29.758
11/24/04	14:09:14	3.0127	2.658	29.758
11/24/04	14:09:24	3.1793	2.637	29.758
11/24/04	14:09:34	3.3460	2.641	29.758
11/24/04	14:09:44	3.5127	2.620	29.758
11/24/04	14:09:54	3.6793	2.621	29.758
11/24/04	14:10:04	3.8460	2.607	29.760
11/24/04	14:10:14	4.0127	2.611	29.758
11/24/04	14:10:24	4.1793	2.599	29.758
11/24/04	14:10:34	4.3460	2.600	29.758
11/24/04	14:10:44	4.5127	2.592	29.760
11/24/04	14:10:54	4.6793	2.594	29.760
11/24/04	14:11:04	4.8460	2.582	29.760
11/24/04	14:11:14	5.0127	2.574	29.760
11/24/04	14:11:24	5.1793	2.577	29.762
11/24/04	14:11:34	5.3460	2.568	29.758
11/24/04	14:11:44	5.5127	2.562	29.760
11/24/04	14:11:54	5.6793	2.562	29.758
11/24/04	14:12:04	5.8460	2.560	29.760
11/24/04	14:12:14	6.0127	2.543	29.760
11/24/04	14:12:24	6.1793	2.535	29.760
11/24/04	14:12:34	6.3460	2.537	29.758
11/24/04	14:12:44	6.5127	2.530	29.760
11/24/04	14:12:54	6.6793	2.537	29.758

11/24/04	14:13:04	6.8460	2.541	29.762
11/24/04	14:13:14	7.0127	2.542	29.762
11/24/04	14:13:24	7.1793	2.543	29.760
11/24/04	14:13:34	7.3460	2.541	29.760
11/24/04	14:13:44	7.5127	2.532	29.762
11/24/04	14:13:54	7.6793	2.523	29.762
11/24/04	14:14:04	7.8460	2.524	29.760
11/24/04	14:14:14	8.0127	2.528	29.762
11/24/04	14:14:24	8.1793	2.529	29.760
11/24/04	14:14:34	8.3460	2.528	29.764
11/24/04	14:14:44	8.5127	2.526	29.762
11/24/04	14:14:54	8.6793	2.526	29.762
11/24/04	14:15:04	8.8460	2.528	29.762
11/24/04	14:15:14	9.0127	2.508	29.764
11/24/04	14:15:24	9.1793	2.508	29.762
11/24/04	14:15:34	9.3460	2.513	29.762
11/24/04	14:15:44	9.5127	2.508	29.762
11/24/04	14:15:54	9.6793	2.505	29.762
11/24/04	14:16:04	9.8460	2.508	29.764
11/24/04	14:16:14	10.0127	2.511	29.762
11/24/04	14:16:24	10.1793	2.511	29.764
11/24/04	14:16:34	10.3460	2.606	29.750
11/24/04	14:16:44	10.5127	2.606	29.750
11/24/04	14:16:54	10.6793	2.606	29.758
11/24/04	14:17:04	10.8460	2.605	29.764
11/24/04	14:17:14	11.0127	2.606	29.770
11/24/04	14:17:24	11.1793	2.476	29.770
11/24/04	14:17:34	11.3460	2.484	29.762
11/24/04	14:17:44	11.5127	2.483	29.760
11/24/04	14:17:54	11.6793	2.476	29.756
11/24/04	14:18:04	11.8460	2.468	29.752
11/24/04	14:18:14	12.0127	2.474	29.750



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW09S.aqt
Date: 08/08/05 Time: 12:21:21

AQUIFER DATA

Saturated Thickness: 8.85 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW09S)

Initial Displacement: 3.635 ft Static Water Column Height: 8.85 ft
Total Well Penetration Depth: 8.85 ft Screen Length: 5. ft
Casing Radius: 0.167 ft Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.003187 cm/sec y0 = 2.17 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:21:50
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-23 104803 02MW09S
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: MW09S

Test defined on: 11/23/04 10:37:35
Test started on: 11/23/04 10:48:04
Test stopped on: 11/23/04 10:53:14
Test extracted on: 11/23/04 14:21:17

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 81

TOTAL DATA SAMPLES 81

Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 1.859 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 1.859 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/23/04	10:48:04	0.0000	1.847	30.029
11/23/04	10:48:04	0.0110	1.858	30.027
11/23/04	10:48:05	0.0220	1.858	30.027
11/23/04	10:48:05	0.0330	1.856	30.027
11/23/04	10:48:06	0.0440	1.333	30.027
11/23/04	10:48:07	0.0550	0.797	30.027
11/23/04	10:48:07	0.0660	1.348	30.027
11/23/04	10:48:08	0.0770	1.384	30.025
11/23/04	10:48:09	0.0880	1.218	30.027
11/23/04	10:48:09	0.0990	1.227	30.027
11/23/04	10:48:10	0.1100	1.218	30.027
11/23/04	10:48:11	0.1210	1.170	30.025
11/23/04	10:48:11	0.1320	1.548	30.025
11/23/04	10:48:12	0.1430	1.306	30.025
11/23/04	10:48:13	0.1540	1.394	30.025
11/23/04	10:48:13	0.1650	1.372	30.027
11/23/04	10:48:14	0.1760	1.382	30.027
11/23/04	10:48:15	0.1870	1.391	30.027
11/23/04	10:48:15	0.1980	1.397	30.025
11/23/04	10:48:16	0.2090	1.403	30.025
11/23/04	10:48:17	0.2200	1.410	30.023

11/23/04	10:48:17	0.2310	1.412	30.023
11/23/04	10:48:18	0.2427	1.421	30.025
11/23/04	10:48:19	0.2552	1.426	30.023
11/23/04	10:48:20	0.2683	1.432	30.025
11/23/04	10:48:20	0.2823	1.439	30.023
11/23/04	10:48:21	0.2972	1.445	30.027
11/23/04	10:48:22	0.3128	1.452	30.025
11/23/04	10:48:23	0.3295	1.459	30.023
11/23/04	10:48:24	0.3472	1.466	30.023
11/23/04	10:48:25	0.3658	1.468	30.023
11/23/04	10:48:27	0.3857	1.481	30.023
11/23/04	10:48:28	0.4067	1.481	30.023
11/23/04	10:48:29	0.4288	1.488	30.021
11/23/04	10:48:31	0.4523	1.494	30.023
11/23/04	10:48:32	0.4772	1.503	30.023
11/23/04	10:48:34	0.5035	1.519	30.021
11/23/04	10:48:35	0.5315	1.546	30.023
11/23/04	10:48:37	0.5612	1.530	30.021
11/23/04	10:48:39	0.5925	1.540	30.021
11/23/04	10:48:41	0.6257	1.549	30.021
11/23/04	10:48:43	0.6608	1.557	30.021
11/23/04	10:48:45	0.6982	1.566	30.021
11/23/04	10:48:48	0.7377	1.576	30.021
11/23/04	10:48:50	0.7795	1.585	30.019
11/23/04	10:48:53	0.8238	1.594	30.019
11/23/04	10:48:56	0.8708	1.603	30.019
11/23/04	10:48:59	0.9207	1.613	30.021
11/23/04	10:49:02	0.9733	1.621	30.017
11/23/04	10:49:05	1.0292	1.633	30.017
11/23/04	10:49:09	1.0883	1.641	30.015
11/23/04	10:49:13	1.1510	1.650	30.019
11/23/04	10:49:17	1.2173	1.663	30.017
11/23/04	10:49:21	1.2877	1.671	30.017
11/23/04	10:49:25	1.3622	1.681	30.017
11/23/04	10:49:30	1.4412	1.690	30.013
11/23/04	10:49:35	1.5248	1.699	30.015
11/23/04	10:49:40	1.6133	1.709	30.015
11/23/04	10:49:46	1.7072	1.715	30.015
11/23/04	10:49:52	1.8065	1.725	30.015
11/23/04	10:49:58	1.9118	1.732	30.015
11/23/04	10:50:05	2.0233	1.740	30.015
11/23/04	10:50:12	2.1415	1.749	30.015
11/23/04	10:50:20	2.2667	1.754	30.013
11/23/04	10:50:27	2.3992	1.763	30.015
11/23/04	10:50:36	2.5397	1.768	30.015
11/23/04	10:50:45	2.6885	1.774	30.015
11/23/04	10:50:54	2.8460	1.780	30.015
11/23/04	10:51:04	3.0127	1.785	30.015
11/23/04	10:51:14	3.1793	1.792	30.015
11/23/04	10:51:24	3.3460	1.794	30.015
11/23/04	10:51:34	3.5127	1.795	30.015
11/23/04	10:51:44	3.6793	1.799	30.015
11/23/04	10:51:54	3.8460	1.803	30.015
11/23/04	10:52:04	4.0127	1.808	30.015
11/23/04	10:52:14	4.1793	1.810	30.013
11/23/04	10:52:24	4.3460	1.810	30.015
11/23/04	10:52:34	4.5127	1.812	30.019
11/23/04	10:52:44	4.6793	1.812	30.013
11/23/04	10:52:54	4.8460	1.814	30.017
11/23/04	10:53:04	5.0127	1.816	30.017

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:27:02
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-23 110017 02MW09SR
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: MW09SR

Test defined on: 11/23/04 10:55:05
Test started on: 11/23/04 11:00:17
Test stopped on: 11/23/04 11:04:59
Test extracted on: 11/23/04 14:22:39

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 78

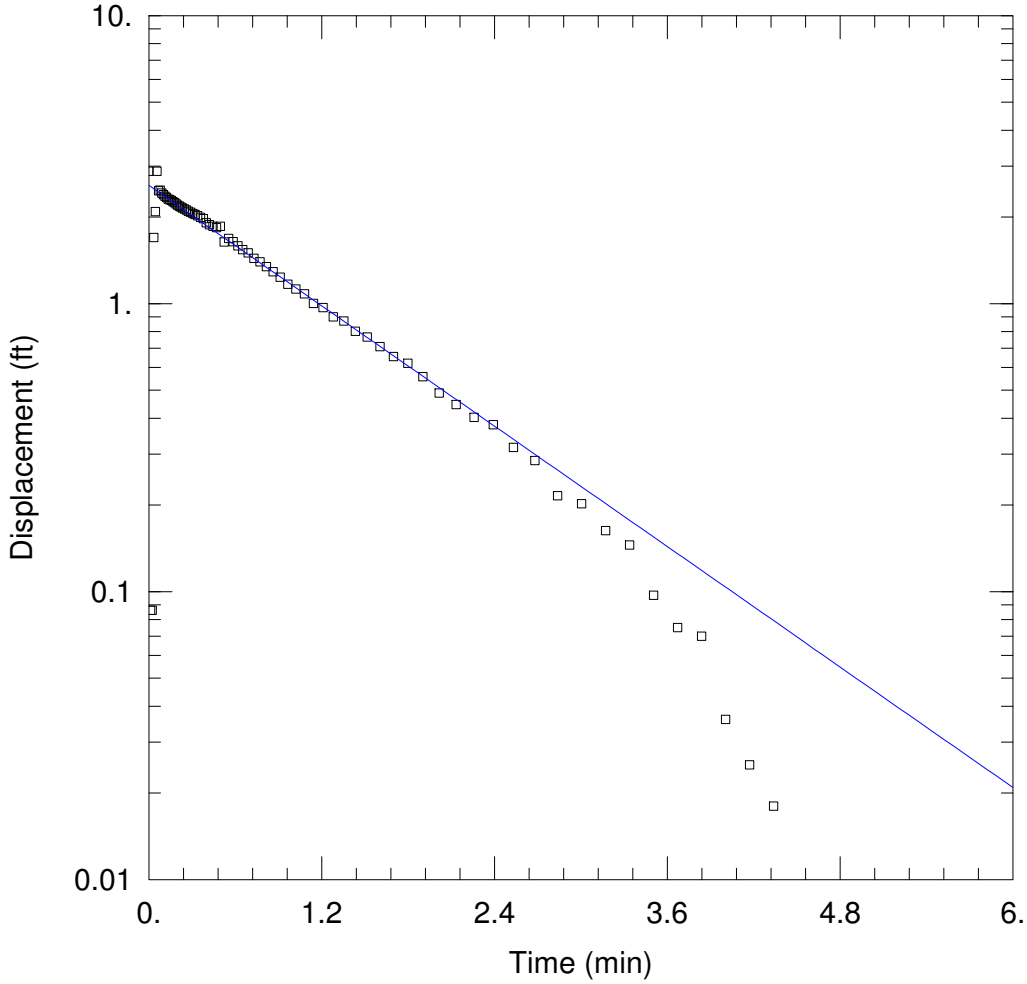
TOTAL DATA SAMPLES 78

Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 1.873 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 1.873 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/23/04	11:00:17	0.0000	1.873	30.011
11/23/04	11:00:17	0.0112	1.884	30.013
11/23/04	11:00:18	0.0223	1.884	30.013
11/23/04	11:00:19	0.0335	1.884	30.015
11/23/04	11:00:19	0.0447	2.981	30.013
11/23/04	11:00:20	0.0558	2.298	30.015
11/23/04	11:00:21	0.0670	2.550	30.011
11/23/04	11:00:21	0.0782	2.533	30.013
11/23/04	11:00:22	0.0893	2.516	30.015
11/23/04	11:00:23	0.1005	2.504	30.015
11/23/04	11:00:23	0.1117	2.490	30.013
11/23/04	11:00:24	0.1228	2.477	30.015
11/23/04	11:00:25	0.1340	2.468	30.013
11/23/04	11:00:25	0.1452	2.456	30.015
11/23/04	11:00:26	0.1563	2.447	30.015
11/23/04	11:00:27	0.1675	2.437	30.013
11/23/04	11:00:27	0.1787	2.429	30.011
11/23/04	11:00:28	0.1898	2.420	30.013
11/23/04	11:00:29	0.2010	2.411	30.013
11/23/04	11:00:29	0.2122	2.404	30.013
11/23/04	11:00:30	0.2233	2.395	30.013

11/23/04	11:00:31	0.2350	2.387	30.013
11/23/04	11:00:31	0.2475	2.380	30.013
11/23/04	11:00:32	0.2607	2.371	30.013
11/23/04	11:00:33	0.2747	2.363	30.013
11/23/04	11:00:34	0.2895	2.354	30.013
11/23/04	11:00:35	0.3052	2.345	30.013
11/23/04	11:00:36	0.3218	2.336	30.011
11/23/04	11:00:37	0.3395	2.326	30.013
11/23/04	11:00:38	0.3582	2.317	30.013
11/23/04	11:00:39	0.3780	2.307	30.013
11/23/04	11:00:40	0.3990	2.289	30.015
11/23/04	11:00:42	0.4212	2.278	30.015
11/23/04	11:00:43	0.4447	2.267	30.015
11/23/04	11:00:45	0.4695	2.256	30.015
11/23/04	11:00:46	0.4958	2.261	30.013
11/23/04	11:00:48	0.5238	2.223	30.015
11/23/04	11:00:50	0.5535	2.218	30.013
11/23/04	11:00:52	0.5848	2.205	30.013
11/23/04	11:00:54	0.6180	2.191	30.013
11/23/04	11:00:56	0.6532	2.179	30.015
11/23/04	11:00:58	0.6905	2.165	30.013
11/23/04	11:01:00	0.7300	2.151	30.015
11/23/04	11:01:03	0.7718	2.138	30.015
11/23/04	11:01:05	0.8162	2.125	30.015
11/23/04	11:01:08	0.8632	2.113	30.013
11/23/04	11:01:11	0.9130	2.098	30.013
11/23/04	11:01:14	0.9657	2.085	30.013
11/23/04	11:01:18	1.0215	2.072	30.015
11/23/04	11:01:21	1.0807	2.058	30.015
11/23/04	11:01:25	1.1433	2.049	30.013
11/23/04	11:01:29	1.2097	2.035	30.015
11/23/04	11:01:33	1.2800	2.022	30.015
11/23/04	11:01:38	1.3545	2.012	30.015
11/23/04	11:01:43	1.4335	2.000	30.013
11/23/04	11:01:48	1.5172	1.992	30.015
11/23/04	11:01:53	1.6057	1.978	30.015
11/23/04	11:01:58	1.6995	1.970	30.013
11/23/04	11:02:04	1.7988	1.958	30.013
11/23/04	11:02:11	1.9042	1.950	30.015
11/23/04	11:02:17	2.0157	1.941	30.015
11/23/04	11:02:25	2.1338	1.933	30.013
11/23/04	11:02:32	2.2590	1.926	30.015
11/23/04	11:02:40	2.3915	1.918	30.013
11/23/04	11:02:48	2.5320	1.911	30.015
11/23/04	11:02:57	2.6808	1.905	30.013
11/23/04	11:03:07	2.8383	1.897	30.013
11/23/04	11:03:17	3.0050	1.891	30.013
11/23/04	11:03:27	3.1717	1.889	30.013
11/23/04	11:03:37	3.3383	1.884	30.013
11/23/04	11:03:47	3.5050	1.882	30.013
11/23/04	11:03:57	3.6717	1.877	30.015
11/23/04	11:04:07	3.8383	1.873	30.015
11/23/04	11:04:17	4.0050	1.871	30.015
11/23/04	11:04:27	4.1717	1.867	30.013
11/23/04	11:04:37	4.3383	1.865	30.015
11/23/04	11:04:47	4.5050	1.866	30.013
11/23/04	11:04:57	4.6717	1.867	30.015



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW10D.aqt
Date: 08/08/05 Time: 12:21:43

AQUIFER DATA

Saturated Thickness: 145. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW10D)

Initial Displacement: 2.879 ft Static Water Column Height: 6. ft
Total Well Penetration Depth: 6. ft Screen Length: 5. ft
Casing Radius: 0.167 ft Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.001456 cm/sec y0 = 2.571 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:31:24
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-24 130721 02MW10DR2 .b
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: 02MW10DR2

Test defined on: 11/24/04 13:04:44
Test started on: 11/24/04 13:07:21
Test stopped on: 11/24/04 13:12:31
Test extracted on: 11/24/04 16:07:21

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 80

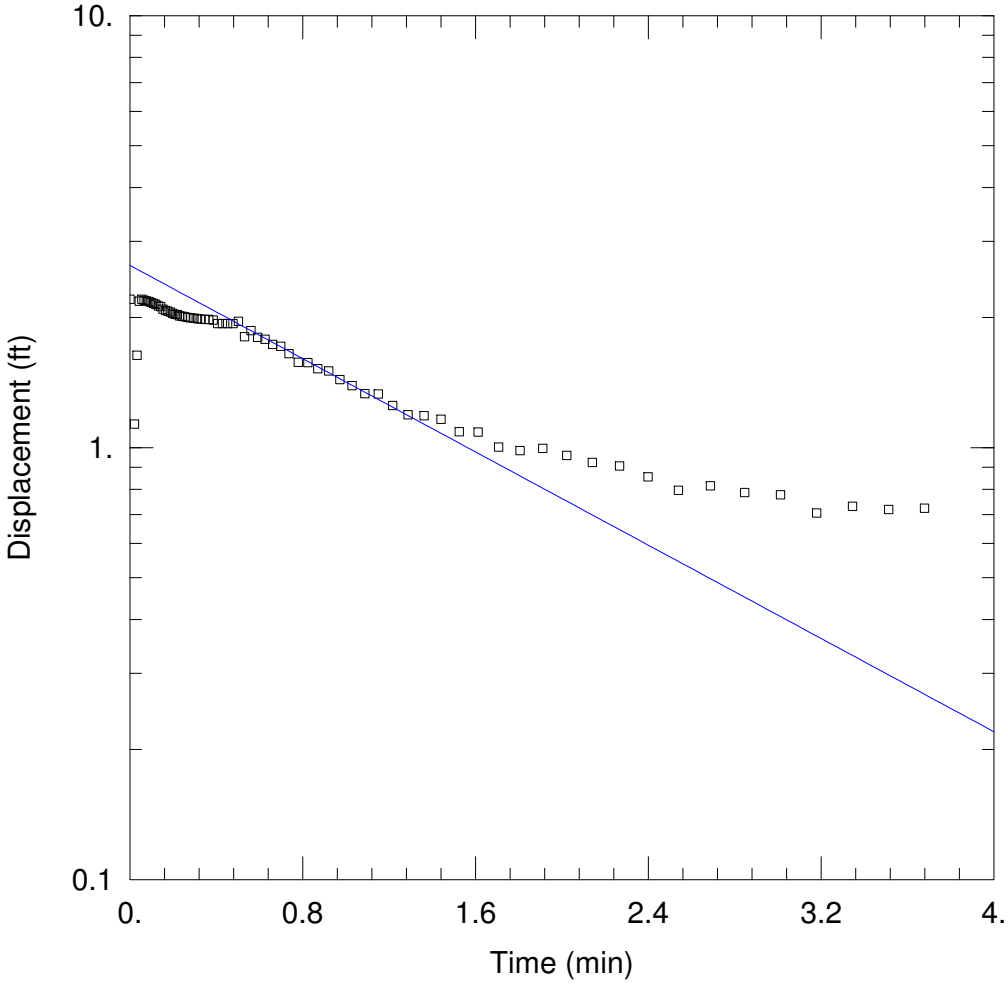
TOTAL DATA SAMPLES 80

Channel number [1]
Measurement type: Pressure
Channel name:
Linearity: 0.0722000
Scale: 15.6629000
Offset: -0.1253000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 3.268 Meters H2O
Referenced on: channel definition.
Pressure head at reference: 3.265 Meters H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/24/04	13:07:21	0.0000	3.281	29.785
11/24/04	13:07:21	0.0112	3.307	29.785
11/24/04	13:07:22	0.0223	3.307	29.785
11/24/04	13:07:23	0.0335	3.797	29.783
11/24/04	13:07:23	0.0447	3.917	29.785
11/24/04	13:07:24	0.0558	4.158	29.783
11/24/04	13:07:25	0.0670	4.033	29.783
11/24/04	13:07:25	0.0782	4.035	29.783
11/24/04	13:07:26	0.0893	4.018	29.783
11/24/04	13:07:27	0.1005	4.009	29.783
11/24/04	13:07:27	0.1117	3.999	29.783
11/24/04	13:07:28	0.1228	3.993	29.783
11/24/04	13:07:29	0.1340	3.984	29.783
11/24/04	13:07:29	0.1452	3.980	29.785
11/24/04	13:07:30	0.1563	3.975	29.783
11/24/04	13:07:31	0.1675	3.969	29.785
11/24/04	13:07:31	0.1787	3.964	29.785
11/24/04	13:07:32	0.1898	3.957	29.787
11/24/04	13:07:33	0.2010	3.950	29.781
11/24/04	13:07:33	0.2122	3.944	29.785
11/24/04	13:07:34	0.2233	3.940	29.785

11/24/04	13:07:35	0.2350	3.935	29.785
11/24/04	13:07:35	0.2475	3.930	29.783
11/24/04	13:07:36	0.2607	3.924	29.783
11/24/04	13:07:37	0.2747	3.919	29.783
11/24/04	13:07:38	0.2895	3.913	29.783
11/24/04	13:07:39	0.3052	3.907	29.785
11/24/04	13:07:40	0.3218	3.902	29.783
11/24/04	13:07:41	0.3395	3.895	29.783
11/24/04	13:07:42	0.3582	3.888	29.783
11/24/04	13:07:43	0.3780	3.882	29.783
11/24/04	13:07:44	0.3990	3.862	29.783
11/24/04	13:07:46	0.4212	3.854	29.783
11/24/04	13:07:47	0.4447	3.846	29.785
11/24/04	13:07:49	0.4695	3.840	29.783
11/24/04	13:07:50	0.4958	3.846	29.785
11/24/04	13:07:52	0.5238	3.779	29.783
11/24/04	13:07:54	0.5535	3.794	29.785
11/24/04	13:07:56	0.5848	3.780	29.785
11/24/04	13:07:58	0.6180	3.764	29.787
11/24/04	13:08:00	0.6532	3.750	29.785
11/24/04	13:08:02	0.6905	3.737	29.785
11/24/04	13:08:04	0.7300	3.719	29.785
11/24/04	13:08:07	0.7718	3.706	29.785
11/24/04	13:08:09	0.8162	3.691	29.785
11/24/04	13:08:12	0.8632	3.674	29.787
11/24/04	13:08:15	0.9130	3.657	29.785
11/24/04	13:08:18	0.9657	3.637	29.785
11/24/04	13:08:22	1.0215	3.623	29.785
11/24/04	13:08:25	1.0807	3.610	29.787
11/24/04	13:08:29	1.1433	3.586	29.785
11/24/04	13:08:33	1.2097	3.576	29.787
11/24/04	13:08:37	1.2800	3.555	29.789
11/24/04	13:08:42	1.3545	3.546	29.785
11/24/04	13:08:47	1.4335	3.525	29.787
11/24/04	13:08:52	1.5172	3.514	29.787
11/24/04	13:08:57	1.6057	3.497	29.789
11/24/04	13:09:02	1.6995	3.480	29.789
11/24/04	13:09:08	1.7988	3.470	29.789
11/24/04	13:09:15	1.9042	3.450	29.787
11/24/04	13:09:21	2.0157	3.430	29.787
11/24/04	13:09:29	2.1338	3.417	29.787
11/24/04	13:09:36	2.2590	3.403	29.789
11/24/04	13:09:44	2.3915	3.397	29.791
11/24/04	13:09:52	2.5320	3.377	29.787
11/24/04	13:10:01	2.6808	3.368	29.789
11/24/04	13:10:11	2.8383	3.346	29.789
11/24/04	13:10:21	3.0050	3.342	29.789
11/24/04	13:10:31	3.1717	3.330	29.791
11/24/04	13:10:41	3.3383	3.325	29.789
11/24/04	13:10:51	3.5050	3.310	29.789
11/24/04	13:11:01	3.6717	3.303	29.789
11/24/04	13:11:11	3.8383	3.302	29.791
11/24/04	13:11:21	4.0050	3.292	29.791
11/24/04	13:11:31	4.1717	3.288	29.793
11/24/04	13:11:41	4.3383	3.286	29.793
11/24/04	13:11:51	4.5050	3.278	29.795
11/24/04	13:12:01	4.6717	3.276	29.795
11/24/04	13:12:11	4.8383	3.275	29.795
11/24/04	13:12:21	5.0050	3.271	29.795



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\lcarter\Local Settings\Temporary Internet Files\02MW10S.aqt
Date: 08/08/05 Time: 12:18:28

AQUIFER DATA

Saturated Thickness: 11. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02MW10S)

Initial Displacement: 2.205 ft
Total Well Penetration Depth: 11. ft
Casing Radius: 0.167 ft
Static Water Column Height: 11. ft
Screen Length: 10. ft
Wellbore Radius: 0.5 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.001003 cm/sec
y0 = 2.641 ft

In-Situ Inc. Hermit 3000

Report generated: 08/08/05 13:31:53
Report from file: P:\CLEANII\BASES\St. Juliens\Slug Tests\SN45451 2004-11-24 133129 02MW10SR .b
DataMgr Version 3.71

Serial number: 00045451
Firmware Version 7.10
Unit name: HERMIT 3000

Test name: 02MW10SR

Test defined on: 11/24/04 13:27:49
Test started on: 11/24/04 13:31:29
Test stopped on: 11/24/04 13:39:58
Test extracted on: 11/24/04 16:08:11

Data gathered using Logarithmic testing
   Maximum time between data points: 0.1667 Minutes.
   Number of data samples: 101

TOTAL DATA SAMPLES 101

Channel number [1]
  Measurement type: Pressure
  Channel name:
  Linearity: 0.0722000
  Scale: 15.6629000
  Offset: -0.1253000
  Warmup: 50
  Specific gravity: 1.000
  Mode: TOC
  User-defined reference: 1.933 Meters H2O
  Referenced on: channel definition.
  Pressure head at reference: 1.934 Meters H2O

Channel number [0]
  Measurement type: Barometric Pressure
  Channel name: Barometric
  Linearity: 0.0000000
  Scale: 0.0000000
  Offset: 0.0000000
  Warmup: 50

Date	Time	ET (min)	Chan[1] Meters H2O	Chan[0] Inches Hg
11/24/04	13:31:29	0.0000	1.937	29.768
11/24/04	13:31:29	0.0110	1.966	29.768
11/24/04	13:31:30	0.0220	2.283	29.770
11/24/04	13:31:30	0.0330	2.436	29.770
11/24/04	13:31:31	0.0440	2.603	29.770
11/24/04	13:31:32	0.0550	2.609	29.770
11/24/04	13:31:32	0.0660	2.606	29.768
11/24/04	13:31:33	0.0770	2.604	29.768
11/24/04	13:31:34	0.0880	2.602	29.768
11/24/04	13:31:34	0.0990	2.598	29.770
11/24/04	13:31:35	0.1100	2.594	29.770
11/24/04	13:31:36	0.1210	2.591	29.768
11/24/04	13:31:36	0.1320	2.586	29.768
11/24/04	13:31:37	0.1430	2.584	29.770
11/24/04	13:31:38	0.1540	2.575	29.768
11/24/04	13:31:38	0.1650	2.571	29.770
11/24/04	13:31:39	0.1760	2.568	29.768
11/24/04	13:31:40	0.1870	2.565	29.770
11/24/04	13:31:40	0.1980	2.561	29.770
11/24/04	13:31:41	0.2090	2.558	29.770
11/24/04	13:31:42	0.2200	2.556	29.768

11/24/04	13:31:42	0.2310	2.553	29.770
11/24/04	13:31:43	0.2427	2.551	29.770
11/24/04	13:31:44	0.2552	2.549	29.770
11/24/04	13:31:45	0.2683	2.547	29.770
11/24/04	13:31:45	0.2823	2.546	29.770
11/24/04	13:31:46	0.2972	2.545	29.770
11/24/04	13:31:47	0.3128	2.543	29.770
11/24/04	13:31:48	0.3295	2.543	29.770
11/24/04	13:31:49	0.3472	2.541	29.772
11/24/04	13:31:50	0.3658	2.541	29.770
11/24/04	13:31:52	0.3857	2.539	29.770
11/24/04	13:31:53	0.4067	2.527	29.770
11/24/04	13:31:54	0.4288	2.527	29.768
11/24/04	13:31:56	0.4523	2.528	29.770
11/24/04	13:31:57	0.4772	2.528	29.770
11/24/04	13:31:59	0.5035	2.535	29.770
11/24/04	13:32:00	0.5315	2.487	29.772
11/24/04	13:32:02	0.5612	2.506	29.772
11/24/04	13:32:04	0.5925	2.486	29.770
11/24/04	13:32:06	0.6257	2.481	29.770
11/24/04	13:32:08	0.6608	2.465	29.772
11/24/04	13:32:10	0.6982	2.461	29.772
11/24/04	13:32:13	0.7377	2.440	29.770
11/24/04	13:32:15	0.7795	2.418	29.770
11/24/04	13:32:18	0.8238	2.417	29.770
11/24/04	13:32:21	0.8708	2.401	29.768
11/24/04	13:32:24	0.9207	2.396	29.768
11/24/04	13:32:27	0.9733	2.375	29.770
11/24/04	13:32:30	1.0292	2.361	29.770
11/24/04	13:32:34	1.0883	2.343	29.770
11/24/04	13:32:38	1.1510	2.343	29.770
11/24/04	13:32:42	1.2173	2.319	29.772
11/24/04	13:32:46	1.2877	2.301	29.772
11/24/04	13:32:50	1.3622	2.299	29.770
11/24/04	13:32:55	1.4412	2.292	29.772
11/24/04	13:33:00	1.5248	2.269	29.772
11/24/04	13:33:05	1.6133	2.268	29.770
11/24/04	13:33:11	1.7072	2.243	29.770
11/24/04	13:33:17	1.8065	2.237	29.772
11/24/04	13:33:23	1.9118	2.241	29.774
11/24/04	13:33:30	2.0233	2.230	29.772
11/24/04	13:33:37	2.1415	2.219	29.774
11/24/04	13:33:45	2.2667	2.214	29.774
11/24/04	13:33:52	2.3992	2.198	29.770
11/24/04	13:34:01	2.5397	2.180	29.774
11/24/04	13:34:10	2.6885	2.186	29.772
11/24/04	13:34:19	2.8460	2.177	29.774
11/24/04	13:34:29	3.0127	2.175	29.774
11/24/04	13:34:39	3.1793	2.152	29.774
11/24/04	13:34:49	3.3460	2.160	29.774
11/24/04	13:34:59	3.5127	2.157	29.772
11/24/04	13:35:09	3.6793	2.158	29.774
11/24/04	13:35:19	3.8460	2.157	29.772
11/24/04	13:35:29	4.0127	2.157	29.772
11/24/04	13:35:39	4.1793	2.155	29.777
11/24/04	13:35:49	4.3460	2.156	29.777
11/24/04	13:35:59	4.5127	2.134	29.777
11/24/04	13:36:09	4.6793	2.135	29.774
11/24/04	13:36:19	4.8460	2.137	29.777
11/24/04	13:36:29	5.0127	2.133	29.774
11/24/04	13:36:39	5.1793	2.140	29.777
11/24/04	13:36:49	5.3460	2.135	29.779
11/24/04	13:36:59	5.5127	2.132	29.777
11/24/04	13:37:09	5.6793	2.139	29.774
11/24/04	13:37:19	5.8460	2.128	29.777
11/24/04	13:37:29	6.0127	2.137	29.779
11/24/04	13:37:39	6.1793	2.138	29.779
11/24/04	13:37:49	6.3460	2.133	29.779
11/24/04	13:37:59	6.5127	2.134	29.779
11/24/04	13:38:09	6.6793	2.120	29.777

11/24/04	13:38:19	6.8460	2.119	29.779
11/24/04	13:38:29	7.0127	2.119	29.779
11/24/04	13:38:39	7.1793	2.120	29.777
11/24/04	13:38:49	7.3460	2.120	29.777
11/24/04	13:38:59	7.5127	2.119	29.779
11/24/04	13:39:09	7.6793	2.116	29.777
11/24/04	13:39:19	7.8460	2.116	29.779
11/24/04	13:39:29	8.0127	2.116	29.777
11/24/04	13:39:39	8.1793	2.111	29.774
11/24/04	13:39:49	8.3460	2.112	29.777

Appendix J
Waste Delineation Logs

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 1	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/11/04 1320 END: 11/11/04 1350 LOGGER : K. Zunich

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	2-6'	48"			2-6': gray slightly silty sand (SM) with some gravel; saturated	
5						
	8-12'	24"				
10					10-12': gray clay (CL); strong petroleum odor; some wood fibers to 11.5'	
					Boring terminated at 12'	
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 2	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/11/04 1400 END: 11/11/04 1450 LOGGER : K. Zunich

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	24"			0-0.5': asphalt 0.5-1'": tan silty sand (SM) with some gravel 1-1.5'": tan slightly moist medium fine sand (SP-SM) with some silt	
	2-6'	18"			1.5-1.9': brown silty sand (SM) with wood chunks and fragments 1.9-2': brownish gray sandy clay (CL)	
5					4-4.5': tan fine sand (SP-SM) with pea gravel 4.5-5.5': brown medium to coarse sand (SP) with pea gravel	
	6-10'	48"			5.5-6':gray fine sand (SM) with some silt at 5.5': thin layer of black organics with pea gravel 6-6.5': gray silty fine sand (SM) with gravel, brick 6.5-7.5': grayish brown sandy clay (CL) with wood fibers 7.5-9': tan silty clayey sand (SC-SM) to silty sand (SM	
10	10-14'	36"			9-10': light tan fine sand (SM) with slight sil 11-13': light tan/gray silty fine sand (SM) 13-14': same as above but with increase orange color with depth	
15					Boring terminated at 14'	
20						
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 3	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/11/04 1450 END: 11/11/04 1510 LOGGER : K. Zunich

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	24"			0-2': organic matter	
	4-8'	36"				
5					5-6': gray clayey sand (SC)	
					6-7': gray silty sand (SM)	
					7-8': tan silty fine sand (SM)	
					Boring terminated at 8'	
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 4	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/11/04 1510 END: 11/11/04 1550 LOGGER : K. Zunich

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	24"			0-2': organic matter; brown sand (SM)	
	4-8'	24"				
5						
					6-8': black clay (CL) with wood fibers, roots, gravel, glass	
	8-12'	48"			8-9': black/dark brown clay (CL) with gravel, roots, wood chunks 9-10': silty sand (SM) with some wood roots	
10					10-12': gray saturated silty sand (SM)	
					Boring terminated at 12'	
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 5	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/12/04 1020 END: 11/12/04 1050 LOGGER : R. Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	24"			0-1': asphalt; at 10", gray sand (SM) with gravel 1-1.2': orange-brown fine sand with gravel (0.25" black gravel) 1.2-1.8': orange-brown fine/medium sand (SP-SM)	
	2-6'	36"			1.8-2': orange-brown medium sand (SP-SM) 2-3.2': light brown/orange fine sands (SM) 3.2-3.5': light gray sandy gravel (GP) 3.5-4': light brown/orange fine sands 4-4.3': blackish-brown fine sand (SM)	
5					4.3-4.5': orange-brown brick and rock fragments 4.5-5': black clayey fine sands ((SC) with some silt; pieces of rock debris and glass	
	6-10'	36"			6-9': light gray fine to medium sands (SP-SM); phragmites stems mixed in	
10					9-10': light greenish gray fine to medium sands (SP-SM)	
					Boring terminated at 10'	
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 6	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/12/04 1130 END: 11/12/04 1150 LOGGER : R. Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	24"			0-0.7': asphalt 0.7-1': asphalt fragments and light gray gravel (GM) with some coarse sand 1-2': orange-brown fine sand (SM)	
	2-6'	48"			2-2.7': light tan fine sands (SM) 2.7-2.8': grayish tan fine sands (SM) with some gravel 2.8-3.2': tan fine sand (SM) 3.2-3.4': dark grayish-brown fine sands with rock	
5					3.4-3.5': rocks and gravel 3.5-3.6': orange-brown sand (SM) with brick debris 3.6-4.2': black gravel, glass debris 4.2-4.5': black clayey sands (SC) 4.5-6': gray moist fine sands (SM)	
					Boring terminated at 6'	
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 7	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/12/04 1150 END: 11/12/04 1235 LOGGER : R. Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	12"			0-2": asphalt	
	2-6'	36"			2-4": dark greenish-brown gravel and rocks with medium fine sand (GP) 4-6": black silty sand (SM) with small rock 6-12": greenish-brown medium-fine sand (SM) with rock, plastic, and rope debris 2-2.7': brown medium fine sand (SP-SM) with small gravel fragments	
5					2.7-3': medium fine sands (SM) with wood fibers and rocks 3-3.7': gravel with fine sand (SP-SM)	
	6-10':	12"			3.7-3.8': light gray stiff fine sand (SM) 3.8-4.8': brownish-black moist sandy silt (SM) with small rock pieces 4.8-5': black, moist sandy silt (SM) with rocks wood fibers	
10					9-9.5': black sandy silt (SM) with rock and glass fragments, wet 9.5-10': light gray fine sands, wet	
					Boring terminated at 10'	
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
181812.FI.FK	DPT 8	SHEET 1 OF 1

WASTE DELINEATION LOG

PROJECT : CTO-14 DRILLING CONTRACTOR : Columbia LOCATION : Site 2

ELEVATION : NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : direct push

WATER LEVELS : START: 11/12/04 1235 END: 11/12/04 1340 LOGGER : R. Ives

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	24"			0-12": asphalt 12-13": brown medium-fine sand (SM) 13-14": concrete rocks 14-22": brown medium fine sand (SM) with rocks 22-24": blackish-brown medium silty sands (SM) with rocks and gravel. At 22" fiber weave mesh above silty layer	
	2-6':				2-6': blackish-brown medium silty sands (SM) with rocks and gravel.	
5					Boring terminated at 6'	
10						
15						
20						
25						

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 1	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/28/01 11:50 END : 6/28/01 12:10 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6	0-6"	Top soil, roots.	
8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56	6"-12"	Organic sandy SILT, dark gray, wet.	Near water line. Trench excavated from just inside water line approx 10'. Removed large chunks of concrete. USA reports metal hits-likely rebar in concrete. Concrete up to 8" thickx2'x3". Surface-phragmites. 8' in from trench - 0-2' - All organic topsoil, brown, moist, no staining or debris other than concrete and brick piece. Photo 26(7)

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 2	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/28/01 12:10 END : 6/28/01 13:00 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8	0-8"	Top soil, light brown, organic, roots	Brick pieces. Photo 26(8)
10, 12, 14, 16, 18, 20, 22, 24	8-24"	Fine to medium grained SAND, light gray with brown and orange staining, moist.	Photo 25(9) Culvert
26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56	24-72"	Organic SILT with trace sand, gray.	No water visible in excavation. No signs of staining or debris. Total Depth 6'

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 3	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/28/01 13:00 END : 6/28/01 14:10 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6	0-6"	Organics and roots	Heavy blast grit - only in top 6".
8, 10, 12, 14, 16, 18	6-18"	Organic SILT, abundant roots up to 1".	
20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54	18-53"	SILT with heavy organics, gray, wet, soft.	Water in bottom 6" of hole. Small amounts of misc. debris, bottle, well cap. No signs of staining. Photo 23(10) Photo 22(11) of trench
56, 58, 60			Total Depth 4'6" Extended trench back 10' from wetlands. ~3.5' organic SILT, gray, soft, small amount of water. Blast grit evident among roots down to ~3.5' bgs. Total Depth 4' Photos 20,21(12) (13). Collected sample SJS02-SB12-001.

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 4	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/28/01 14:20 END : 6/28/01 14:30 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Top soil, light brown to tan, roots.	
4			
6			
8			
10	4-18"	Medium grained SAND, light brown to tan.	Blast grit/soil mix 20% to 100% grit.
12			
14			
16			
18			
20	18-54"	Sandy CLAY, grading more sandy with depth, brown to light brown.	Water coming in at bottom of hole. No other signs of debris or staining other than blast grit mix in top 18".
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
56			Total Depth 4'6" Approx. 20' behind Trench 3. Photo 19(14) of trench Collected sample SJS05-SB25-001.

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 5	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 08:25 END : 6/29/01 08:50 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4	0-12"	Top soil with some gravel, heavy roots.	
6			
8			
10			
12			
14			
16			
18			
20	12-36"	Organic top soil, brown.	Concrete and brick chunks present.
22			
24			
26			
28			
30			
32			
34			
36		Silt, gray.	Some large concrete chunks.
38			Total Depth 3' Photo 35(1)
40			No sign of staining or debris other than concrete.
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 6	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 08:50 END : 6/29/01 09:25 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2		BERM- 2' high, 8" wide: Medium to fine grained SAND, tan, roots, organic.	No sign of debris in 2'.
4			
6			
8			
10			
12			
14			
16			
18			
20			
22			
24			
26		From Grade (Excluding Berm): Organic SILT, brown, moist, roots.	Small concrete chunks (1 large embedded in east side of trench), some small metal straps. No staining, blast grit or other debris
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			Total Depth 6' Photo 34,33(2)
56			

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 7	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 09:25 END : 6/29/01 09:50 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Top soil with organics and roots.	
4			
6			
8			
10	4-24"	Organic silty SAND with some gravel, brown.	Small metal wires, trace blast grit mixed in soil.
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34	24-48"	Sandy CLAY, gray, moist to wet, plastic, trace organics.	
36			
38			
40			
42			
44			
46			
48			
50			Total Depth 4' Hole appears pretty clean except for trace blast grit and some metal and asphalt chunks. Photo 32(3)
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 8	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 09:50 END : 6/29/01 10:25 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Top soil, brown, organics.	Trace blast grit mix in topsoil. 1 piece of burnt wood.
4			
6			
8			
10			
12			
14			
16	4"-48"	Clayey SAND, light brown to tan, semi-plastic.	No metal hits. No signs of debris or staining.
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			Total Depth 4' Photo 30(4)
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 9 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 10:25 END : 6/29/01 10:55 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	0-24"	Top soil, heavy rooted.	Abundant blast grit on north side of trench, no sign on south side.
26, 28, 30, 32, 34, 36	24-36"	Silty fine SAND, tan to light brown, poorly graded.	No signs of debris
38, 40, 42, 44, 46, 48, 50, 52, 54, 56			Total Depth 3' Photo 30(5) of south wall without grit. Photo 29,28(6) of north wall with grit.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 10 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 10:55 END : 6/29/01 11:35 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-8"	Organic top soil, sand, brown to dark brown, abundant roots.	Small percentage (10%) of blast grit mix.
4			
6			
8			
10			
12			
14			
16			
18	8-45"	Clayey SAND or sandy CLAY, light brown to tan, moist, slightly plastic.	Small piece of metal found at 18" bgs. Water slowly coming in at bottom of hole. No signs of staining, debris, or blast grit.
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			Total Depth 3'9" Photo 27(7)
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 11 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 11:35 END : 6/29/01 12:00 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8	0-8"	Organic top soil, dark brown, abundant roots.	Small trace of blast grit.
10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42	8-42"	Gravel and cobbles, FILL in a gray silty sand.	Some small pieces of metal. Large concrete piece in bottom. No signs of blast grit.
44, 46, 48, 50, 52, 54, 56			Total Depth 3'5" Photo 26(8) of trench Photo 25(9) of surface debris located just north of trench, appears to be empty. Cans, bottles, wood, and misc. steel.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 12 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 12:50 END : 6/29/01 13:20 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8, 10, 12	0-12"	Sandy top soil with heavy organics.	No visible blast grit.
14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48	12-48"	Clayey SAND, brown to tan, moist, semi-plastic	No trace blast grits, no metal hits, and no signs of disposal.
50, 52, 54, 56			Total Depth 4' Photo 24(10)

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 13 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 13:20 END : 6/29/01 13:55 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Top soil, light brown to brown, roots and organics.	
4			
6			
8			
10	4-18"	Medium to fine grained SAND, tan to light brown, poorly graded.	
12			
14			
16			
18	18-20"	Small lense of SILT, dark brown, organics.	Evidence of broken glass and gravel.
20			
22			
24			
26			
28	20-48"	Sandy CLAY, tan to brown, slightly plastic.	No signs of debris, staining, or blast grit.
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			Total Depth 4' Photo 23,22(11)
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 14 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 13:55 END : 6/29/01 15:15 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
	0-12"	**From edge of wetlands, 10' to east:** Organic top soil with roots.	Very heavy (phragmites) water in hole at 12"
6			20% blast grit.
	0-12"	**UPLAND SLOPE:** Top soil, brown to black, roots, organics.	Gravel up to 2" intermixed with many tree
8		**Bottom of trench:** SILT with gravel, black, wet. Also silty SAND, iron stained at to slope.	pieces - 1' diameter x 4' length at most. 2 metal pipes - 6" diameter x 4' length.
10	0-12"	**MIDSLOPE:** Top soil with roots	
12			
14			
16			
	12-30"	**MIDSLOPE:** Organic soil.	Heavy blast grit %.
18			Too much gravel and wood in bottom.
20			
22			
24			
26			
28			
30			
32			**TOP OF SLOPE:** Total Depth 5'
34			Showing lots of grit in sidewall at 5' bgs. Bottom of hole very wet black silt with heavy organics. Caving in of loose blast grit/soil mix 50/50 split.
36			Picture 21(12) looking along trench towards wetlands.
38			Collected sample SJS02-SB13-002.
40			May have been faint petroleum odor near bottom of trench when collecting sample - very faint but organic. Put a piece of soil in groundwater and no sheen developed. Assume organic decay.
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 15 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 15:15 END : 6/29/01 15:45 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			Some small pockets of blast grit in top 6". None appears below small gravel areas in top 18".
4			
6	0-18"	Topsoil with abundant roots.	GRAVEL, obvious fill.
8			
10			
12			
14			
16			
18			
20			
22			
24	18-36"	Fine grained SAND, gray with tan mottles, roots.	No signs of blast grit.
26			
28			
30			
32			
34		Grading to SILT, dark gray to black, soft.	Bottom of hole is wet at 36" bgs. Less gravel.
36			
38			Total Depth 3' Same as Trench 14 from lower level of wetlands. Approx 10-12' upland/inland.
40			
42			Photo 21(13), standing water in most of the bottom of excavation and stadia rod on righthand side in middle of trench.
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 16 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/29/01 15:45 END : 6/29/01 16:10 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6	0-6"	Top soil, organics, roots.	No sign of blast grit
8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42	6-42"	Fine grained SAND, tan to gray with orange and brown mottles, dry to moist, poorly graded.	No sign of blast grit or debris.
44, 46, 48, 50, 52, 54	42-54"	Sandy clayey SILT, gray to dark gray, trace organics, semi-plastic.	
56			Total Depth 4' 6" Photo 20(14) No signs of staining or debris in trench.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 17 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 08:25 END : 6/30/01 09:10 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8, 10, 12	0-12"	Top soil with trace sand, dark brown to black, abundant roots and organics.	
14, 16, 18, 20, 22, 24	12-24"	Silty SAND, dark brown, moist.	Concrete and brick rubble intermixed. Perhaps trace blast grit - not large fraction.
26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56			Total Depth 2' Photo 35(1) Oil/Petroleum leaking into trench from north side. Dark black areas with sheen on water. Mild odor at bottom of trench. Collect SJS02-SB14-001 sample for TPH. Photo 30(4)

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 18 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 09:10 END : 6/30/01 09:50 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4	0-12"	Top soil, dark brown to black, organics.	Some sign of black stained (burning). Contains trace blast grit (<15%)
6			
8			
10			
12			
14			
16			
18			
20			
22			
24	12-48"	Sandy CLAY to clayey SAND, tan to light brown, semi-plastic.	Some cobbles. No sign of blast grit, debris, or staining.
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			Total Depth 4' Photo 34,33(2)
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 19	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 14:30 END : 6/30/01 14:40 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Silty, organic top soil, light brown, abundant roots.	
4			
6			
8			
10	4-24"	General debris FILL.	Debris, concrete chunks, metal strapping, small pipes, etc. Appears to have been there awhile all very rusted. Mixed in with assortment of soil including dark black soil, blast grit in pockets but not consistent down to 24".
12			
14			
16			
18			
20			
22			
24			
26	24-48"	Medium to fine grained SAND with trace clay/silt, gray with orange mottles.	
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			Total Depth 4' Photo 29,28(5)
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 20 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 10:45 END : 6/30/01 11:25 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6	0-18"	Organic SILT, abundant roots.	Typical "marsh mud".
8			
10			
12			
14			
16			
18			
20	18-24"	SILT, dark gray, very soft, roots, organics.	No signs of metal or debris. Dark-stained throughout with organic (decay) odor. Water in bottom, filling slowly.
22			
24			Total Depth 2' Photo 32(3)
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 21 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 11:25 END : 6/30/01 11:35 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6	0-18"	FILL from sand and gravel to clay and silt.	Small pieces of debris, plastic.
8			
10			
12			
14			
16			Lense of white material? Collected small bag sample.
18			
20			
22			
24	18-36"	Clayey SILT, soft gray, very soft, organics.	
26			
28			
30			
32			
34			
36			
38			Total Depth 3'
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 22 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 15:25 END : 6/30/01 15:50 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Top soil with trace gravel, gray to light brown, dry, roots.	
4			
6			
8			
10			
12			
14	4-36"	Gravel to cobble, boulder FILL with some silt and sand.	Some large pieces of asphalt up to 4". Some dark organic silt in bottom. No obvious signs of debris, metal, soil staining, or blast grit.
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			Total Depth 3' Photo 27(6) looking into marsh.
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 23 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 15:50 END : 6/30/01 16:00 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Rich, organic top soil.	
4			
6			
8			
10			
12			
14			
16	4-30"	Gravel to cobble FILL, loose.	Some larger concrete chuncks, up to 1' square and asphalt. No signs of blast grit or soil staining.
18			
20			
22			
24			
26			
28			
30			
32			Total Depth 2'6" Photo 26(7)
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 24	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 16:00 END : 6/30/01 16:15 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Top soil.	Blast grit is abundant in top 6". Any below seems to have fallen in during excavation.
4			
6			
8			
10			
12			
14	4-36"	Gravel to cobble FILL.	Asphalt and concrete.
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36		Sandy SILT with organics, gray.	
38			Total Depth 3' Very similar to Trench 23.
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 25 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 16:30 END : 6/30/01 16:45 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6	0-6"	Top soil.	Root structure for phragmites.
8, 10, 12, 14, 16, 18, 20, 22, 24	6-24"	Gravel to cobble FILL with some silt.	Concrete and asphalt chunks.
26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56			Total Depth 2' Photo 25(8) Blast grit not observed except for dusting on surface.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 26 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 6/30/01 16:45 END : 6/30/01 17:00 LOGGER : P. Landin

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4	0-12"	Gravel to cobble FILL.	Chunks of asphalt and concrete. Blast grit only on surface. Assume this location similar to others in area with fill present.
6			
8			
10			
12			Total Depth 1'
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 27 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 09:50 END : 7/2/01 10:30 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8, 10, 12, 14	0-14"	GRAVEL and SAND, black.	Blast grit on surface, black.
16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42	14-42"	SAND and GRAVEL, brown.	Bricks Water at 3' bgs.
44, 46, 48, 50	42-50"		Asphalt pieces, black, odor.
52, 54	50-54"		Wood
56	54-60"	Silt, gray.	Collected sample SJS02-SB15-001 for Metals and Dioxin analyses.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 28 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 END : 7/2/01 09:30 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			A spent shell was found on ground surface.
4	0-12"	Silty SAND with gravel, gray.	
6			
8			
10			
12			
14			
16	12-26"	Sandy SILT with less gravel	Location of 5" rounds. Two 5" shells which have been pushed together. Photo 35 & 34(1) 5" Mark 5 38 Caliber. Photo 33(2)
18			
20			
22			
24			
26			
28			
30	26-44"	Gravel rock, wet.	More debris (fuse cap looks like another 5" round), pipe, wood. Water level went to about 2'10". Photo 31(4) Appears to be slight sheen on soil pipe.
32			
34			
36			
38			
40			
42			
44			
46			Total Depth 3'6" Photo 32(3) No blast grit apparent.
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 29 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 10:30 END : 7/2/01 11:05 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			Some concrete and railroad ties on surface.
4	0-14"	Top soil and organic material, sandy SILT, wet, abundant roots.	
6			
8			
10			
12			
14			
16			
18	14-24"	Sandy SILT, dark gray to black, wet, decrease in roots.	No fill.
20			Water coming into the hole.
22			
24			
26			Total Depth 2' Length About 7' Photo 27
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 30 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 11:05 END : 7/2/01 11:15 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			Asphalt in hole, dig until natural material. Suspect that the area was built up.
4			
6			
8			
10			
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			Total Depth 5'
52			Natural material at 5' bgs. Fill to surface. Debris all the way down, glass, metal, wood, concrete.
54			Photos 26 & 25, asphalt
56			Water looks like it will fill in to at least 4' bgs. No evidence of blast grit.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 31 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 12:20 END : 7/2/01 12:50 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8, 10	0-10"	Top soil and silty SAND, dry, roots.	
12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34	10-34"	Silty SAND, gray to dark gray, wet, sticky, non plastic.	
36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56			Total Depth 2'10" Length 10' Photo 24 Looks natural, high root content.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 32 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 12:50 END : 7/2/01 13:34 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Silty SAND, brown, dry, abundant roots.	No blast grit. Pieces of concrete at surface.
4			
6			
8			
10			
12			
14	4-36"	Sandy SILT, brown, cohesive, non plastic, roots.	
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40	36-52"	Silty SAND, black, abundant tree limbs.	No odor or indication of burnt material. Wood is not burnt.
42			
44			
46			
48		SILT layer, gray.	Just above silt is abundance of tree limbs several inches in diameter. Photo 23 & 22 Water filling in at 4' bgs.
50			
52			
54	52-72"	SAND, gray to dark gray.	No asphalt seen. Total Depth 6'
56			

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 33	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 12:50 END : 7/2/01 13:34 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8, 10, 12	0-12"	Sandy SILT, brown to tan, dry, loose, roots.	
14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36	12-36"	Debris.	Wood, paper, cans, bottles, metal spikes, plywood. No indication of blast grit.
38, 40, 42, 44, 46, 48	36-48"	Silty SAND, gray, moist, cohesive, non plastic.	
50, 52, 54, 56	48-60"	SAND with some silt, natural, tan to brown, moist.	Total Depth 5' Photo 21 Collected sample SJS02-SB16-001 for dioxins

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 34 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 14:27 END : 7/2/01 14:50 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10			
12	0-30"	Silty SAND, brown to tan, dry, loose to slightly cohesive.	
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34	30-42"	Dark stained horizon.	Collected sample SJS02-SB17-001.
36			
38			
40			
42			
44			
46	42-66"	Silty SAND, black.	
48			Abundant wood, tree branches to 1" x 4"
50			
52			
54			Water at 5' bgs. Collapsing, could not reach bottom. Total Depth 5' 6"
56			Photo 19 trench Photo 20

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 35	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 15:40 END : 7/2/01 16:56 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6, 8, 10, 12	0-12"	Gravel and brick in a silty SAND matrix, gray, dry, loose.	
14, 16, 18, 20, 22, 24	12-24"	Same as above with more SILT, slightly more cohesive.	
26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48	24-48"	Brick, SAND, and SILT.	Petroleum odor. Collapsing, could not reach bottom. Water at 3'6" bgs.
50, 52, 54, 56			Total Depth 4' Photos 18-16 No indication of blast grit.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 36 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/2/01 16:56 END : 7/2/01 17:00 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2, 4, 6	0-6"	Top soil and silty CLAY, brown, moist to wet, sticky, non plastic.	
8, 10, 12, 14, 16, 18, 20, 22, 24	6-24"	Black organic layer.	Petroleum odor.
26, 28, 30	24-30"	SILT, brown, sticky, non plastic.	Slight sheen on water. Collected sample SJS02-SB18-001 for TPH
32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56			Total Depth 2'6"

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 37 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/3/01 08:00 END : 7/3/01 10:00 LOGGER : B. Friedmann

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10	0-24"	Small top soil horizon then fine to medium grained silty SAND, dry, loose.	Piece of brick and pipe.
12			
14			
16			
18			
20			
22			
24			
26			Collected sample SJS02-SB19-001.
28			
30			
32			
34			
36			
38	24-60"	Sandy SILT, wet, cohesive, nonfriable.	No odor.
40			Tarpaper, black soils, wood, may have been burned.
42			
44			
46			
48			
50			
52		**At 60":** Silty SAND, brown.	Bail of hay.
54		**At 60-84":** SAND with silt, brown.	Some wood.
56			Total Depth 7' Water filling hole. Photos 34-32 (2) Photos 36 & 35 Debris

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 38 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/3/01 13:35 END : 7/3/01 14:15 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4	0-12"	Organic SAND with silt, brown, moist, roots.	
6			
8			
10			
12			
14			
16			
18			
20	12-60"	Silty SAND, black, wet.	Wood fragments observed. Black staining- signs of petroleum contamination.
22			
24			
26			
28			
30			
32			
34			
36			Water table at 3' bgs.
38			
40			
42			
44			
46			
48			
50			Appears to be natural.
52			
54	60-84"	SILT, gray, saturated, roots in top 1'.	Total Depth 7'
56			Photo 24

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 39	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/3/01 14:15 END : 7/3/01 14:45 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Silty SAND-top soil, brown, very moist.	
4			
6			
8			
10			
12	4-24"	SAND with trace fines, mottled tan and gray.	Gravel from a drain or pipe bed approx. 6" bgs on side of excavation closest to culvert. Water table at 1'6" bgs.
14			
16			
18			
20			
22			
24			
26			Total Depth 2'1" Photo 22 No apparent contamination.
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 40 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/3/01 14:45 END : 7/3/01 15:30 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4	0-18"	SAND with some silt, moist.	Possible fill - plastic and gravel pieces visible.
6			
8			
10			
12			
14			
16			
18			
20			There is a 1" layer of dark brown silty sand at 19" bgs. Contains porcelain fragments. No unusual odor.
22			
24			
26			
28			
30	18-60"	Silty SAND, brown and orange, moist to very moist.	Appears to be natural soil.
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			Total Depth 5'
56			Photo 21 No apparent contamination.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 51 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/5/01 12:30 END : 7/5/01 13:15 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10			
12	0-36"	Sandy SILT, brown, damp.	Concrete, wood, and metal fragments observed.
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
	36-72"	Sandy SILT, mottled blue gray, saturated.	Wood fragments and organic material present.
46			Strong organic odor. Water table at 6' bgs.
48			
50			
52			
54			Total Depth 6'
56			Photo 25-24 No apparent contamination.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 52 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/5/01 13:15 END : 7/5/01 13:45 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-4"	Top soil.	
4			
6			
8	4-18"	Sandy SILT, brown, damp.	Brick, plastic, concrete and metal fragments observed.
10			
12			
14			
16			
18			
20			
22			
24			
26			
28			
30	18-78"	Silty SAND, brown, moist to saturated.	Appears to be natural material.
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			Water table at 6.5' bgs.
54			Total Depth 6'6"
56			Photo 23 No apparent contamination.

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 53	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/5/01 13:45 END : 7/5/01 14:10 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4	0-12"	Top soil, dark brown, damp.	Brick and concrete fragments observed.
6			
8			
10			
12			
14			
16			
18			
20			
22			
24			
26	12-78"	Silty SAND, mottled tan and gray, moist to saturated.	Appears to be natural soil.
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			Water table at 5.5' bgs.
54			Total Depth 6'5"
56			Photo 22 No apparent contamination.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 54 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/5/01 13:45 END : 7/5/01 14:10 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-5"	Top soil, dark brown, damp.	Brick and gravel fragments observed.
2			
4			
6			
8			
10			
12			
14			
16			
18			
20			
	5-72"	Silty SAND, tan, moist to saturated.	Appears to be natural material.
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			Water table at 5.5' bgs.
54			Total Depth 6'1"
56			Photo 21 No apparent contamination.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 55 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/5/01 14:35 END : 7/5/01 15:05 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10			
12			
14			
16			
18			
20			
	0-54"	Sandy SILT, brown, damp.	Brick, metal sheeting and large 1-2' concrete blocks observed.
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
	54-66"	Gravelly SILT with some ssand, gray.	Total Depth 5'6" Water table at 5.5' bgs.
56		Appears to be fill.	Photo 20-19 No apparent contamination.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 56 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/5/01 15:05 END : 7/5/01 15:30 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-3"	Top soil with organics, mottled tan, black, and brown.	Wood fragments observed.
2			
4			
6			
8			
10			
12			
14			
16			
18			
20			
	3-72"	Silty SAND, tan, moist to saturated.	Appears to be natural soil.
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			Water table at 5.5' bgs.
54			Total Depth 5'9"
56			Photo 18 No apparent contamination or blast grit observed.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 57 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/5/01 15:30 END : 7/5/01 16:15 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-2"	Silty SAND and top soil with rounded quartz gravel, brown.	Brick and glass fragments observed.
4			
6			
8			
10			
12			
14			
16			
18			
20	2-48"	Organic silty SAND, orange brown, moist.	Appears to be natural soil.
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			Total Depth 4'1" Photo 17 No apparent contamination or blast grit observed.
52			
54			
56			

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 58 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/6/01 08:10 END : 7/6/01 08:35 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10			
	0-54"	Silty SAND with gravel, brown.	Large concrete blocks and metal pipe observed.
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			
	54-72"	Gravelly SAND with some silt, organic.	Total Depth 6'2" Water table at 5' bgs.
56		Brick fragments observed.	Photo 35 All material at this location appears to be fill.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 59 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/6/01 08:35 END : 7/6/01 09:10 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10	0-24"	Sandy SILT, brown, damp.	Brick and concrete fragments observed.
12			
14			
16			
18			
20			
22			
24			
26			
28			
30	24-72"	Silty SAND, dark brown.	Blast grit observed.
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54	72-90"	Silty SAND with organic material, brown.	Total Depth 6'6" Photo 34-33 Extended - Total Depth 8'3" Photo 32 Photo 31,30 general set-up
56	90-102"	Sandy SILT, gray, saturated. Some brick fragments observed.	Collect sample SJS02-SB22-001 for TALmetals

PROJECT NUMBER	TEST PIT NUMBER	
138804.FI.TR	SJS02-TRENCH 60	SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/6/01 09:10 END : 7/6/01 09:50 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6	0-15"	Sandy SILT, brown, damp.	Brick, concrete, and wood fragments observed.
8			
10			
12			
14			
16	15-19"	Silty SAND, black, damp.	No blast grit present.
18			
20			
22			
24			
26			
28			
30	19-90"	Silty SAND, mottled tan and gray, moist to saturated.	Appears to be natural soil.
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			Water table at 5' bgs.
54			Total Depth 7'6" Photo 29-28
56			Photo 27 - silt fence along marshland

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 61 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/6/01 09:50 END : 7/6/01 10:00 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10	0-36"	Sandy SILT with rounded quartz gravel, brown, damp.	Concrete blocks and glass bottles observed.
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40	36-54"	Gravelly SILT with some sand, black, damp.	Slag and brick fragments observed.
42			
44			
46			
48			Collect sample SJS02-SB23-001 for metals
50			
52			
54	54-84"	Silty SAND, mottled tan and gray, saturated.	Total Depth 7'2"
56		Appears to be natural soil.	Photo 26

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 62 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/6/01 10:25 END : 7/6/01 11:20 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0-6"	Sandy SILT, brown, damp.	Small concrete blocks observed.
4			
6			
8			
10			
12			
14			
16			
18			
20			
22			
24			
26			
28			
30	6"-84"	Silty SAND, mottled tan and gray, moist.	Appears to be natural soil.
32			
34			
36			
38			
40			
42			
44			
46			
48			
50			
52			
54			Total Depth 7'3" Photo 25
56			Continued to 8' bgs, collapsed. No apparent contamination.

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 63 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/6/01 11:20 END : 7/6/01 12:00 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10			
12	0-36"	Sandy SILT, brown, damp.	Large concrete blocks, intact wood boards, and brick fragments present.
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40	36-81"	Sandy SILT slightly mixed with organic material and stained black, gray, moist.	
42			
44			
46			
48			
50			
52			
54			Total Depth 6'9" Photo 24-23
56			No burned material or blast grit present. Staining likely due to organics

PROJECT NUMBER	TEST PIT NUMBER
138804.FI.TR	SJS02-TRENCH 64 SHEET 1 OF 1

TEST PIT LOG

PROJECT : St. Juliens Creek Annex - Site 2 LOCATION : Chesapeake, Virginia

ELEVATION : N/A TRENCHING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : N/A

WATER LEVELS : N/A START : 7/6/01 12:00 END : 7/6/01 12:30 LOGGER : B. Francisco

Depth (inches)	Interval (inches)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2			
4			
6			
8			
10	0-30"	Sandy SILT, brown, damp.	Large concrete blocks, bricks, metal, pipe pieces observed.
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40	30-84"	Coarse to medium grained SAND, black.	Probable fill.
42			
44			
46			
48			
50			
52			Water table at 6.5' bgs.
54	84-87"	SILT, gray with some black staining.	Total Depth 7'3" Photo 22
56		Appears to be natural soil.	Collected sample SBS02-SB24-001 for metals at 7' bgs.

Appendix K
Membrane Interface Probe Reports and Correlation Plots

SmartData Solutions®

Subsurface Characterization Using Membrane Interface Probe (MIP) and Soil Conductivity (SC) Technologies at the St Juliens Creek Annex - Combined Portsmouth, VA

PREPARED FOR

CH2M Hill
5700 Cleveland St, STE 101
Virginia Beach, Virginia 23462

June 12, 2007

PREPARED BY

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FIGURES

Figure 1 .....Sitemap and MIP Locations

Figure 2 .....Plan View Relative Azimuth 180°, PID Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 3 .....Oblique View Relative Azimuth 195°, PID Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 4 .....Transect View Relative Azimuth 180°, PID Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 5 .....Transect View Relative Azimuth 270°, PID Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 6 .....Transect View Relative Azimuth 90°, PID Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 7 .....Transect View Relative Azimuth 0°, PID Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 8 .....Plan View Relative Azimuth 180°, ECD Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 9 .....Oblique View Relative Azimuth 195°, ECD Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 10 .....Transect View Relative Azimuth 180°, ECD Response >3.5E+05uV, Conductivity Response > 75mS/M

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Figure 11 .....Transect View Relative Azimuth 270°, ECD Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 12 .....Transect View Relative Azimuth 90°, ECD Response >3.5E+05uV, Conductivity Response > 75mS/M

Figure 13 .....Transect View Relative Azimuth 0°, ECD Response >3.5E+05uV, Conductivity Response > 75mS/M

APPENDIX

Appendix A: MIP Logs (Best Fit Scale)

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Introduction

CH2M Hill contracted **COLUMBIA Technologies, LLC (COLUMBIA)** to conduct an investigation of subsurface contamination at the St Juliens Creek Annex - Revisit site, located in Portsmouth, VA. This investigation involved delineating the depth and horizontal extent of contamination using Membrane Interface Probe (MIP) and Soil Conductivity (SC) technologies. The purpose of this investigation was to characterize subsurface soils in the vadose and saturated zones, and delineate the nature and extent of soil and groundwater contamination.

The investigation was conducted November 8, 2004 through November 11, 2004 and May 8, 2007 through May 10, 2007 by COLUMBIA.

Objectives

The objectives of the MIP/SC investigation were to:

1. Characterize subsurface soils in the vadose and saturated zones.
2. Delineate the lateral boundaries of the contaminant in soil and groundwater.
3. Delineate the vertical extent of contamination in soil and groundwater.

Equipment Description

The MIP/SC probe is approximately 12-inches (30 cm) in length and 1.5-inches (3.8 cm) in diameter. The probe is driven into the ground at the nominal rate of one foot per minute using a Geoprobe® or similar direct push rig.

Soil conductivity, the inverse of soil resistivity, is measured using a dipole arrangement. In this process, an alternating electrical current is transmitted through the soil from the center, isolated pin of the probe. This current is then passed back to the probe body. The voltage response of the imposed current to the soil is measured across these same two points. Conductivity is measured in Siemens/meter, and due to the low conductivity of earth materials, the SC probe uses milliSiemens/meter (mS/m). The probe is reasonably accurate in the range of 5 to 400 mS/m. In general, at a given location, lower conductivity values are generally characteristic of larger particles such as sands, while higher conductivities are characteristic of finer sized particles such as silts and clays.

The MIP portion of the probe was developed and patented by Geoprobe Systems, Inc. The operating principle is based on heating the soil and/or water around a semi-permeable

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polymer membrane to 121ºC, which allows volatile organic compounds (VOCs) to partition across this membrane. The MIP can be used in saturated or unsaturated soils, as water does not pass through the membrane. Nitrogen is used as a carrier gas, and travels from a surface supply down a transfer tubing which sweeps across the back of the membrane and returns any captured VOCs to the installed detectors at the surface. It takes approximately 37 seconds for the nitrogen gas stream to travel through 100 feet of inert tubing and reach the detectors.

COLUMBIA utilizes three detectors: a Photo Ionization Detector (PID), a Flame Ionization Detector (FID) and an Electron Capture Detector (ECD), mounted on a laboratory grade Shimadzu Model 14A gas chromatograph. The output signal from the detectors is captured by a MIP data logging system installed on a MIP Field Computer or laptop computer. Conductivity, speed, detector data and temperature are displayed continuously in real time during each push of the probe. In addition, the data logs can be printed for display and analysis following the data logging run or exported to common spreadsheet software for further analysis using COLUMBIA's ***SmartData Solutions***tm technology.

The PID detector consists of a special UV lamp mounted on a thermostatically controlled, low volume, flow-through cell. The temperature is adjustable from ambient temperature to 250ºC. The 10.2 electron volt (eV) UV lamp emits energy at a wavelength of 120 nanometers, which is sufficient to ionize most aromatics (benzene, toluene, xylene, etc.) and many other molecules (e.g. H_2S, hexane, ethanol) whose ionization potential is below 10.2 eV. The PID also emits a lower response for chlorinated compounds such as TCE and PCE. Methanol and water, which have ionization potentials greater than 10.2 eV, do not respond on the PID. Detection limits for aromatics are in the low picogram range at the detector. Since the PID is non-destructive, it is often run first in series with other detectors for multiple analyses from a single injection. Use of the PID is mandated in several EPA methods (8021, TO-14 etc.) because of its sensitivity and selectivity.

The most commonly used GC detector is the FID, which responds linearly over several orders of magnitude from its minimum detectable quantity of about 100 picograms. The FID response is very stable from day to day, and is not susceptible to contamination from dirty samples or column bleed. This detector responds to any molecule with a carbon-hydrogen bond, but poorly to compounds such as H_2S, CCl_4, or NH_3. The carrier gas effluent from the GC column is mixed with hydrogen and burned. Hydrogen supports a flame and ionizes the analyte molecules. A

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collector electrode attracts the negative ions to the electrometer amplifier, producing an analog signal, which is directed to the data system input.

The ECD detector consists of a sealed stainless steel cylinder containing radioactive Nickel-63. The Nickel-63 emits beta particles (electrons), which collide with the carrier gas molecules, ionizing them in the process. This forms a stable cloud of free electrons in the ECD cell. When electro-negative compounds (especially chlorinated, fluorinated or brominated molecules) such as carbon tetrachloride or TCE enter the cell, they immediately combine with the free electrons, temporarily reducing the number remaining in the electron cloud. The detector electronics, which maintain a constant current of about 1 nanoampere through the electron cloud, are forced to pulse at a faster rate to compensate for the decreased number of free electrons. The pulse rate is converted to an analog output, which is transmitted to the data system.

System Performance Testing

Prior to logging each MIP location, performance tests with specific compounds are conducted to evaluate the sensitivity of the particular probe, transfer line and detector suite to be used. An aqueous phase test is performed prior to each location using neat benzene and neat TCE. The resulting values are recorded and compared to predetermined values.

Investigation Methods

MIP/SC profiling was conducted at 41 locations total on, or adjacent to the property of the St Juliens Creek Annex - Revisit, selected by CH2M Hill's representative onsite. Drilling was completed using a Geoprobe® rig, and termination of MIP logging was determined by CH2M Hill's representative onsite. The results from each location are shown in Appendix A. Maps and 3D graphics of the site have been prepared for easier visualization of the subsurface.

MIP Log Interpretation

Each MIP log includes six separate graphs of data. The first graph is conductivity and is measured in millisiemens per Meter (mS/M). In general, lower conductivities are indicative of coarser grained particles, such as sands, and higher conductivities are characteristic of finer grained particles, such as silts and clays. The second graph is the rate of penetration (speed of

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the probe) and is measured in feet/min. This information can be used to determine how resistant the subsurface is to the direct push and/or percussion. The next three graphs are measures of chemical detector response: PID, FID, and ECD, measured in microvolts (uV). These graphs are a linear scale, and give relative concentrations of contamination. The last graph displays the temperature of the probe as it is advanced in the subsurface. This graph can sometimes be useful to determine where groundwater is encountered.

Correlating MIP Results to Sampling & Laboratory Analyses

It is important to note that some variation between MIP results and quantitative laboratory analyses of selected soil or groundwater samples can be expected. The MIP process uses a membrane extraction process from a heated zone of varying subsurface matrix of soil, water, and/or vapor. Soil and groundwater results involve the collection of a sample, extraction of sub-sample at the surface, and then transporting them to a laboratory for further extraction and analysis. These two processes are different by definition. The difference is further accentuated by any difference in depth from where the respective samples are taken for the two different processes and the type of matrix that is sampled.

MIP results are not quantitative results, i.e. concentration values. Contaminant concentration is a ratio of contaminant mass to a particular matrix volume. The mass of a compound that passes through the membrane for evaluation by the MIP detector system will vary as a result of several factors including the volume and type of matrix from which the mass is extracted. Therefore, an accurate calculation of mass is preempted.

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When the MIP system lineup and operating protocol are standardized between data points, then the MIP results are an accurate representation of the relative variation of contaminant mass detected with changes in depth. The variation in this case will be wholly dependent on the subsurface conditions, not the internal MIP system performance. This leads to an accurate estimation of the plume boundaries and the geometric volume of soils that it occupies. Follow on soil and groundwater confirmation samples co-located with MIP boring locations taken on hundreds of contaminated sites investigated by Columbia Technologies confirm a high overall correlation between MIP results and quantitative lab results.

SmartData Solutions®

COLUMBIA's SmartData Solutions® is a patented process (U.S. Patent No, 7,058,509) that enables the rapid processing of field data into easy to understand 3D visualizations posted to a password protected website. This process includes quality assurance, formatting and rapid visualization of the data for the project team and enables a complete check of the dataset prior to completion of fieldwork.

Delineation and Volume

The SmartData Solutions® graphics display a 3-dimensional view of the contamination plume. These plumes are calculated by extrapolating data in three dimensions between measured data points. The plume is calculated only within the bounds of the outermost measured points. A plume is considered to be unbounded when it extends to the bounds of those outermost measured points. A fully bounded plume will exist entirely within the confines of the outermost measured points.

The SmartData Solutions® graphics also display a plume volume calculation in the heading. This volume is based on the minimum response level listed in the heading. Volume is calculated by using the scale of the map provided. As a result, the plume calculation is only as accurate as the scale and details of the map. It is important to note that the plume volume calculation reflects only the portion of the plume that exists within the outermost measured points. The volume reported of an unbounded plume may be greatly understated. In any case, the volumes reported are intended for general planning purposes only and may vary from actual volumes.

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3-Dimensional Orientation

The SmartData Solutions® graphics use a relative azimuth system to describe map orientation because many maps are not oriented with true North at the top of the map. The relative azimuth system uses a 360° compass to describe the position *from which* the graphic is being viewed. For example, a viewer "looking east" on a North oriented map would have a relative azimuth of 270°., i.e. the viewer would be standing on the "western" 270° azimuth point looking through the center to the "east".

The header also describes elevation. Elevation is the number of degrees that the graphic is rotated on the vertical Z axis. A plan view has an elevation of 90°; a transect view has an elevation of 0°.

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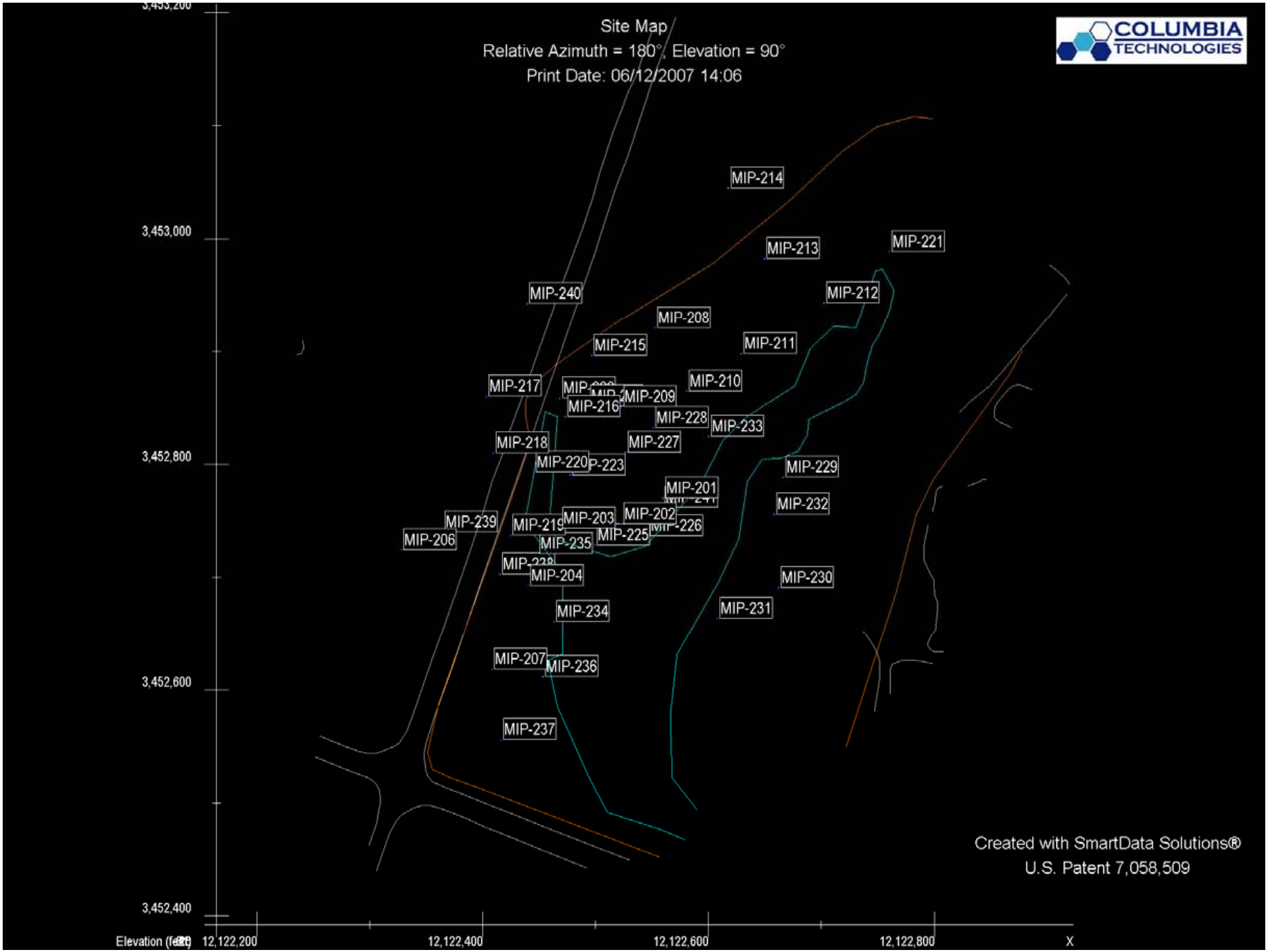

Figure 1 Sitemap and MIP Locations
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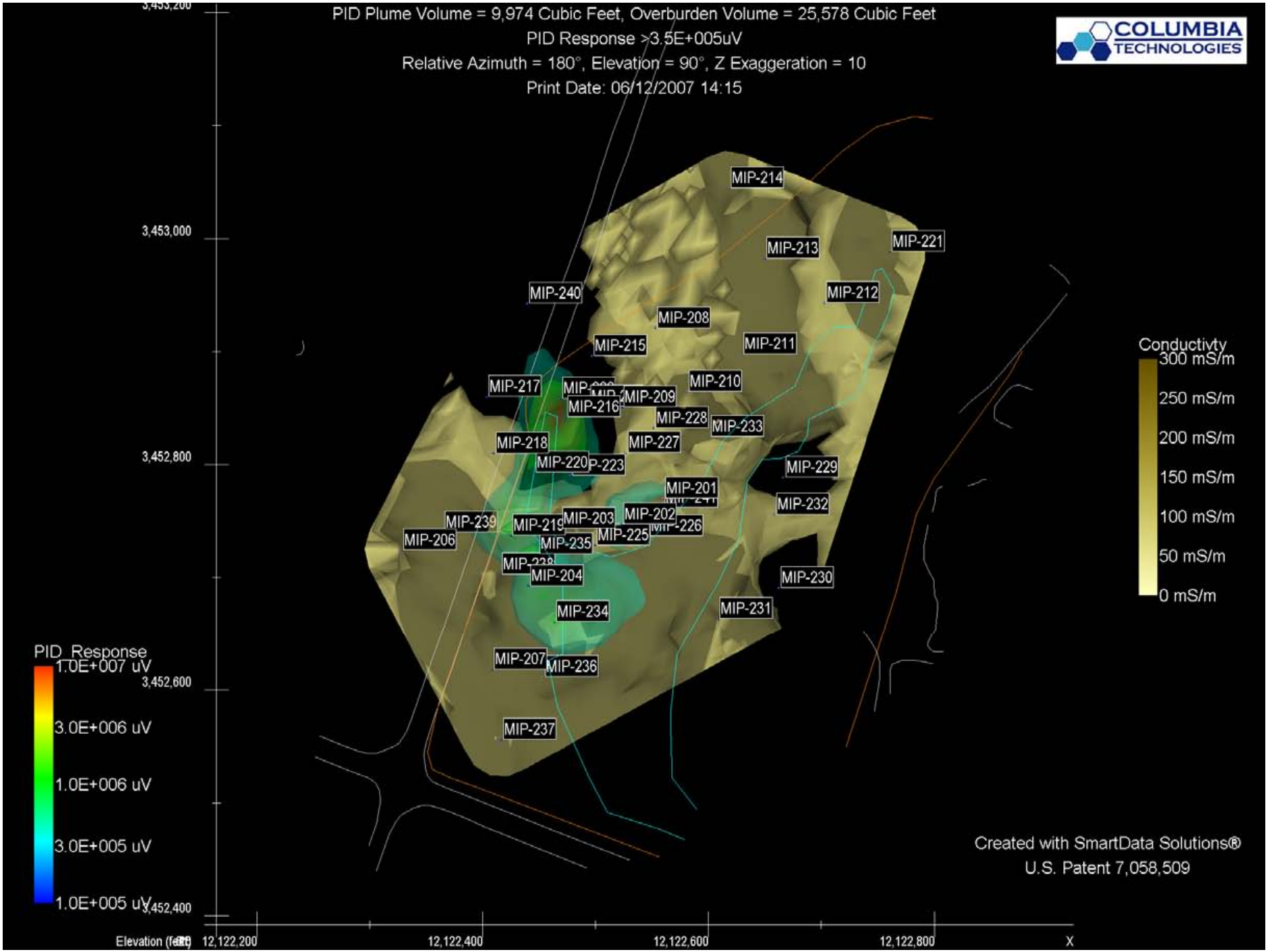

Figure 2 Plan View Relative Azimuth 180°
Nov 8, 2004 – Nov 11, 2004 and May 8, 2007 – May 10, 2007

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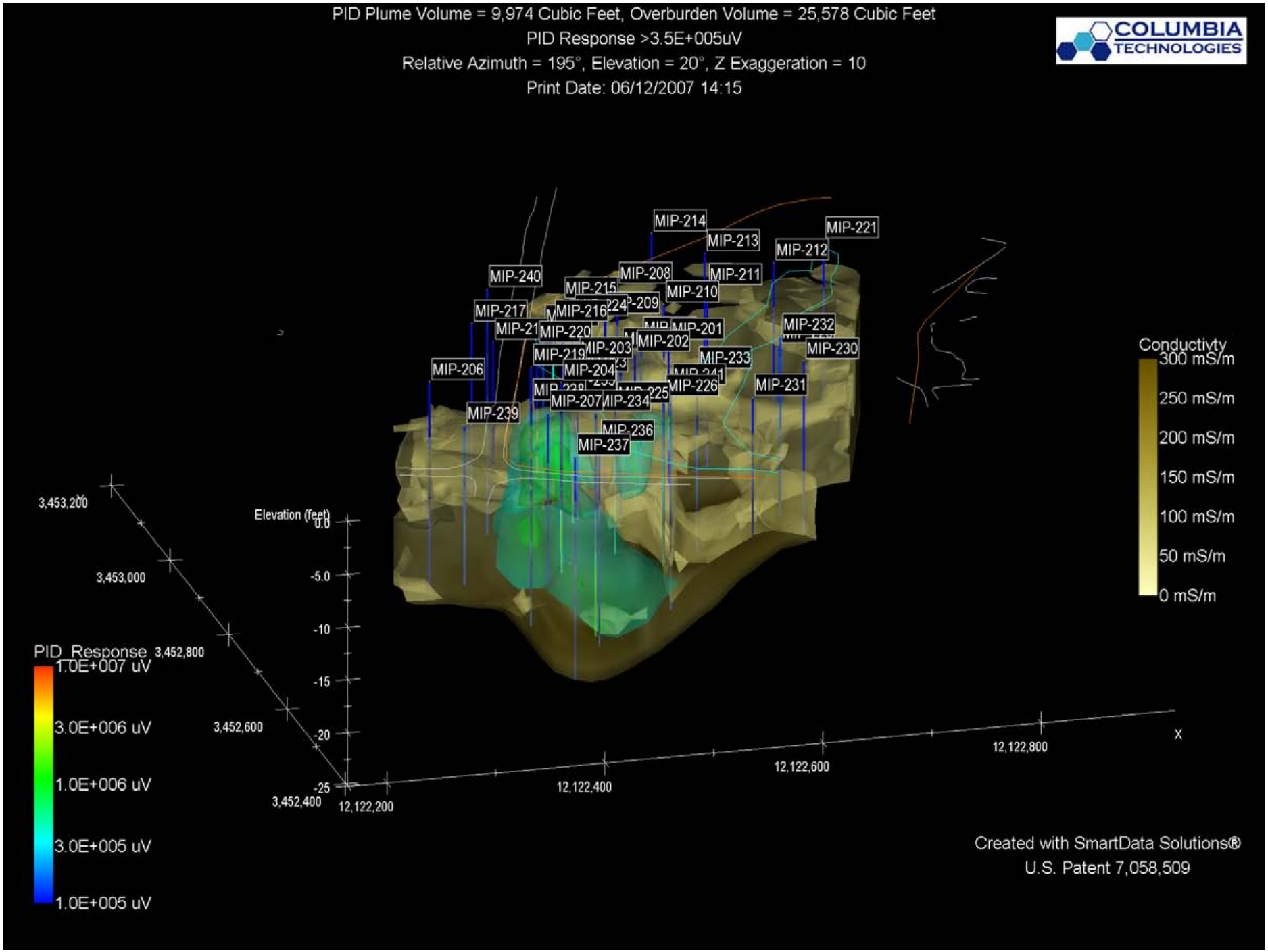

Figure 3 Oblique View Relative Azimuth 195°
Nov 8, 2004 – Nov 11, 2004 and May 8, 2007 – May 10, 2007

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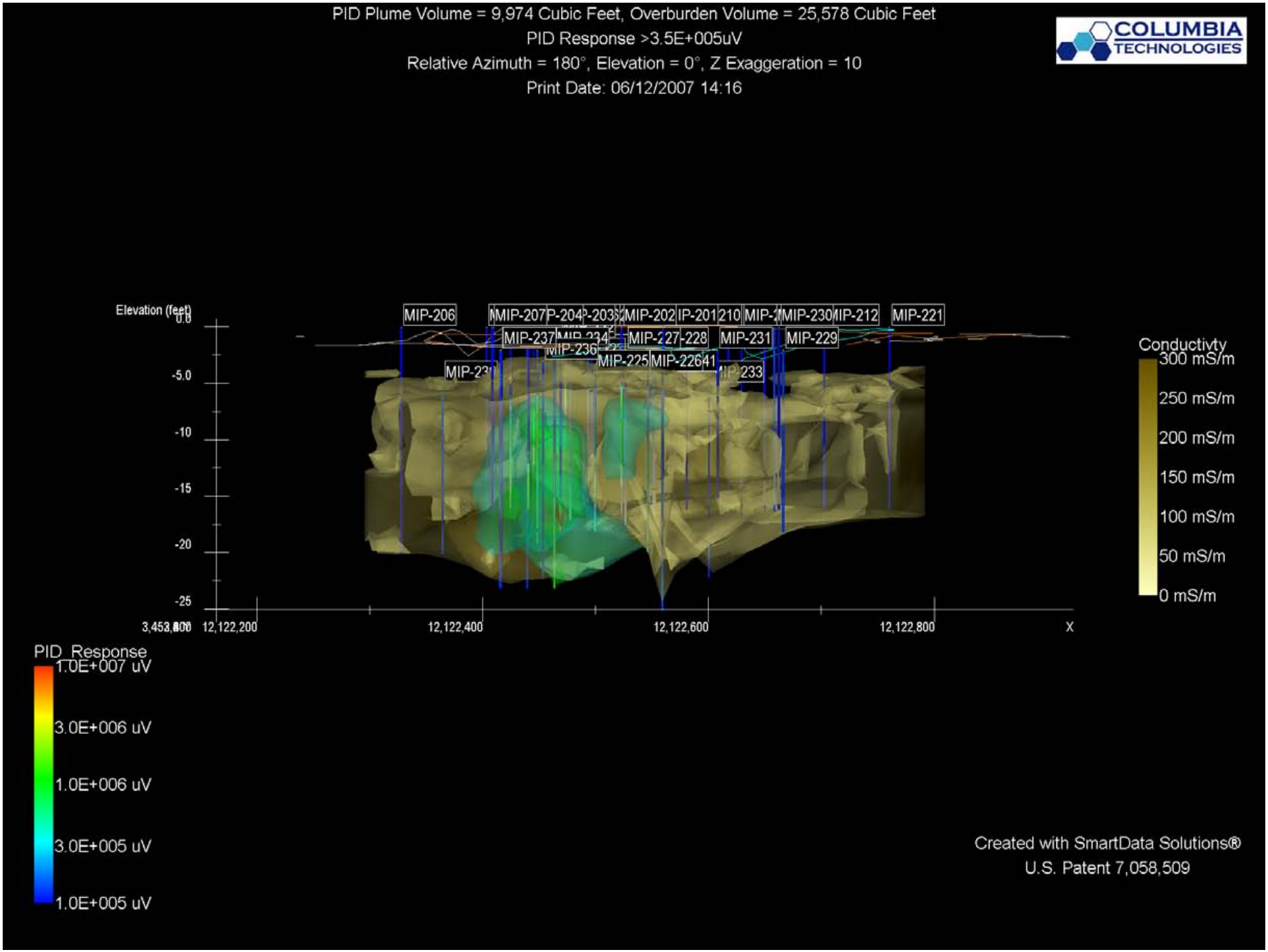

Figure 4 Transect View Relative Azimuth 180°
Nov 8, 2004 – Nov 11, 2004 and May 8, 2007 – May 10, 2007

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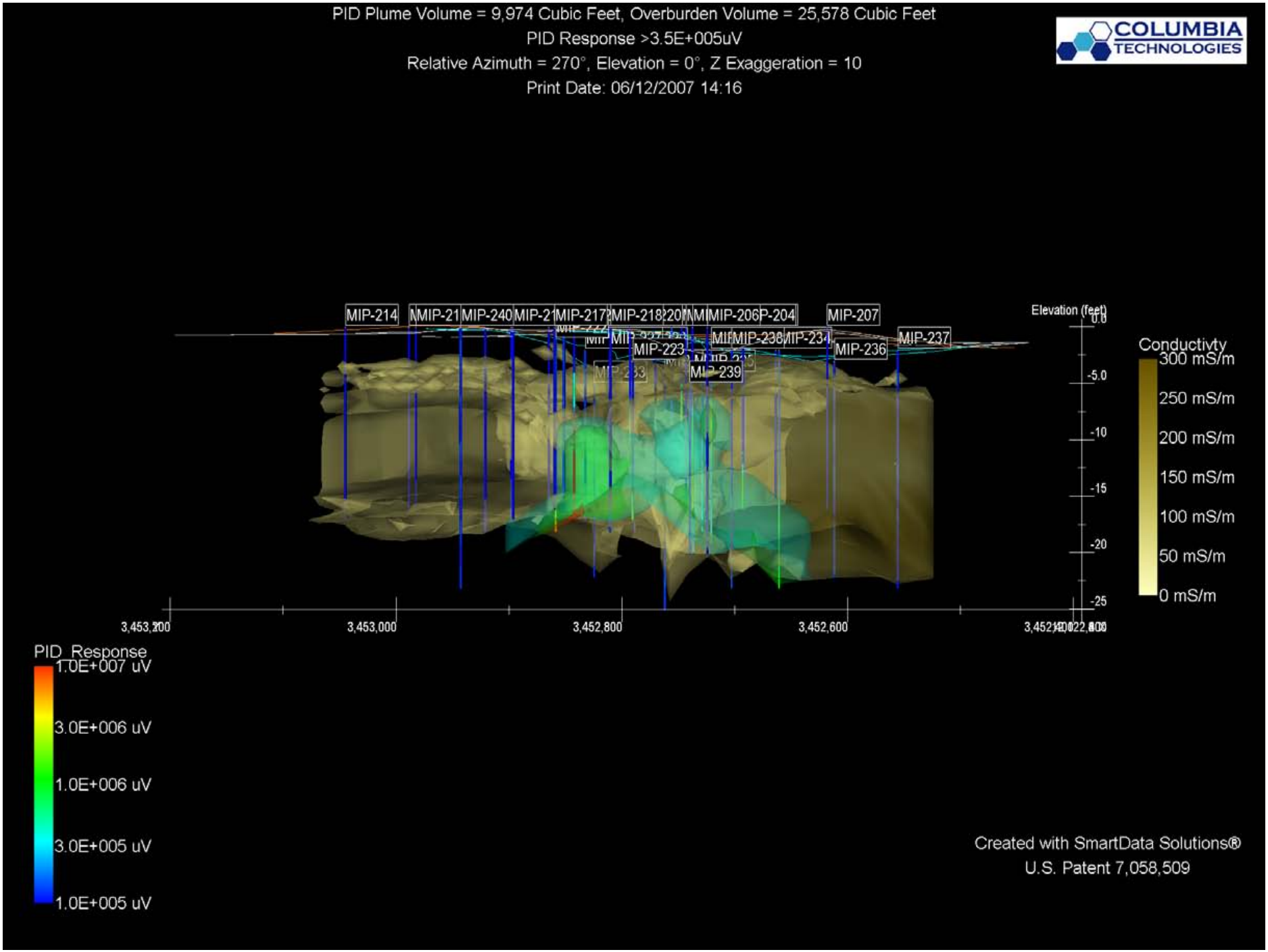

Figure 5 Transect View Relative Azimuth 270°
Nov 8, 2004 – Nov 11, 2004 and May 8, 2007 – May 10, 2007

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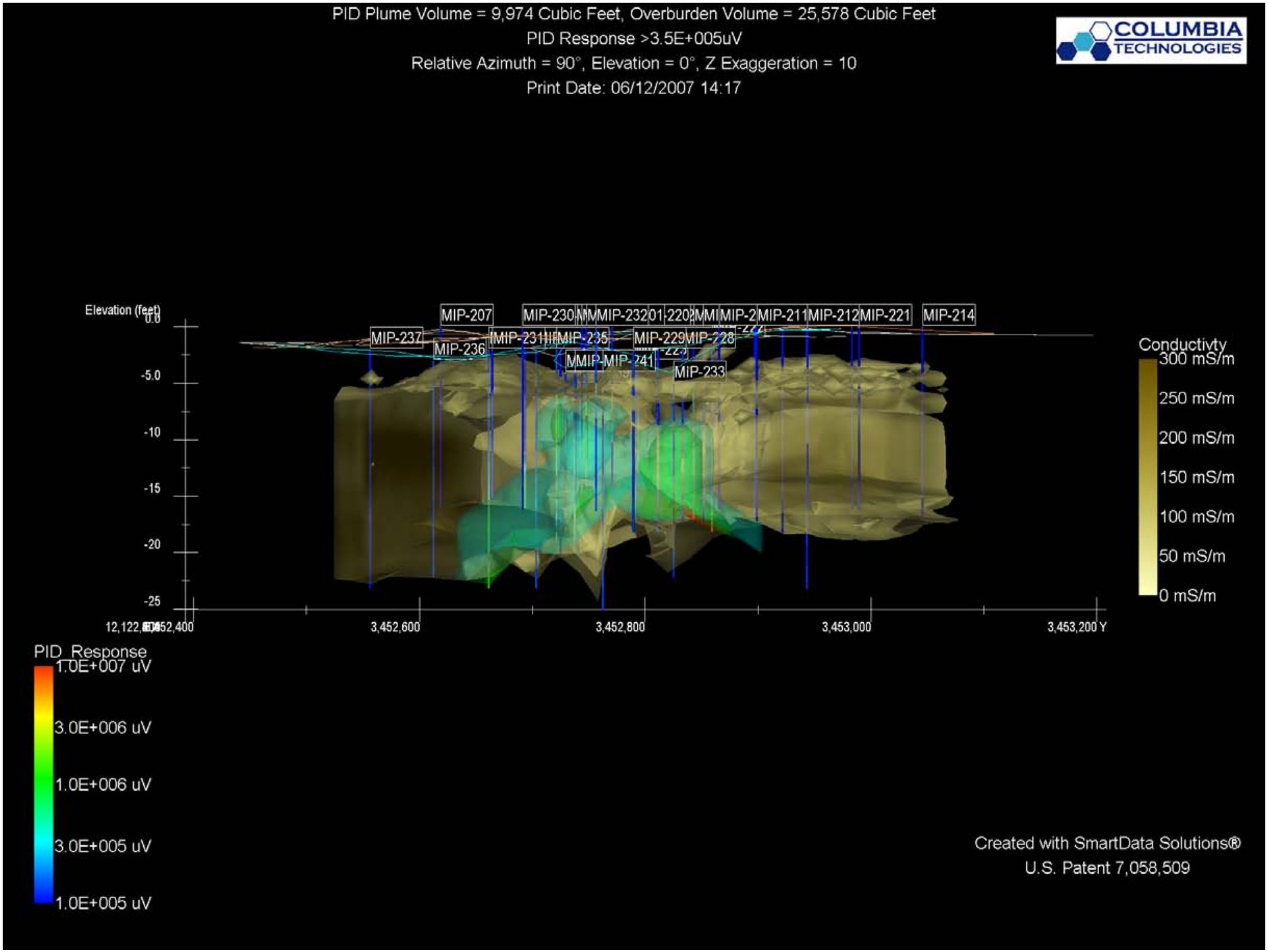

Figure 6 Transect View Relative Azimuth 90°
Nov 8, 2004 – Nov 11, 2004 and May 8, 2007 – May 10, 2007

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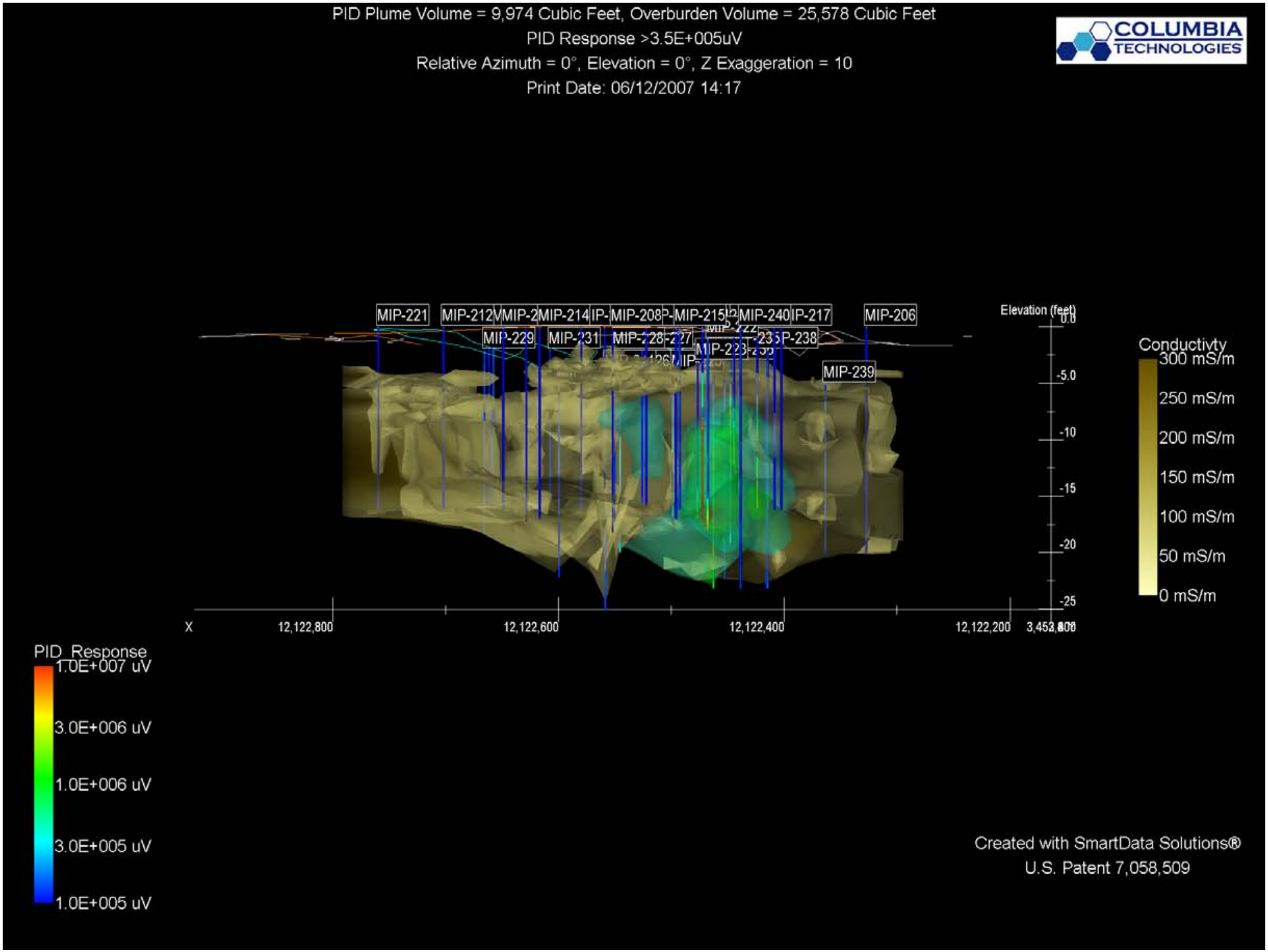

Figure 7 Transect View Relative Azimuth 0°
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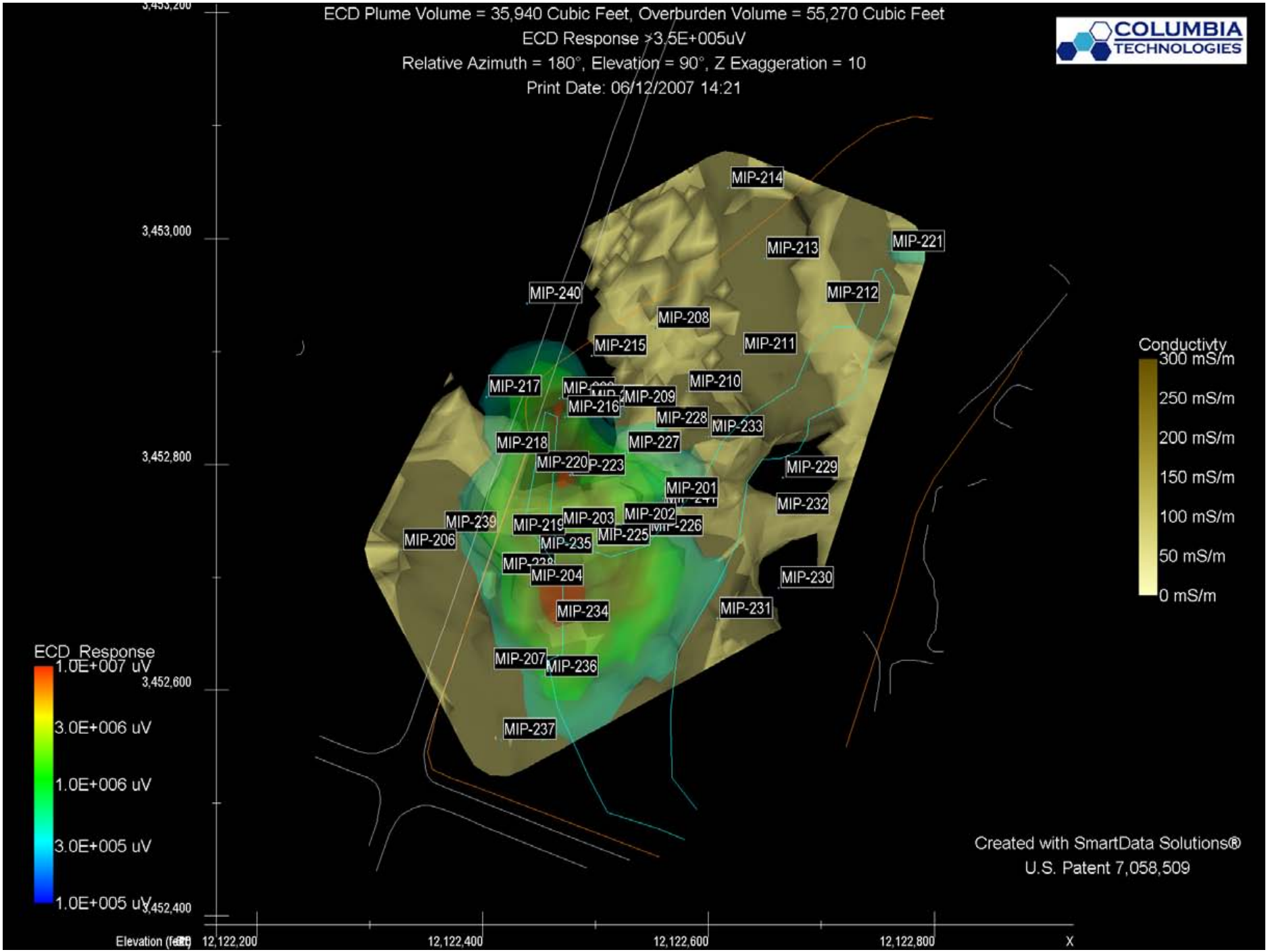

Figure 8 Plan View Relative Azimuth 180°
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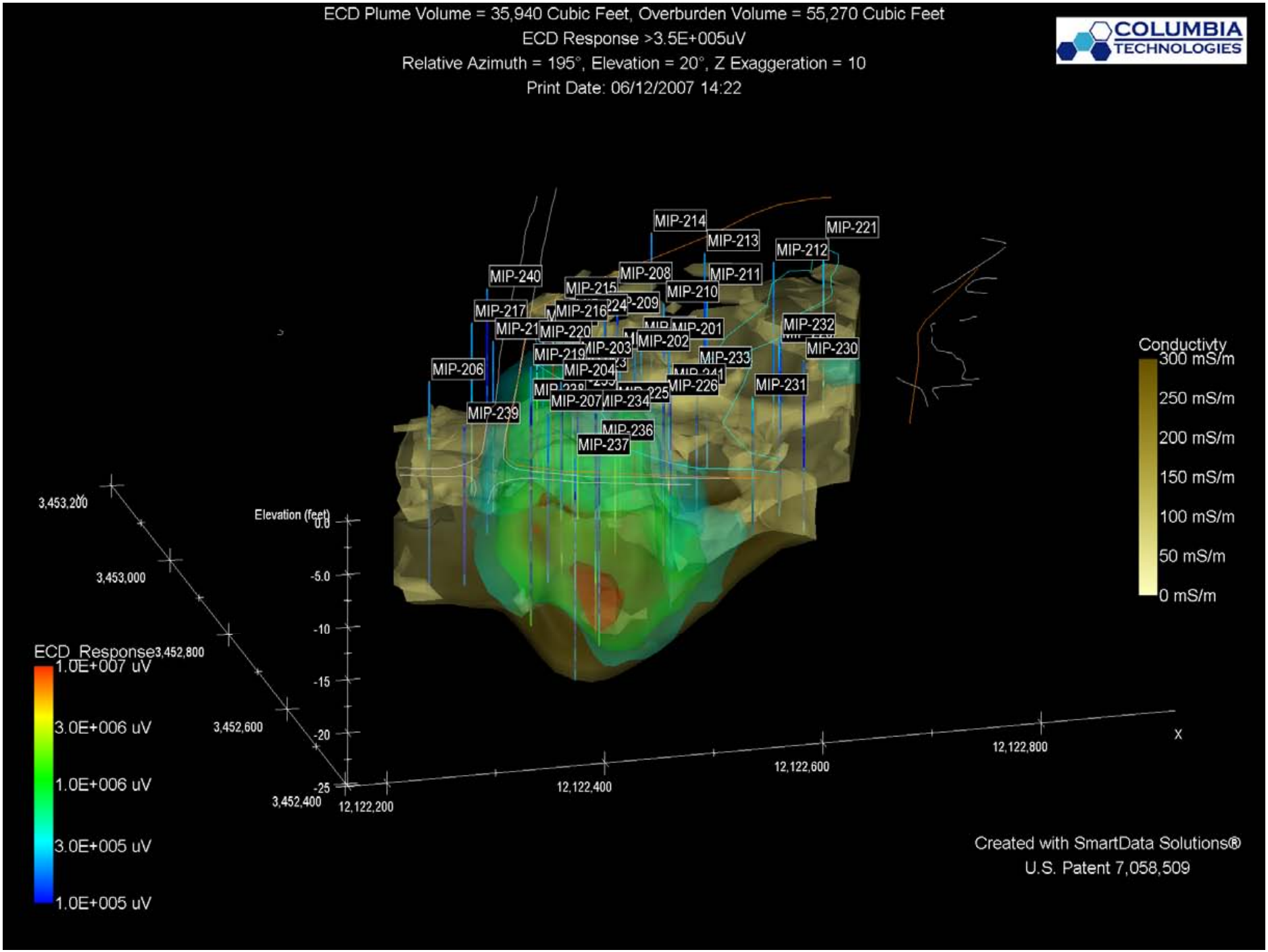

Figure 9 Oblique View Relative Azimuth 195°
Nov 8, 2004 – Nov 11, 2004 and May 8, 2007 – May 10, 2007

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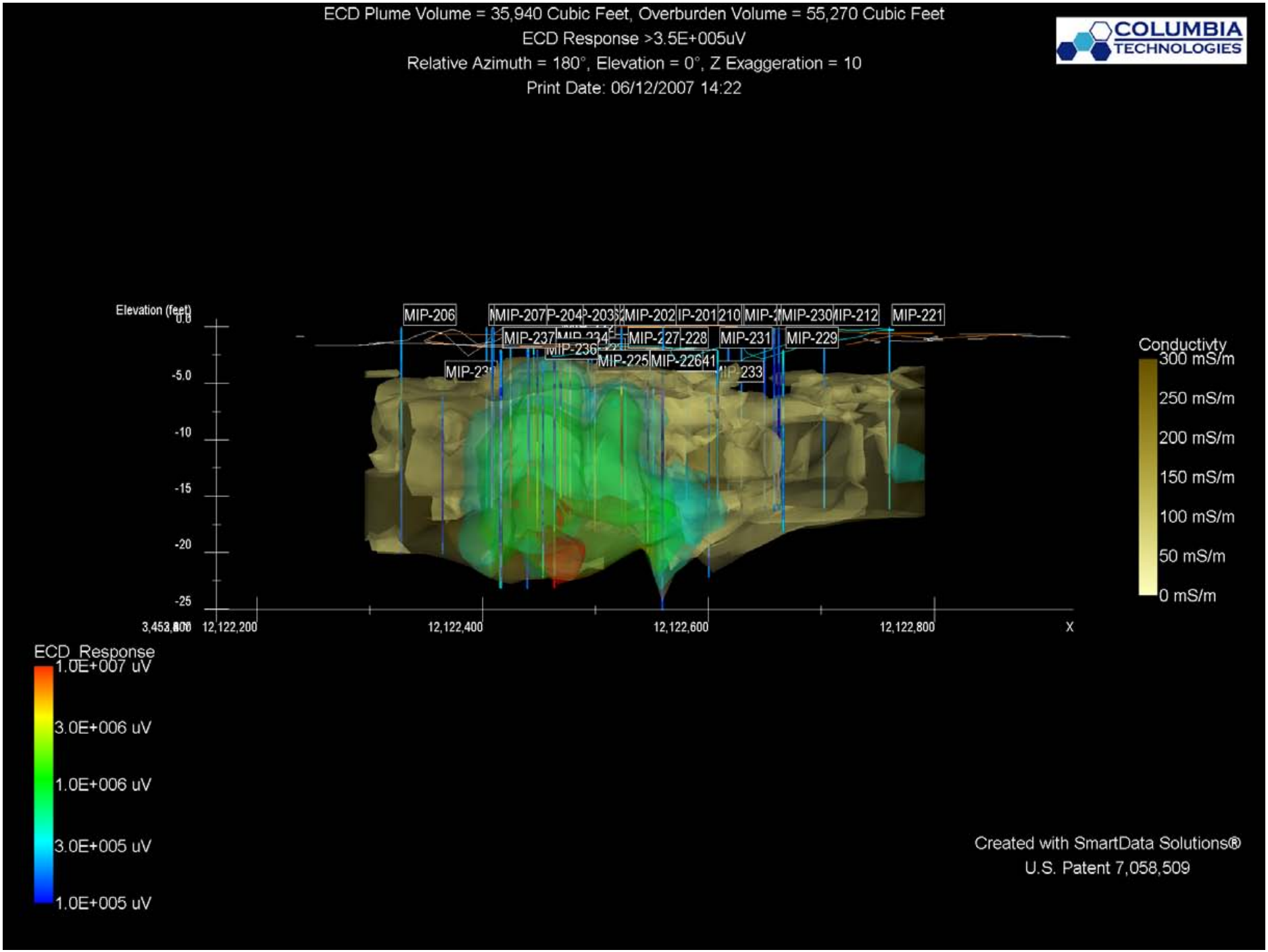

Figure 10 Transect View Relative Azimuth 180°
Nov 8, 2004 – Nov 11, 2004 and May 8, 2007 – May 10, 2007

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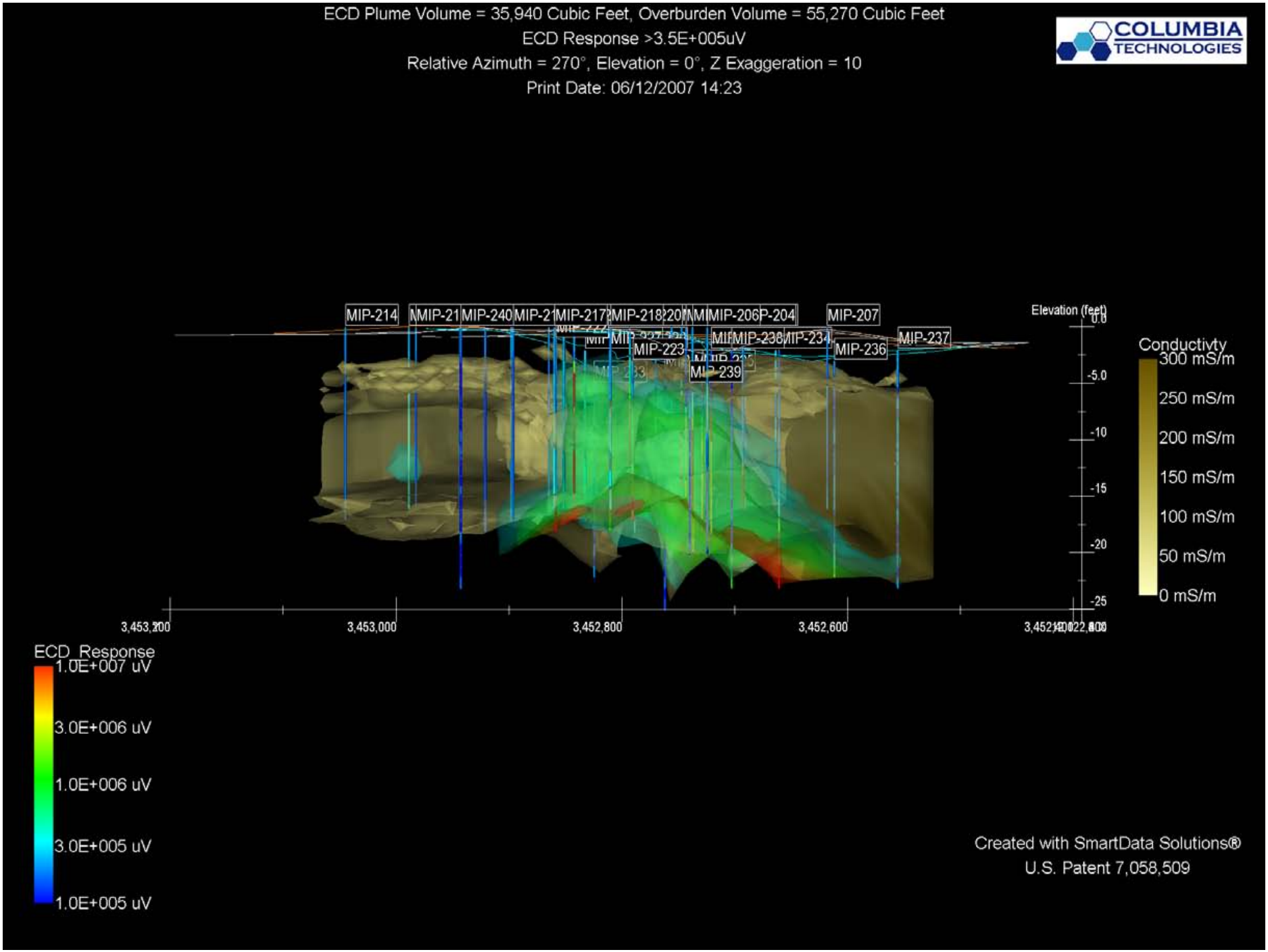

Figure 11 Transect View Relative Azimuth 270°
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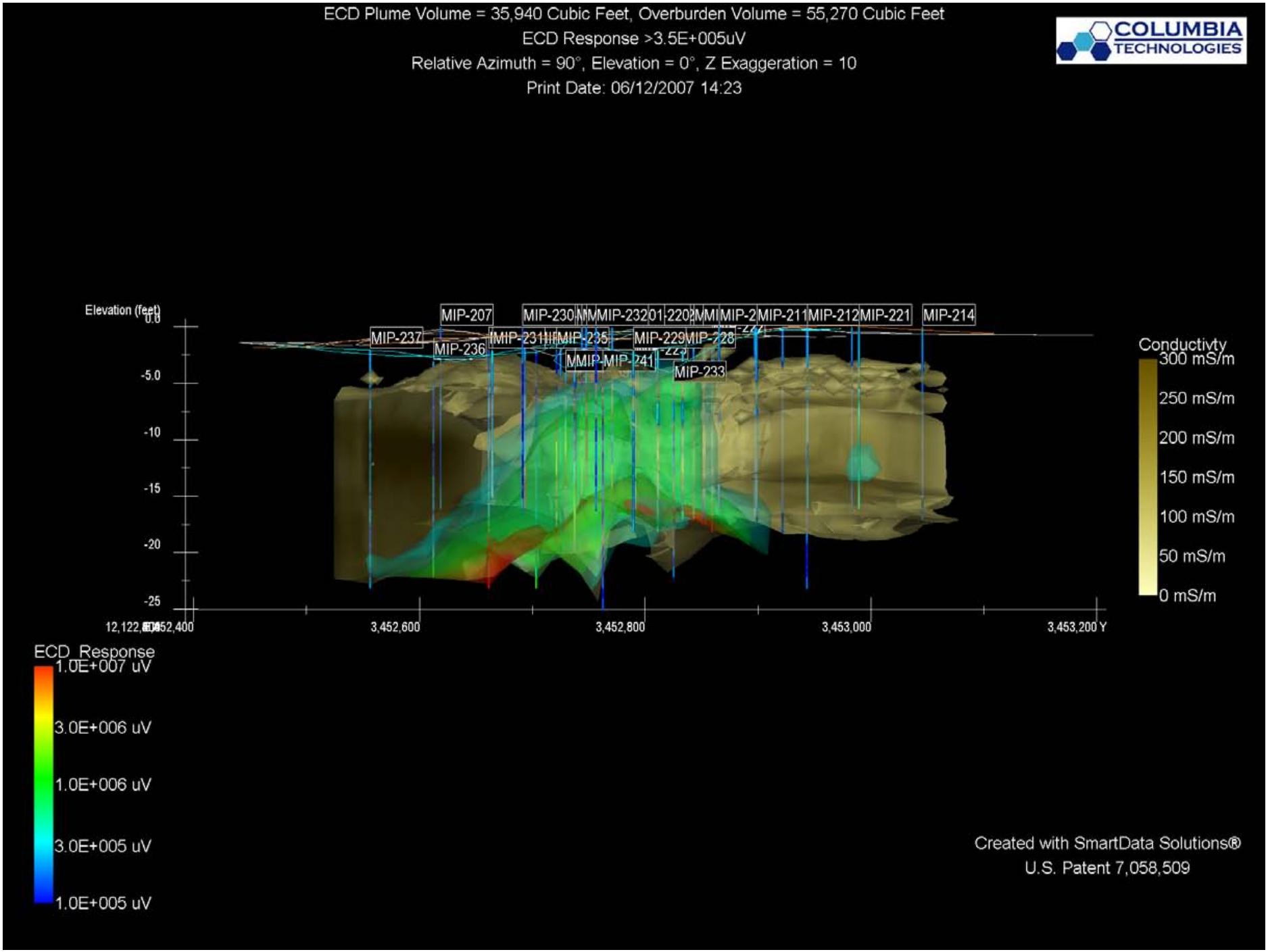

Figure 12 Transect View Relative Azimuth 90°
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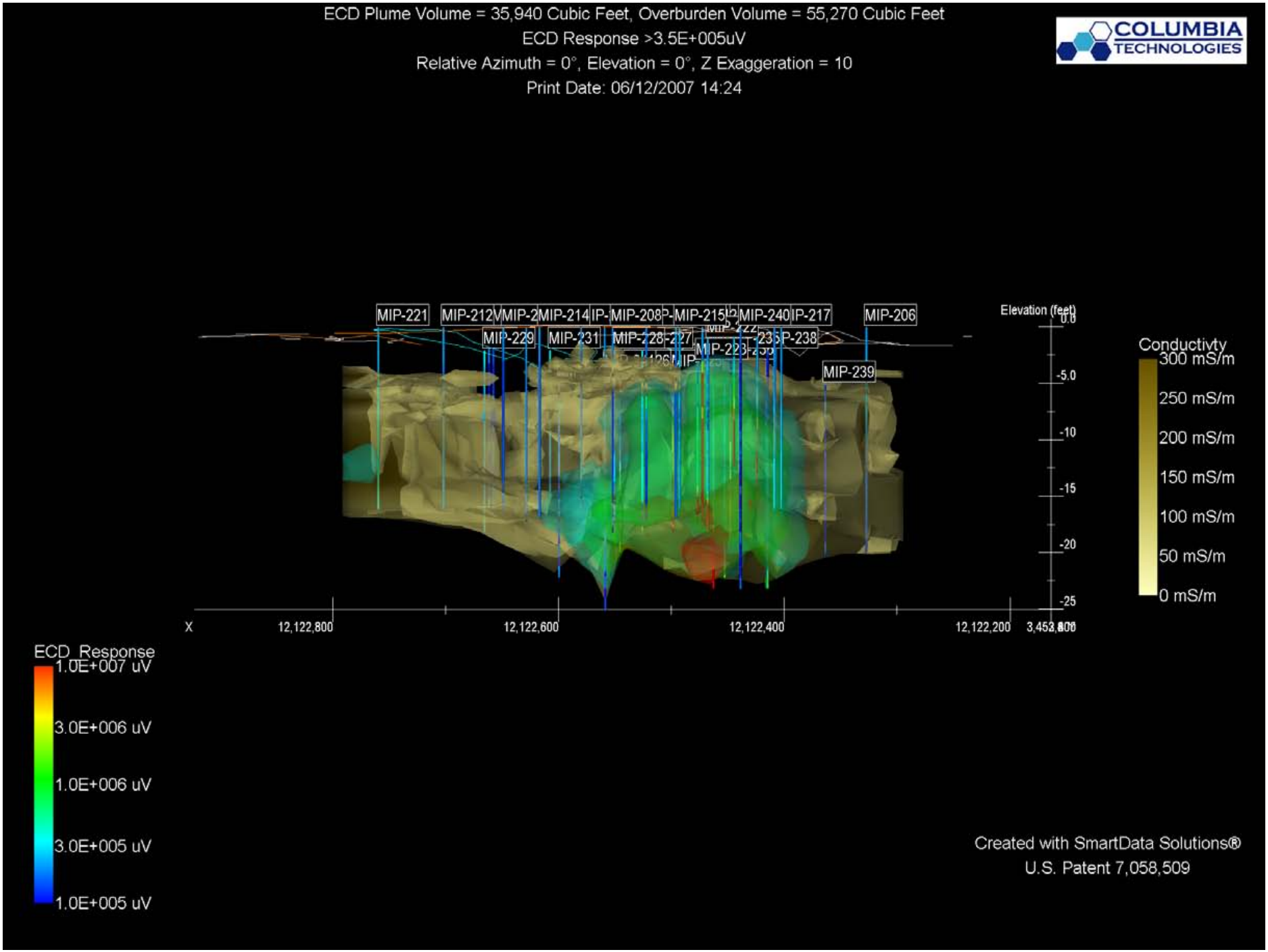

Figure 13 Transect View Relative Azimuth 0°
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APPENDIX A

MIP Logs (Best Fit Scale)

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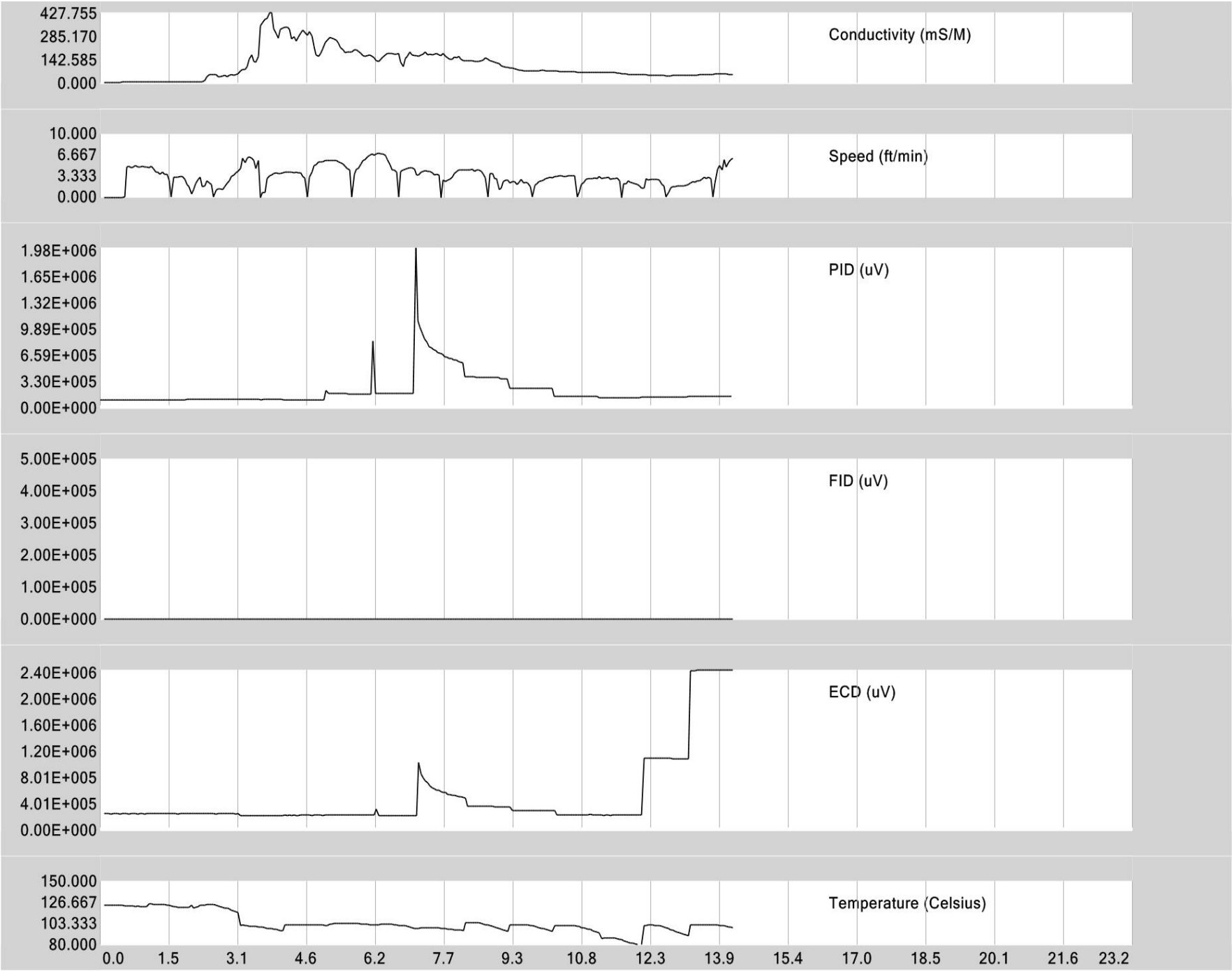
MIP-201



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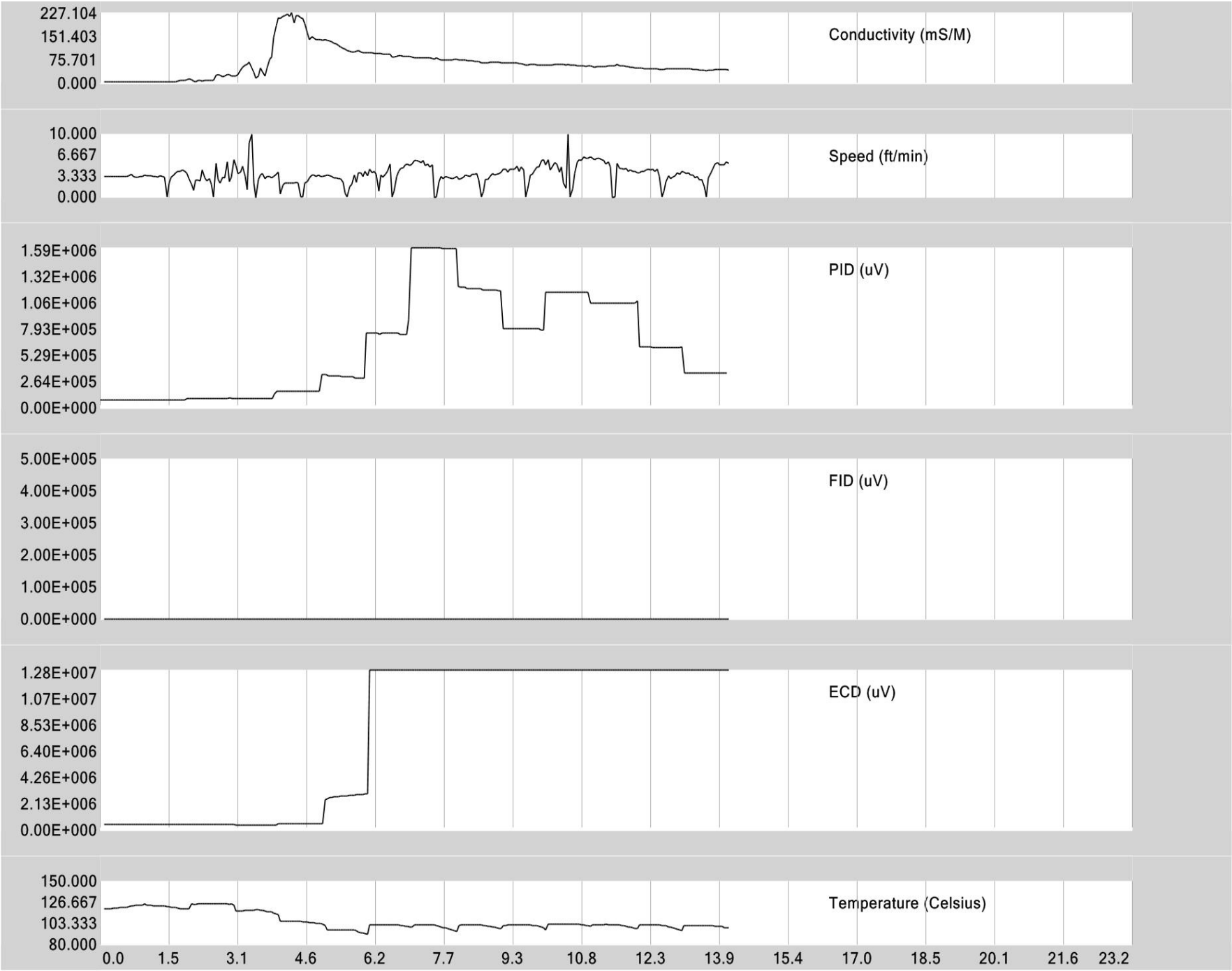

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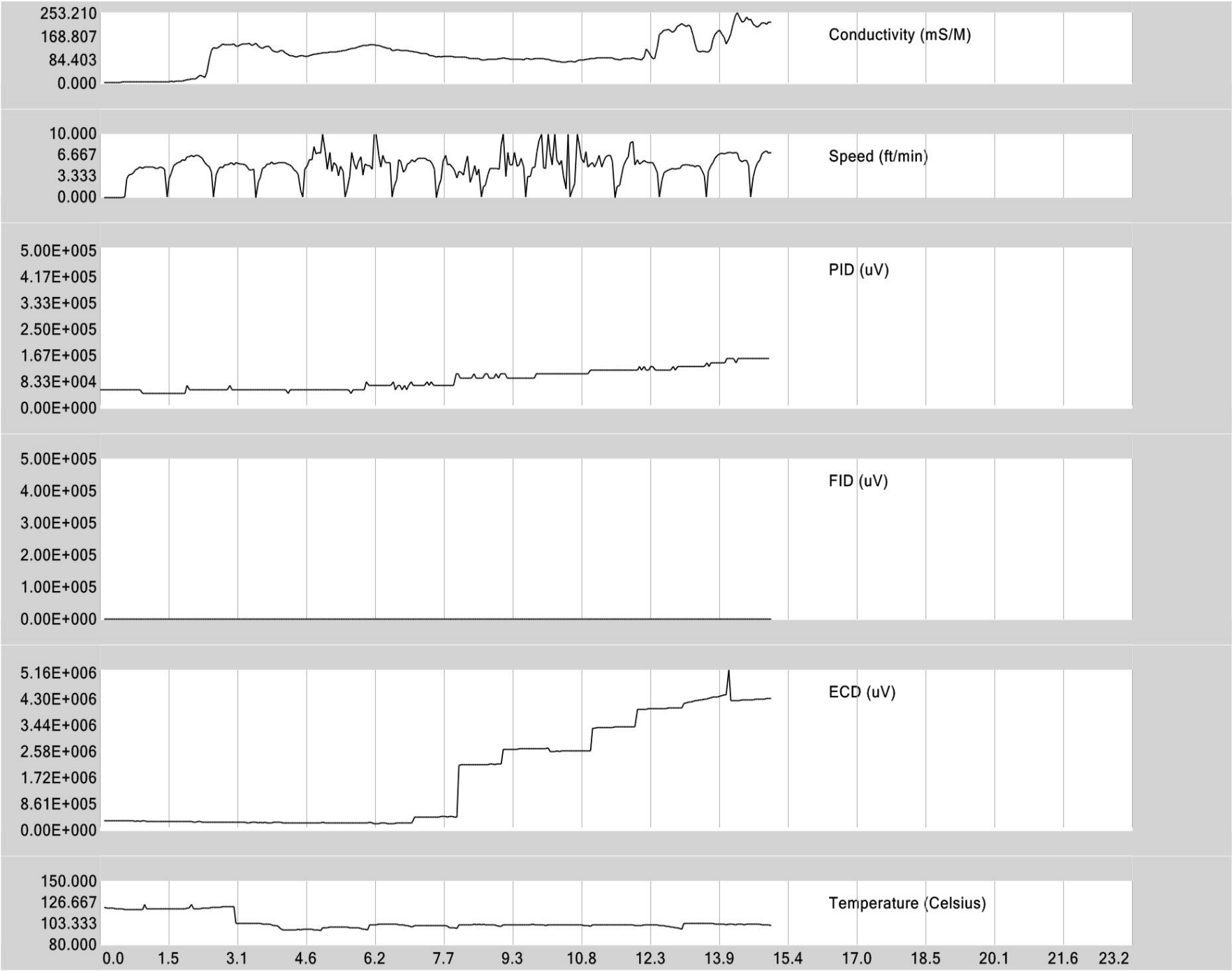

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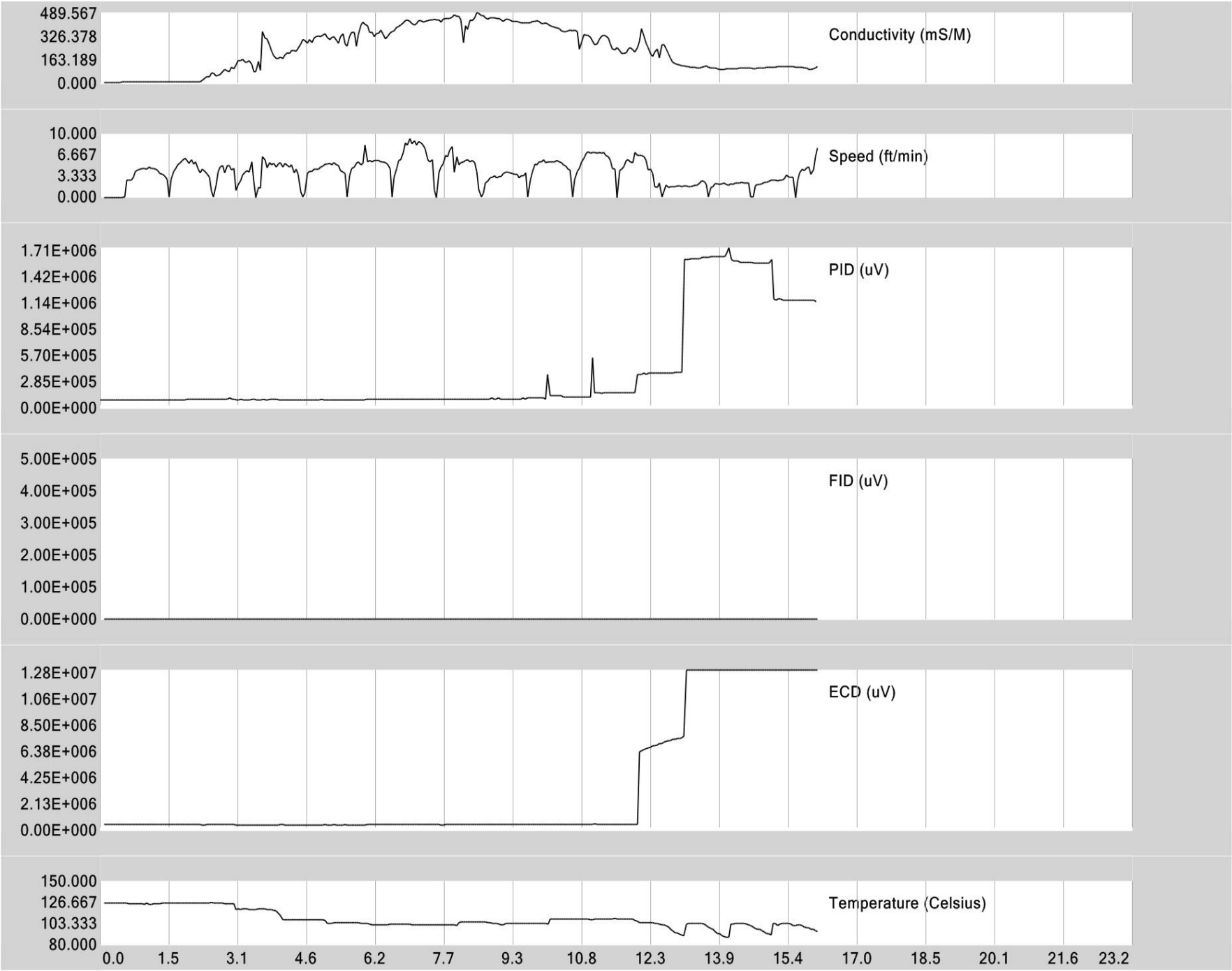

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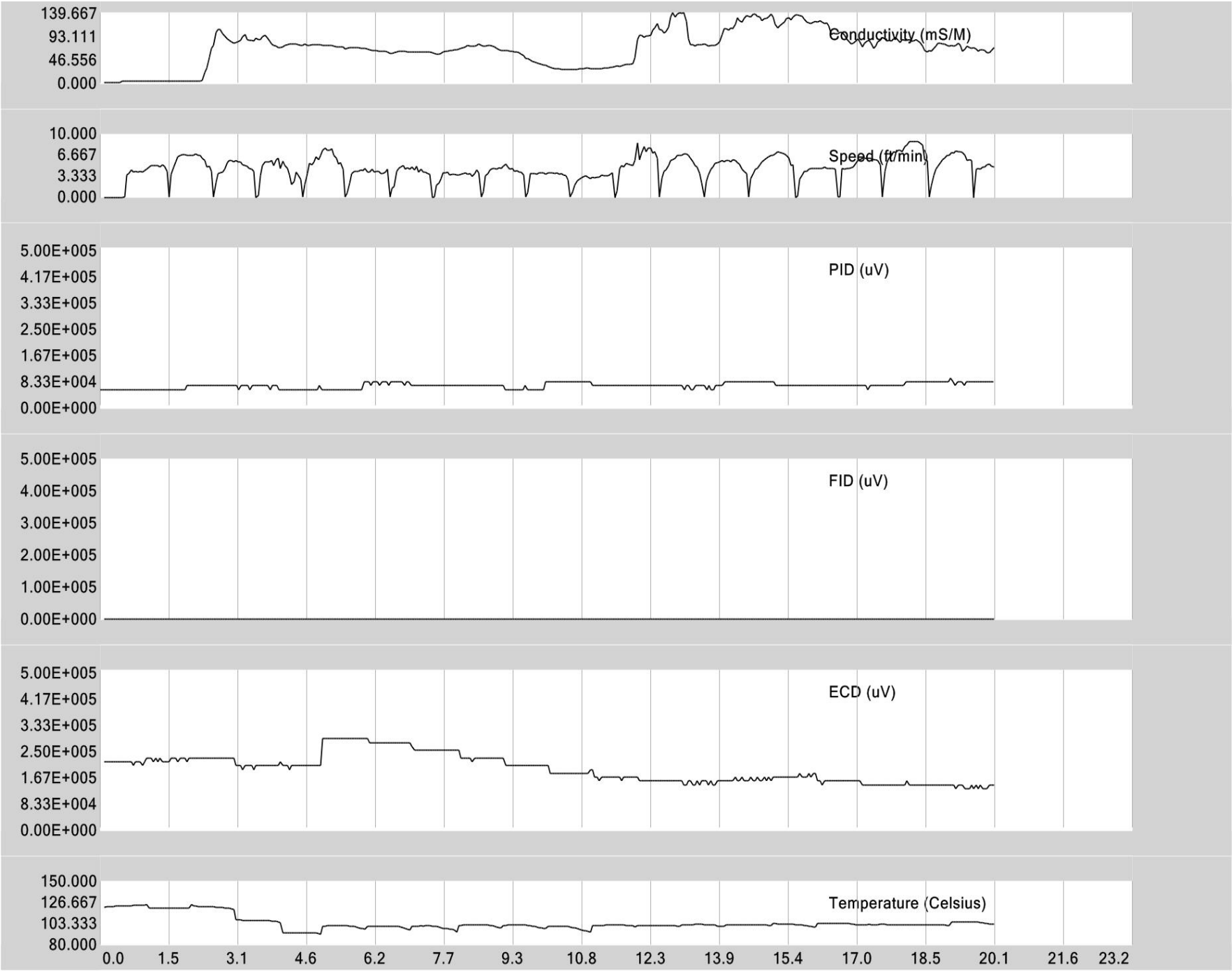

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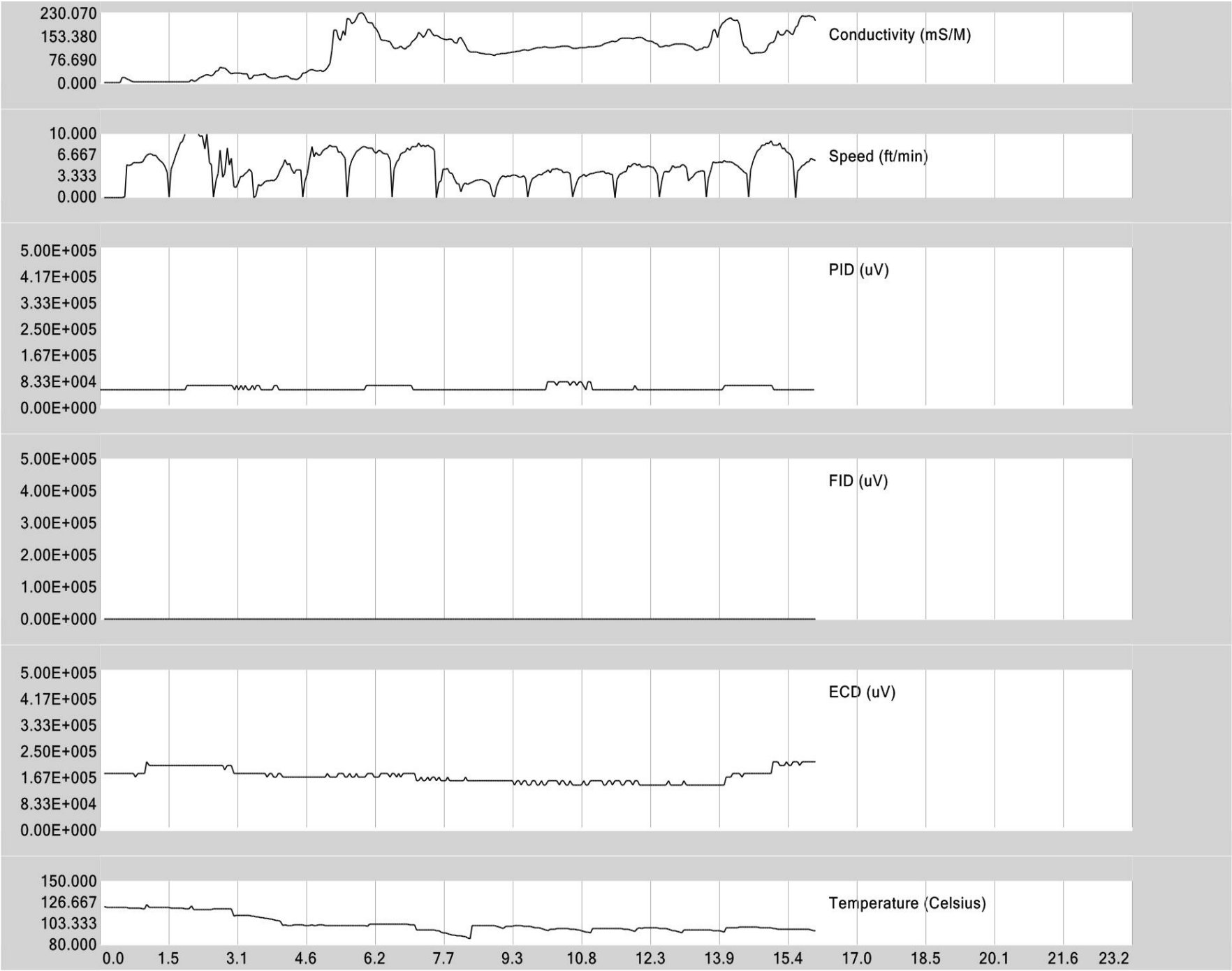

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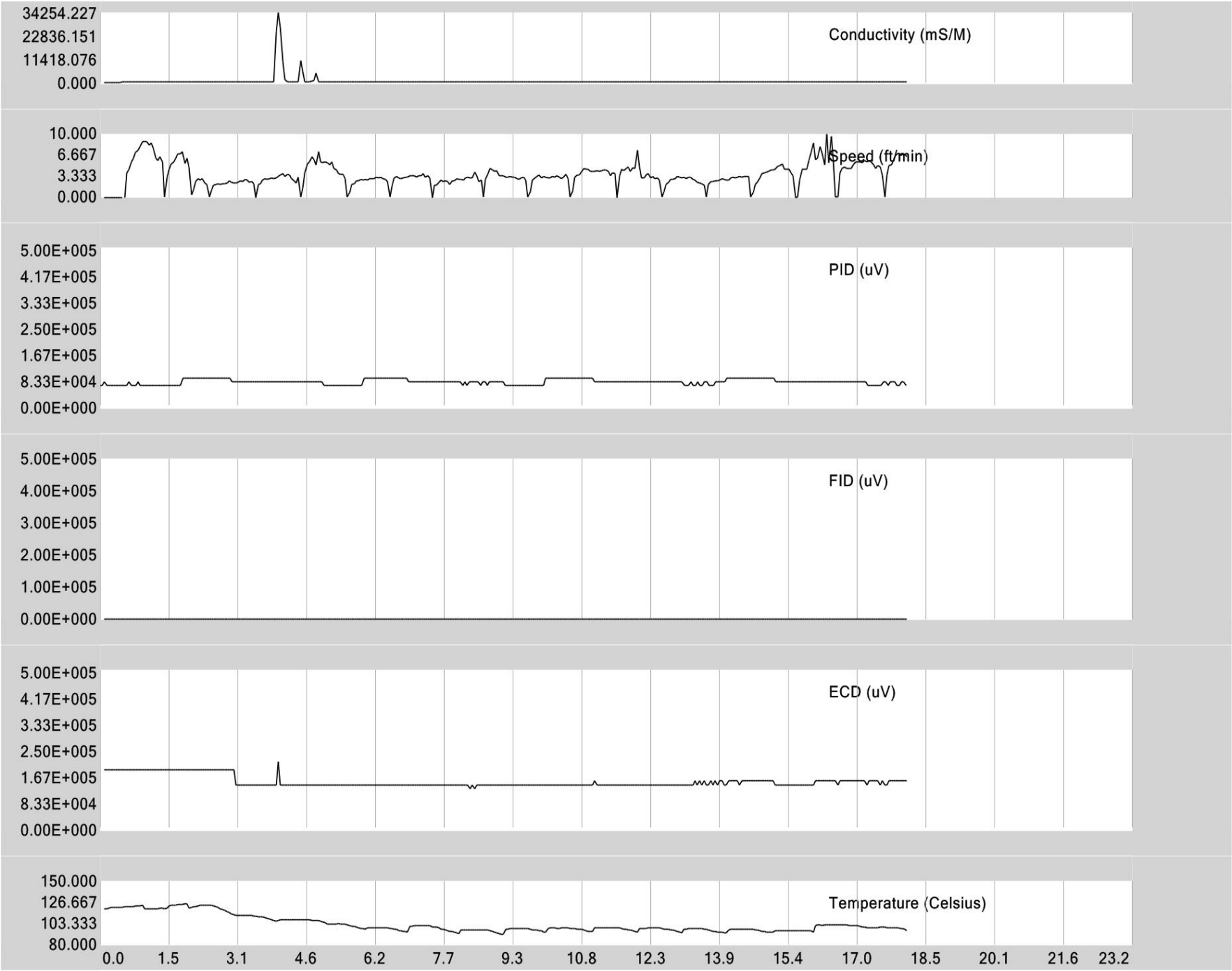

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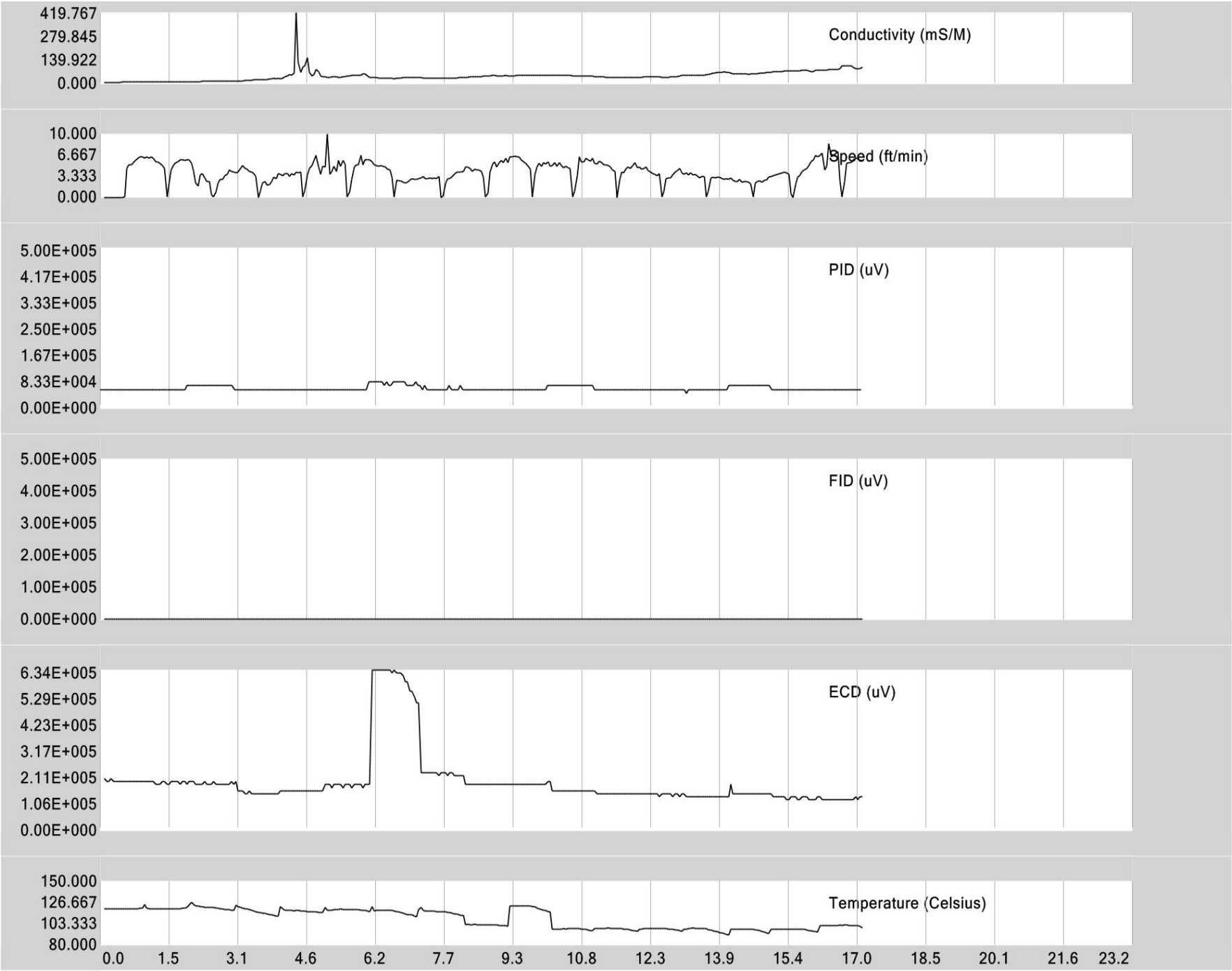

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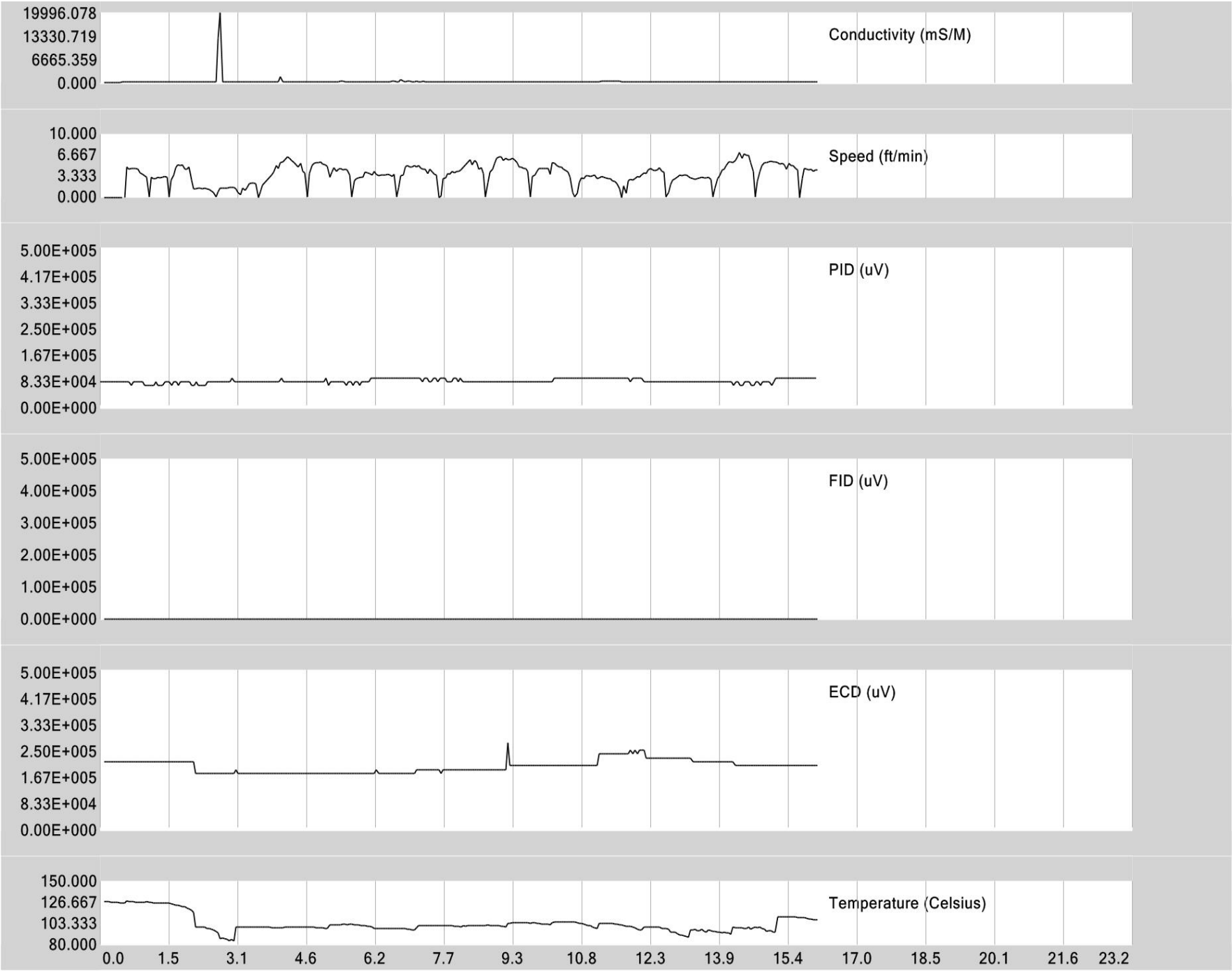

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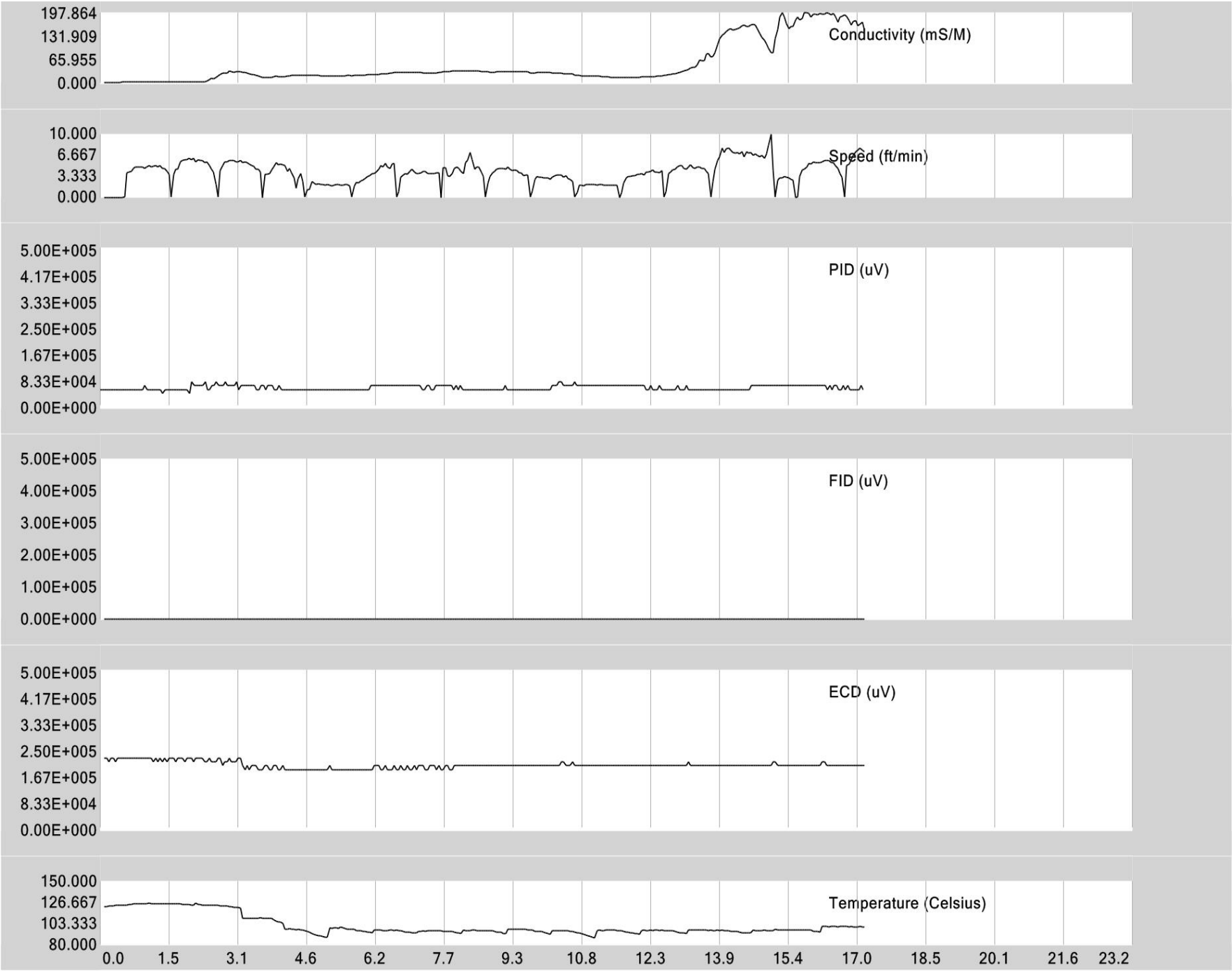

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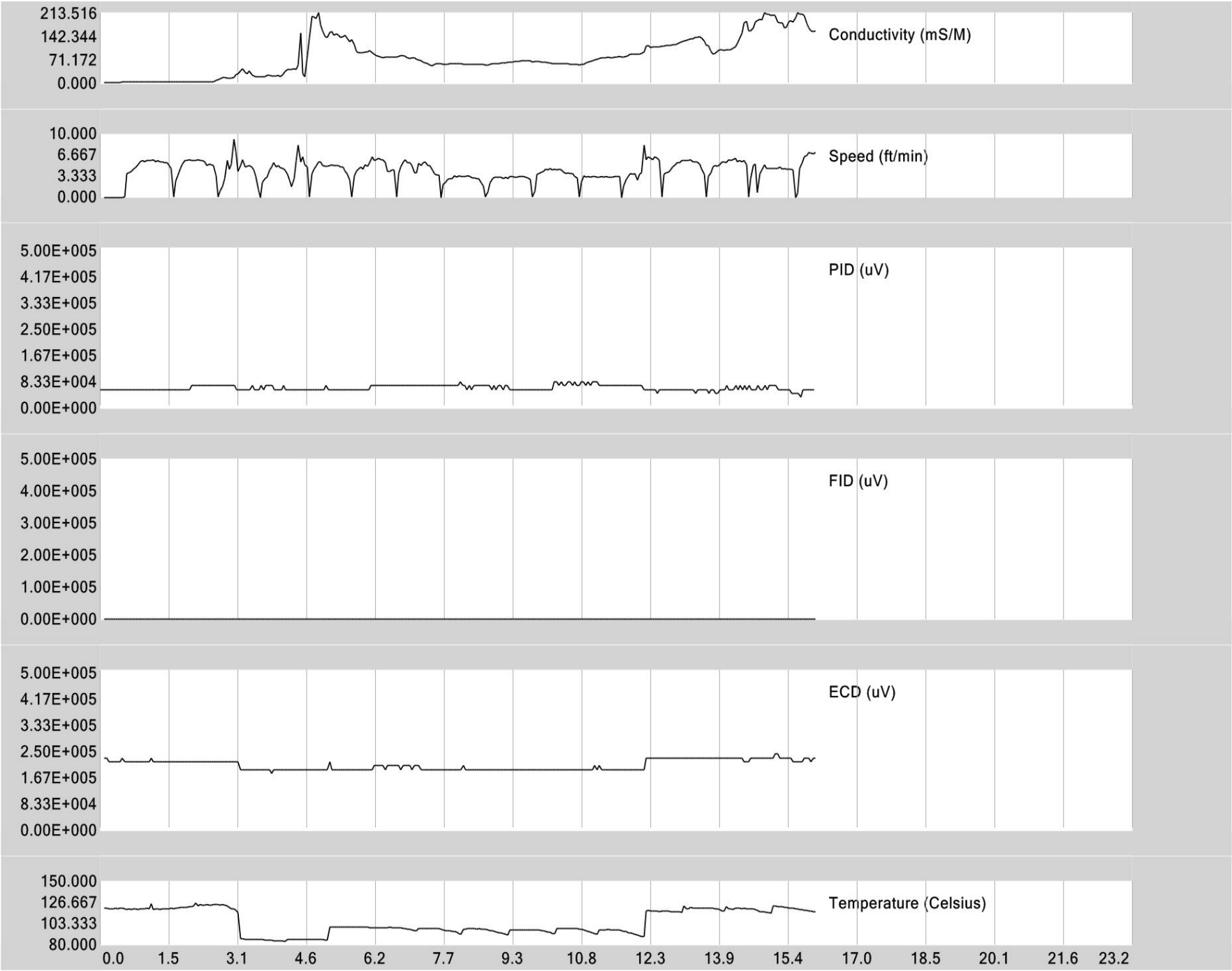

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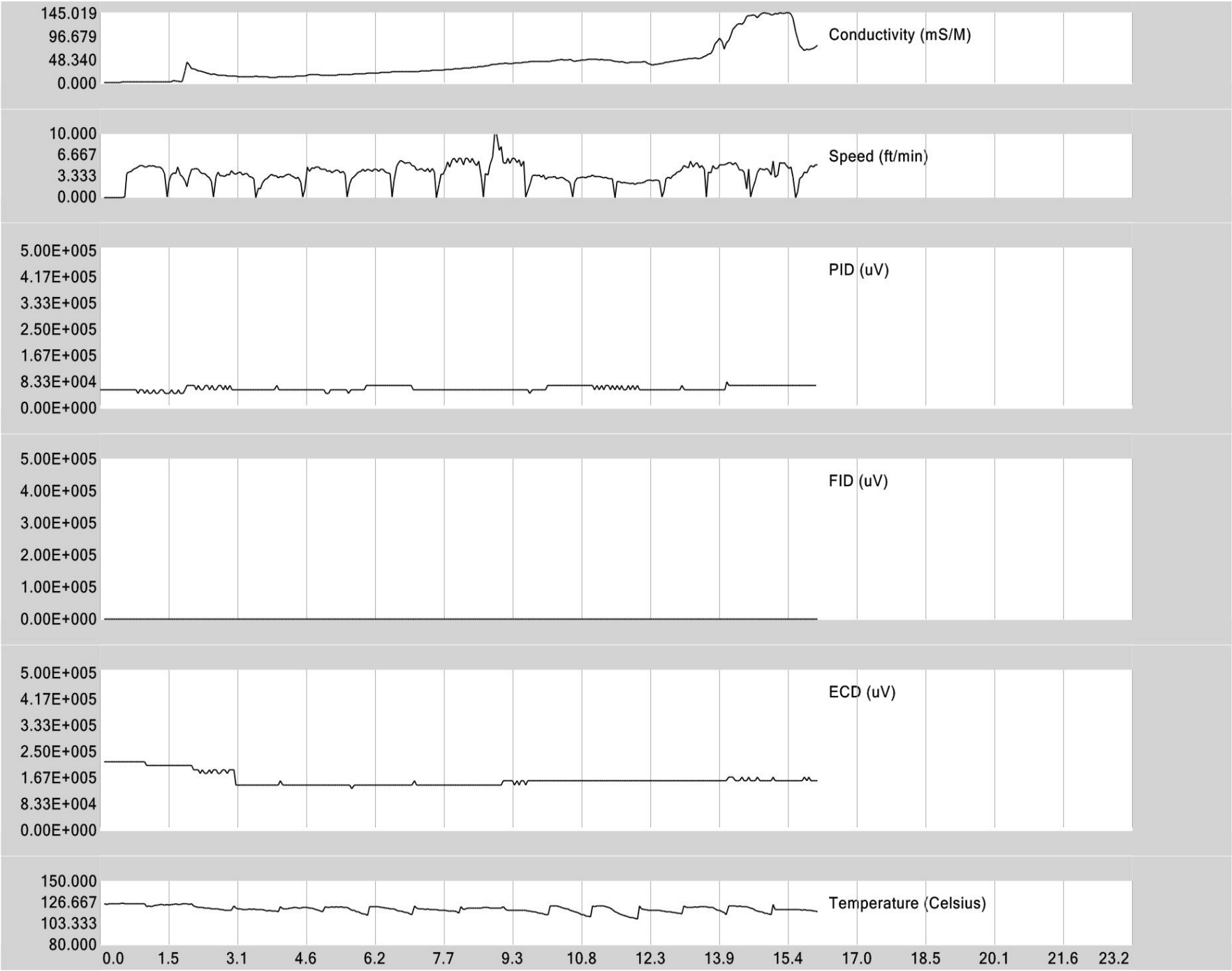

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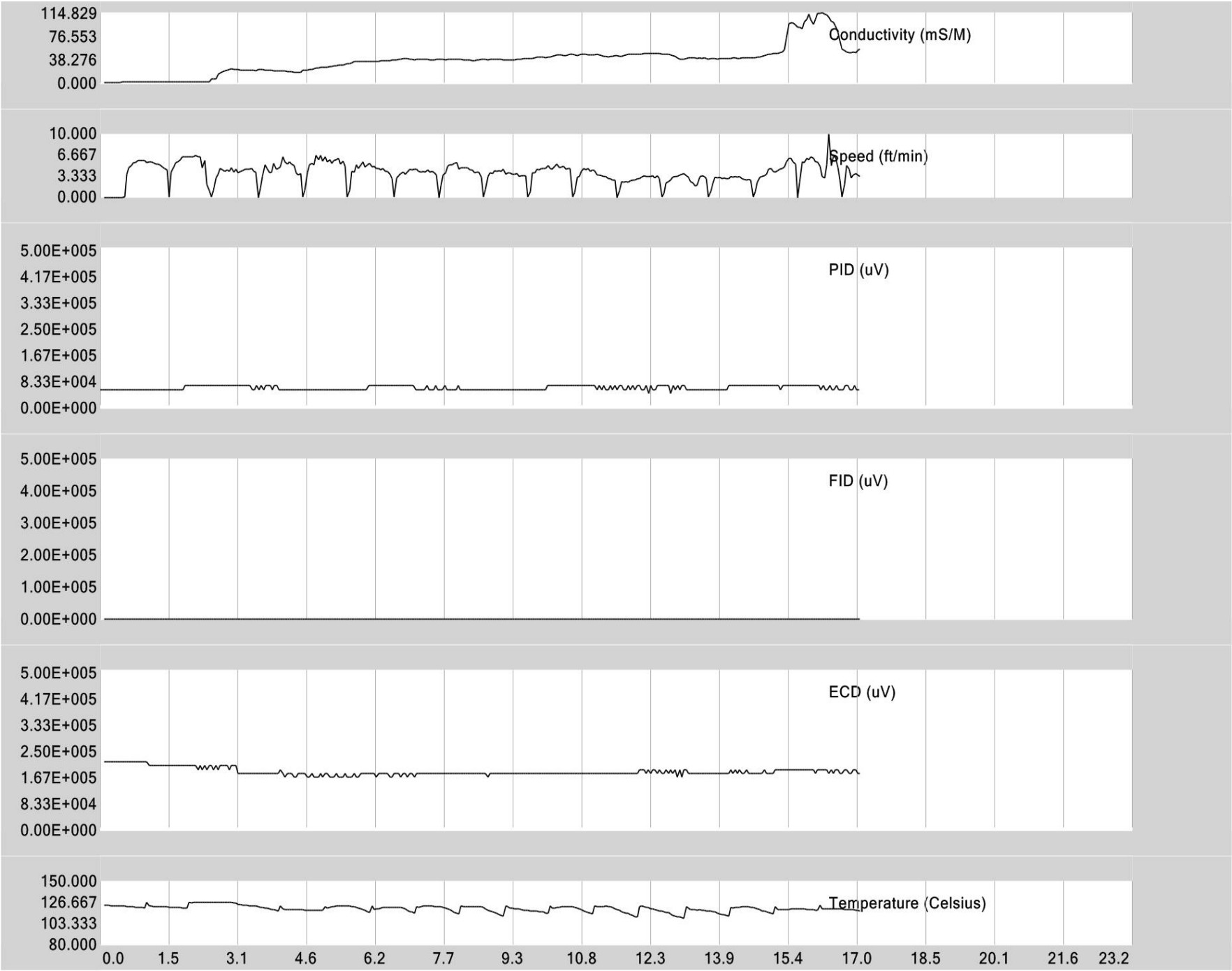

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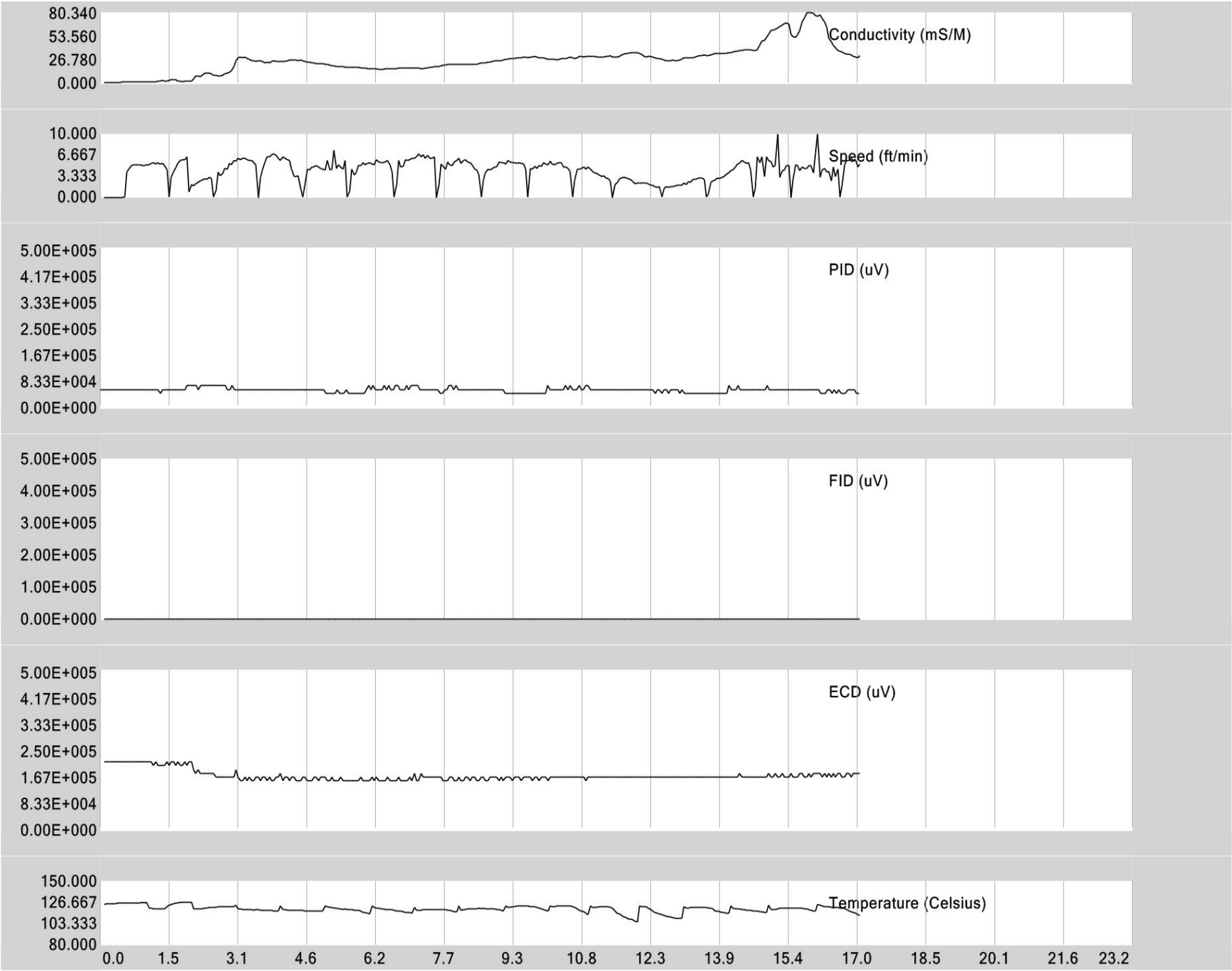

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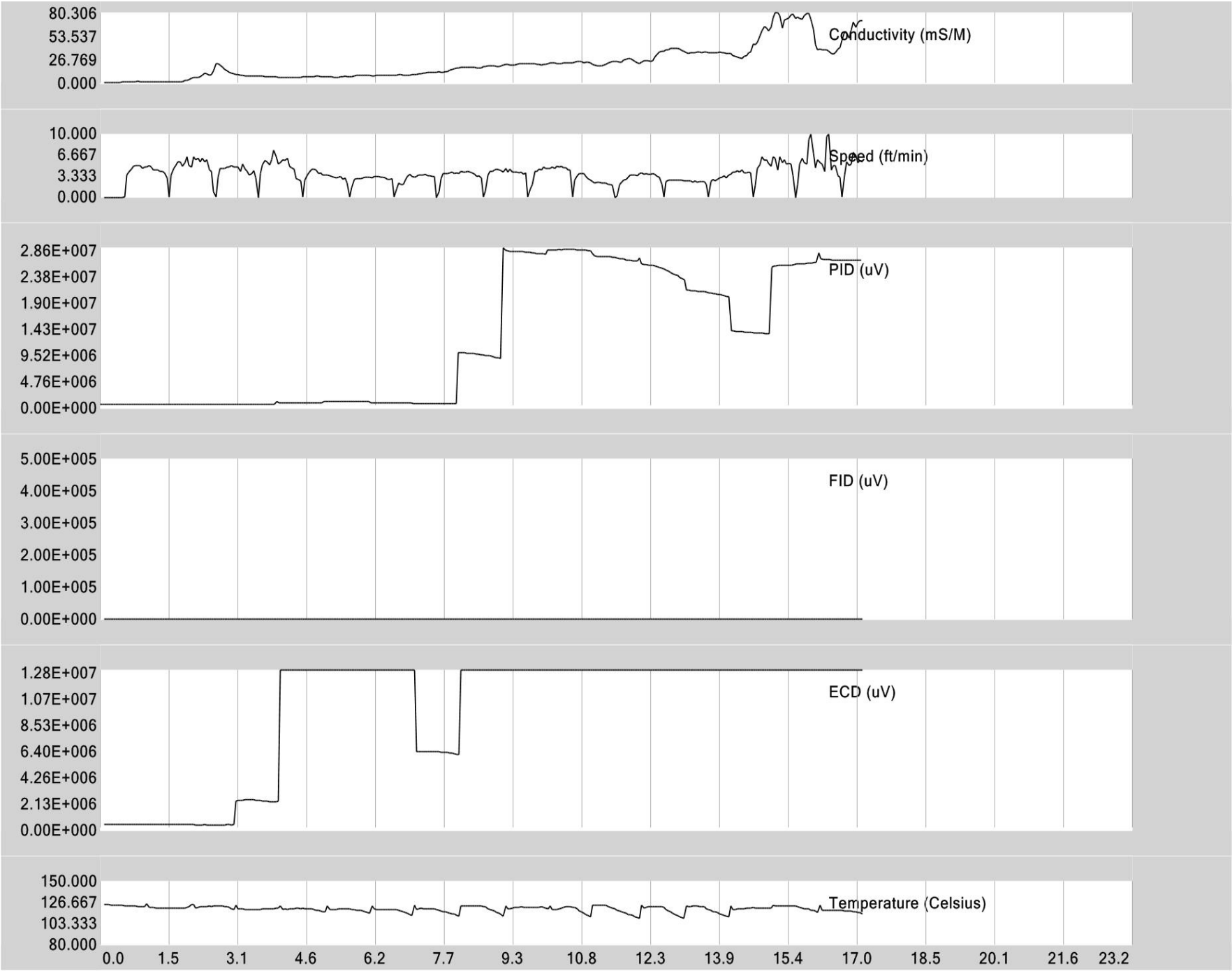

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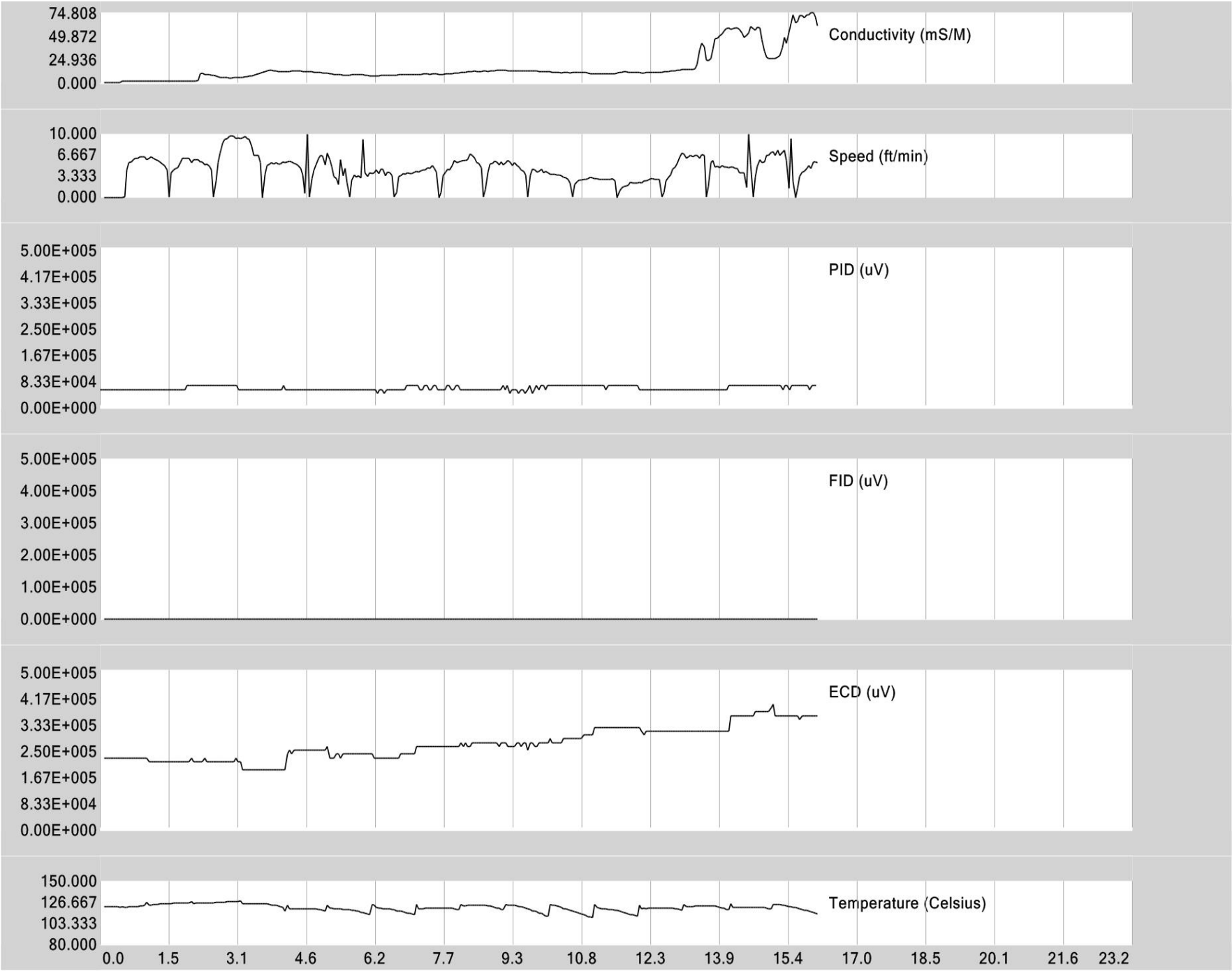

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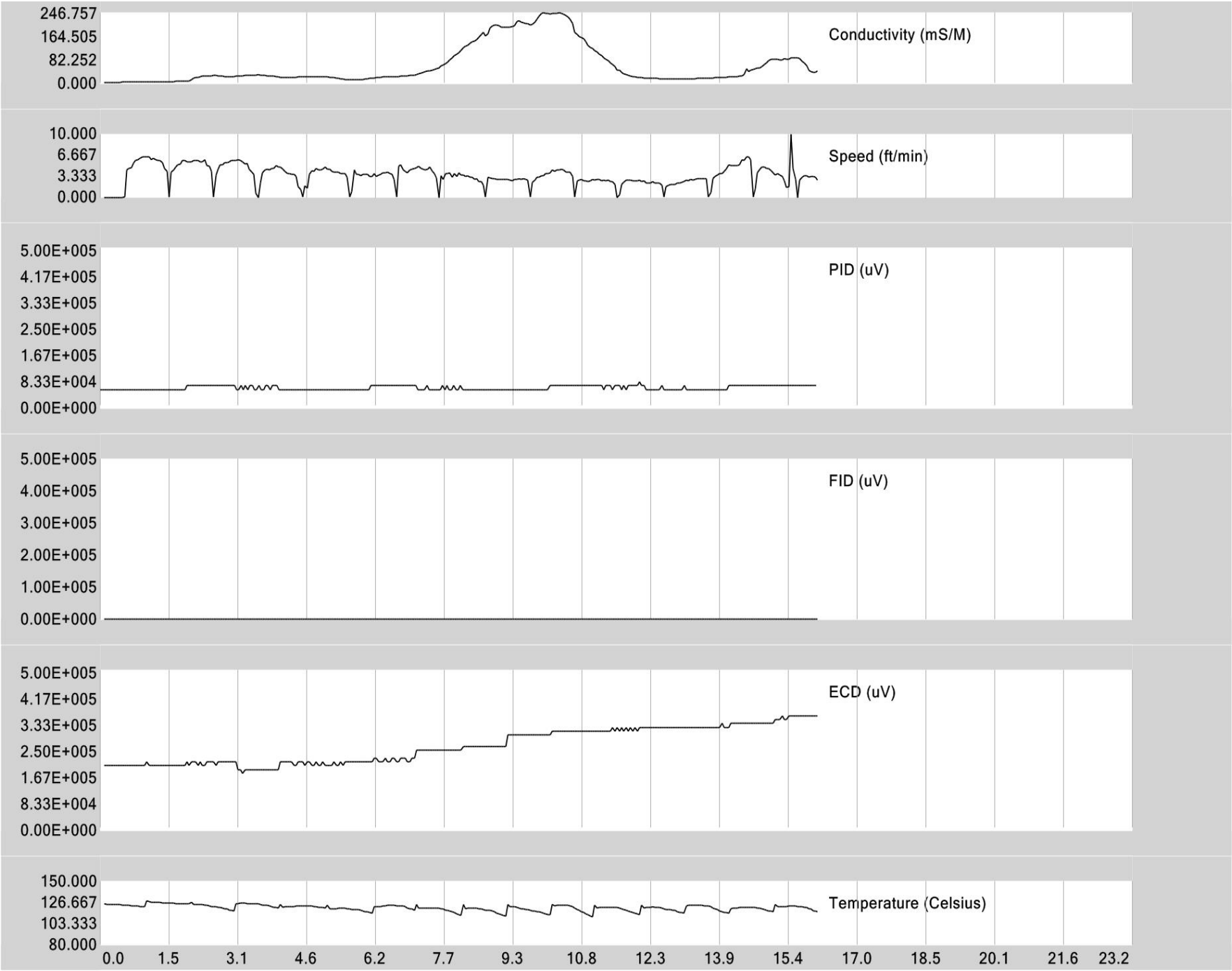

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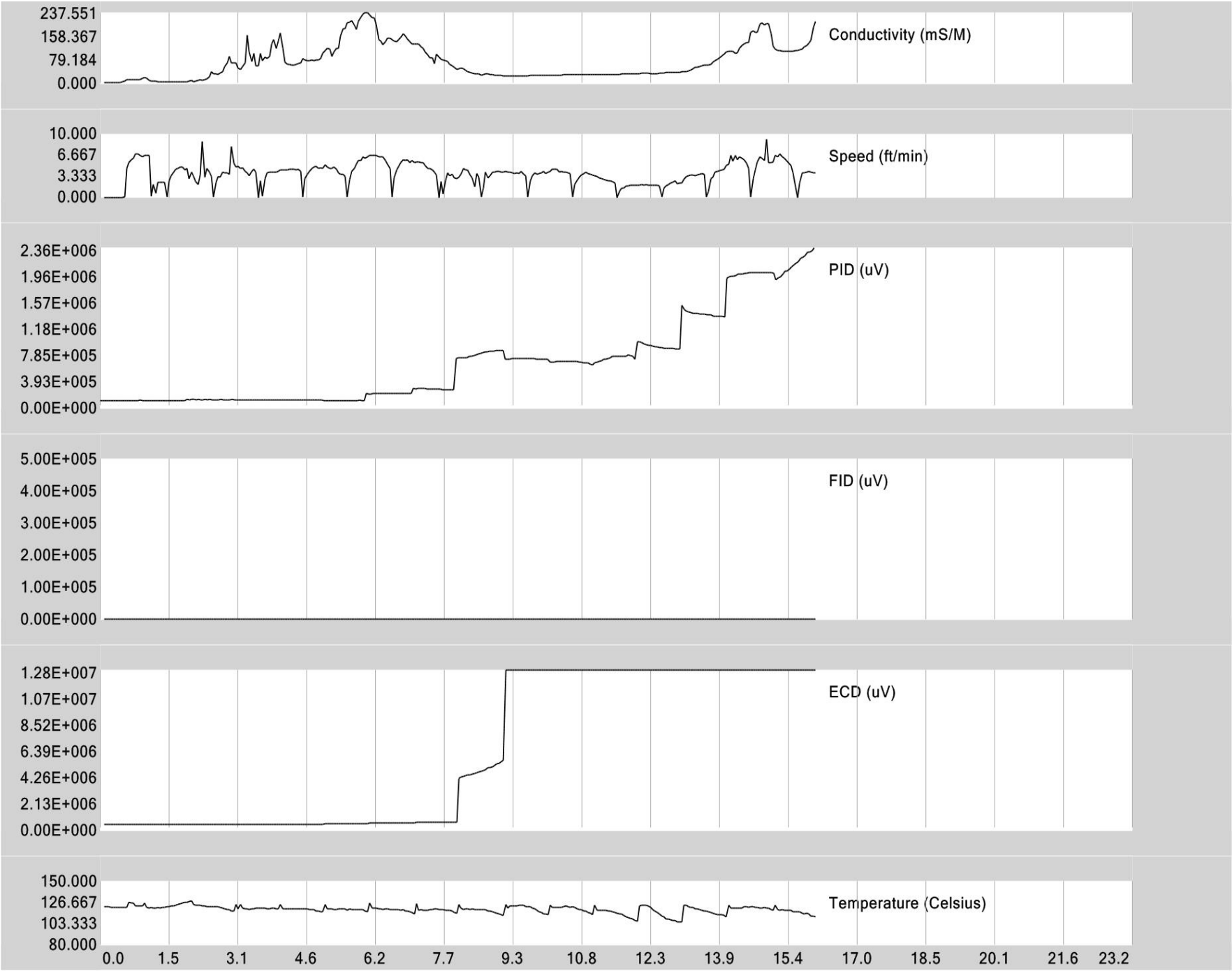

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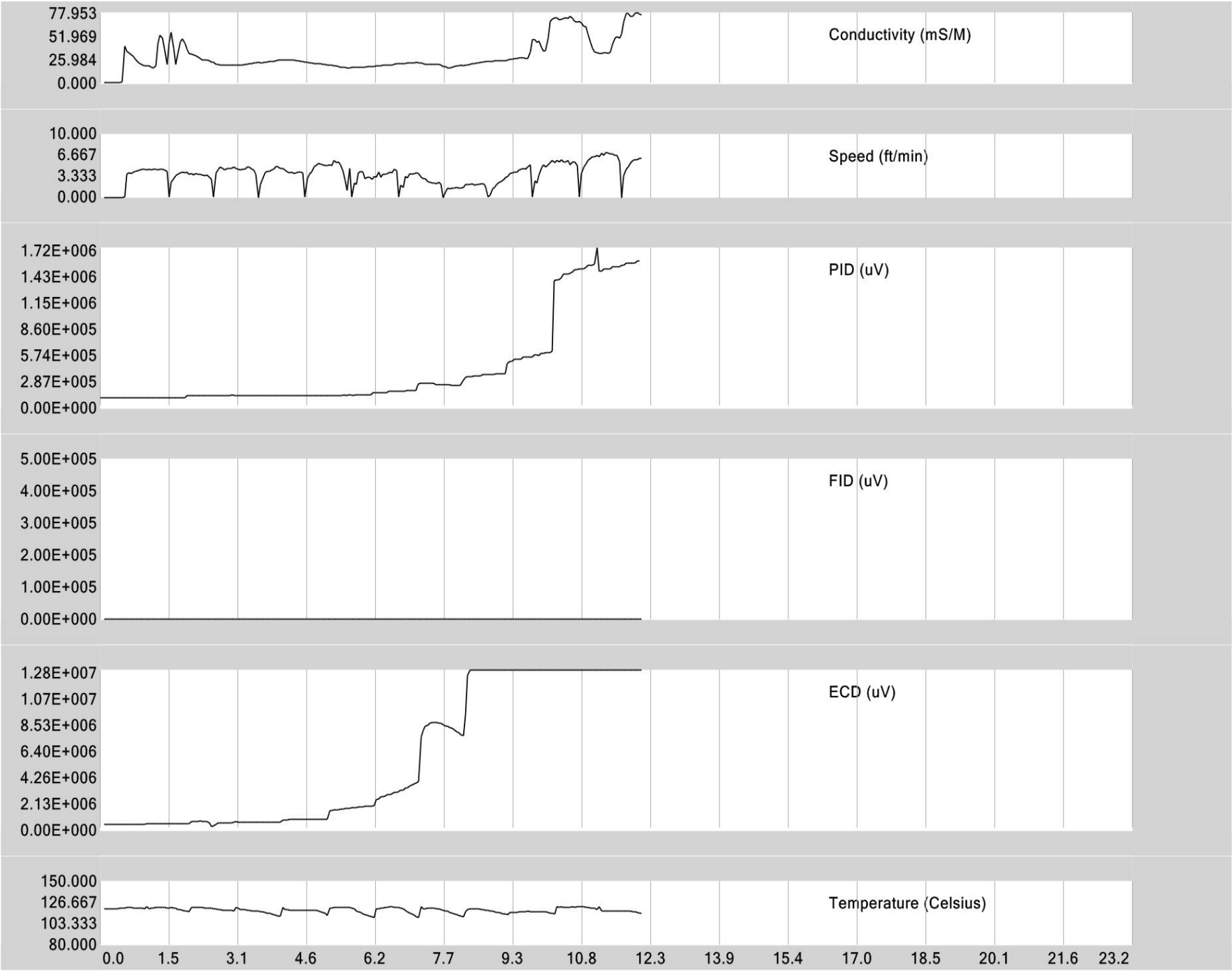

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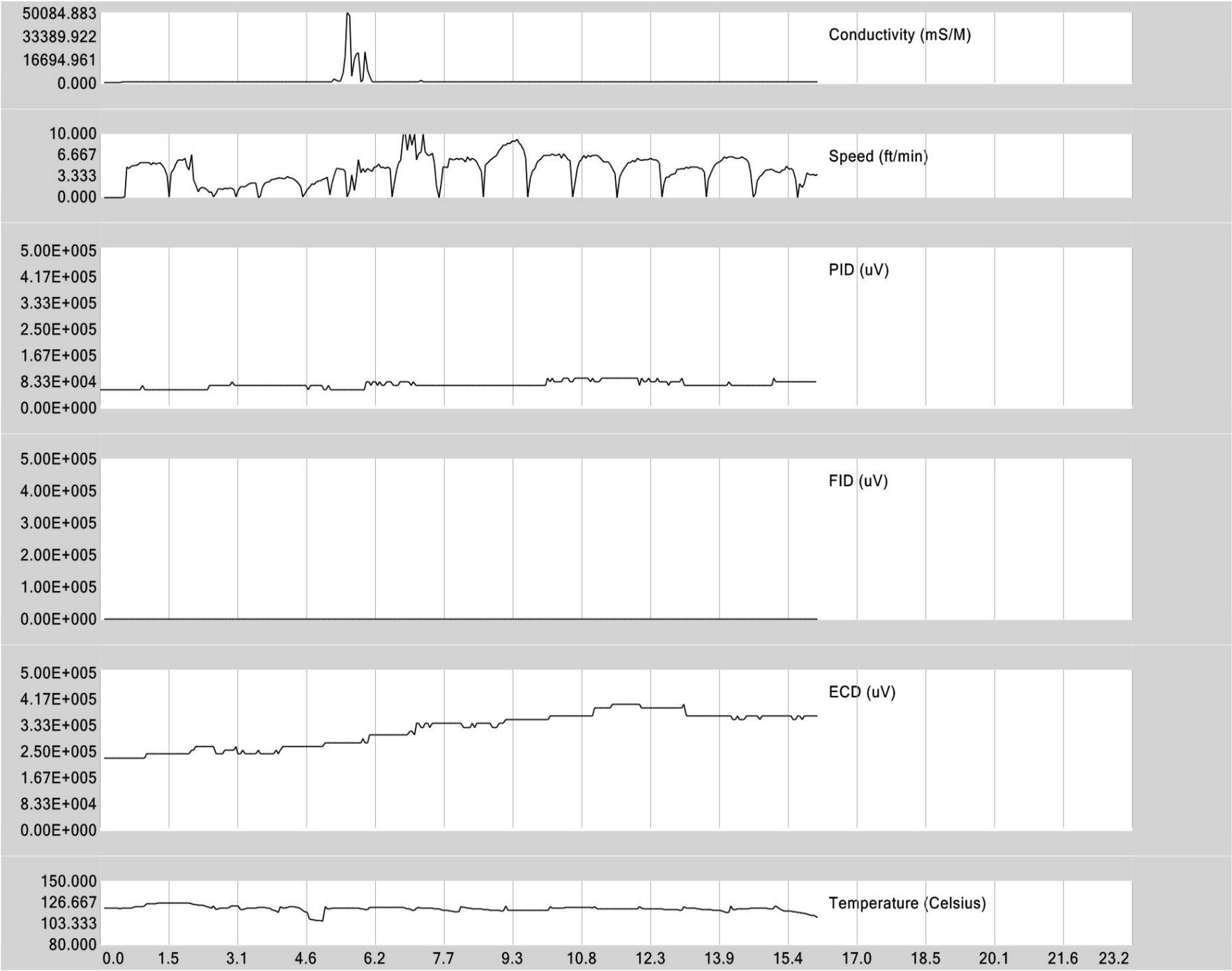

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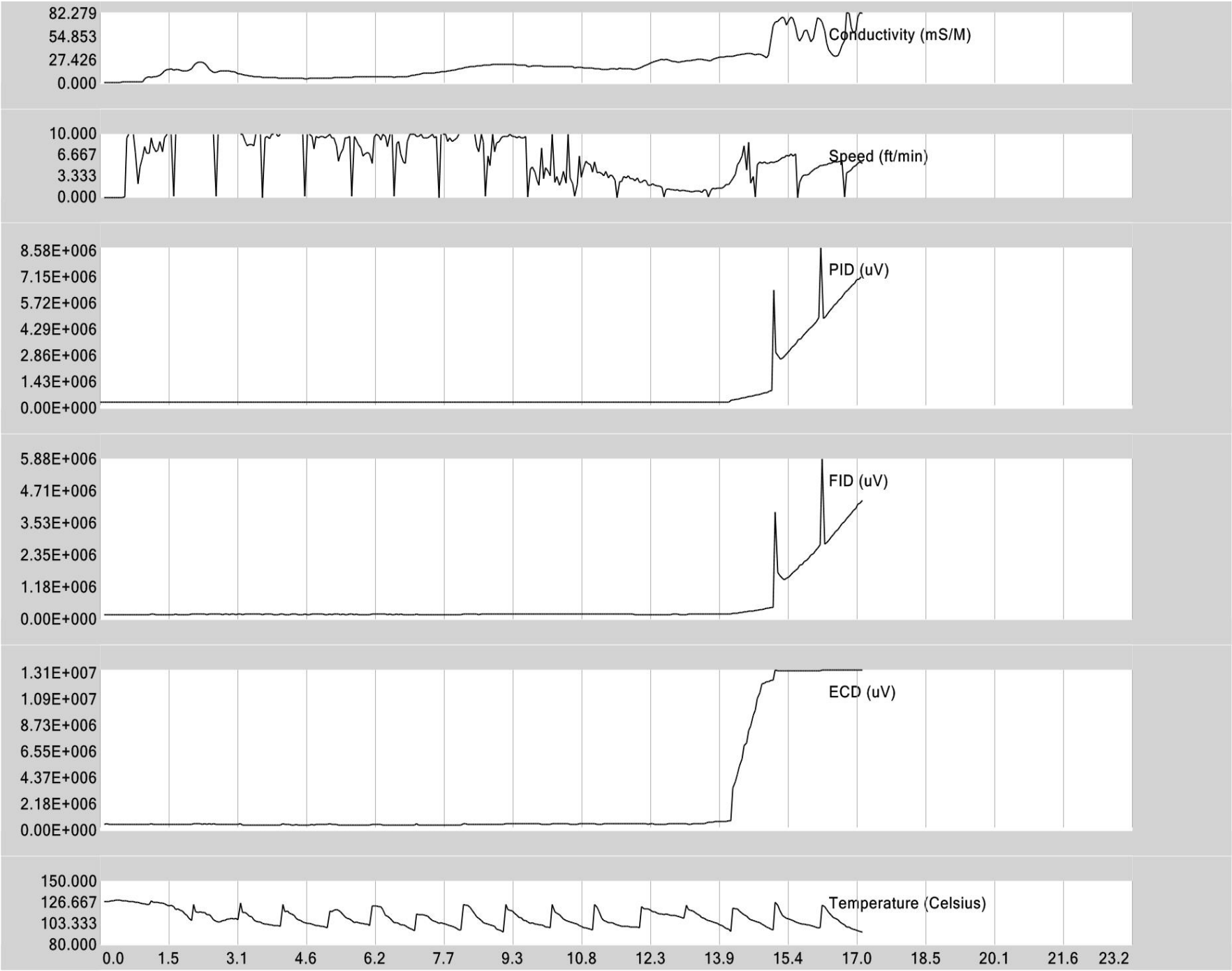

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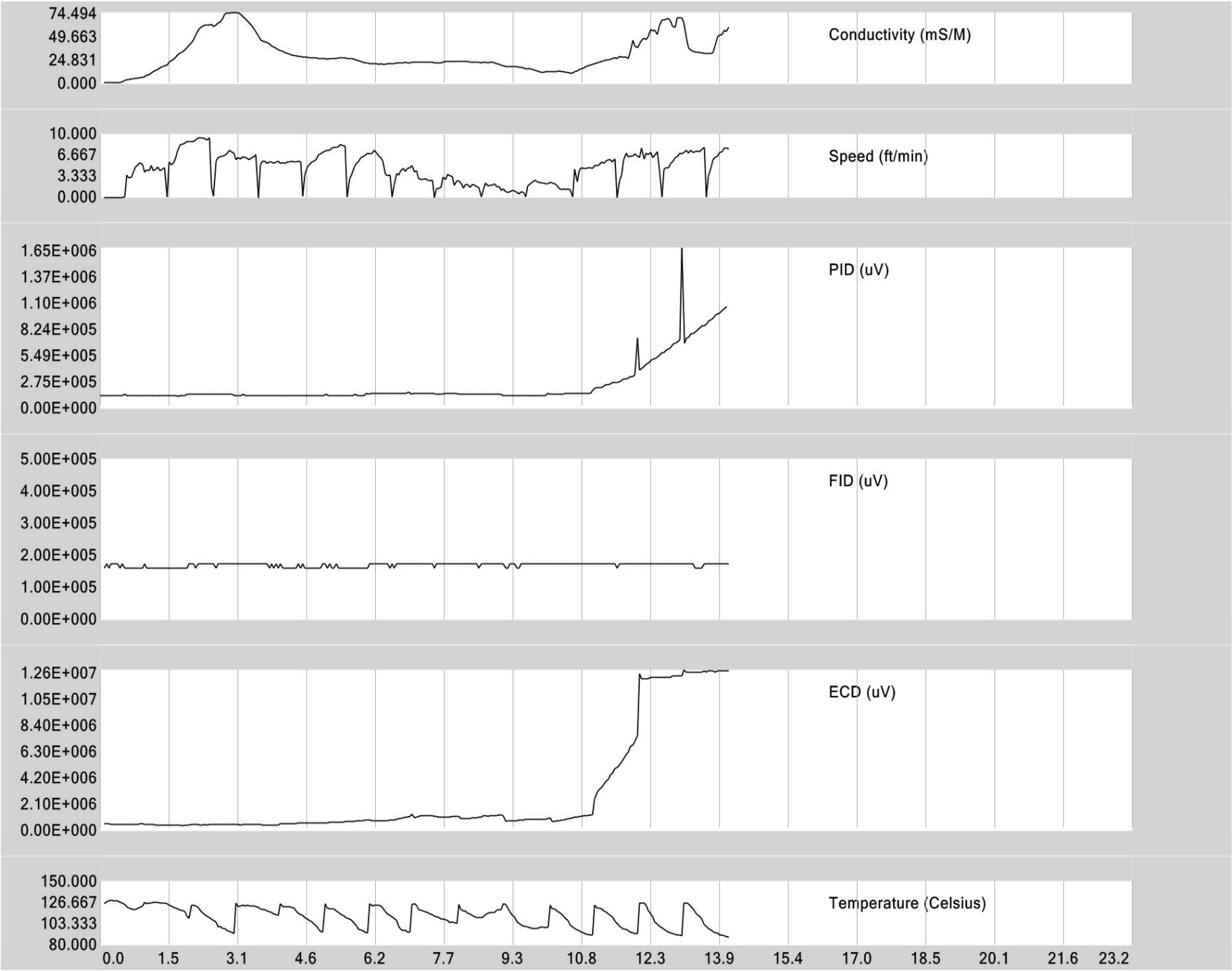

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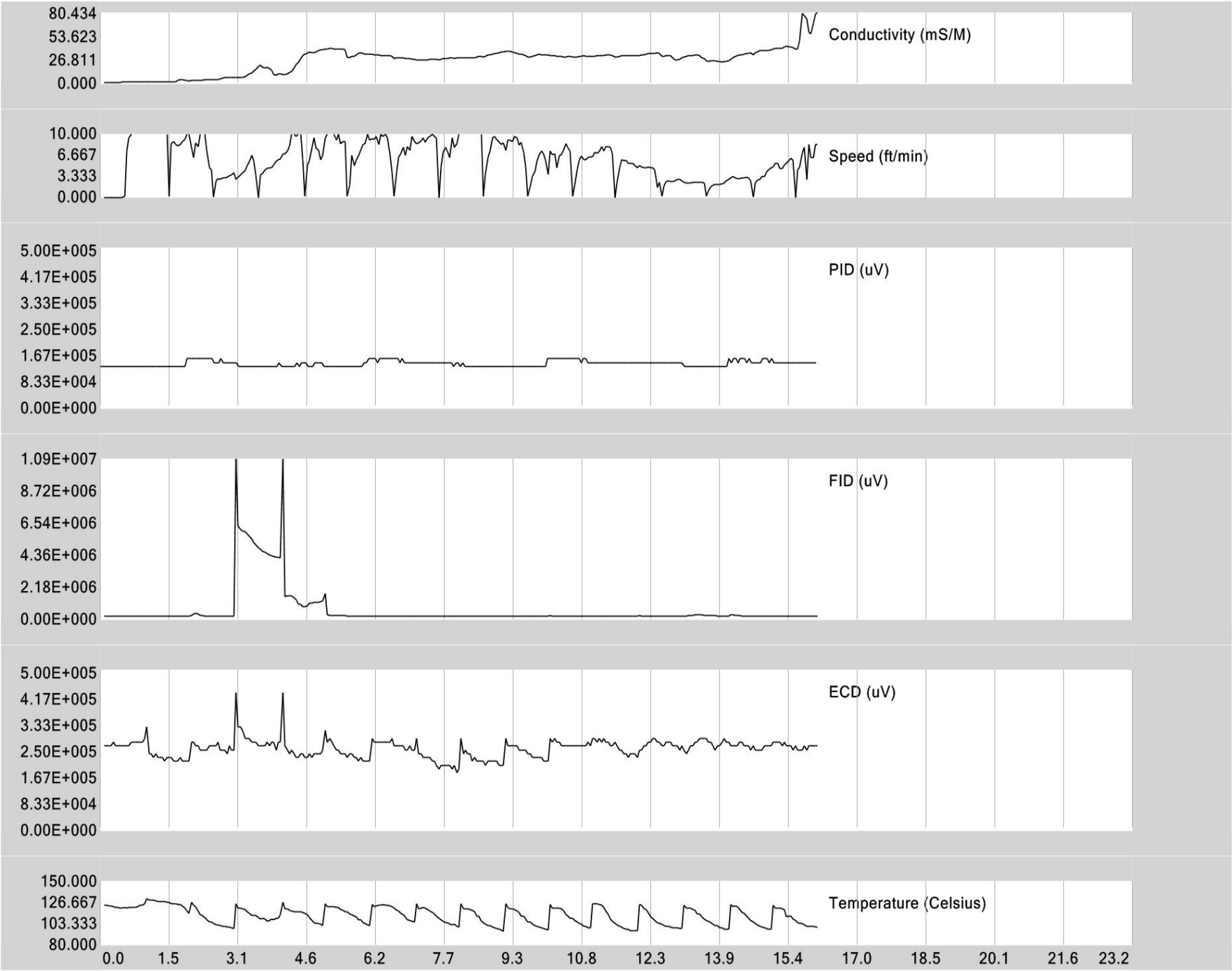

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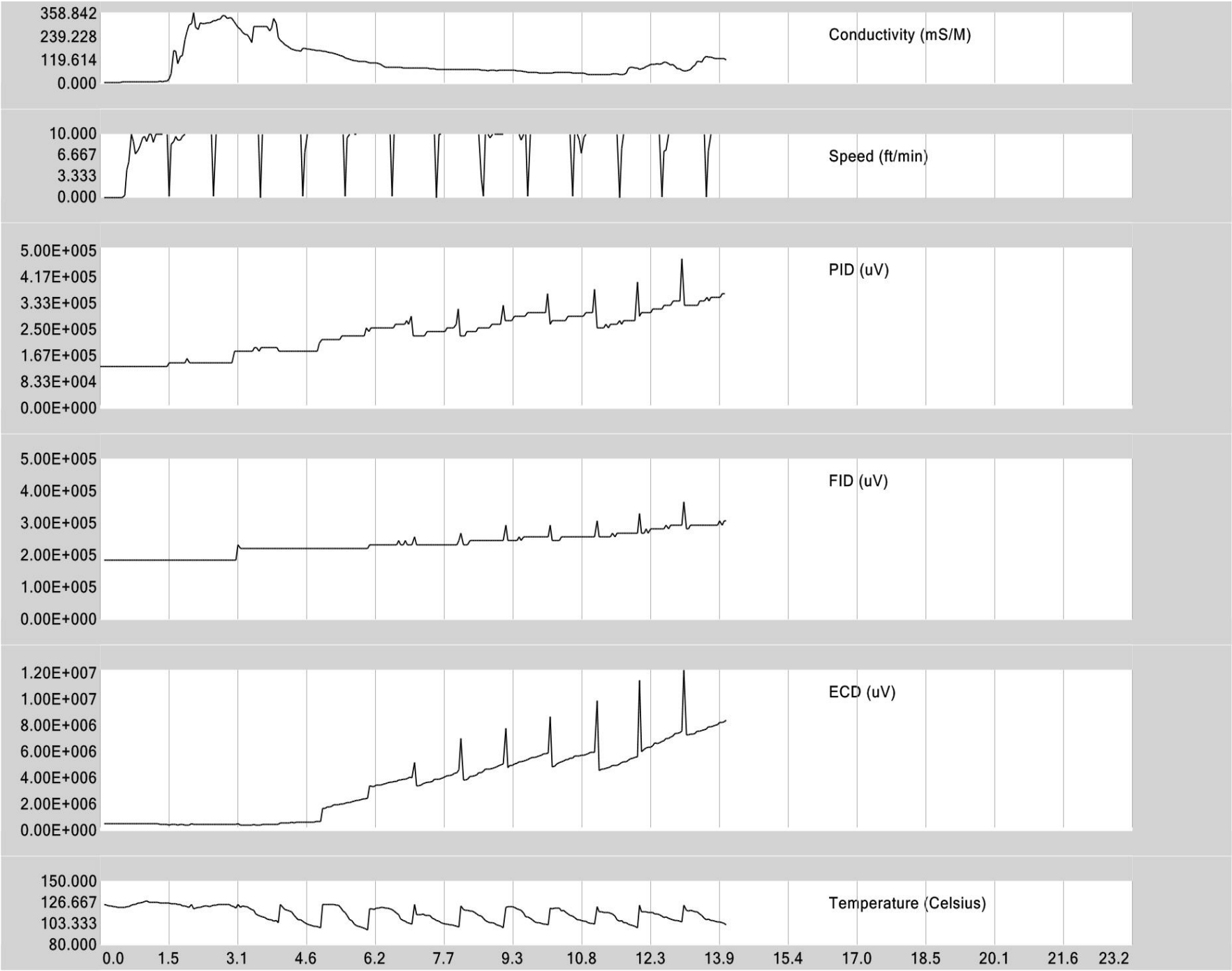

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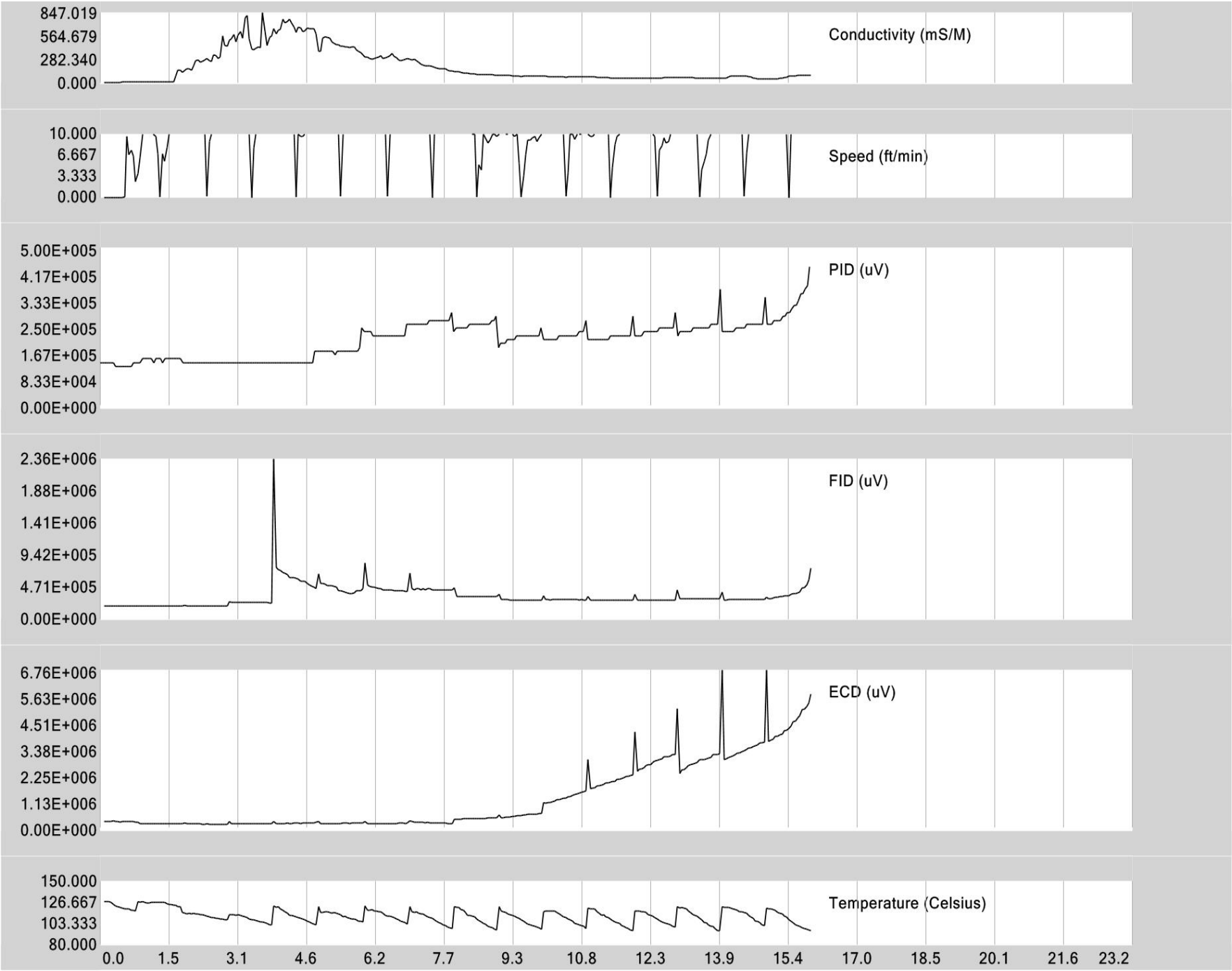

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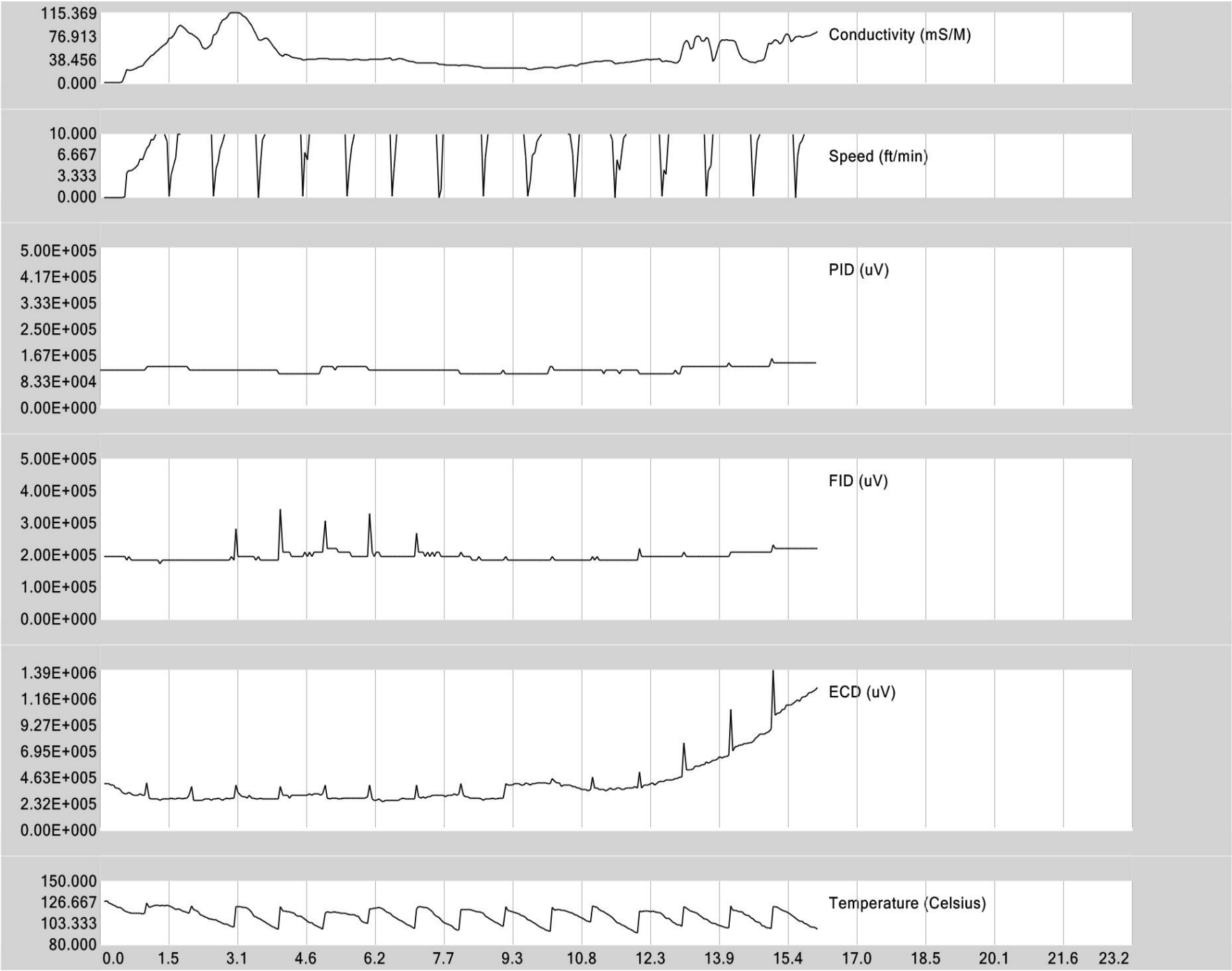

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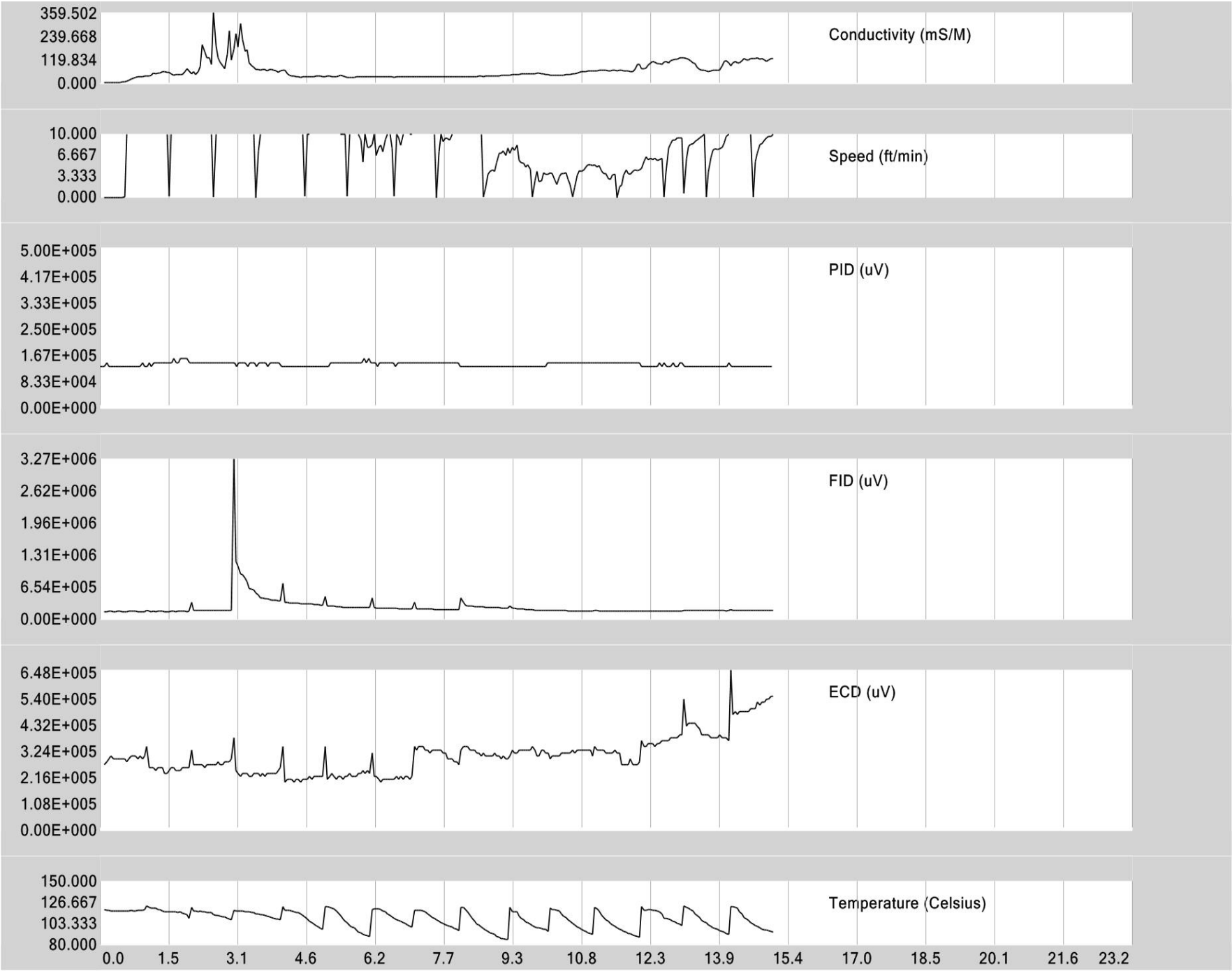

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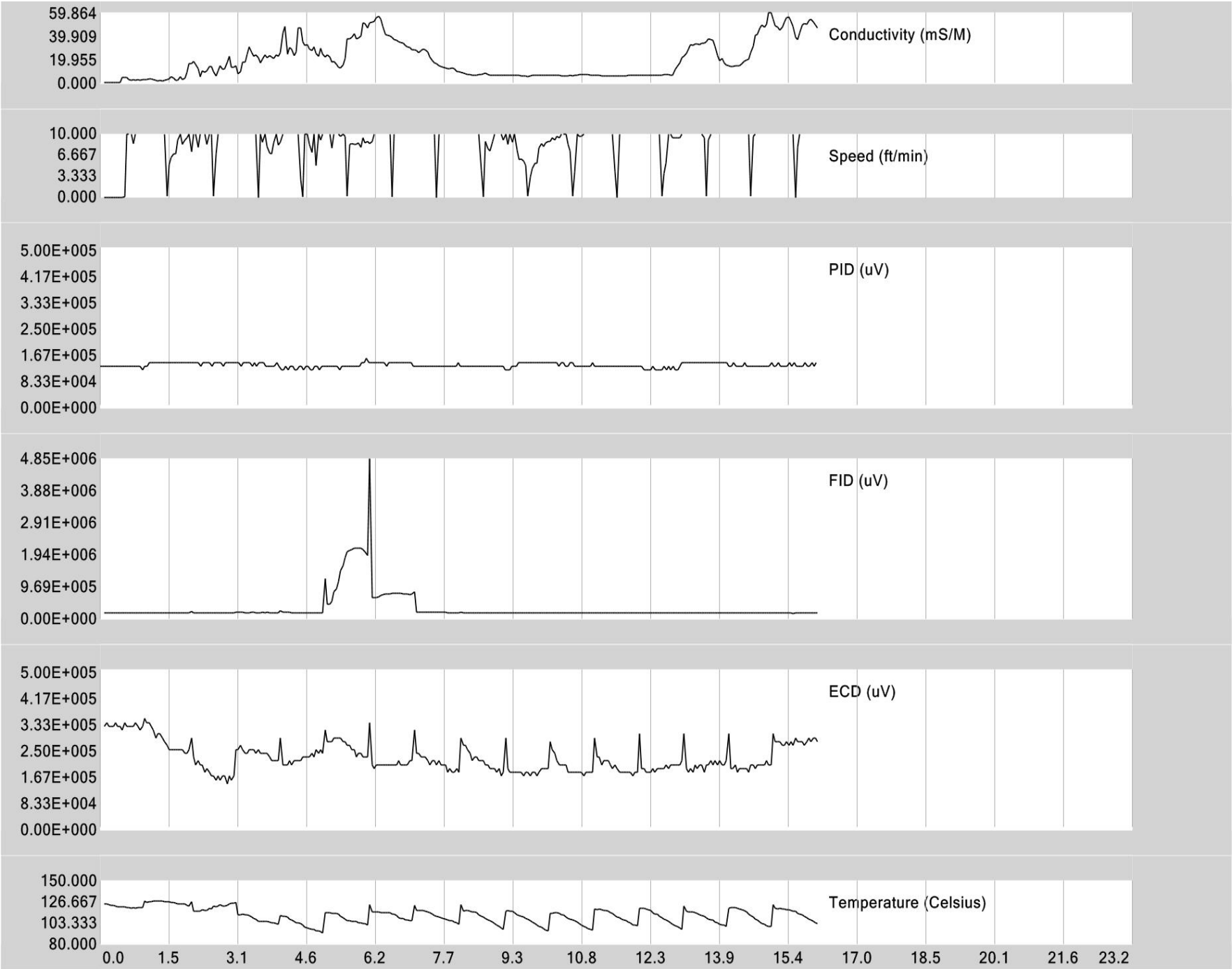

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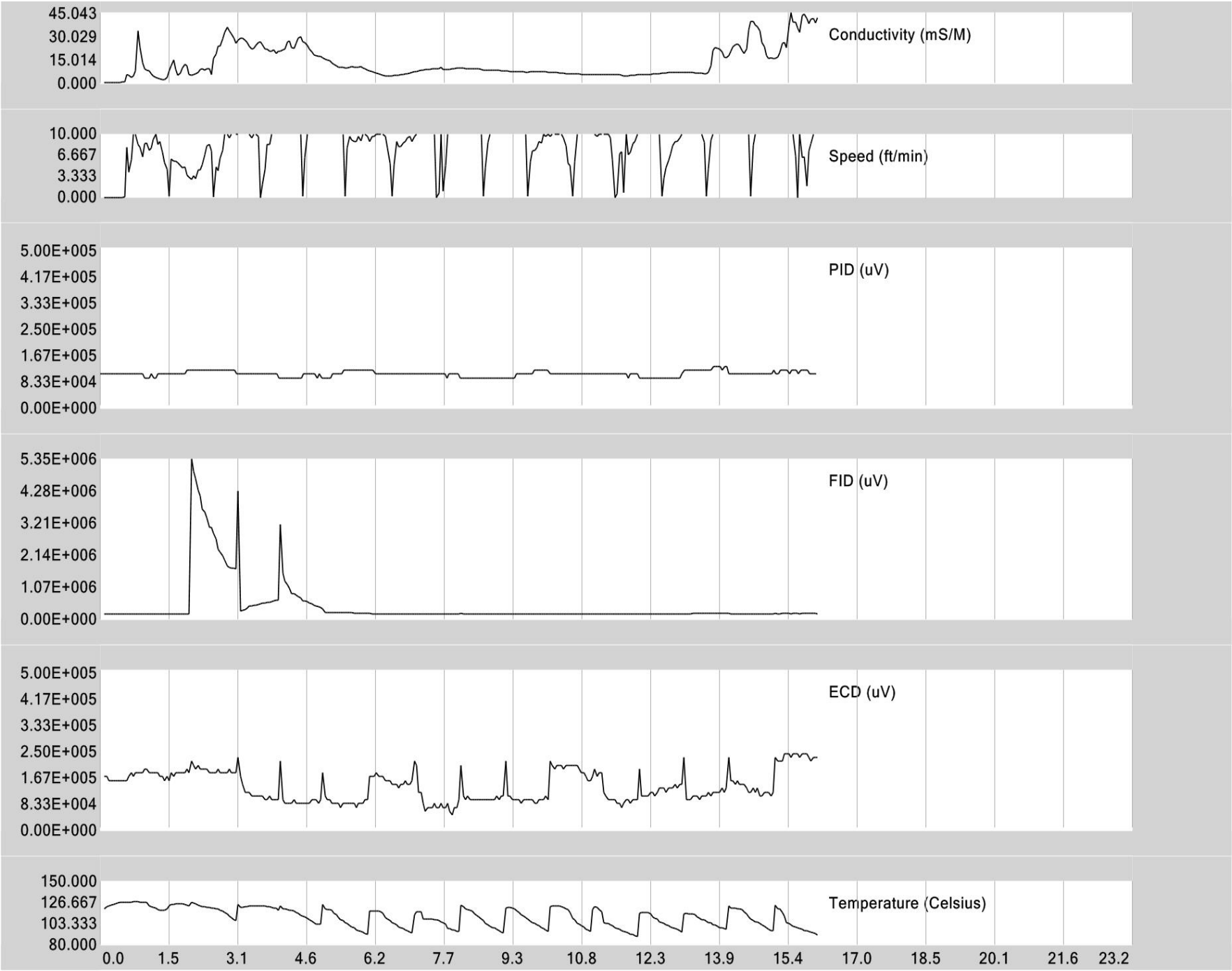

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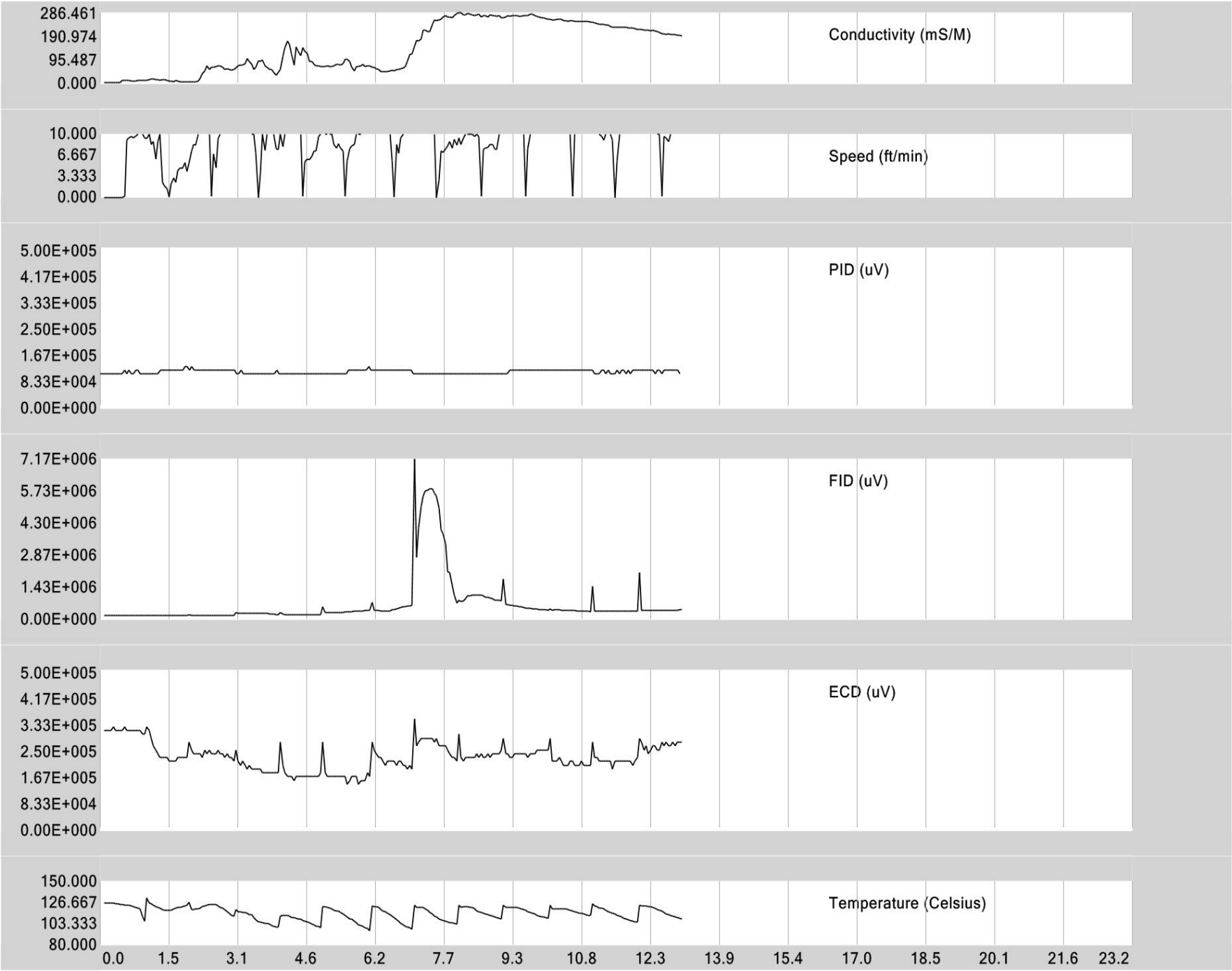

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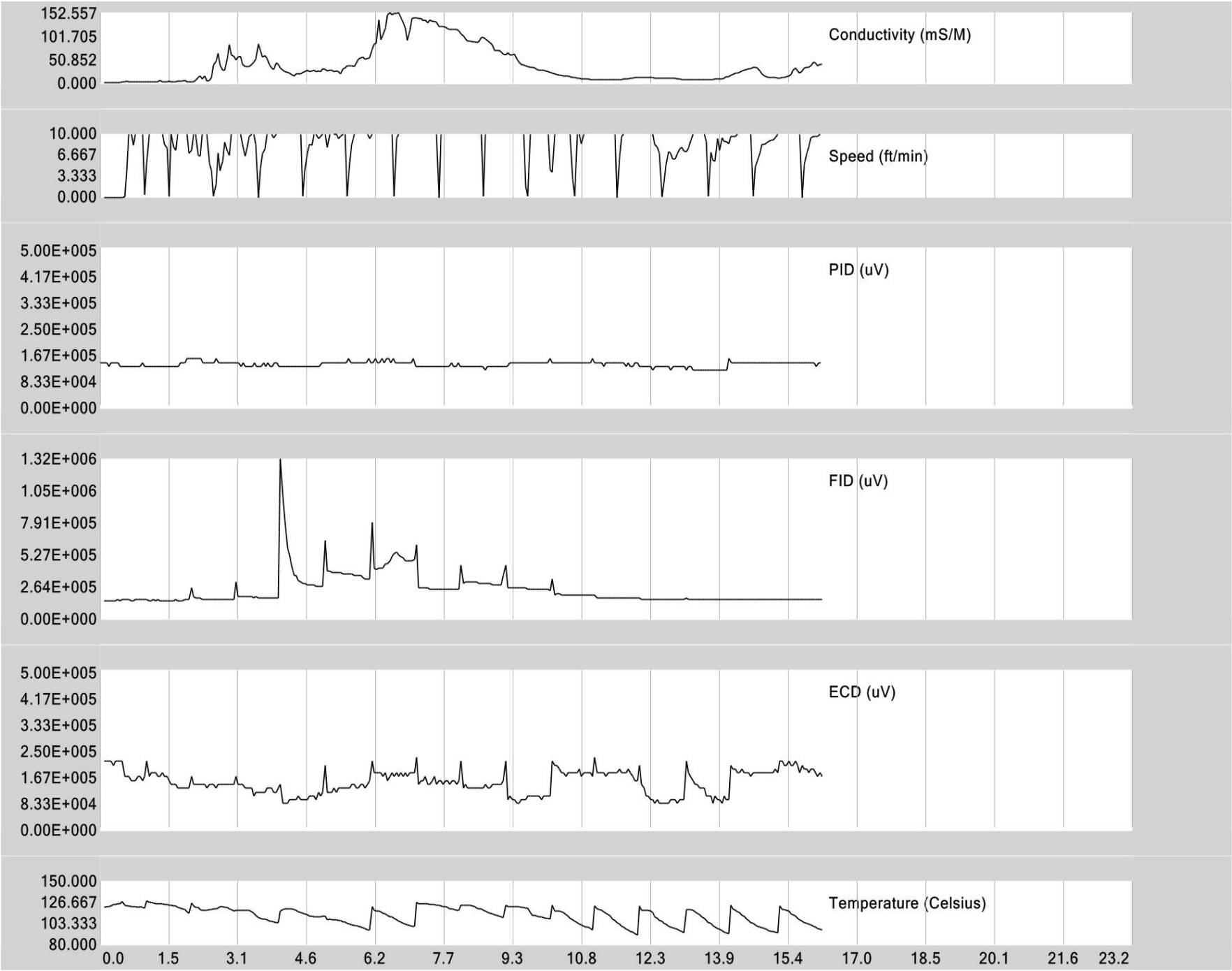

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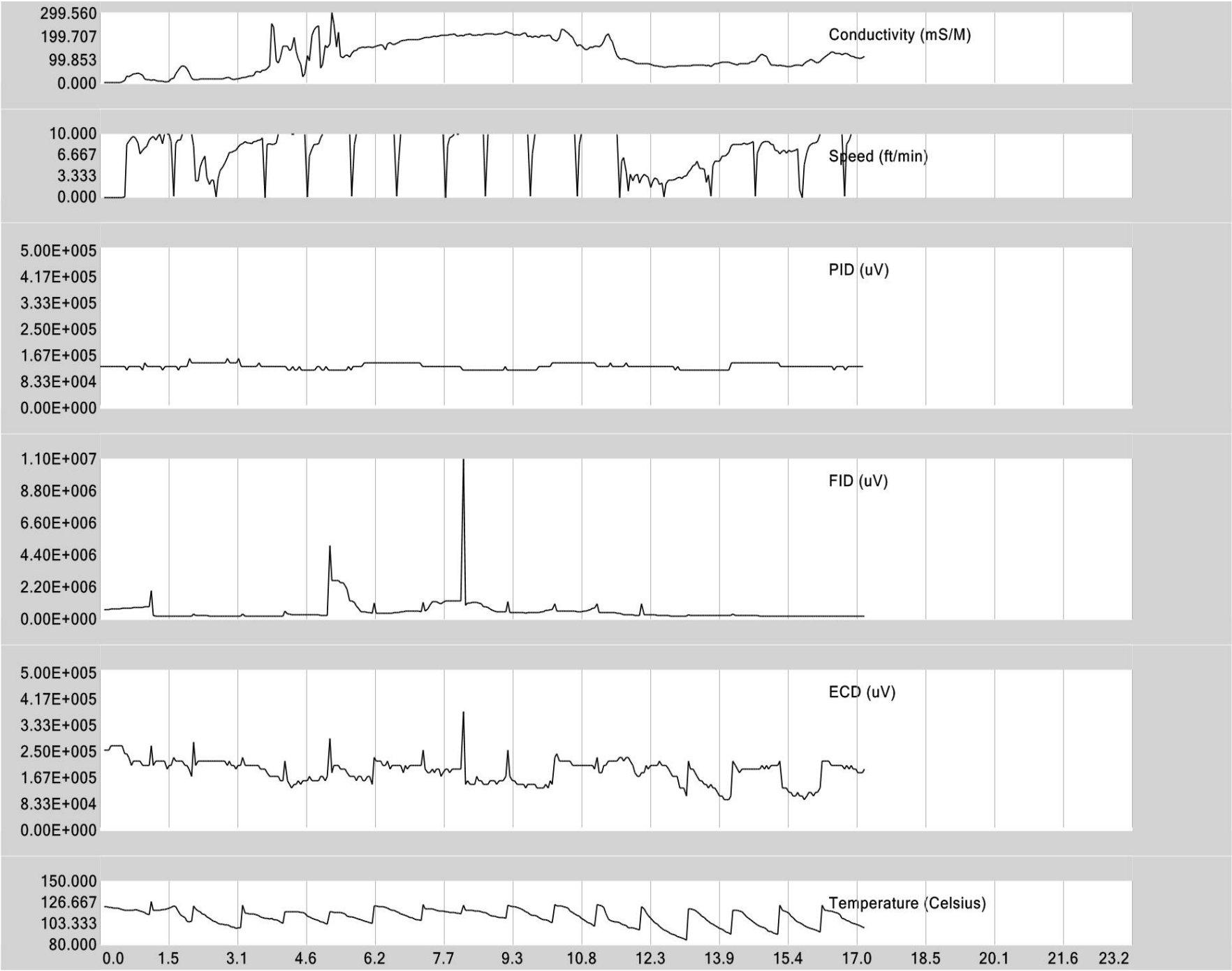

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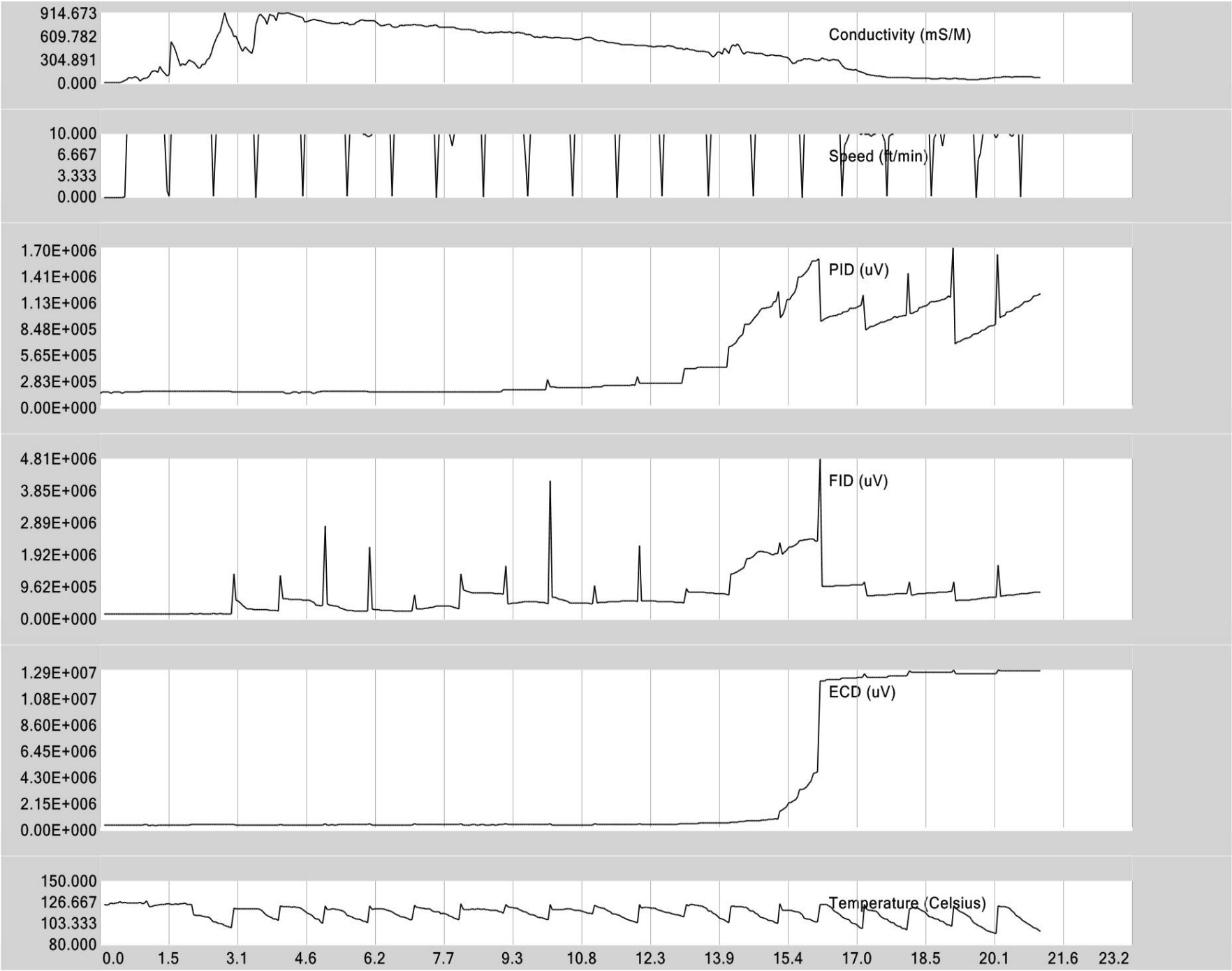

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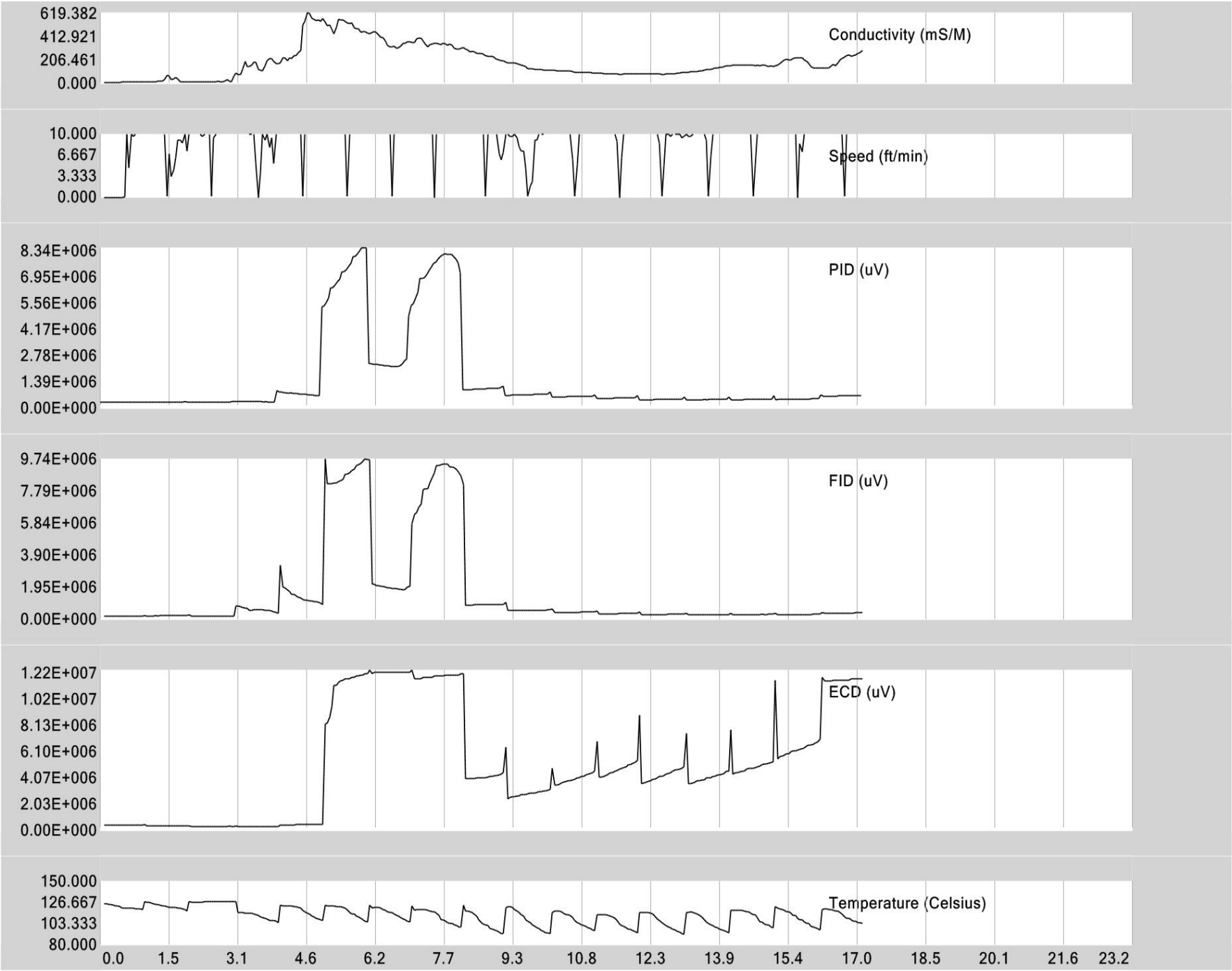

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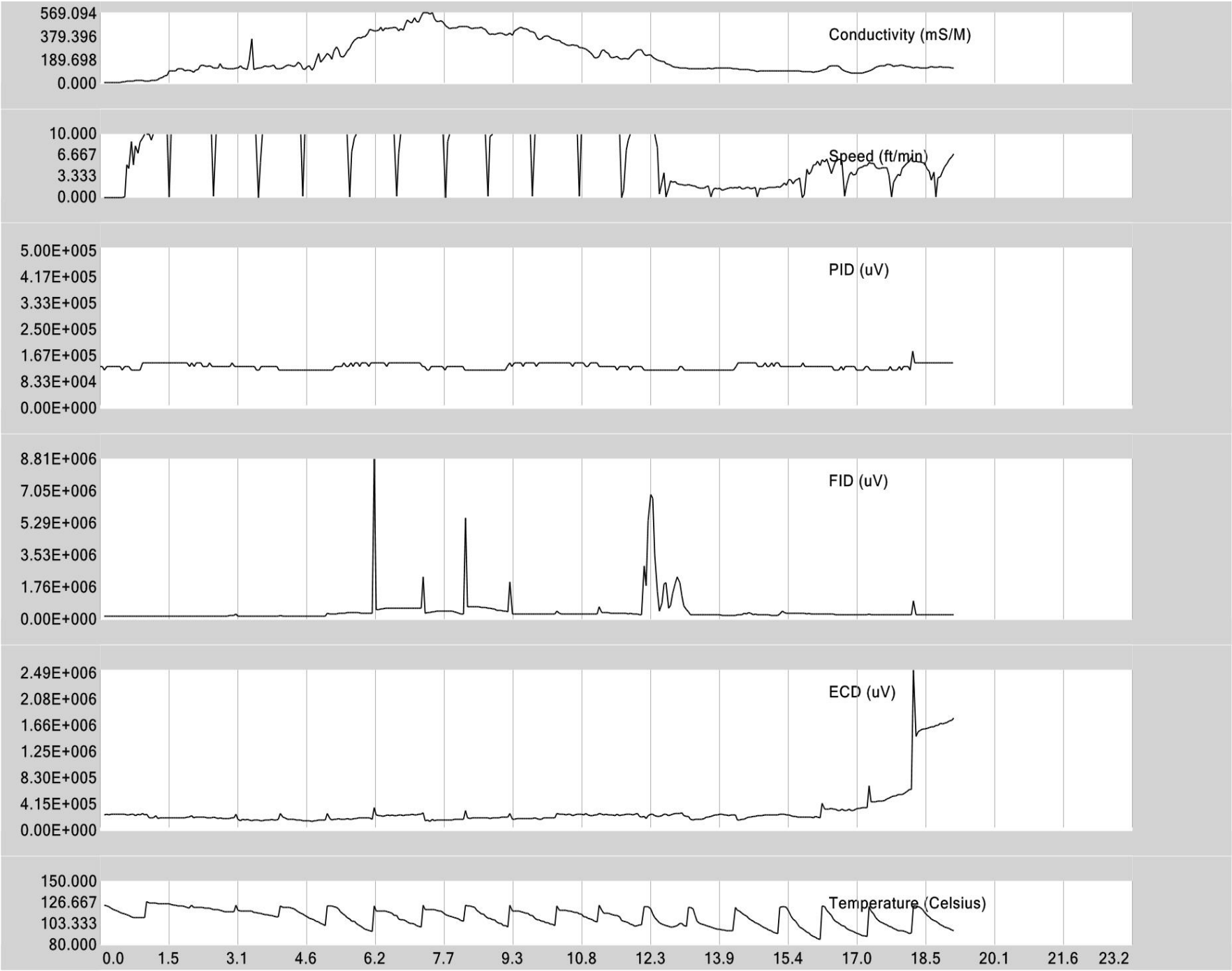

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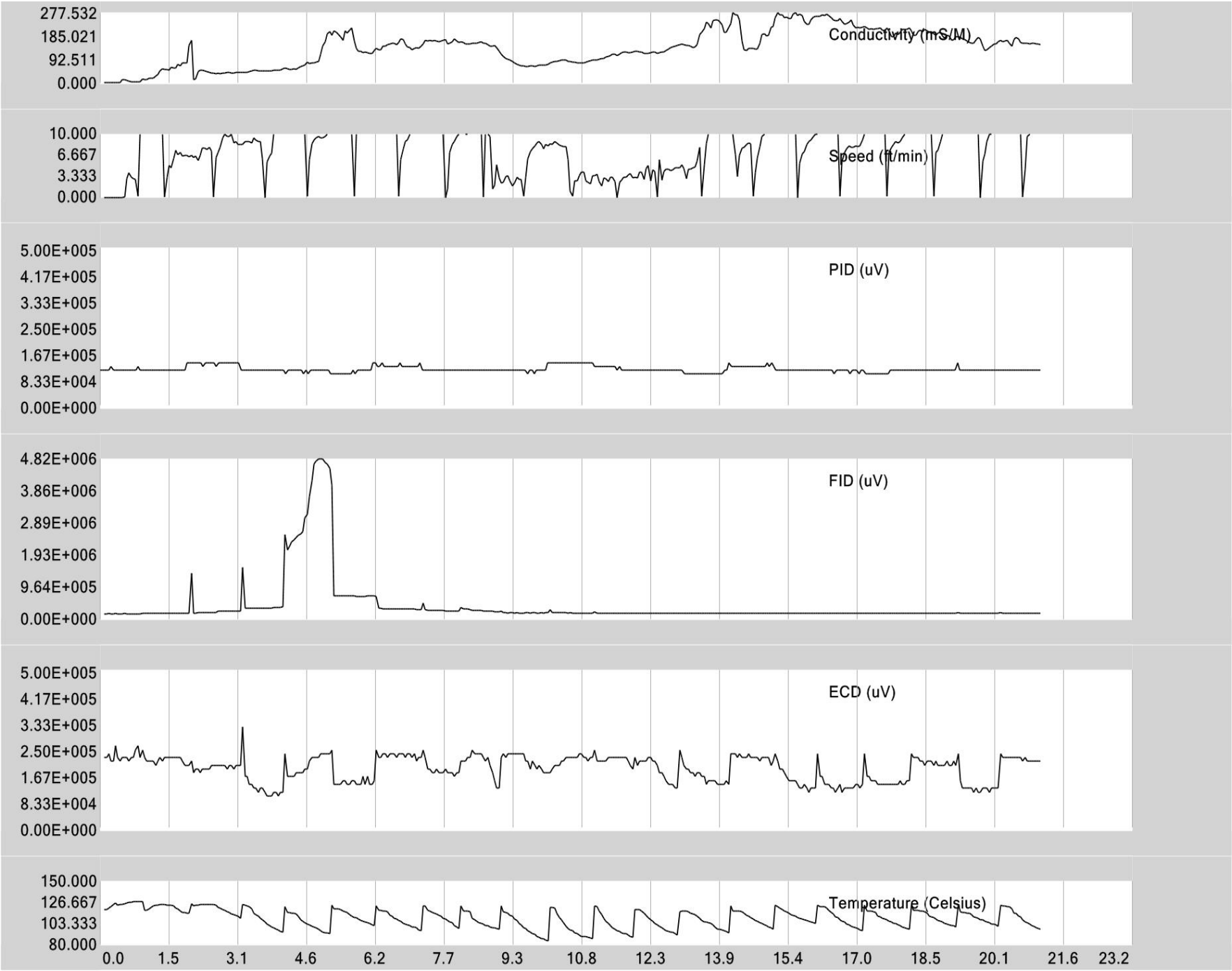

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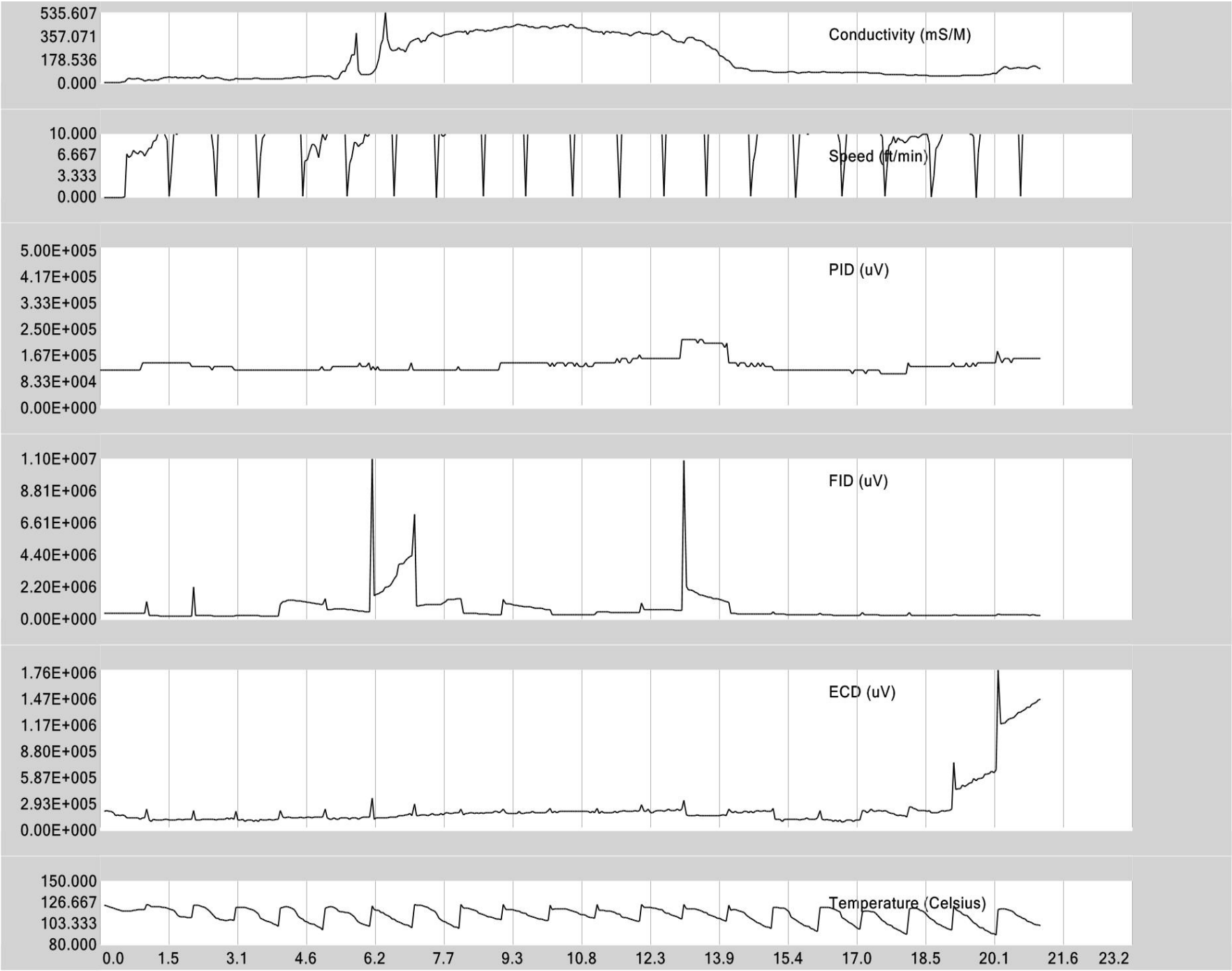

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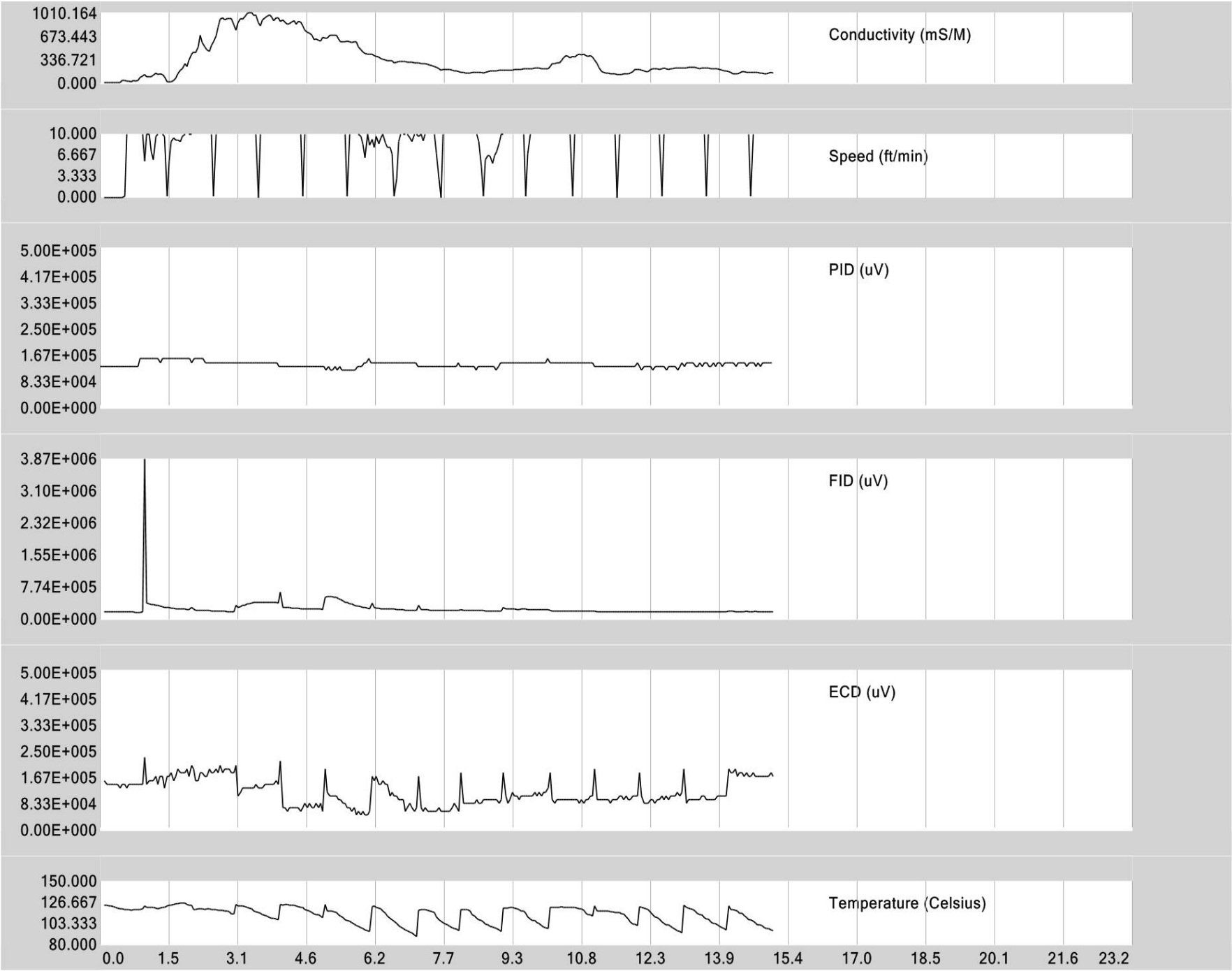

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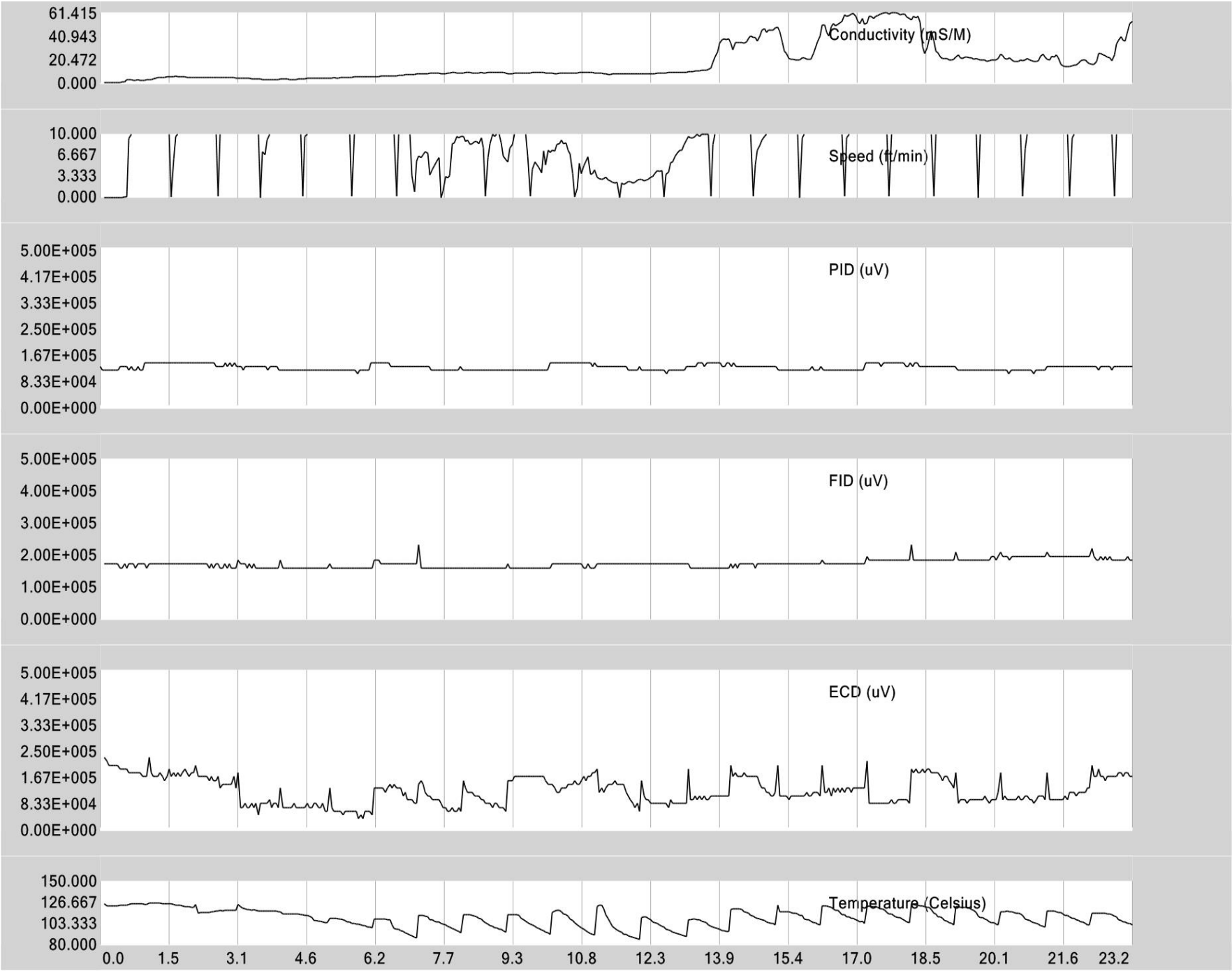

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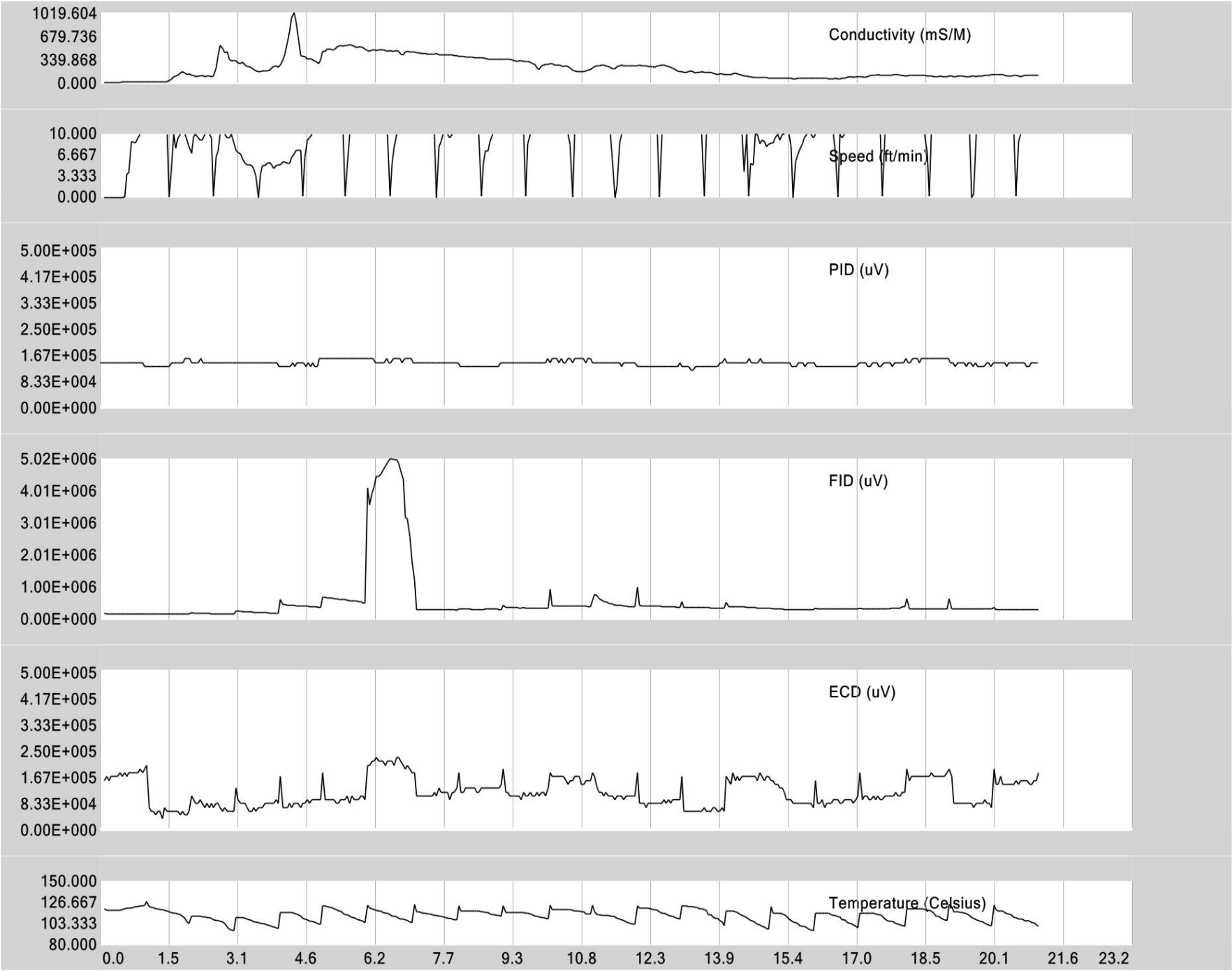

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Input for MIP-Laboratory Data Correlation Plots
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

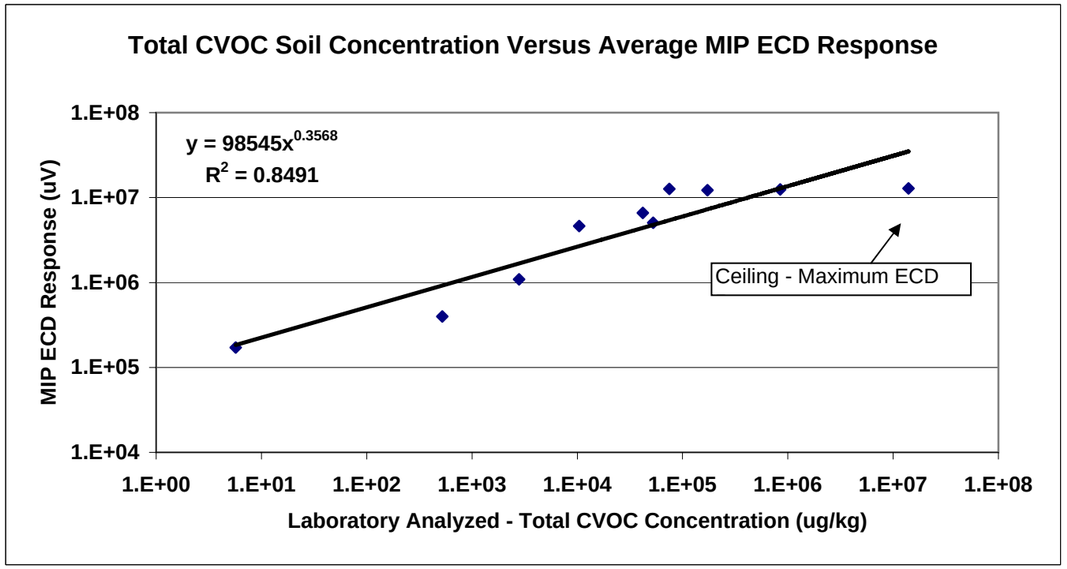
Table K-1

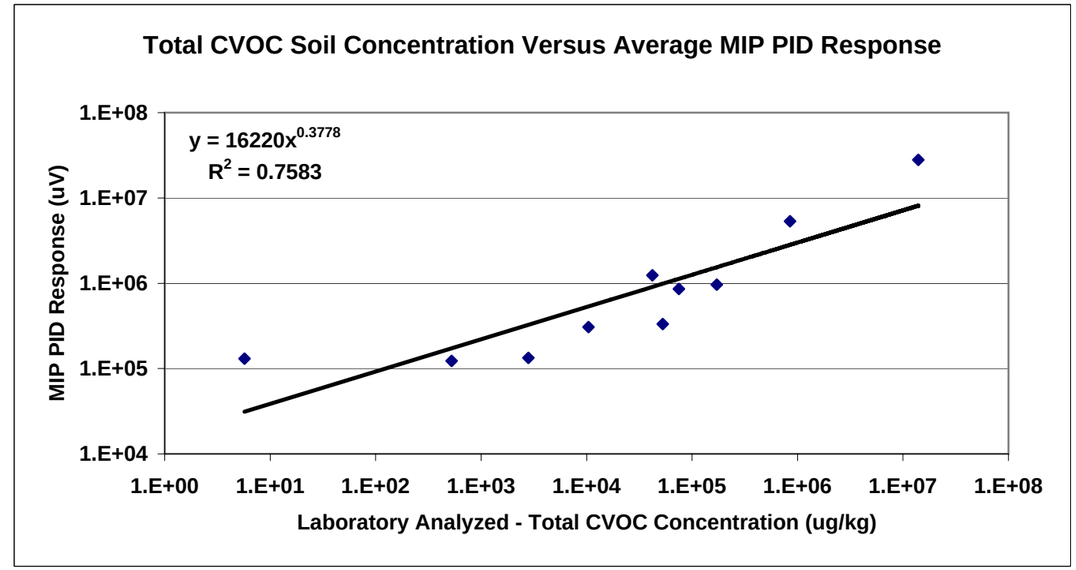
Soil Sample Station ID	MIP Station ID	Sample Depth (ft bgs)	Laboratory Data: Total Detected CVOC Concentrations in Soil (ug/kg)	MIP Response: Average ECD Response (uV)	MIP Response: Maximum ECD Response (uV)	MIP Response: Average PID Response (uV)	MIP Response: Maximum PID Response (uV)
SJS02-SB01	MIP227	15-16	2,800	1,090,524	1,390,000	133,321	146,110
SJS02-SB02	MIP226	15-16	10,400	4,631,500	5,910,000	307,244	439,083
SJS02-SB03	MIP234	15.5-16.5	42,000	6,601,905	12,100,000	1,240,689	1,574,353
SJS02-SB03	MIP234	16.5-17.5	172,000	12,252,381	12,600,000	965,736	1,183,723
SJS02-SB03	MIP234	19-20	75,000	12,628,571	12,900,000	856,453	1,696,425
SJS02-SB03	MIP234	4.5-5	6	170,909	172,000	130,573	133,903
SJS02-SB04	MIP235	11.5-12.5	52,700	5,037,619	9,290,000	331,542	500,118
SJS02-SB04	MIP235	5.5-6.5	848,000	12,438,095	12,800,000	5,334,757	8,337,151
SJS02-SB05	MIP216	10-10.5	14,000,000	12,780,578	12,780,578	27,984,045	28,194,900
SJS02-SB07	MIP228	13-14	524	396,952	526,000	122,858	133,903
SJS02-SB06	MIP222	17.5-18.5	126	No data	No data	No data	No data

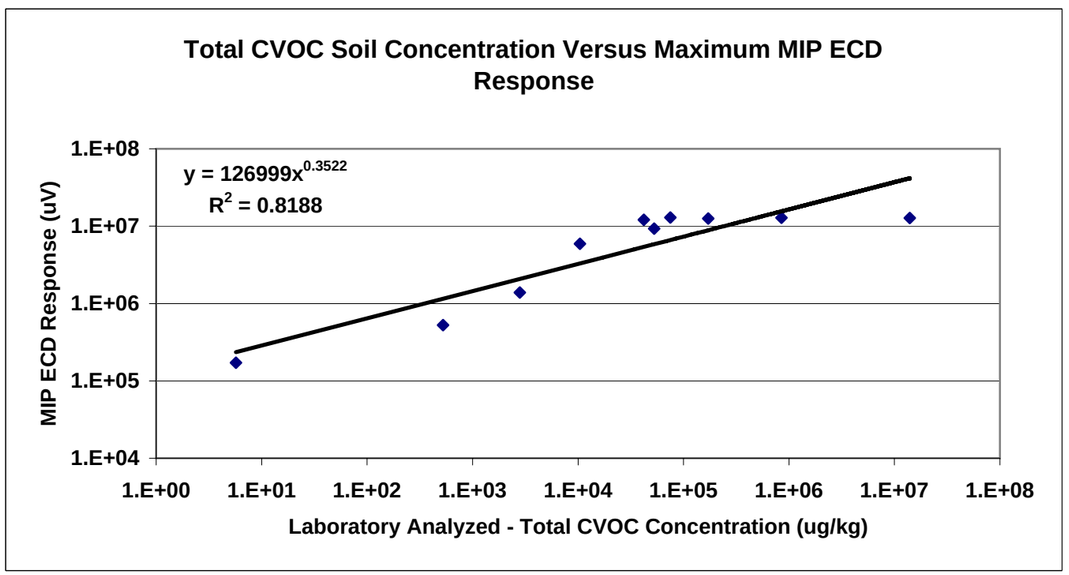
Table K-2

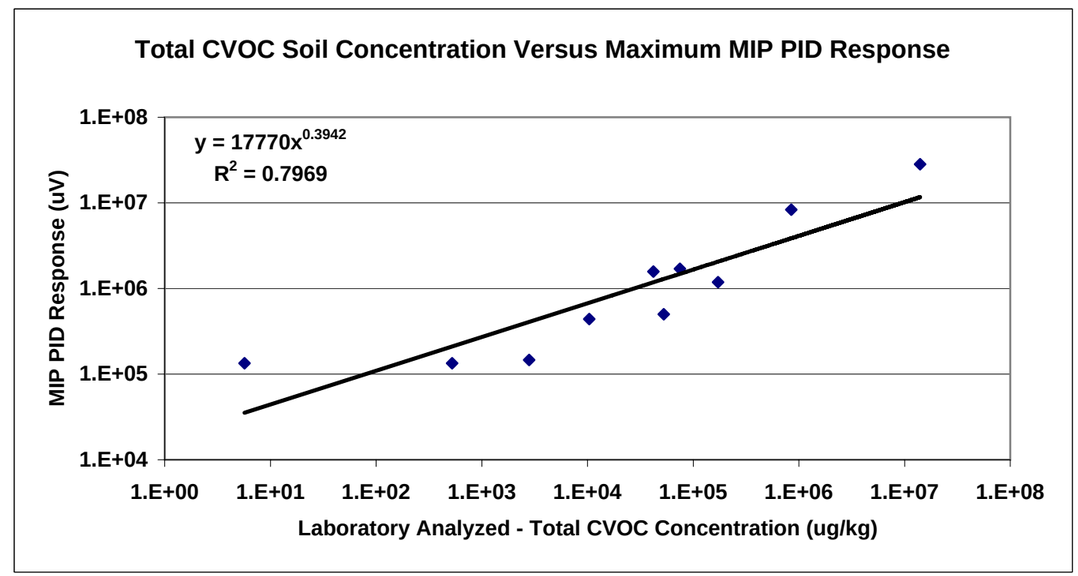
Groundwater Sample Station ID	MIP Station ID	Sample Depth (ft bgs)	Laboratory Data: Total Detected CVOC Concentrations in Groundwater (ug/L)	MIP Response: Average ECD Response (uV)	MIP Response: Maximum ECD Response (uV)	MIP Response: Average PID Response (uV)	MIP Response: Maximum PID Response (uV)
SJS02-GW02	MIP231	5.5-6.5	1	183,190	270,000	108,325	121,695
SJS02-GW04	MIP236	16.5-18.5	5,612	783,463	2,690,000	117,824	170,523
SJS02-GW08	MIP207	15.5-18.5	10	205,110	207,145	4,311,789	12,100,000
SJS02-GW13	MIP222	12-13.5	4,820	248,194	282,000	131,146	133,903
SJS02-GW13	MIP222	15-15.5	12,000	12,781,818	13,100,000	2,488,785	6,249,718
SJS02-GW14	MIP225	5.5-6	52,000	2,302,727	2,480,000	219,353	219,353
SJS02-GW14	MIP225	12-13.5	120,000	7,258,065	12,300,000	315,828	463,498
SJS02-GW15	MIP226	13-13.5	127,100	2,845,455	3,090,000	234,889	243,768
SJS02-GW16	MIP223	11-11.5	69,000	3,351,436	4,700,888	176,072	219,353
SJS02-GW16	MIP223	13-14	370,000	12,823,337	13,001,795	853,546	1,647,598
SJS02-GW17	MIP238	16.5-17.5	1,068	116,162	196,000	108,325	109,488
SJS02-GW17	MIP238	19.5-21	11,292	988,387	1,760,000	139,809	170,523
SJS02-GW18	MIP234	18.5-19	295,600	12,700,000	12,700,000	1,109,370	1,147,100
SJS02-GW19	MIP227	12.5-13	961	415,000	441,000	98,390	109,488
SJS02-GW20	MIP232	13-14	3	114,467	209,000	112,975	121,695

CVOC = chlorinated volatile organic compounds
ECD = electron capture detector
ft bgs = feet below ground surface
MIP = membrane interface probe
PID = photoionization detector
ug/kg = micrograms per kilogram
ug/L = micrograms per liter
uV = microvolts

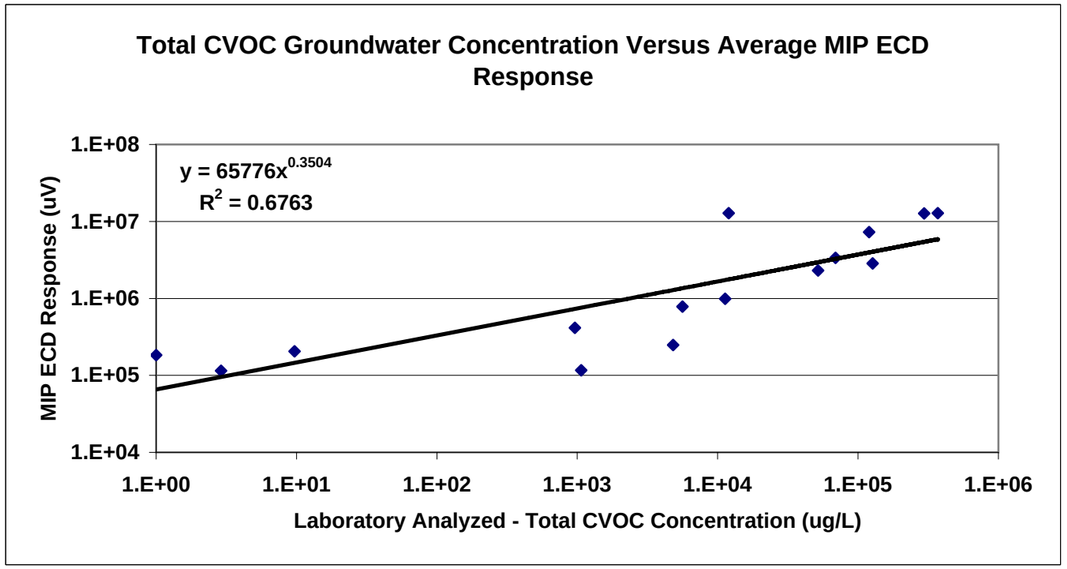


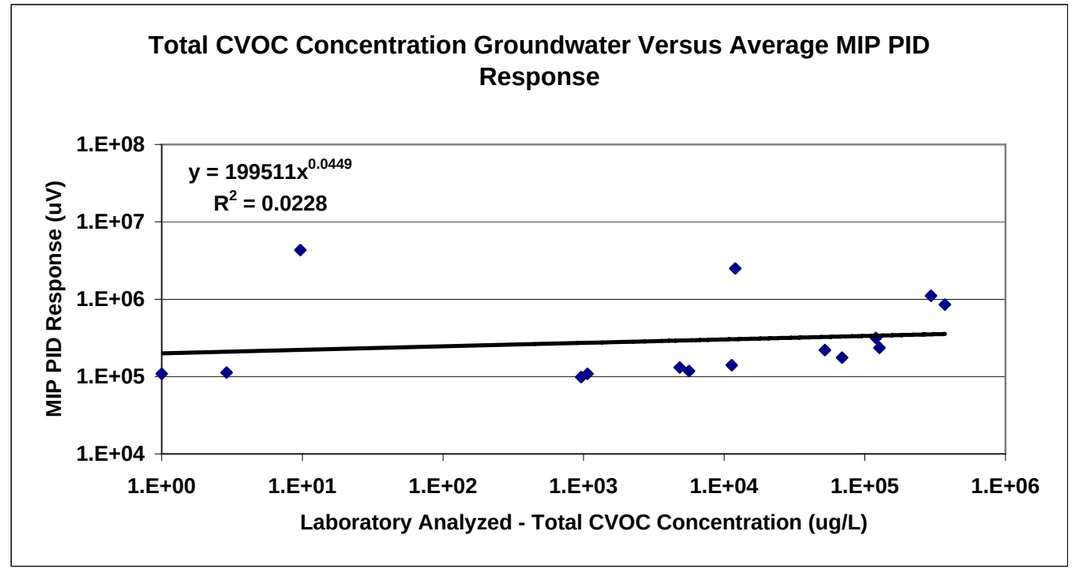


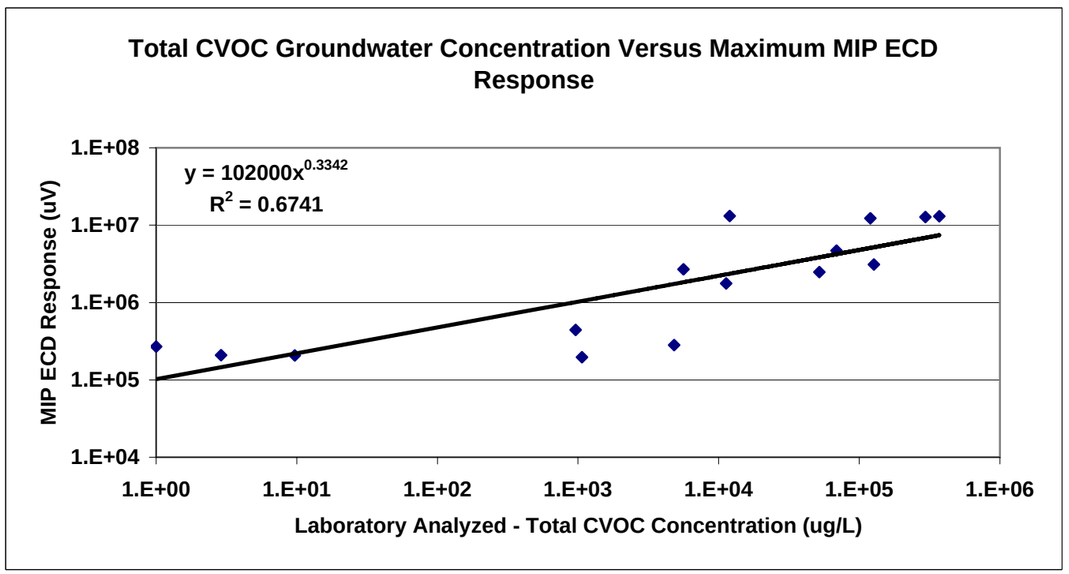


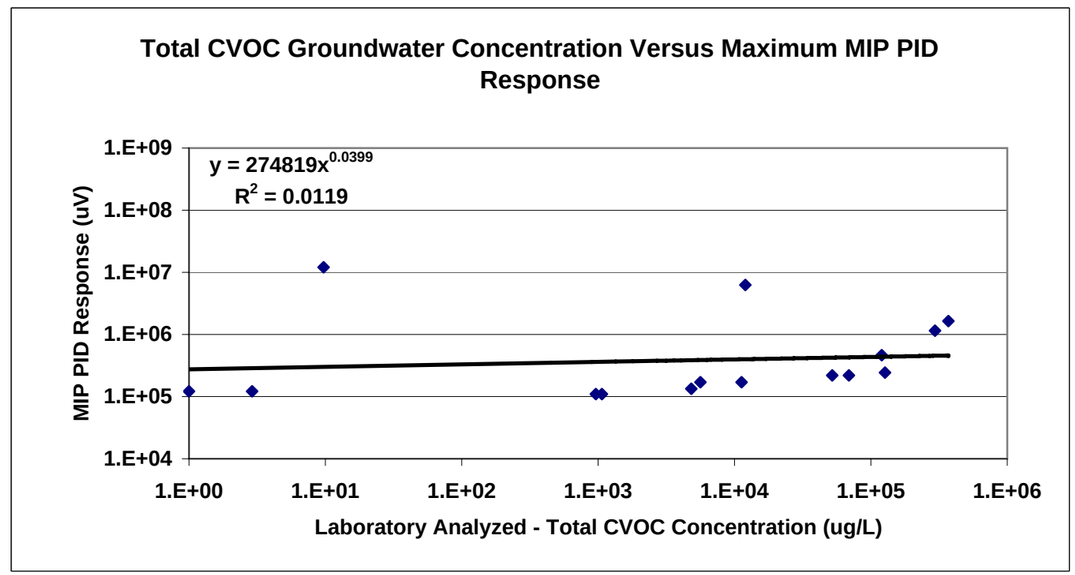


CVOC = chlorinated volatile organic compounds
ECD = electron capture detector
MIP = membrane interface probe
PID = photoionization detector
ug/kg = micrograms per kilogram
uV = microvolts









CVOC = chlorinated volatile organic compounds
ECD = electron capture detector
MIP = membrane interface probe
PID = photoionization detector
ug/L = micrograms per liter
uV = microvolts

Appendix L
Modeling Technical Memorandum

Fate and Transport Modeling Assessment for Site 2, Saint Juliens Creek Annex, Chesapeake, Virginia

Introduction

CH2M HILL completed a modeling assessment to estimate the maximum extent of the chlorinated volatile organic compound (CVOC) plumes in shallow groundwater at Site 2 and the time of remediation (TOR). The TOR is the time required for source area CVOC concentrations in groundwater to reduce to target concentrations, such as the Federal Maximum Contaminant Limits (MCLs). The modeling was based on the assumption that only natural attenuation (NA) processes will affect the plumes. The models selected for this assessment were Natural Attenuation Software (NAS) (Version 2.1.1), developed at the Virginia Polytechnic Institute and State University (Virginia Tech) and the BIOBALANCE Toolkit (BIOBALANCE) (Version 1.03), distributed by GSI Environmental (GSI). Both applications are public domain software. This technical memorandum (TM) describes the application of the NAS and BIOBALANCE to Site 2 plumes and summarizes the results.

Study Objectives

The objective of this modeling effort was to provide quantitative estimates of the maximum CVOC plume extents and the TORs under NA conditions. For this evaluation, the TOR was defined as the time required for groundwater CVOC concentrations in the source area to reach MCLs. The results can be used as a basis to evaluate the potential impact of source treatment or removal on TORs and future plume extents. These estimates help stakeholders select the most appropriate remediation alternatives.

Modeling Software Selection

Natural Attenuation Software

Model Description

NAS is a screening-level model that estimates the time for contaminated groundwater plumes to reach remedial goals under NA alone, or with source-zone treatment. NAS was developed in a collaborative effort by Virginia Tech, the U.S. Geological Society (USGS), and Naval Facilities Engineering Command. The software program is described in detail in the *Natural Attenuation Software (NAS) User's Manual, Version 2* (Widdowson et al., 2005). NAS performs a Time of Stabilization (TOS) analysis and TOR analysis to estimate timeframes. General model input requirements for NAS include hydrogeologic and geotechnical parameters, source area characteristics, CVOC concentration data along the centerline of the plume, geochemical and reduction-oxidation (redox) data

along the centerline of the plume, and an estimate of the non-aqueous phase liquid (NAPL) mass within the source area.

The NAS regression algorithm estimates the natural attenuation capacity (NAC) for each contaminant. The NAC conceptually is the "contaminant-lowering capacity of an aquifer per unit length (feet or meters) of flowpath" (Chapelle, et al., 2003). The NAC is dependent upon the contaminant concentrations, the hydrologic characteristics (such as groundwater velocity and dispersion), and the apparent first-order decay rates for each contaminant in the plume. Based on the assigned contaminant concentration-distance profile and groundwater transport properties, the model estimates values for CVOC first-order decay rates, dispersivity, and maximum plume length. Site-specific geochemical data are used to assign variable redox zones along the flowpath. Once these redox zones are established, a different NAC and first-order decay rate is calculated for each contaminant in each zone.

In the TOS analysis, NAS uses an analytical method to solve the transport equation. The source area groundwater concentration and "stabilization" time required to meet groundwater target levels at a downgradient compliance point are calculated. This calculation assumes steady-state conditions for both groundwater flow and contaminant levels in the source area. The model uses the contaminant migration velocities and the contaminant decay rates estimated by the program. The TOS analysis determines whether the current source area concentrations need to be reduced so that the compliance point concentrations will be below MCLs. If source area concentrations need to be reduced, the model will calculate the lower source area concentration needed to meet MCLs at the compliance point. Using actual or reduced source area concentrations, the model then estimates the time it will take for the plume to stabilize. The NAS calculations may show that source reduction and additional stabilization time are required, even though compliance point groundwater concentrations are currently below the MCLs. This is because the model may calculate that the plume has not yet stabilized and will continue to migrate.

In the TOR analysis, NAS uses one-dimensional numerical methods to solve the transport equation. The model estimates the time required for source area groundwater concentrations to attenuate to target groundwater concentrations, such as MCLs. Calculations are performed using the MODFLOW numerical code to solve the groundwater flow equations and the SEAM3D numerical code to solve the contaminant transport equations. As a simplifying assumption, the model assigns the highest known groundwater concentration over the entire source area. The model also requires specification of the NAPL source mass, either as an estimate or as an uncertainty range. The TOR computation incorporates dissolution of the NAPL mass within the specified source area, the mass flux from the source area, and attenuation of the contaminant. By modifying input values of the NAPL mass, the model can estimate the effects of source zone treatment on TOR.

Model Limitations

The NAS model is a one-dimensional transport model; therefore, input data and CVOC calculations occur within the centerline of the plume. Because the available site-specific data are often not exactly from the plume centerline, modeled results may over- or

underestimate attenuation and TOR. The NAS model employs simplifying assumptions about hydrogeologic, biological, and geochemical processes. The NAS developers discourage using the model to calculate estimates if all the input parameters are not available. For example, if sufficient geochemical data are not available to identify redox zones, then variable NAC values (although they may be representative of site conditions) should not be applied along the flowpath. Because subsurface conditions are complex, the model can provide only approximate estimates of TOR.

BIOBALANCE Toolkit

Model Description

BIOBALANCE is a screening-level model based on mass balance principles that evaluate contaminant plume stability and sustainability of NA processes. It has a Microsoft® Excel-based interface and is described in detail in *BIOBALANCE: A Mass Balance Toolkit.* (Kamath et al., 2006). General data input requirements for BIOBALANCE are similar to NAS.

BIOBALANCE incorporates four modules for the screening analysis. The Source Module uses mass balance equations to estimate the TOR, or remediation timeframe, for source area CVOC concentrations to attenuate to target treatment levels. The module requires that concentrations of CVOCs in source area groundwater and soil be entered. The module will estimate the source mass and source decay rate, or these values may be user defined. The TOR analysis may be performed assuming reductions in either source mass and/or mass flux to evaluate different remediation scenarios. The TOR is estimated using either a first order decay or compound model. The first order decay model assumes that source concentrations and mass flux decrease under a first-order relationship, and that there is a linear relationship between source mass and mass flux for the entire simulation period. On the contrary, the compound model assumes that there are limited changes in mass flux until a large amount of source mass has been depleted. This is a more appropriate for source areas containing a pooled dense non-aqueous phase liquid (DNAPL). The first-order decay model was used for the Site 2 assessment.

The Competition Module estimates how competing electron acceptors impact the availability of electron donors for reductive dechlorination of CVOCs. The Donor Module evaluates the impact of anthropogenic sources of carbon in the mass balance assessment. Because only NA was assumed to affect the Site 2 plumes, the Donor Module was not included in this assessment. The Plume Module estimates the maximum plume length and time for plume stabilization under monitored natural attenuation (MNA) only and source mass or flux reduction scenarios.

Model Limitations

Similar to the NAS approach, the BIOBALANCE model assumes one-dimensional transport in a homogeneous aquifer. The model only estimates TOR and maximum plume lengths for the parent CVOCs. It includes the presence of daughter products in the mass balance of electron donors and acceptors but does not track the "production" of daughter products through reductive dechlorination. The mass balance equations

assume stoichiometric relationships, which are presented in literature and may not apply to site-specific conditions.

Model Development

A horizontal transport model was developed for the shallow Columbia Aquifer. **Table L-1** summarizes input parameters for model hydrogeology and source area dimensions. The estimated TCE source mass, approximately 1,200 kilograms, was used for the TOR assessment in NAS. Because of the variability in the Site 2 hydrogeology, the model TORs were estimated under estimated minimum-flow, average-flow, and maximum-flow conditions. The different flow values were based on the minimum, average, and maximum estimates of hydraulic conductivity, horizontal hydraulic gradient, and organic carbon content. Site-specific contaminant and geochemical data (**Table L-2**) collected during the June 2007 sampling event were used for model inputs. Trichloroethene (TCE), the parent compound, was included in both the NAS and BIOBALANCE assessments. For the NAS model, TCE reductive degradation products (cis-1,2-dichloroethene [DCE] and vinyl chloride [VC]), were also included in the model to evaluate the TOR for all CVOCs. When running the TOR assessment in NAS, the NAPL fraction for each of the CVOCs was assigned based on the ratio of the dissolved level of the compound to the total dissolved CVOC concentration.

NAS calculates the NAC for each model using the contaminant concentration with distance profile along the plume centerline. Shallow groundwater at Site 2 flows to the south-southeast, towards the tidal inlet and St. Juliens Creek (**Figure L-1)**. Accordingly, CVOC and geochemical concentrations for five shallow monitoring wells (SJS02-MW07S, -MW10S, -MW14S, -MW15S, -MW16S) were included as model input (**Table L-2**). The NAS program uses the site-specific geochemical data and built-in decision logic to assign variable redox zones along the model flowpath and to calculate degradation rates. However, due to the variability of the geochemical data along the plume, NAS was not able to differentiate areas of the plume. Each well was manually assigned to be under sulfate-reducing/methanogenic conditions to force the program to use a single NAC and decay rate for the entire plume. The TCE decay rates estimated by the NAS model were also used as input to the Plume Module in BIOBALANCE model.

The maximum plume extents were estimated using the TOS analysis feature. The point of compliance distance was modified using a trial and error method, until "No Reduction Required" was indicated for each parameter. This was assumed to be the maximum distance that each contaminant would migrate. To estimate the time for the contaminant plume to stabilize to the calculated maximum plume length, an analytical solution to the Domenico groundwater transport model (Domenico, 1987) was used. The analytical solution is provided in *FATE 5: A Natural Attenuation Calibration Tool for Groundwater Fate and Transport Modeling* (Nevin, et al. 1997).

BIOBALANCE estimated the source mass concentration and mass flux based on the geometric mean of the TCE soil concentrations in the identified hot spot area along with the geometric mean of the TCE groundwater concentration, source dimensions and groundwater velocity. Because the highest membrane interface probe (MIP) response occurred beneath the water table, Site 2 was considered to have a submerged source.

Model Results

The complete results from the NAS models are provided in **Attachment A**. The complete results from the BIOBALANCE models are provided in **Attachment B**.

NAC and First-Order Decay

The NAC and first-order decay rates calculated by the NAS model are summarized in **Table L-3**. The average NAS-calculated decay rates for TCE, cis-1,2-DCE, and VC were 3.6/year, 4.4/year, and 5.3/year, respectively. The high and low ranges of first-order decay rates calculated by NAS are directly related to the maximum groundwater flux and minimum groundwater flux values, respectively. However, all of the estimated decay rates are considered reasonable based on existing literature-reported CVOC first-order decay rates. Suarez and Rifai (1999) reported reductive dechlorination rates based on field and in-situ studies of 0 to 8.4/year for TCE, 0 to 47/year for cis-1,2-DCE, and 0 to 2.6/year for VC. Because the first order decay rates for cis-1,2-DCE and VC are based on the change in site-specific groundwater concentrations over distance, these rates are a blend of both degradation and production as daughter products.

First order decay rates were also estimated using the Buscheck and Alcantar (1995) method. This method is based on the contaminant concentrations along the plume centerline, but incorporates effects of dispersion and retardation. The average Buscheck and Alcantar-calculated Site 2 decay rates for TCE, cis-1,2-DCE, and VC were 0.091/year, 0.215/year and 0.599/year, respectively. These rates are lower than the typical ranges reported in technical literature.

TOR Analysis

NAS Model

The NAS model estimates of TOR are presented in **Table L-4**. The average TORs for TCE, cis-1,2-DCE, and vinyl chloride to reach their MCLs under NA processes were 65, 54, and 68 years, respectively. To evaluate the impact of source reduction on the TOR, the model was then used to calculate TOR under various source reduction scenarios. The NAS model suggests that the TORs for TCE, cis,-1,2-DCE, vinyl chloride will only decrease between 0.2 and 0.3 years if the source mass is reduced by 95 percent. The most persistent CVOC is vinyl chloride.

Assuming minimum flow and first-order decay conditions, the TORs to reach MCLs was estimated to be greater than 100 years for all CVOCs. Assuming maximum flow and first-order decay conditions, the TORs to reach MCLs were estimated to only be 1.1, 1.0, and 1.4 years for TCE, cis-1,2-DCE, and VC, respectively. The maximum flow rates cause the model to compute unreasonably high biodegradation rates, and these TOR results appear to be unrealistic. The average flux conditions are considered to provide the most likely TORs. More importantly, source removal had little impact on the TORs, regardless of assumptions about flow conditions.

BIOBALANCE Model

The BIOBALANCE model estimates of TOR are presented in **Table L-4**. Assuming average flow conditions, the TOR for TCE in the hot spot area to reduce to the MCL is estimated at 230 years. Assuming maximum flow conditions, to the TOR is 38 years and assuming

minimum flow conditions to the TOR is 1,700 years. If the source mass is reduced up to 95 percent, the TOR for the CVOCs to reach MCLs are estimated to decrease to 156 years under average flow conditions. The BIOBALANCE estimates of TOR are higher than the NAS model results for TCE. However, the BIOBALANCE program estimates the TORs decrease more extensively with source reduction. This is attributed to the fact that the BIOBALANCE model decays "source" contaminants which are not only sorbed to soil but dissolved in groundwater.

Plume Extent and Time of Stabilization Analysis

NAS Model

The NAS model results for the TOS analysis are summarized in **Table L-5**. Based on the model-calculated NACs, the maximum distance that the TCE, cis-1,2-DCE, and vinyl chloride plumes will travel from the SJS02-MW10D source area are 480 feet, 370 feet, and 395 feet, respectively. The time it will take these plumes to stabilize is estimated at 13 years.

The NAS model predicted that source reduction is required in order for the steady-state TCE groundwater concentration at St Juliens Creek to be less than the MCL. The target reduction in concentration is 79, 525 µg/L. If the source is reduced to this target concentration, it is estimated that it will take an additional 13.5 years for the plume to reach steady-state. There is no source reduction required for cis-1,2-DCE or vinyl chloride; these concentrations will decrease below MCLs before reaching St. Juliens Creek due to NA processes.

BIOBALANCE Model

The maximum plume extents estimated by the BIOBALANCE model under steady-state conditions are summarized in **Table L-5**. As stated previously, this model only addresses the parent compound (TCE). Assuming a medium biological degradation rate, the steady-state TCE plume length is estimated at 446 feet, consistent with the average-flow NAS results. However, the estimated time until the plume reaches steady-state is longer at 48 years.

Assuming the minimum first-order decay rate fro the model calculations, the maximum TCE plume length is estimated over 1,000 feet with a stabilization time of 200 years. Assuming the maximum first-order decay rate, the TCE plume is estimated at 290 feet, which is shorter than the existing plume length, in only 8 years.

Conclusions

Models based on Site 2 conditions were used to evaluate the potential of NA processes to address contaminant plumes. CH2M HILL used NAS and BIOBALANCE models to produce estimates of TOR, time of plume stabilization, and maximum plume extent. The model calculations were based on available data (hydrologic, geochemical, and contaminant characteristics) from the shallow Columbia aquifer. Differences between TOR estimates and observed conditions at Site 2 can be attributed to hydrologic, biological, and geochemical complexities of the site and the simplifying assumptions used in the models. Therefore, the

model calculations cannot be regarded as accurate predictors of future plume behavior. The model results are useful to evaluate the relative outcomes of different treatment scenarios.

Various TOR estimates were computed for groundwater in the source area to achieve MCLs. It is noted that MCLs may not be the final cleanup targets, but they were used as conservative screening values for this evaluation. Because of the large mass of CVOCs, NAS estimated 70 years are needed for NA to cleanup CVOCs in the source area; vinyl chloride was the more persistent contaminant. BIOBALANCE estimated over 200 years are needed for TCE to reduce to the MCL. Without concentration trend data to provide stronger evidence on biodegradation rates, it seems appropriate to use the longer number for estimating the effects of NA. Source removal had little impact on the TORs calculated by NAS, but BIOBALANCE showed a large decrease in TOR with source removal. However, even with source removal, BIOBALANCE estimated a TOR greater than 100 years.

BIOBALANCE calculated steady-state plume lengths that are generally consistent with existing site conditions. Both models predict that the TCE plume may migrate further than SJS02-MW16S, but should not extend more than 60 feet from this well. Based on average hydrogeologic values, the estimated times for the plumes to reach steady state are between 14 and 40 years. If the MCL is selected as the remedial goal at St Juliens Creek, then some source treatment may be required. NAS estimated that the plume would stabilize an additional thirteen years after source treatment.

References

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Suarez, M.P. and Rifai, H. 1999. *Biodegradation Rates for Fuel Hydrocarbons and Chlorinated Solvents in Groundwater.* Bioremediation Journal 3(4). pp 337-362.

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Tables

TABLE L-1
General Model Input Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Input Parameter	Units	Value	Reference
Hydraulic Conductivity	ft/day		ERI slug test results for Columbia Aquifer
Minimum		1	
Maximum		9	
Average		3	
Hydraulic Gradient	ft/ft		
Minimum		0.004	Historical RI data
Maximum		0.02	June 2007 potentiometric map
Average		0.01	June 2007 potentiometric map
Weight Percent Organic Carbon	%		
Minimum		0.1	May 2007 TOC data
Maximum		7.4	May 2007 TOC data
Average		1.8	May 2007 TOC data
Total Porosity	ft^3/ft^3	0.3	Average from May 2007 geotechnical results
Effective Porosity	ft^3/ft^3	0.2	Estimated; silty sand
Source Length	ft	250	Chlorinated VOC hot spot depicted by MIP
Source Width	ft	125	Chlorinated VOC hot spot depicted by MIP
Contaminated Aquifer Thickness	ft	15	The Columbia aquifer begins at 3 to 7 ft bgs and extends to approximately 15 to 25 ft bgs and is approximately 15 ft thick
Distance to Point of Compliance	ft	450	St. Juliens Creek
Regulatory Compliance Concentration	---		Federal Maximum Contaminant Level
Trichlorethene	µg/L	5	
cis-1,2-Dichloroethene	µg/L	70	
Vinyl Chloride	µg/L	2	
TCE Concentration in Saturated Source Zone Soil	mg/kg	39	Geometric mean of May 2007 TCE soil concentrations within CVOC hot spot below water table
TCE Concentration in Source Zone	mg/L	54	Geometric mean of May 2007 DPT and June 2007 TCE groundwater concentrations within CVOC hot spot
Soil Bulk Density	g/cc	1.5	Average from May 2007 geotechnical results
Source NAPL Mass	kg	777	Estimated by BIOBALANCE model
Source NAPL Mass	lb	1713	Estimated by BIOBALANCE model
NAPL Mass Fraction	---		Estimated from ratio of dissolved concentrations in hot spot (SJS02-MW07S and -10S; June 2007 data)
Trichlorethene	µg/L	0.82	
cis-1,2-Dichloroethene	µg/L	0.17	
Vinyl Chloride	µg/L	0.01	
Percent NAPL Removed	%	0	Assumes natural attenuation (NA) processes only

Notes:

% = percent
BD = below laboratory detection limit
ERI = Expanded Remedial Investigation
ft = feet
g/cc = grams per cubic centimeter
kg = kilograms
lb = pounds
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
mg/L = milligrams per liter
MIP = Membrane interface probe
NAPL = non-aqueous phase liquid
nM = nanomoles
RI = Remedial Investigation
SO4/CO2-red = sulfate/carbon dioxide reducing
TOC = total organic carbon
VOC = volatile organic compound
yr = year

TABLE L-2
Chemistry Input Data
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Parameter	SJS02-MW10S	SJS02-MW07S	SJS02-MW15S	SJS02-MW14S	SJS02-MW16S
Distance from Source (ft)	0	90	200	250	420
Sample Date	6/6/2007	6/4/2007	6/5/2007	6/6/2007	6/5/2007
Trichloroethene (ug/L)	77,000	210,000	240,000	84,000	62
cis-1,2-Dichloroethene (ug/L)	21,000	30,000	130,000	30,000	9
Vinyl Chloride (ug/L)	1,900	2,600	32,000	6,500	0.7
Dissolved Oxygen (mg/L)	1.5	3.5	0.55	1	0.8
Nitrate (mg/L)	BD	BD	BD	BD	BD
Ferrous Iron (mg/L)	2.6	20.8	9	12.2	26.6
Sulfate (mg/L)	5.1	42.1	4.4	13	28.2
Sulfide (mg/L)	BD	BD	BD	BD	BD
Methane (mg/L)	0.84	0.39	8.5	2.8	6.8
Hydrogen (nM)	2.5	1.7	860	290	7.2
Redox Condition	SO4/CO2-red.	SO4/CO2-red.	SO4/CO2-red.	SO4/CO2-red.	SO4/CO2-red.

Notes:

BD = below laboratory detection limit

ft = feet

mg/L = milligrams per liter

nM = nanomoles

SO4/CO2-red = sulfate/carbon dioxide reducing

TABLE L-3

Summary of Apparent Natural Attenuation Capacity (NAC) and First-Order Decay Rates
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Parameter	Natural Attenuation Capacity (ft^{-1})[a]	First-Order Decay Rate (1/day)[b, c]			First-Order Decay Rate (1/year')[b, c]		
		Minimum	Average	Maximum	Minimum	Average	Maximum
Natural Attenuation Software (NAS) Model							
Trichloethene	0.040	0.0013	0.0099	0.0596	0.47	3.6	21.8
cis-1,2-Dichloroethene	0.039	0.0016	0.0121	0.0729	0.58	4.4	26.6
Vinyl Chloride	0.045	0.0019	0.0144	0.0863	0.69	5.3	31.5
Buscheck and Alcantar Method							
Trichloethene	NA	9.7E-06	2.5E-04	0.008	0.004	0.091	3.0
cis-1,2-Dichloroethene	NA	2.5E-05	5.9E-04	0.011	0.009	0.215	4.1
Vinyl Chloride	NA	9.2E-05	1.6E-03	0.013	0.033	0.599	4.8

Notes:

[a] NAC is based on a single zone.

[b] Calculation of minimum, maximum, and average values is based on the minimum, maximum, and average values for hydraulic conductivity, hydraulic gradient, and organic carbon content.

[c] A first-order decay rate of zero indicates that no degradation is occurring.

NA = not anlayzed using this method

TABLE L-4
Time of Remediation (TOR) Modeling Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Hydrogeologic Flow Scenario	Percent of NAPL Source Reduction	Time of Source Area Remediation (years) [a, b, c]			
		Natural Attenuation Software (NAS) Model Results			BIOBALANCE Model Results
		Trichloethene	cis-1,2-Dichloroethene	Vinyl Chloride	Trichloethene[d]
Maximum Flow	0	1.1	1	1.4	38
Average Flow	0	64.7	54.2	67.9	230
Minimum Flow	0	+100	+100	+100	1,727
Maximum Flow	50	1.1	1	1.4	35
Average Flow	50	64.6	54.1	67.7	213
Minimum Flow	50	+100	+100	+100	1,599
Maximum Flow	95	1.1	1	1.3	26
Average Flow	95	64.5	53.9	67.6	156
Minimum Flow	95	+100	+100	+100	1,170

Notes:

[a] The time of remediation is the time required for chlorinated volatile organic compounds in the source area to attenuate to Maximum Contaminant Levels.

[b] Calculation of minimum, maximum, and average values is based on the minimum, maximum, and average values for hydraulic conductivity, hydraulic gradient, and organic carbon content.

[c] The maximum model timeframe in NAS is 100 years.

[d] Only the parent compound, trichloroethene, was included in the model assessment.

TABLE L-5
Maximum Plume Extent and Time of Stabilization Modeling Results
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, VA

Parameter	Natural Attenuation Software (NAS) Model Results						BIOBALANCE Model Results					
	Maximum Plume Length (ft)	Time of Plume Stabilization - Steady State (yr)	Target Source Area Concentration Required to Reach MCL at Compliance Point (ug/L)	Time Required After Source Reduction For TCE at Compliance Point to Reach MCL- Steady State (years) [b]			Maximum Plume Distance from CVOC hot spot (ft)[c]			Time of Plume Stabilization - Steady State (yr)		
				Maximum Flow	*Average Flow*	*Minimum Flow*	λ = 0.47/year	λ = 3.6/year	λ = 21.8/year	λ = 0.47/year	λ = 3.6/year	λ = 21.8/year
Trichloethene[b]	480	13	79,525	39	13.5	4.1	1190	196	40	200	40	8
cis-1,2-Dichloroethene	370	7	No Reduction Required	---	---	---	---	---	---	---	---	---
Vinyl Chloride	395	6	No Reduction Required	---	---	---	---	---	---	---	---	---

Notes:
[a] Calculation of minimum, maximum, and average values is based on the minimum, maximum, and average values for hydraulic conductivity, hydraulic gradient, and organic carbon content.
[b] Only the parent compound, trichloroethene, was included in the model assessment.
[c] The length of the CVOC hot spot is estimated at 250 feet. To estimate the total length of the plume, 250 feet should be added to the distances.

Figures

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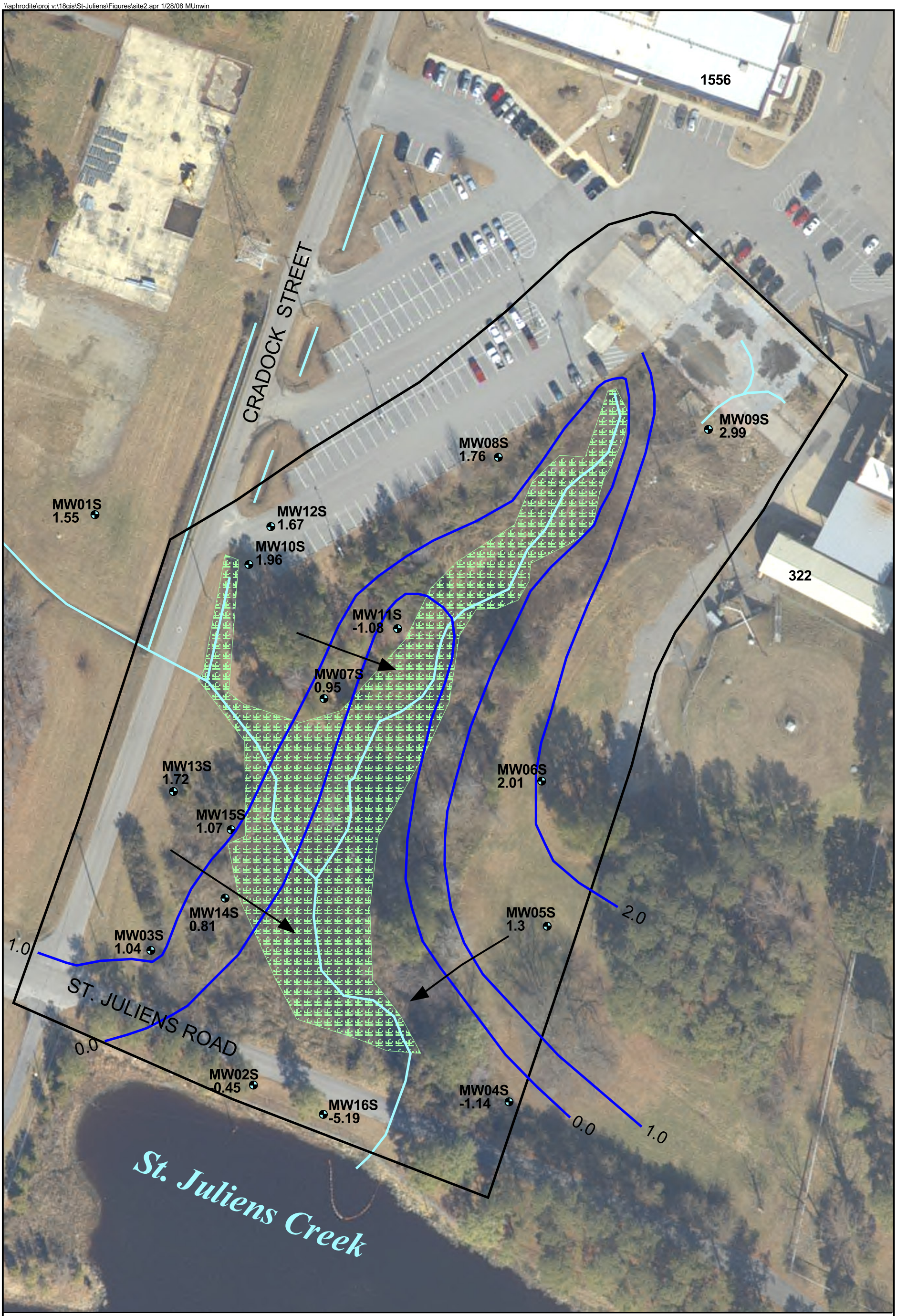


LEGEND

- Site Boundary
- Drainage
- Wetland
- Estimated Groundwater Flow Direction
- Potentiometric Surface Contours (June 2007)
- Shallow Monitoring Well Location
- 1.55 Groundwater Elevation (feet above mean sea level)

N

0 70 140 Feet

Figure L-1
Columbia Aquifer Potentiometric Surface
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

Attachment A

Average Flow -TOR Results

Facility Name:	St, Juliens Creek Annex	Length:	feet
Site Name:	Site 2	Time:	days
Additional Description:	CVOCs	Mass:	pounds

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [ft/d]	9.0	3.0	1.0
Hydraulic Gradient [ft/ft]	0.02	0.01	0.004
Total Porosity [-]		0.3	
Effective Porosity [-]		0.2	
Groundwater Vel. [ft/d]	0.9	0.15	0.02

	NAPL Source
NAPL Source Length [ft]	250.0
NAPL Source Width [ft]	125.0
Contaminated Aquifer Thickness [ft]	15.0

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
Total Chl. Eth.	True	True
TCE	True	True
cis-DCE	True	True
Vinyl Chl.	True	True
Ethene	False	False
Chloride	False	False

Dispersion Parameters

Estimated Plume Length [ft]	529.3
Longitudinal Dispersivity [ft]	18.42
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [ft]	0.92

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.001
Average	0.018
Minimum	0.074

	Total Chl. Eth.	TCE	cis-DCE	Vinyl Chl.
Koc [L/kg]	126	126	65	57
Retardation Factor [-]				

Maximum	2.17	2.17	1.6	1.53
Average	22.04	22.04	11.85	10.52
Minimum	87.48	87.48	45.61	40.12

Contaminant Concentration Profiles (6/4/2007)

Well Name	Distance [ft]	Total Chl. Eth. [µg/L]	TCE [µg/L]	cis-DCE [µg/L]	Vinyl Chl. [µg/L]
MW10S	0	99900.	77000.	21000.	1900.
MW07S	90	242600.	210000.	30000.	2600.
MW15S	200	402000.	240000.	130000.	32000.
MW14S	250	120500.	84000.	30000.	6500.
MW16S	420	71.7	62.	9.	0.7

Redox Indicator Concentration Profiles (6/4/2007)

Well Name	Distance [ft]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
MW10S	0	1.5	BD	2.6	5.1	BD	0.84	2.5	SO4/CO2-red.
MW07S	90	3.5	BD	20.8	42.1	BD	0.39	1.7	SO4/CO2-red.
MW15S	200	0.55	BD	9.	4.4	BD	8.5	860.	SO4/CO2-red.
MW14S	250	1.	BD	12.2	13.	BD	2.8	290.	SO4/CO2-red.
MW16S	420	0.8	BD	26.6	28.2	BD	6.8	7.2	SO4/CO2-red.

Attenuation Rates

	Total Chl. Eth.	TCE	cis-DCE	Vinyl Chl.
NAC (Single Zone) [1/ft]	0.0403	0.0387	0.0445	0.0499
Decay Rate [1/d]				
Maximum	0.0631	0.0596	0.0729	0.0863
Average	0.0105	0.0099	0.0121	0.0144
Minimum	0.0014	0.0013	0.0016	0.0019

Time of Stabilization(TOS) and Max Source Conc. Calculations

Distance to POC [ft] 450.0

		Source Reduction			Time of Stabilization [years]					
	RCC		Conc [µg/L]		Breakthrough Time			Time to Equilibrium		
Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
Total Chl. Eth.		3	402000							
TCE	5.0	3	240000	79525	21.8	9.7	3.2	39.0	13.5	4.1
cis-DCE	70.0	3	130000	No Reduction Required						
Vinyl Chl.	2.0	3	32000	No Reduction Required						

Time of Remediation(TOR) Calculations

NAPL Component	Mass Fraction[-]	Solubility [mg/L]	Molecular Wght[g/mole]
Total Chl. Eth.	0.00	0.0	0.0
TCE	0.82	1100.0	131.5
cis-DCE	0.17	800.0	97.0
Vinyl Chl.	0.01	2670.0	62.5

Max Time of Analysis [yr] 100

	SCC [µg/L]	Mass [lb]	Plan 1 0% Removed	Plan 2 50% Removed	Plan 3 95% Removed
			MNA	MNA	MNA
Total Chl. Eth.		1,713			
TCE	5.0	1,713	64.7	64.6	64.5
cis-DCE	70.0	1,713	54.2	54.1	53.9
Vinyl Chl.	2.0	1,713	67.9	67.7	67.6

Minimum Flow -TOR Results

Facility Name:	St, Juliens Creek Annex	Length:	feet
Site Name:	Site 2	Time:	days
Additional Description:	CVOCs	Mass:	pounds

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum		NAPL Source
Hydr. Conductivity [ft/d]	1.0	1.0	1.0	NAPL Source Length [ft]	250.0
Hydraulic Gradient [ft/ft]	0.004	0.004	0.004	NAPL Source Width [ft]	125.0
Total Porosity [-]		0.3		Contaminated Aquifer Thickness [ft]	15.0
Effective Porosity [-]		0.2			
Groundwater Vel. [ft/d]	0.02	0.02	0.02		

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
Total Chl. Eth.	True	True
TCE	True	True
cis-DCE	True	True
Vinyl Chl.	True	True
Ethene	False	False
Chloride	False	False

Dispersion Parameters

Estimated Plume Length [ft]	529.3
Longitudinal Dispersivity [ft]	18.42
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [ft]	0.92

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.074
Average	0.074
Minimum	0.074

	Total Chl. Eth.	TCE	cis-DCE	Vinyl Chl.
Koc [L/kg]	126	126	65	57
Retardation Factor [-]				

Maximum	87.48	87.48	45.61	40.12
Average	87.48	87.48	45.61	40.12
Minimum	87.48	87.48	45.61	40.12

Contaminant Concentration Profiles (6/4/2007)

Well Name	Distance [ft]	Total Chl. Eth. [µg/L]	TCE [µg/L]	cis-DCE [µg/L]	Vinyl Chl. [µg/L]
MW10S	0	99900.	77000.	21000.	1900.
MW07S	90	242600.	210000.	30000.	2600.
MW15S	200	402000.	240000.	130000.	32000.
MW14S	250	120500.	84000.	30000.	6500.
MW16S	420	71.7	62.	9.	0.7

Redox Indicator Concentration Profiles (6/4/2007)

Well Name	Distance [ft]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
MW10S	0	1.5	BD	2.6	5.1	BD	0.84	2.5	SO4/CO2-red.
MW07S	90	3.5	BD	20.8	42.1	BD	0.39	1.7	SO4/CO2-red.
MW15S	200	0.55	BD	9.	4.4	BD	8.5	860.	SO4/CO2-red.
MW14S	250	1.	BD	12.2	13.	BD	2.8	290.	SO4/CO2-red.
MW16S	420	0.8	BD	26.6	28.2	BD	6.8	7.2	SO4/CO2-red.

Attenuation Rates

	Total Chl. Eth.	TCE	cis-DCE	Vinyl Chl.
NAC (Single Zone) [1/ft]	0.0403	0.0387	0.0445	0.0499
Decay Rate [1/d]				
Maximum	0.0014	0.0013	0.0016	0.0019
Average	0.0014	0.0013	0.0016	0.0019
Minimum	0.0014	0.0013	0.0016	0.0019

Time of Stabilization(TOS) and Max Source Conc. Calculations

Distance to POC [ft] 450.0

Contaminant	RCC [µg/L]	Source Reduction Conc [µg/L] Well	Current	Target	Time of Stabilization [years] Breakthrough Time Maximum	Average	Minimum	Time to Equilibrium Maximum	Average	Minimum
Total Chl. Eth.		3	402000							
TCE	5.0	3	240000	79525	144.8	144.8	144.8	183.7	183.7	183.7
cis-DCE	70.0	3	130000	No Reduction Required						
Vinyl Chl.	2.0	3	32000	No Reduction Required						

Time of Remediation(TOR) Calculations

NAPL Component	Mass Fraction[-]	Solubility [mg/L]	Molecular Wght[g/mole]
Total Chl. Eth.	0.00	0.0	0.0
TCE	0.82	1100.0	131.5
cis-DCE	0.17	800.0	97.0
Vinyl Chl.	0.01	2670.0	62.5

Max Time of Analysis [yr] 100

	SCC [µg/L]	Mass [lb]	Plan 1 0% Removed	Plan 2 50% Removed	Plan 3 95% Removed
			MNA	MNA	MNA
Total Chl. Eth.		1,713			
TCE	5.0	1,713	100+	100+	100+
cis-DCE	70.0	1,713	100+	100+	100+
Vinyl Chl.	2.0	1,713	100+	100+	100+

Maximum Flow -TOR Results

Facility Name:	St, Juliens Creek Annex	Length:	feet
Site Name:	Site 2	Time:	days
Additional Description:	CVOCs	Mass:	pounds

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [ft/d]	9.0	9.0	9.0
Hydraulic Gradient [ft/ft]	0.02	0.02	0.02
Total Porosity [-]		0.3	
Effective Porosity [-]		0.2	
Groundwater Vel. [ft/d]	0.9	0.9	0.9

	NAPL Source
NAPL Source Length [ft]	250.0
NAPL Source Width [ft]	125.0
Contaminated Aquifer Thickness [ft]	15.0

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
Total Chl. Eth.	True	True
TCE	True	True
cis-DCE	True	True
Vinyl Chl.	True	True
Ethene	False	False
Chloride	False	False

Dispersion Parameters

Estimated Plume Length [ft]	529.3
Longitudinal Dispersivity [ft]	18.42
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [ft]	0.92

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.001
Average	0.001
Minimum	0.001

	Total Chl. Eth.	TCE	cis-DCE	Vinyl Chl.
Koc [L/kg]	126	126	65	57
Retardation Factor [-]				

Maximum	2.17	2.17	1.6	1.53
Average	2.17	2.17	1.6	1.53
Minimum	2.17	2.17	1.6	1.53

Contaminant Concentration Profiles (6/4/2007)

Well Name	Distance [ft]	Total Chl. Eth. [µg/L]	TCE [µg/L]	cis-DCE [µg/L]	Vinyl Chl. [µg/L]
MW10S	0	99900.	77000.	21000.	1900.
MW07S	90	242600.	210000.	30000.	2600.
MW15S	200	402000.	240000.	130000.	32000.
MW14S	250	120500.	84000.	30000.	6500.
MW16S	420	71.7	62.	9.	0.7

Redox Indicator Concentration Profiles (6/4/2007)

Well Name	Distance [ft]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
MW10S	0	1.5	BD	2.6	5.1	BD	0.84	2.5	SO4/CO2-red.
MW07S	90	3.5	BD	20.8	42.1	BD	0.39	1.7	SO4/CO2-red.
MW15S	200	0.55	BD	9.	4.4	BD	8.5	860.	SO4/CO2-red.
MW14S	250	1.	BD	12.2	13.	BD	2.8	290.	SO4/CO2-red.
MW16S	420	0.8	BD	26.6	28.2	BD	6.8	7.2	SO4/CO2-red.

Attenuation Rates

	Total Chl. Eth.	TCE	cis-DCE	Vinyl Chl.
NAC (Single Zone) [1/ft]	0.0403	0.0387	0.0445	0.0499
Decay Rate [1/d]				
Maximum	0.0631	0.0596	0.0729	0.0863
Average	0.0631	0.0596	0.0729	0.0863
Minimum	0.0631	0.0596	0.0729	0.0863

Time of Stabilization(TOS) and Max Source Conc. Calculations

Distance to POC [ft] 450.0

Contaminant	RCC [µg/L]	Source Reduction Conc [µg/L] Well	Current	Target	Time of Stabilization [years] Breakthrough Time Maximum	Average	Minimum	Time to Equilibrium Maximum	Average	Minimum
Total Chl. Eth.		3	402000							
TCE	5.0	3	240000	79525	0.5	0.5	0.5	0.9	0.9	0.9
cis-DCE	70.0	3	130000	No Reduction Required						
Vinyl Chl.	2.0	3	32000	No Reduction Required						

Time of Remediation(TOR) Calculations

NAPL Component	Mass Fraction[-]	Solubility [mg/L]	Molecular Wght[g/mole]
Total Chl. Eth.	0.00	0.0	0.0
TCE	0.82	1100.0	131.5
cis-DCE	0.17	800.0	97.0
Vinyl Chl.	0.01	2670.0	62.5

Max Time of Analysis [yr] 5

	SCC [µg/L]	Mass [lb]	Plan 1 0% Removed MNA	Plan 2 50% Removed MNA	Plan 3 95% Removed MNA
Total Chl. Eth.		1,713			
TCE	5.0	1,713	1.1	1.1	1.0
cis-DCE	70.0	1,713	1.0	1.0	1.0
Vinyl Chl.	2.0	1,713	1.4	1.4	1.3

Attachment B

Average Flow Conditions

General Information

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions

1. Enter value directly

2. Value entered previously

3. Value calculated by model

Step 1. ENTER GENERAL INFORMATION

Site Location I.D.: **Site 2, St. Juliens Creek Annex, Chesapeake, VA**

Constituent of Interest: TCE and Daughter Products

Step 2. ENTER HYDROGEOLOGIC DATA

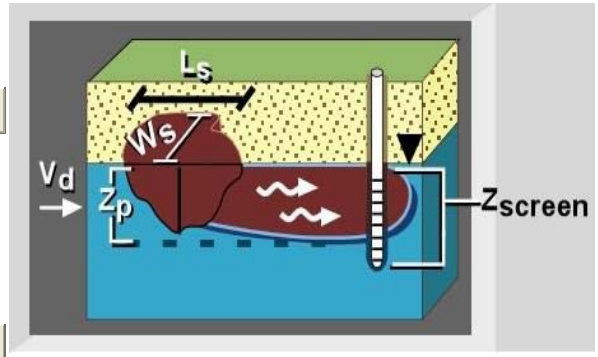
Type of Source: Submerged Source

(If you need to change the Source Type after adding data, click on "Restore Original Equations". You will lose all earlier input Data.)

Groundwater Seepage Velocity	V_s	=	54.5	*(ft/yr)*
Aquifer Porosity	n	=	0.20	
Concentration Goal	C_{G_bd}	=	0.005	*(mg/L)*
Thickness of Plume	Z_p	=	15.000	*(ft)*
Screen Length	Z_{Screen}	=	10.0	*(ft)*
Calculated Concentration Goal	C_{G_new} ?	=	**0.005**	*(mg/L)*
Soil Bulk Density	ρ_b	=	1.5	*(g/cm^3)*
Organic Carbon Partitioning Coefficient for Contaminant	K_{oc}	=	130	*(cm^3/g-soil)*

Seepage Velocity Calculator

Typical values for Koc



Step 3. ENTER SOURCE GEOMETRY

Width of Source	W_s	=	125	*(ft)*
Length of Source	L_s	=	250	*(ft)*

Step 4. ENTER GEOCHEMICAL DATA

Is reductive dechlorination an important attenuation mechanism at your site?

- ◉ Yes
- ○ No

Clear and Restore Original Equations

Insert Example Set

Advance to Next Module

HELP

Average Flow Conditions

Source Flux Estimator (SOURCE-Submerged)

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions

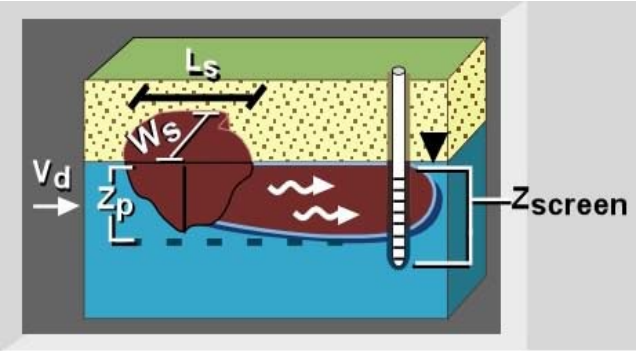
1. Enter value directly

2. Value entered in General Information page

3. Value calculated by model

Site Location I.D.: Site 2, St. Juliens Creek Annex, Chesapeake, VA

Constituent of Interest: TCE



STEP 1. ENTER COC DATA — **Submerged Source**

Average GW Concentration in Source	C_{S_GW}	=	54	*(mg/L)*
Average Soil Concentration in Source	C_{S_Soil}	=	39	*(mg/kg)* *(Use samples below water table)*
Concentration goal	C_{g_GW}	=	0.005	*(mg/L)*

STEP 2. REVIEW HYDROGEOLOGIC DATA

Darcy Velocity	V_d	=	10.9	*(ft/yr)*
Width of Submerged Source	W_s	=	125	*(ft)*
Thickness of Submerged Source	Z_p	=	15.0	*(ft)*
Length of Submerged Source	L_s	=	250	*(ft)*
Flowrate through Submerged Source	Q	=	579,000	*(L/yr)*

STEP 3. CALCULATE MASS FLUX

Mass Flux	W_{0_S}	=	31.3	*(kg/yr)*	Mass in Source Zone	M_{0_GW}	=	777	*(kg)*
Mass Flux Goal	W_g	=	0.0029	*(kg/year)*	Source Decay Coeff.	K_s	=	0.040	*(per year)*

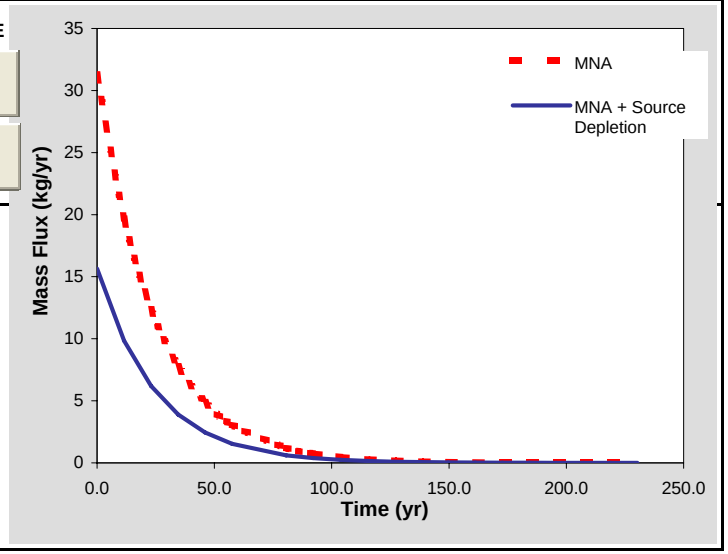
Overwrite Ks *Restore Ks*

STEP 4. SELECT SOURCE DECAY MODEL

Decay Model = Exponential Decay *(choose exponential, or compound model)* ?

STEP 5. ENTER REDUCTION FACTOR (SOURCE CHARACTERISTICS AFTER IMPLEMENTATION OF A SOURCE TREATMENT TECHNOLOGY) (OPTIONAL)

Remaining Mass	RF_{m_S}	=	0.5	? *How Are RFw and RFm Related?*
Remaining Mass Flux	RF_{w_S}	=	0.5	? *How Do Different Technologies Affect RFw And RFm?*



SUMMARY

Remediation TimeFrame for "MNA only" Scenario	RTF_{MNA}	=	230	*(yr)*
Remediation Timeframe for "Source Treatment" Scenario (Source Depletion followed by MNA)	RTF_{MNA+SD}	=	213	*(yr)*
Ratio of Remediation TimeFrame	$\frac{RTF_{MNA+SD}}{RTF_{MNA}}$	=	93	%

Average Flow Conditions

Source Flux Estimator (SOURCE-Submerged)

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions

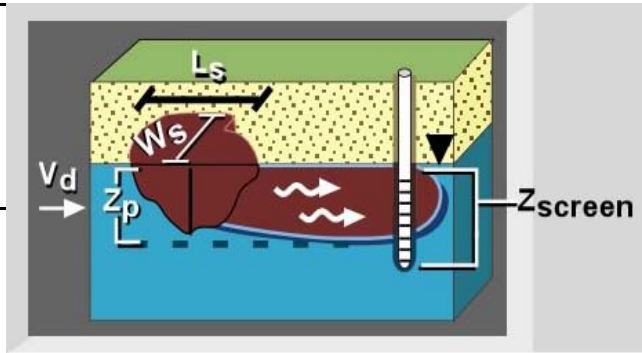
1. Enter value directly

2. Value entered in General Information page

3. Value calculated by model

Site Location I.D.: Site 2, St. Juliens Creek Annex, Chesapeake, VA

Constituent of Interest: TCE



STEP 1. ENTER COC DATA — **Submerged Source**

Average GW Concentration in Source	C_{S_GW}	=	54	*(mg/L)*
Average Soil Concentration in Source	C_{S_Soil}	=	39	*(mg/kg)* *(Use samples below water table)*
Concentration goal	C_{g_GW}	=	0.005	*(mg/L)*

STEP 2. REVIEW HYDROGEOLOGIC DATA

Darcy Velocity	V_d	=	10.9	*(ft/yr)*
Width of Submerged Source	W_s	=	125	*(ft)*
Thickness of Submerged Source	Z_p	=	15.0	*(ft)*
Length of Submerged Source	L_s	=	250	*(ft)*
Flowrate through Submerged Source	Q	=	579,000	*(L/yr)*

STEP 3. CALCULATE MASS FLUX

Mass Flux	W_{0_S}	=	31.3	*(kg/yr)*	Mass in Source Zone	M_{0_GW}	=	777	*(kg)*
Mass Flux Goal	W_g	=	0.0029	*(kg/year)*	Source Decay Coeff.	K_s	=	0.040	*(per year)*

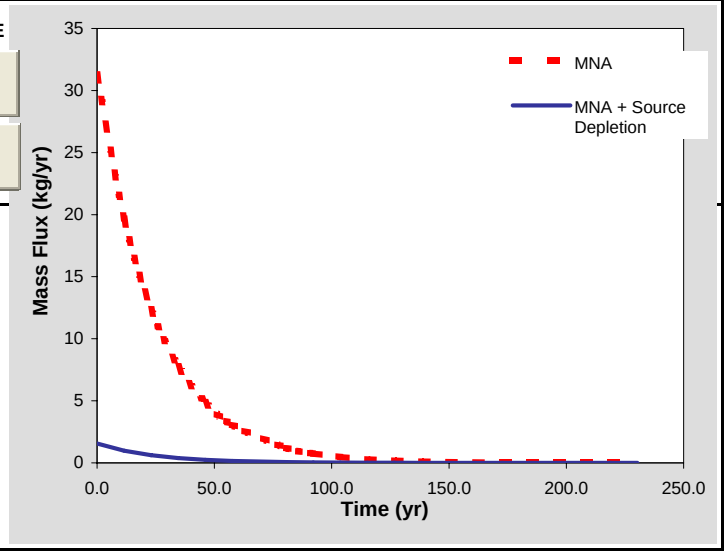
Overwrite Ks *Restore Ks*

STEP 4. SELECT SOURCE DECAY MODEL

Decay Model = Exponential Decay *(choose exponential, or compound model)* ?

STEP 5. ENTER REDUCTION FACTOR (SOURCE CHARACTERISTICS AFTER IMPLEMENTATION OF A SOURCE TREATMENT TECHNOLOGY) (OPTIONAL)

Remaining Mass	RF_{m_S}	=	0.05	? *How Are RFw and RFm Related?*
Remaining Mass Flux	RF_{w_S}	=	0.05	? *How Do Different Technologies Affect RFw And RFm?*



SUMMARY

Remediation TimeFrame for "MNA only" Scenario	RTF_{MNA}	=	230	*(yr)*
Remediation Timeframe for "Source Treatment" Scenario (Source Depletion followed by MNA)	RTF_{MNA+SD}	=	156	*(yr)*
Ratio of Remediation TimeFrame	$\frac{RTF_{MNA+SD}}{RTF_{MNA}}$	=	68	%

General Information

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions

- *1. Enter value directly*
- *2. Value entered previously*
- *3. Value calculated by model*

Step 1. ENTER GENERAL INFORMATION

Site Location I.D.: **Site 2, St. Juliens Creek Annex, Chesapeake, VA**

Constituent of Interest: TCE and Daughter Products

Step 2. ENTER HYDROGEOLOGIC DATA

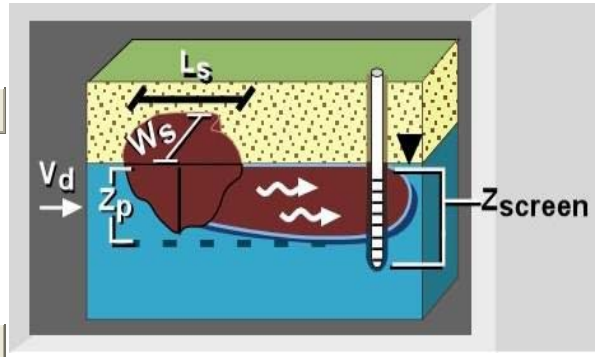
Type of Source: Submerged Source

(If you need to change the Source Type after adding data, click on "Restore Original Equations". You will lose all earlier input Data.)

Groundwater Seepage Velocity	V_s	=	7.3	*(ft/yr)*
Aquifer Porosity	n	=	0.20	
Concentration Goal	C_{G_bd}	=	0.005	*(mg/L)*
Thickness of Plume	Z_p	=	15.000	*(ft)*
Screen Length	Z_{Screen}	=	10.0	*(ft)*
Calculated Concentration Goal	C_{G_new} ?	=	**0.005**	*(mg/L)*
Soil Bulk Density	ρ_b	=	1.5	*(g/cm^3)*
Organic Carbon Partitioning Coefficient for Contaminant	K_{oc}	=	130	*(cm^3/g-soil)*

Seepage Velocity Calculator

Typical values for Koc



Step 3. ENTER SOURCE GEOMETRY

Width of Source	W_s	=	125	*(ft)*
Length of Source	L_s	=	250	*(ft)*

Step 4. ENTER GEOCHEMICAL DATA

Is reductive dechlorination an important attenuation mechanism at your site?

- ◉ Yes
- ○ No

Clear and Restore Original Equations

Insert Example Set

Advance to Next Module

HELP

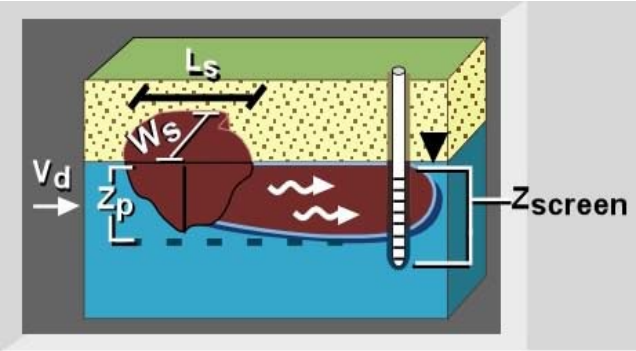
Minimum Flow Conditions

Source Flux Estimator (SOURCE-Submerged)

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions
- *1. Enter value directly*
- *2. Value entered in General Information page*
- *3. Value calculated by model*

Site Location I.D.: Site 2, St. Juliens Creek Annex, Chesapeake, VA
Constituent of Interest: TCE



STEP 1. ENTER COC DATA — **Submerged Source**

Average GW Concentration in Source	C_{S_GW}	=	54	*(mg/L)*
Average Soil Concentration in Source	C_{S_Soil}	=	39	*(mg/kg)* *(Use samples below water table)*
Concentration goal	C_{g_GW}	=	0.005	*(mg/L)*

STEP 2. REVIEW HYDROGEOLOGIC DATA

Darcy Velocity	V_d	=	1.5	*(ft/yr)*
Width of Submerged Source	W_s	=	125	*(ft)*
Thickness of Submerged Source	Z_p	=	15.0	*(ft)*
Length of Submerged Source	L_s	=	250	*(ft)*
Flowrate through Submerged Source	Q	=	77,200	*(L/yr)*

STEP 3. CALCULATE MASS FLUX

Mass Flux	W_{0_S}	=	4.17	*(kg/yr)*
Mass Flux Goal	W_g	=	0.000386	*(kg/year)*
Mass in Source Zone	M_{0_GW}	=	777	*(kg)*
Source Decay Coeff.	K_s	=	0.005	*(per year)*

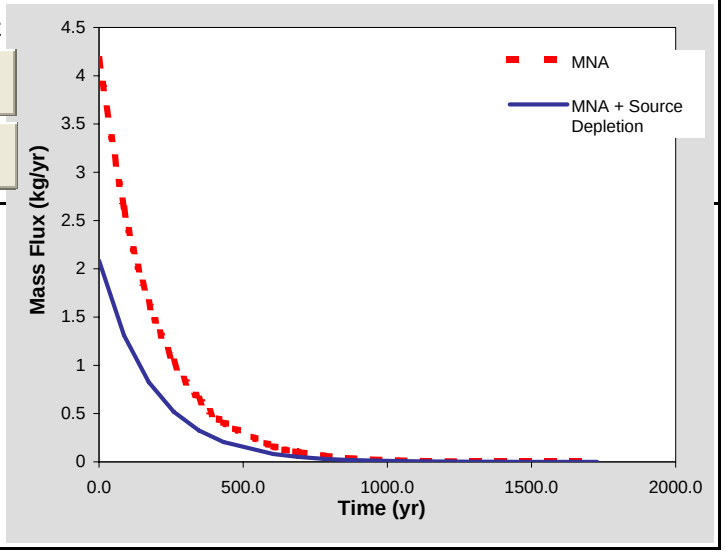
Overwrite Ks *Restore Ks*

STEP 4. SELECT SOURCE DECAY MODEL

Decay Model = Exponential Decay *(choose exponential, or compound model)* ?

STEP 5. ENTER REDUCTION FACTOR (SOURCE CHARACTERISTICS AFTER IMPLEMENTATION OF A SOURCE TREATMENT TECHNOLOGY) (OPTIONAL)

Remaining Mass	RF_{m_S}	=	0.5	? *How Are RFw and RFm Related?*
Remaining Mass Flux	RF_{w_S}	=	0.5	? *How Do Different Technologies Affect RFw And RFm?*



SUMMARY

Remediation TimeFrame for "MNA only" Scenario	RTF_{MNA}	=	1727	*(yr)*
Remediation Timeframe for "Source Treatment" Scenario (Source Depletion followed by MNA)	RTF_{MNA+SD}	=	1599	*(yr)*
Ratio of Remediation TimeFrame	$\frac{RTF_{MNA+SD}}{RTF_{MNA}}$	=	93	%

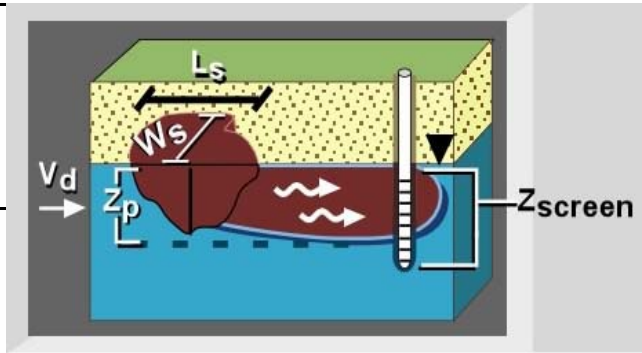
Minimum Flow Conditions

Source Flux Estimator (SOURCE-Submerged)

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions
- *1. Enter value directly*
- *2. Value entered in General Information page*
- *3. Value calculated by model*

Site Location I.D.: Site 2, St. Juliens Creek Annex, Chesapeake, VA
Constituent of Interest: TCE



STEP 1. ENTER COC DATA — **Submerged Source**

Average GW Concentration in Source	C_{S_GW}	=	54	*(mg/L)*
Average Soil Concentration in Source	C_{S_Soil}	=	39	*(mg/kg)* *(Use samples below water table)*
Concentration goal	C_{g_GW}	=	0.005	*(mg/L)*

STEP 2. REVIEW HYDROGEOLOGIC DATA

Darcy Velocity	V_d	=	1.5	*(ft/yr)*
Width of Submerged Source	W_s	=	125	*(ft)*
Thickness of Submerged Source	Z_p	=	15.0	*(ft)*
Length of Submerged Source	L_s	=	250	*(ft)*
Flowrate through Submerged Source	Q	=	77,200	*(L/yr)*

STEP 3. CALCULATE MASS FLUX

Mass Flux	W_{0_S}	=	4.17	*(kg/yr)*
Mass Flux Goal	W_g	=	0.000386	*(kg/year)*
Mass in Source Zone	M_{0_GW}	=	777	*(kg)*
Source Decay Coeff.	K_s	=	0.005	*(per year)*

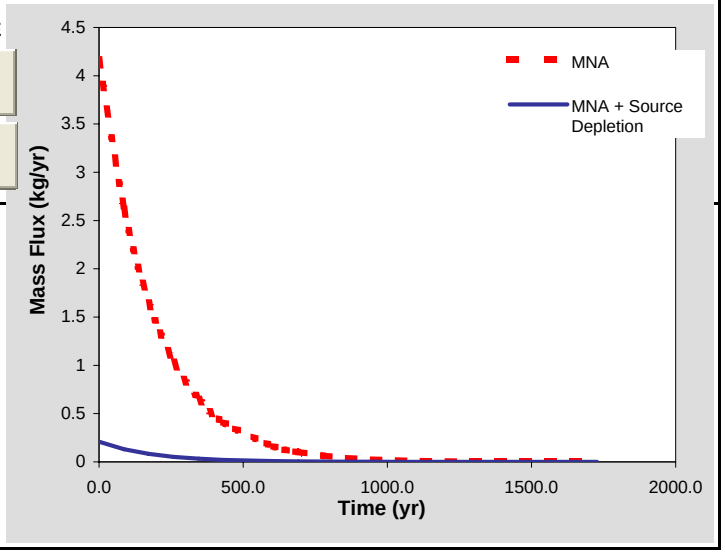
Overwrite Ks *Restore Ks*

STEP 4. SELECT SOURCE DECAY MODEL

Decay Model = Exponential Decay *(choose exponential, or compound model)* ?

STEP 5. ENTER REDUCTION FACTOR (SOURCE CHARACTERISTICS AFTER IMPLEMENTATION OF A SOURCE TREATMENT TECHNOLOGY) (OPTIONAL)

Remaining Mass	RF_{m_S}	=	0.05	? *How Are RFw and RFm Related?*
Remaining Mass Flux	RF_{w_S}	=	0.05	? *How Do Different Technologies Affect RFw And RFm?*



SUMMARY

Remediation TimeFrame for "MNA only" Scenario	RTF_{MNA}	=	1727	*(yr)*
Remediation Timeframe for "Source Treatment" Scenario (Source Depletion followed by MNA)	RTF_{MNA+SD}	=	1170	*(yr)*
Ratio of Remediation TimeFrame	$\frac{RTF_{MNA+SD}}{RTF_{MNA}}$	=	68	%

General Information

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions

- *1. Enter value directly*
- *2. Value entered previously*
- *3. Value calculated by model*

Step 1. ENTER GENERAL INFORMATION

Site Location I.D.: **Site 2, St. Juliens Creek Annex, Chesapeake, VA**

Constituent of Interest: TCE and Daughter Products

Step 2. ENTER HYDROGEOLOGIC DATA

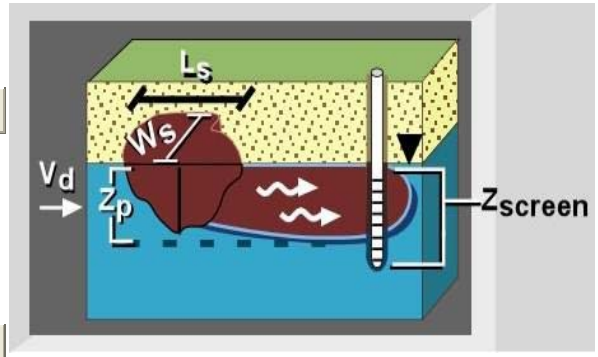
Type of Source: Submerged Source

(If you need to change the Source Type after adding data, click on "Restore Original Equations". You will lose all earlier input Data.)

Groundwater Seepage Velocity	V_s	=	328.3	*(ft/yr)*
Aquifer Porosity	n	=	0.20	
Concentration Goal	C_{G_bd}	=	0.005	*(mg/L)*
Thickness of Plume	Z_p	=	15.000	*(ft)*
Screen Length	Z_{Screen}	=	10.0	*(ft)*
Calculated Concentration Goal	C_{G_new} ?	=	**0.005**	*(mg/L)*
Soil Bulk Density	ρ_b	=	1.5	*(g/cm^3)*
Organic Carbon Partitioning Coefficient for Contaminant	K_{oc}	=	130	*(cm^3/g-soil)*

Seepage Velocity Calculator

Typical values for Koc



Step 3. ENTER SOURCE GEOMETRY

Width of Source	W_s	=	125	*(ft)*
Length of Source	L_s	=	250	*(ft)*

Step 4. ENTER GEOCHEMICAL DATA

Is reductive dechlorination an important attenuation mechanism at your site?

- (•) Yes
- ( ) No

Clear and Restore Original Equations

Insert Example Set

Advance to Next Module

HELP

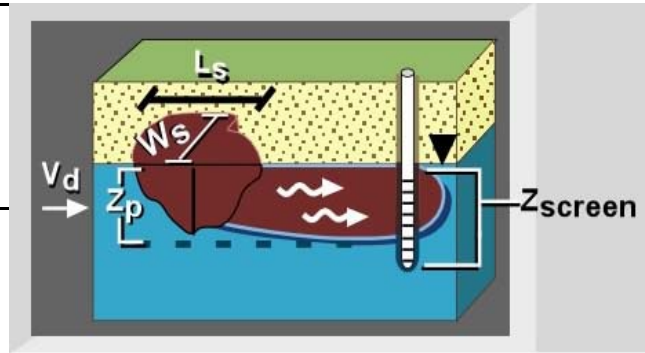
Maximum Flow Conditions

Source Flux Estimator (SOURCE-Submerged)

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions
- *1. Enter value directly*
- *2. Value entered in General Information page*
- *3. Value calculated by model*

Site Location I.D.: Site 2, St. Juliens Creek Annex, Chesapeake, VA
Constituent of Interest: TCE



STEP 1. ENTER COC DATA — **Submerged Source**

Average GW Concentration in Source	C_{S_GW}	=	54	*(mg/L)*
Average Soil Concentration in Source	C_{S_Soil}	=	39	*(mg/kg)* *(Use samples below water table)*
Concentration goal	C_{g_GW}	=	0.005	*(mg/L)*

STEP 2. REVIEW HYDROGEOLOGIC DATA

Darcy Velocity	V_d	=	65.7	*(ft/yr)*
Width of Submerged Source	W_s	=	125	*(ft)*
Thickness of Submerged Source	Z_p	=	15.0	*(ft)*
Length of Submerged Source	L_s	=	250	*(ft)*
Flowrate through Submerged Source	Q	=	3,490,000	*(L/yr)*

STEP 3. CALCULATE MASS FLUX

Mass Flux	W_{0_S}	=	188	*(kg/yr)*	Mass in Source Zone	M_{0_GW}	=	777	*(kg)*
Mass Flux Goal	W_g	=	0.0175	*(kg/year)*	Source Decay Coeff.	K_s	=	0.242	*(per year)*

Overwrite Ks *Restore Ks*

STEP 4. SELECT SOURCE DECAY MODEL

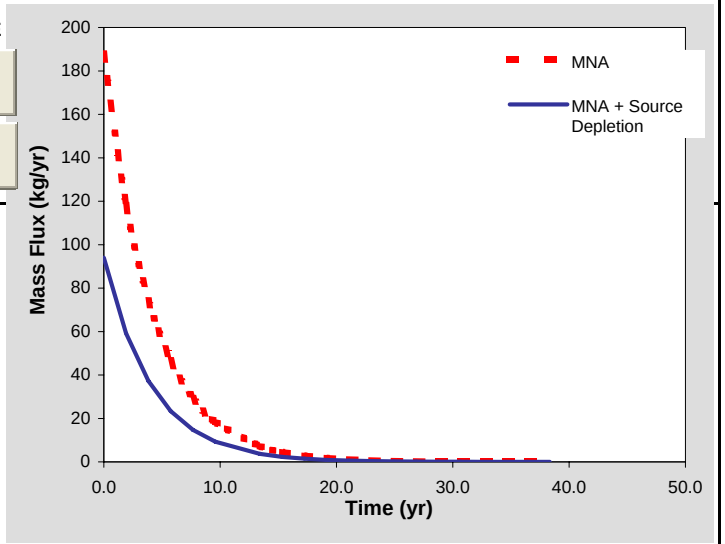
Decay Model = Exponential Decay *(choose exponential, or compound model)* ?

STEP 5. ENTER REDUCTION FACTOR (SOURCE CHARACTERISTICS AFTER IMPLEMENTATION OF A SOURCE TREATMENT TECHNOLOGY) (OPTIONAL)

Remaining Mass	RF_{m_S}	=	0.5	? *How Are RFw and RFm Related?*
Remaining Mass Flux	RF_{w_S}	=	0.5	? *How Do Different Technologies Affect RFw And RFm?*

SUMMARY

Remediation TimeFrame for "MNA only" Scenario	RTF_{MNA}	=	38	*(yr)*
Remediation Timeframe for "Source Treatment" Scenario (Source Depletion followed by MNA)	RTF_{MNA+SD}	=	35	*(yr)*
Ratio of Remediation TimeFrame	$\frac{RTF_{MNA+SD}}{RTF_{MNA}}$	=	93	%



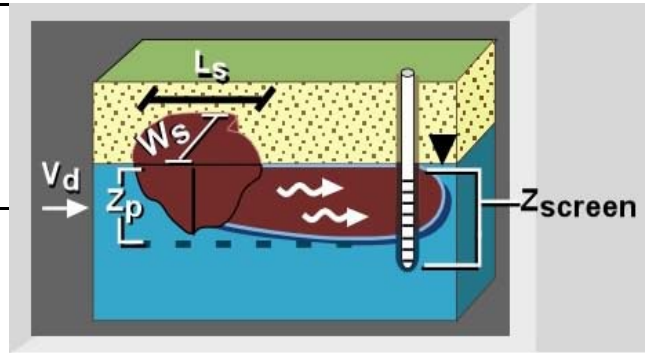
Maximum Flow Conditions

Source Flux Estimator (SOURCE-Submerged)

Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions
- *1. Enter value directly*
- *2. Value entered in General Information page*
- *3. Value calculated by model*

Site Location I.D.: Site 2, St. Juliens Creek Annex, Chesapeake, VA
Constituent of Interest: TCE



STEP 1. ENTER COC DATA — **Submerged Source**

Average GW Concentration in Source	C_{S_GW}	=	54	*(mg/L)*
Average Soil Concentration in Source	C_{S_Soil}	=	39	*(mg/kg)* *(Use samples below water table)*
Concentration goal	C_{g_GW}	=	0.005	*(mg/L)*

STEP 2. REVIEW HYDROGEOLOGIC DATA

Darcy Velocity	V_d	=	65.7	*(ft/yr)*
Width of Submerged Source	W_s	=	125	*(ft)*
Thickness of Submerged Source	Z_p	=	15.0	*(ft)*
Length of Submerged Source	L_s	=	250	*(ft)*
Flowrate through Submerged Source	Q	=	3,490,000	*(L/yr)*

STEP 3. CALCULATE MASS FLUX

Mass Flux	W_{0_S}	=	188	*(kg/yr)*	Mass in Source Zone	M_{0_GW}	=	777	*(kg)*
Mass Flux Goal	W_g	=	0.0175	*(kg/year)*	Source Decay Coeff.	K_s	=	0.242	*(per year)*

Overwrite Ks *Restore Ks*

STEP 4. SELECT SOURCE DECAY MODEL

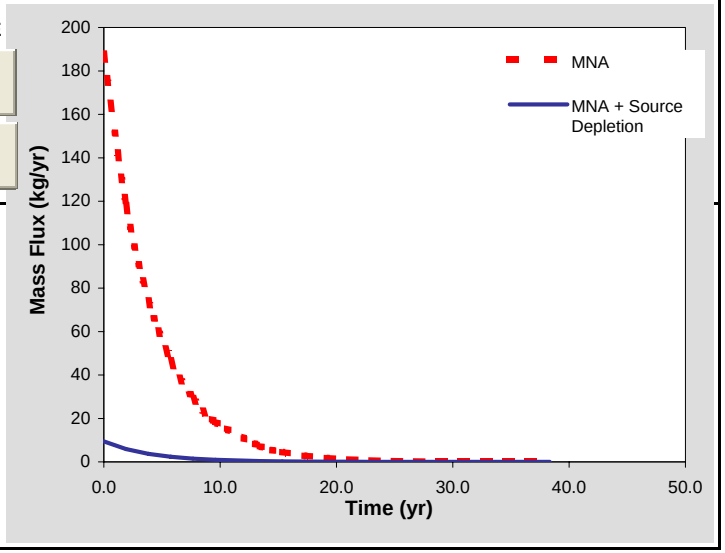
Decay Model = Exponential Decay *(choose exponential, or compound model)* ?

STEP 5. ENTER REDUCTION FACTOR (SOURCE CHARACTERISTICS AFTER IMPLEMENTATION OF A SOURCE TREATMENT TECHNOLOGY) (OPTIONAL)

Remaining Mass	RF_{m_S}	=	0.05	? *How Are RFw and RFm Related?*
Remaining Mass Flux	RF_{w_S}	=	0.05	? *How Do Different Technologies Affect RFw And RFm?*

SUMMARY

Remediation TimeFrame for "MNA only" Scenario	RTF_{MNA}	=	38	*(yr)*
Remediation Timeframe for "Source Treatment" Scenario (Source Depletion followed by MNA)	RTF_{MNA+SD}	=	26	*(yr)*
Ratio of Remediation TimeFrame	$\frac{RTF_{MNA+SD}}{RTF_{MNA}}$	=	68	%



COMPETITION (Source Zone Only)

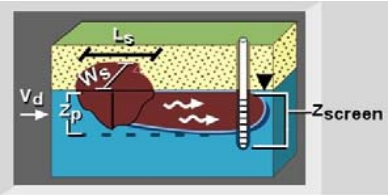
Savannah River National Laboratory & Groundwater Services, Inc.

KEY: Data Input Instructions
- *1. Enter value directly*
- *2. Value entered in General Information page*
- *3. Value calculated by model*

Site Location I.D.: Site 2, St. Juliens Creek Annex, Chesapeake, VA
Constituent of Interest: TCE

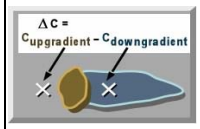
Step 1. REVIEW HYDROGEOLOGIC DATA

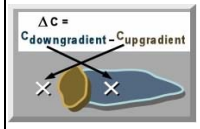
Darcy Velocity	V_d	=	10.9	*(ft/yr)*
Width	W_s	=	125	*(ft)*
Thickness	Z_p	=	15.0	*(ft)*
Groundwater Flowrate	Q	=	579,427	*(L/yr)*



Step 2. ESTIMATE DONOR USED FOR DEPLETION OF COMPETING ELECTRON ACCEPTORS ("EA") IN THE SOURCE ZONE
This step calculates the mass flux of H_2 (kg/yr) used to deplete competing electron acceptors every year

Calculation Method

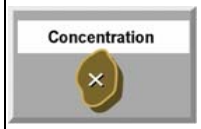




	Competing EA or By-Products	ΔC (mg/L)	Mass Flux (W): Competing EA (kg/year)	Mass Flux (W): H_2 Equivalents (kg/year) ?	Mass Flux (W): Organic Donor Equivalent (kg/year) ? Lactate
Electron Acceptor 1	O_2	0.0			
Electron Acceptor 2	NO_3^-	0.0			
Electron Acceptor 3	SO_4^{2-}	37.0	21.4	1.78	13.4
By-Product 1	Fe (II) (Fe Calculator, Reset)		69.569496	1.24	9.3
By-Product 2	CH_4	0.6	0.359	0.18	1.35
			TOTAL	3.2	24.1

Step 3. REVIEW PARENT CHLORINATED VOC (CVOC) TCE and Daughter Products

Step 4. ESTIMATE DONOR USED FOR DECHLORINATION OF PARENT COMPOUND TO DAUGHTER PRODUCTS IN THE SOURCE ZONE
This step calculates the mass flux of H_2 (kg/yr) used to generate CVOC daughter products every year



	CVOC Reactions	Concentration (mg/L)	Mass Flux (W): CVOC (kg/year)	Mass Flux (W): H_2 Equivalents (kg/year) ?	Mass Flux (W): Organic Donor Equivalent (kg/year) ? Lactate
Parent Compound	TCE				
Daughter Product 1	cis-1,2-DCE	26.000	15.1	0.311	2.33
Daughter Product 2	VC	2.300	1.33	0.0851	0.638
Daughter Product 3	Ethene	0.033	0.0191	0.00409	0.0307
			TOTAL	0.40019	2.9987

Result Summary

% Donor (H_2 equivalents) going to solvent (H_2 equivalents) during initial stages of source remediation = **11.10** (%)

Clear and Restore Original Equations | Go To General Information Sheet | Advance to Next Module | ***HELP***

Plume Module
Decay Rate = 0.47/year; Reduced Ks to 0.01/year for model stability

PLUME

Savannah River National Laboratory & Groundwater Services, Inc.

Site Location I. Site 2, St. Julliens Creek Annex, Chesapeake, VA

Constituent of Interest: TCE

KEY: Data Input Instructions

- *1. Enter value directly*
- *2. Value entered in General Information Page*
- *3. Value calculated by model*

1. HYDROGEOLOGY

Seepage Velocity	*Vs*	=	**54**	*(ft/yr)*

2. ADSORPTION

Retardation Factor*	*R*	=	**18.6**	
or			↑ *or*	
Porosity in Saturated Zone	*n*	=	**0.20**	*(-)*
Soil Bulk Density	*rho*	=	**1.5**	*(g/cm^3)*
Partition Coefficient	*Koc*	=	**130**	*(cm^3/g-soil)*
FractionOrganicCarbon	*foc*	=	**0.018**	

3. BIODEGRADATION

1st Order Decay Coeff*	λ	=	**0.047**	*(yr^{-1})*	?

4. SOURCE DATA

Source Thickness in Saturated Zone* **15.00** *(ft)*

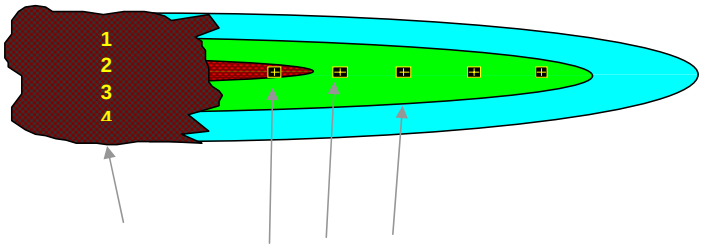
Source Width* (ft)	Conc. (mg/L)*
125	**54.000**

Source Decay	K_s	=	**0.01**	*(yr^{-1})*	*Overwrite Ks* / *Restore Ks*

5. Concentration Limit

Concentration below which no flux is calculated (e.g., MCL)

C(limit) = **0.005** *(mg/L)*



Plume Module Output: Centerline Concentrations Downgradient of Source

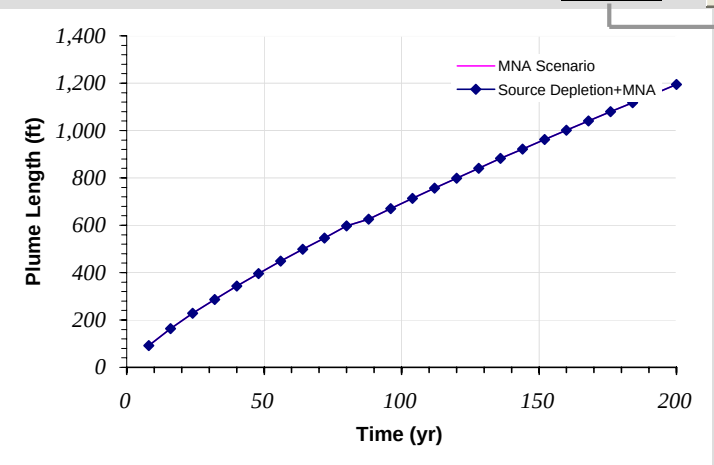
Clear and Restore Original Equations | Go To General Information Sheet | Calculate Centerline Output | **HELP**

Assumptions

Plume Module Output
Decay Rate = 0.47/year

Result Summary 1:

Simulation Run Time *(Total number of years)* 200 *(yrs)* Run



Maximum Plume Length for MNA
(A + D + S + B)

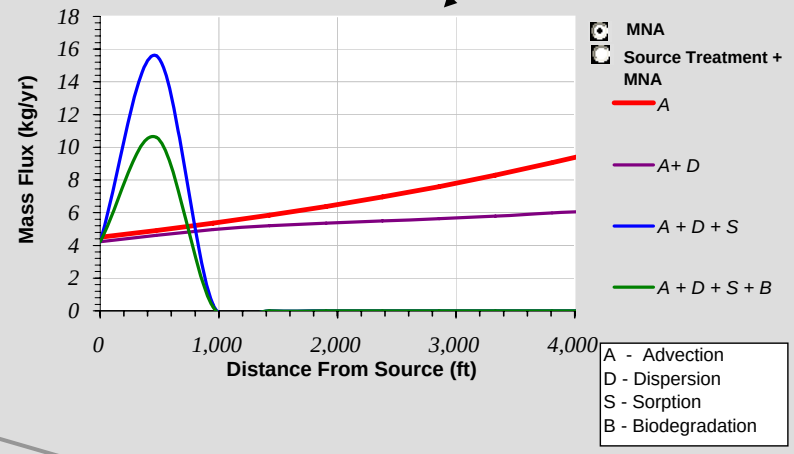
Time (yrs)	Plume Length (ft)
200	1190

Maximum Plume Length for Source Depletion
(A + D + S + B)

Time (yrs)	Plume Length (ft)
200	1190

Result Summary 2:

Mass Flux Calculated at Time, t = 200 *(yrs)* Run



Result Summary 3: Centerline Concentration/Mass Flux versus Distance Calculated for Time, t = 200 yrs ?

Distance from Source (ft)	0	476	952	1428	1904	2380	2856	3332	3808	4125	4443
Centreline Concentration, C_{MNA} (mg/L)	15.800	16.000	0.268	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Centreline Concentration, $C_{SourceDepletion+MNA}$ (mg/L)	15.800	16.000	0.268	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Monitored Natural Attenuation Only Scenario

Mass Flux (kg/yr) calculated for Time t = 200 yrs

A	4.500	4.910	5.360	5.850	6.380	6.960	7.600	8.290	9.050	9.590	10.200
A + D	4.230	4.610	4.970	5.200	5.360	5.500	5.640	5.800	5.980	6.110	6.260
A + D + S	4.230	15.600	0.374	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A + D + S + B	4.230	10.600	0.238	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source Treatment Scenario (Source Depletion Followed by MNA)

Mass Flux (kg/yr) calculated for Time t = 200 yrs

A	4.500	4.910	5.360	5.850	6.380	6.960	7.600	8.290	9.050	9.590	10.200
A + D	4.230	4.610	4.970	5.200	5.360	5.500	5.640	5.800	5.980	6.110	6.260
A + D + S	4.230	15.600	0.374	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A + D + S + B	4.230	10.600	0.238	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

% Reduction in Flux due to Source Removal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Plume Module
Decay Rate = 3.6/year

PLUME

Savannah River National Laboratory & Groundwater Services, Inc.

Site Location I. Site 2, St. Julliens Creek Annex, Chesapeake, VA

Constituent of Interest: TCE

KEY: Data Input Instructions

- *1. Enter value directly*
- *2. Value entered in General Information Page*
- *3. Value calculated by model*

1. HYDROGEOLOGY

Seepage Velocity	*Vs*	=	54	*(ft/yr)*

2. ADSORPTION

Retardation Factor*	*R*	=	18.6	
or			↑ or	
Porosity in Saturated Zone	*n*	=	0.20	*(-)*
Soil Bulk Density	*rho*	=	1.5	*(g/cm^3)*
Partition Coefficient	*Koc*	=	130	*(cm^3/g-soil)*
FractionOrganicCarbon	*foc*	=	0.018	

3. BIODEGRADATION

1st Order Decay Coeff*	λ	=	3.600	*(yr^{-1})*	?

4. SOURCE DATA

Source Thickness in Saturated Zone* 15.00 *(ft)*

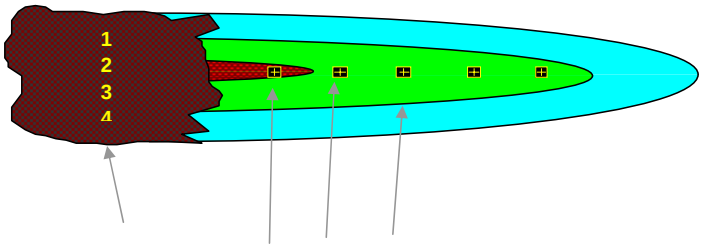
Source Width* (ft)	Conc. (mg/L)*
125	54.000

Source Decay	K_s	=	0.04	*(yr^{-1})*	*Overwrite Ks* / *Restore Ks*

5. Concentration Limit

Concentration below which no flux is calculated (e.g., MCL)

C(limit) = 0.005 *(mg/L)*



Plume Module Output: Centerline Concentrations Downgradient of Source

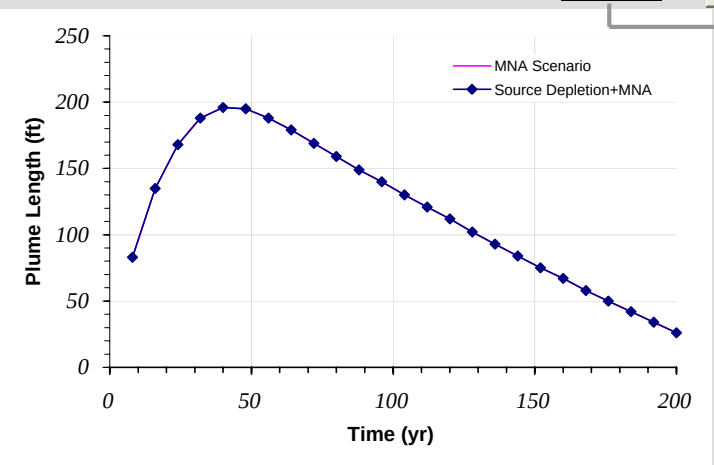
Clear and Restore Original Equations | Go To General Information Sheet | Calculate Centerline Output | **HELP**

Assumptions

Plume Module Output
Decay Rate = 3.6/year

Result Summary 1:

Simulation Run Time *(Total number of years)* 200 *(yrs)* Run



Maximum Plume Length for MNA
(A + D + S + B)

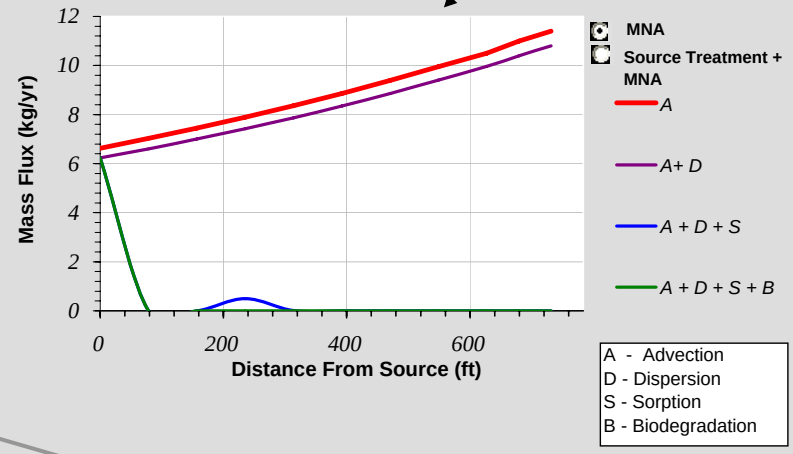
Time (yrs)	Plume Length (ft)
40	196

Maximum Plume Length for Source Depletion
(A + D + S + B)

Time (yrs)	Plume Length (ft)
40	196

Result Summary 2:

Mass Flux Calculated at Time, t = 40 *(yrs)* Run



Result Summary 3: Centerline Concentration/Mass Flux versus Distance Calculated for Time, t = 40 yrs

?

Distance from Source (ft)	0	78	157	235	314	392	470	549	627	679	732
Centreline Concentration, C_{MNA} (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Centreline Concentration, $C_{SourceDepletion+MNA}$ (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Monitored Natural Attenuation Only Scenario

Mass Flux (kg/yr) calculated for Time t = 40 yrs

A	6.630	7.030	7.450	7.890	8.360	8.860	9.390	9.950	10.500	11.000	11.400
A + D	6.230	6.600	7.000	7.420	7.870	8.350	8.860	9.400	9.960	10.400	10.800
A + D + S	6.230	0.000	0.000	0.501	0.014	0.000	0.000	0.000	0.000	0.000	0.000
A + D + S + B	6.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source Treatment Scenario (Source Depletion Followed by MNA)

Mass Flux (kg/yr) calculated for Time t = 40 yrs

A	6.630	7.030	7.450	7.890	8.360	8.860	9.390	9.950	10.500	11.000	11.400
A + D	6.230	6.600	7.000	7.420	7.870	8.350	8.860	9.400	9.960	10.400	10.800
A + D + S	6.230	0.000	0.000	0.501	0.014	0.000	0.000	0.000	0.000	0.000	0.000
A + D + S + B	6.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

% Reduction in Flux due to Source Removal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Plume Module
Decay Rate = 21.8/year

PLUME

Savannah River National Laboratory & Groundwater Services, Inc.

Site Location I. Site 2, St. Julliens Creek Annex, Chesapeake, VA

Constituent of Interest: TCE

KEY: Data Input Instructions

- *1. Enter value directly*
- *2. Value entered in General Information Page*
- *3. Value calculated by model*

1. HYDROGEOLOGY

Seepage Velocity	*Vs*	=	54	*(ft/yr)*

2. ADSORPTION

Retardation Factor*	*R*	=	18.6	
or			↑ *or*	
Porosity in Saturated Zone	*n*	=	0.20	*(-)*
Soil Bulk Density	*rho*	=	1.5	*(g/cm^3)*
Partition Coefficient	*Koc*	=	130	*(cm^3/g-soil)*
FractionOrganicCarbon	*foc*	=	0.018	

3. BIODEGRADATION

1st Order Decay Coeff*	λ	=	21.800	*(yr^{-1})* ?

4. SOURCE DATA

Source Thickness in Saturated Zone* 15.00 *(ft)*

Source Width* (ft)	Conc. (mg/L)*
125	54.000

Source Decay	K_s	=	0.04	*(yr^{-1})*

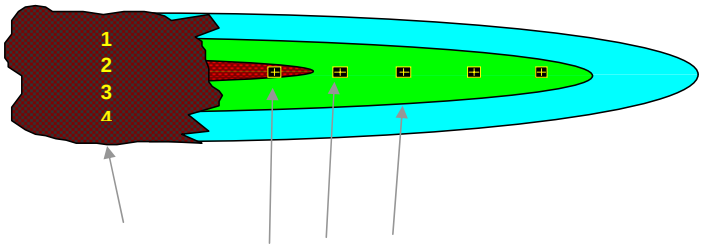
Overwrite Ks

Restore Ks

5. Concentration Limit

Concentration below which no flux is calculated (e.g., MCL)

C(limit) = 0.005 *(mg/L)*



Plume Module Output: Centerline Concentrations Downgradient of Source

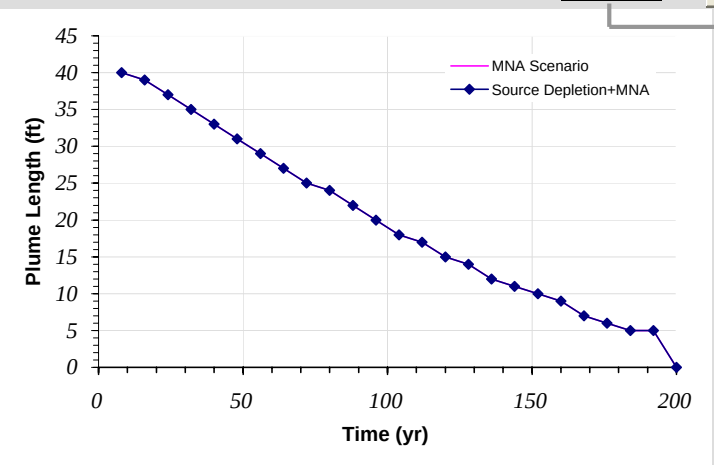
Clear and Restore Original Equations | Go To General Information Sheet | Calculate Centerline Output | **HELP**

Assumptions

Plume Module Output
Decay Rate = 21.8/year

Result Summary 1:

Simulation Run Time *(Total number of years)* 200 *(yrs)* Run



Maximum Plume Length for MNA
(A + D + S + B)

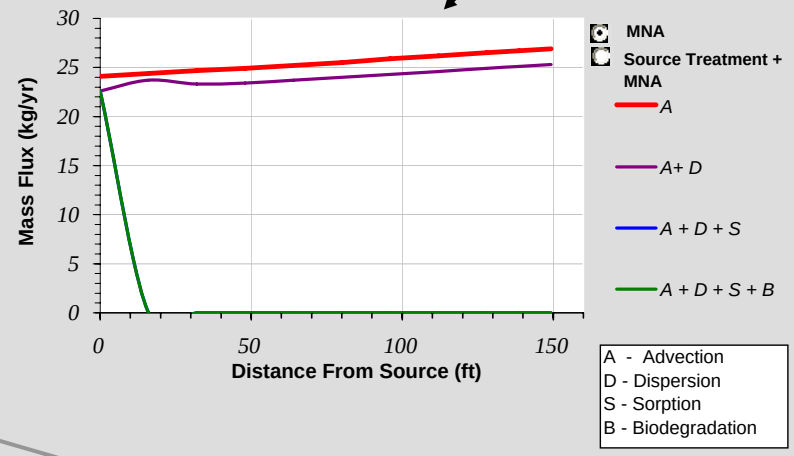
Time (yrs)	Plume Length (ft)
8	40

Maximum Plume Length for Source Depletion
(A + D + S + B)

Time (yrs)	Plume Length (ft)
8	40

Result Summary 2:

Mass Flux Calculated at Time, t = 8 *(yrs)* Run



A - Advection
D - Dispersion
S - Sorption
B - Biodegradation

Result Summary 3: Centerline Concentration/Mass Flux versus Distance Calculated for Time, t = 8 yrs

?

Distance from Source (ft)	0	16	32	48	64	80	96	112	128	139	149
Centreline Concentration, C_{MNA} (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Centreline Concentration, $C_{SourceDepletion+MNA}$ (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Monitored Natural Attenuation Only Scenario

Mass Flux (kg/yr) calculated for Time t = 8 yrs

A	24.100	24.400	24.700	24.900	25.200	25.500	25.900	26.200	26.500	26.700	26.900
A + D	22.600	23.700	23.300	23.400	23.700	24.000	24.300	24.600	24.900	25.100	25.300
A + D + S	22.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A + D + S + B	22.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source Treatment Scenario (Source Depletion Followed by MNA)

Mass Flux (kg/yr) calculated for Time t = 8 yrs

A	24.100	24.400	24.700	24.900	25.200	25.500	25.900	26.200	26.500	26.700	26.900
A + D	22.600	23.700	23.300	23.400	23.700	24.000	24.300	24.600	24.900	25.100	25.300
A + D + S	22.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A + D + S + B	22.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

% Reduction in Flux due to Source Removal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Appendix M
Human Health Risk Assessment Tables

==========

Model Version: 1.0 Build 264
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==========

The time step used in this model run: 1 - Every 4 Hours (6 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 472.700 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	661.000	472.700
1-2	661.000	472.700
2-3	661.000	472.700
3-4	661.000	472.700
4-5	661.000	472.700
5-6	661.000	472.700
6-7	661.000	472.700

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

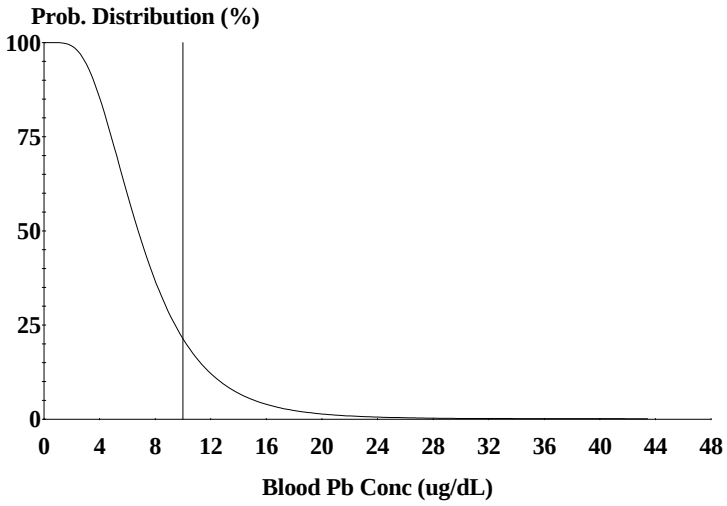
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (ug/day)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	2.332	0.000	0.337
1-2	0.034	2.377	0.000	0.822
2-3	0.062	2.732	0.000	0.876
3-4	0.067	2.687	0.000	0.913
4-5	0.067	2.708	0.000	0.991
5-6	0.093	2.905	0.000	1.063
6-7	0.093	3.236	0.000	1.091

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	11.988	14.678	7.8
1-2	18.565	21.798	8.9
2-3	19.006	22.675	8.4
3-4	19.444	23.111	8.0
4-5	15.070	18.835	6.7
5-6	13.795	17.857	5.7
6-7	13.141	17.561	5.0



Cutoff = 10.000 ug/dl
Geo Mean = 7.105
GSD = 1.600
% Above = 23.357

Age Range = 0 to 84 months
Time Step = Every 4 Hours
Run Mode = Research

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current / Future	Surface Soil	Surface Soil	Site 2	Trespasser	Adult	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest soil
					Adolescent	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest soil
				Landscaper	Adult	Dermal	On-Site	Quant	Landscapers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Landscapers may incidentally ingest soil
		Air	Emissions from Surface Soil at Site 2	Trespasser	Adult	Inhalation	On-Site	Quant	Trespassers may inhale volatiles/particulates
					Adolescent	Inhalation	On-Site	Quant	Trespassers may inhale volatiles/particulates
				Landscaper	Adult	Inhalation	On-Site	Quant	Landscapers may inhale volatiles/particulates
	Surface Water	Surface Water	Drainage Features and Ponded Area	Trespasser/Visitor	Adult	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with surface water while wading
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest surface water while wading
					Adolescent	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with surface water while wading
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest surface water while wading
	Sediment	Sediment	Drainage Features and Ponded Area	Trespasser/Visitor	Adult	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with sediment while wading
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest sediment while wading
					Adolescent	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with sediment
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest sediment while wading
Future	Groundwater	Shallow Groundwater	Shallow Aquifer Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child/Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
				Industrial Worker	Adult	Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
			Water in Excavation	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers may contact groundwater while performing construction or excavation activities.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Air	Shallow Aquifer Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future and adults may inhale vapors while showering.
					Child	Inhalation	On-site	None	Children are assumed not to shower.
					Child/Adult	Inhalation	On-site	None	Adult will be used to evaluate child/adult since children are assumed not to shower.
			Indoor Air	Resident	Adult	Inhalation	On-site	Qual	Due to the high concentrations of VOC in groundwater, it is understood this pathway would result in a risk, and it was therefore not quantitatively evaluated.
					Child	Inhalation	On-site	Qual	Due to the high concentrations of VOC in groundwater, it is understood this pathway would result in a risk, and it was therefore not quantitatively evaluated.
					Child/Adult	Inhalation	On-site	Qual	Due to the high concentrations of VOC in groundwater, it is understood this pathway would result in a risk, and it was therefore not quantitatively evaluated.
				Industrial Worker	Adult	Inhalation	On-site	Qual	Due to the high concentrations of VOC in groundwater, it is understood this pathway would result in a risk, and it was therefore not quantitatively evaluated.
			Water Vapors at Excavation Pit	Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors from groundwater while performing construction or excavation activities.
	Soil[1]	Soil[1]	Site 2	Resident	Adult	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Residents may incidentally ingest soil
					Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Residents may incidentally ingest soil
					Adult/Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Residents may incidentally ingest soil
Future	Soil[1]	Soil[1]	Site 2	Construction Worker	Adult	Dermal	On-Site	Quant	Workers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Workers may incidentally ingest soil
				Industrial Worker	Adult	Dermal	On-Site	Quant	Workers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Workers may incidentally ingest soil
		Air	Emissions from Soil at Site 2	Resident	Adult	Inhalation	On-Site	Quant	Residents may inhale volatiles/particulates
					Child	Inhalation	On-Site	Quant	Residents may inhale volatiles/particulates
					Adult/Child	Inhalation	On-Site	Quant	Residents may inhale volatiles/particulates
				Industrial Worker	Adult	Inhalation	On-Site	Quant	Workers may inhale volatiles/particulates
				Construction Worker	Adult	Inhalation	On-Site	Quant	Workers may inhale volatiles/particulates

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Surface Water	Surface Water	Drainage Features and Ponded Area	Resident	Adult	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with surface water while wading
						Ingestion	On-Site	None	Residents may ingest surface water while wading
					Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with surface water while wading
						Ingestion	On-Site	None	Residents may ingest surface water while wading
					Adult/Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with surface water while wading
						Ingestion	On-Site	None	Residents may ingest surface water while wading
	Sediment	Sediment	Drainage Features and Ponded Area	Resident	Adult	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with sediment while wading
						Ingestion	On-Site	Quant	Residents may incidentally ingest sediment while wading
					Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with sediment while wading
						Ingestion	On-Site	Quant	Residents may incidentally ingest sediment while wading
					Adult/Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with sediment while wading
						Ingestion	On-Site	Quant	Residents may incidentally ingest sediment while wading

1. Surface and subsurface soil.

TABLE 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Site 2	78-93-3	2-Butanone	2.0E-01		2.0E-01		MG_KG	SJS02-SS11-000	1/23	0.01 - 0.015	2.0E-01	ND	2.8E+03 nc	NA	NA	NO	BSL
	67-64-1	Acetone	7.0E-03	J	3.5E-02		MG_KG	SJS02-SS10-000	3/23	0.01 - 0.015	3.5E-02	ND	6.1E+03 nc	NA	NA	NO	BSL
	75-09-2	Methylene chloride	1.6E-03	J	2.8E-03	J	MG_KG	SJS17-SS02-000	2/23	0.01 - 0.015	2.8E-03	ND	1.1E+01 ca	NA	NA	NO	BSL
	108-88-3	Toluene	1.0E-03	J	2.0E-03	J	MG_KG	SJS02-SS08-000	2/23	0.01 - 0.015	2.0E-03	ND	5.0E+02 nc	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	3.5E-02	J	3.1E-01	J	MG_KG	SJS02-SS03-000	4/23	0.33 - 1.7	3.1E-01	ND	3.1E+01 nc	NA	NA	NO	BSL
	83-32-9	Acenaphthene	6.3E-02	J	3.7E-01		MG_KG	SJS17-SS04-000	6/23	0.08 - 1.7	3.7E-01	9.2E-02	3.4E+02 nc	NA	NA	NO	BSL
	208-96-8	Acenaphthylene	3.7E-02	J	8.2E-01	J	MG_KG	SJS02-SS03-000	12/23	0.08 - 1.7	8.2E-01	9.5E-02	1.5E+01 nc	NA	NA	NO	BSL
	120-12-7	Anthracene	4.3E-02	J	7.9E-01		MG_KG	SJS17-SS04-000	10/23	0.08 - 1.7	7.9E-01	9.1E-02	1.7E+03 nc	NA	NA	NO	BSL
	56-55-3	Benzo(a)anthracene	1.2E-01	J	2.3E+00		MG_KG	SJS02-SS03-000	18/23	0.08 - 1.7	2.3E+00	6.9E-03	1.5E-01 ca	NA	NA	YES	ASL
	50-32-8	Benzo(a)pyrene	1.3E-01	J	2.1E+00		MG_KG	SJS17-SS04-000	18/23	0.08 - 1.7	2.1E+00	9.1E-02	1.5E-02 ca	NA	NA	YES	ASL
	205-99-2	Benzo(b)fluoranthene	5.7E-02	J	2.0E+00		MG_KG	SJS17-SS03-000	19/23	0.08 - 1.7	2.0E+00	9.1E-02	1.5E-01 ca	NA	NA	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	7.6E-02	J	1.6E+00		MG_KG	SJS17-SS03-000	17/23	0.08 - 1.7	1.6E+00	9.1E-02	1.7E+02 nc	NA	NA	NO	BSL
	207-08-9	Benzo(k)fluoranthene	6.2E-02	J	1.6E+00		MG_KG	SJS17-SS03-000	18/23	0.08 - 1.7	1.6E+00	9.1E-02	1.5E+00 nc	NA	NA	YES	ASL
	85-68-7	Butylbenzylphthalate	3.3E-02	J	4.3E-01	J	MG_KG	SJS17-SS03-000	5/23	0.33 - 1.7	4.3E-01	ND	1.2E+03 nc	NA	NA	NO	BSL
	86-74-8	Carbazole	6.3E-02	J	3.5E-01	J	MG_KG	SJS17-SS04-000 SJS02-SS11-000	6/23	0.33 - 1.7	3.5E-01	ND	2.4E+01 ca	NA	NA	NO	BSL
	218-01-9	Chrysene	1.3E-01	J	2.7E+00		MG_KG	SJS02-SS03-000	18/23	0.08 - 1.7	2.7E+00	1.0E-01	1.5E+01 ca	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	4.1E-02	J	5.1E-01	J	MG_KG	SJS02-SS20-000	7/23	0.33 - 1.7	5.1E-01	ND	6.1E+02 nc	NA	NA	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	5.4E-02	J	4.4E-01		MG_KG	SJS17-SS04-000	5/23	0.08 - 1.7	4.4E-01	9.1E-02	1.5E-02 ca	NA	NA	YES	ASL
	132-64-9	Dibenzofuran	2.5E-02	J	2.2E-01	J	MG_KG	SJS17-SS04-000	5/23	0.33 - 1.7	2.2E-01	ND	NA	NA	NA	NO	NTX
	206-44-0	Fluoranthene	4.5E-02	J	5.0E+00		MG_KG	SJS02-SS03-000	19/23	0.08 - 1.7	5.0E+00	1.0E-01	2.3E+02 nc	NA	NA	NO	BSL
	86-73-7	Fluorene	4.8E-02	J	3.8E-01	L	MG_KG	SJS02-SS03-000 SJS17-SS04-000	6/23	0.08 - 1.7	3.8E-01	9.2E-02	2.3E+02 nc	NA	NA	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	8.6E-02	J	1.5E+00		MG_KG	SJS17-SS03-000	18/23	0.08 - 1.7	1.5E+00	9.1E-02	1.5E-01 ca	NA	NA	YES	ASL
	91-20-3	Naphthalene	1.4E-02	J	2.5E-01		MG_KG	SJS17-SS04-000	5/23	0.08 - 1.7	2.5E-01	9.2E-02	3.9E+00 ca	NA	NA	NO	BSL
	85-01-8	Phenanthrene	4.1E-02	J	4.4E+00		MG_KG	SJS02-SS03-000	17/23	0.08 - 1.7	4.4E+00	9.1E-02	1.7E+02 nc	NA	NA	NO	BSL
	129-00-0	Pyrene	4.8E-02	J	7.2E+00		MG_KG	SJS02-SS03-000	19/23	0.08 - 1.7	7.2E+00	1.3E-01	1.7E+02 nc	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	3.5E-02		1.7E+00	J	MG_KG	SJS17-SS03-000	8/23	0.33 - 1.7	1.7E+00	ND	3.5E+01 ca	NA	NA	NO	BSL
	72-54-8	4,4'-DDD	1.6E-03	J	4.2E+00		MG_KG	SJS02-SS09-000	19/23	0.0033 - 0.38	4.2E+00	1.1E-02	2.0E+00 ca	NA	NA	YES	ASL
	72-55-9	4,4'-DDE	1.6E-03	J	7.2E+00	J	MG_KG	SJS02-SS20-000	22/23	0.0033 - 2	7.2E+00	2.7E-01	1.4E+00 ca	NA	NA	YES	ASL
	50-29-3	4,4'-DDT	3.0E-03	J	1.2E+01	J	MG_KG	SJS02-SS20-000	22/22	0.0033 - 2	1.2E+01	3.4E-02	1.7E+00 ca	NA	NA	YES	ASL
	11096-82-5	Aroclor-1260	1.5E-02	J	2.7E+00	J	MG_KG	SJS17-SS03-000	8/23	0.033 - 0.35	2.7E+00	ND	2.2E-01 ca	NA	NA	YES	ASL
	60-57-1	Dieldrin	7.9E-04	J	3.8E-03	J	MG_KG	SJS02-SS02-000	3/23	0.0033 - 0.035	3.8E-03	1.2E-02	3.0E-02 ca	NA	NA	NO	BSL
	33213-65-9	Endosulfan II	7.9E-03	J	5.3E-02	J	MG_KG	SJS17-SS03-000	3/23	0.0033 - 0.035	5.3E-02	1.4E-02	3.7E+01 nc	NA	NA	NO	BSL
	72-20-8	Endrin	2.4E-02	J	2.4E-02	J	MG_KG	SJS17-SS03-000	1/23	0.0033 - 0.035	2.4E-02	1.3E-02	1.8E+00 nc	NA	NA	NO	BSL
	7421-93-4	Endrin aldehyde	2.2E-03	J	7.3E-02	J	MG_KG	SJS17-SS03-000	3/23	0.0033 - 0.035	7.3E-02	1.2E-02	1.8E+00 nc	NA	NA	NO	BSL
	76-44-8	Heptachlor	2.2E-03	J	2.2E-03	J	MG_KG	SJS02-SS12-000	1/23	0.0017 - 0.018	2.2E-03	ND	1.1E-01 ca	NA	NA	NO	BSL
	5103-71-9	alpha-Chlordane	8.1E-04	J	5.0E-02	J	MG_KG	SJS02-SS12-000	8/23	0.0017 - 0.2	5.0E-02	9.1E-03	1.6E+00 ca	NA	NA	NO	BSL
	5103-74-2	gamma-Chlordane	2.0E-03	UJ	2.9E-02	J	MG_KG	SJS02-SS12-000	6/23	0.0017 - 0.018	2.9E-02	6.1E-03	1.6E+00 ca	NA	NA	NO	BSL
	7429-90-5	Aluminum	2.0E+03		1.9E+04		MG_KG	SJS02-SS06-000	23/23	3.5 - 8.79	1.9E+04	7.7E+03	7.7E+03 nc	NA	NA	YES	ASL
	7440-36-0	Antimony	5.3E-01	J	7.0E+00	J	MG_KG	SJS02-SS03-000	9/21	0.34 - 0.62	7.0E+00	7.0E-01	3.1E+00 nc	NA	NA	YES	ASL

TABLE 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-38-2	Arsenic	1.3E+00 J	1.8E+01	MG_KG	SJS02-SS13-000	22/23	0.34 - 0.65	1.8E+01	5.7E+00	3.9E-01 ca	NA	NA	YES	ASL
	7440-39-3	Barium	9.8E+00 J	4.7E+02	MG_KG	SJS02-SS20-000	23/23	0.029 - 0.4	4.7E+02	4.0E+01	1.5E+03 nc	NA	NA	NO	BSL
	7440-41-7	Beryllium	1.5E-01 J	1.3E+01	MG_KG	SJS02-SS06-000	15/23	0.019 - 0.2	1.3E+01	2.8E-01	1.6E+01 nc	NA	NA	NO	BSL
	7440-43-9	Cadmium	1.0E-01 J	9.3E+00 K	MG_KG	SJS17-SS03-000	18/23	0.05 - 0.8	9.3E+00	ND	7.0E+00 nc	NA	NA	YES	ASL
	7440-70-2	Calcium	4.8E+02 J	1.6E+04	MG_KG	SJS02-SS14-000	23/23	4.5 - 17.37	1.6E+04	1.2E+03	N/A	NA	NA	NO	NUT
	7440-47-3	Chromium	2.5E+00	2.5E+02	MG_KG	SJS02-SS06-000	23/23	0.2 - 1.4	2.5E+02	7.0E+00	2.3E+01 nc	NA	NA	YES	ASL
	7440-48-4	Cobalt	5.5E-01 J	6.3E+01	MG_KG	SJS02-SS06-000	18/23	0.08 - 1.6	6.3E+01	2.2E+01	1.6E+02 nc	NA	NA	NO	BSL
	7440-50-8	Copper	5.7E+00	5.0E+03 J	MG_KG	SJS17-SS04-000	23/23	0.2 - 1.2	5.0E+03	1.7E+01	3.1E+02 nc	NA	NA	YES	ASL
	57-12-5	Cyanide	2.0E-01	8.5E-01 J	MG_KG	SJS02-SS03-000	3/19	0.18 - 0.53	8.5E-01	ND	3.1E+02 nc	NA	NA	NO	BSL
	7439-89-6	Iron	2.6E+03	1.1E+05	MG_KG	SJS02-SS03-000, SJS02-SS06-000	23/23	0.91 - 6.8	1.1E+05	3.7E+03	5.5E+03 nc	NA	NA	YES	ASL
	7439-92-1	Lead	1.3E+01	3.1E+03 K	MG_KG	SJS17-SS04-000	23/23	0.17 - 2.3	3.1E+03	6.1E+01	4.0E+02	NA	NA	YES	ASL
	7439-95-4	Magnesium	2.3E+02 J	2.6E+03	MG_KG	SJS02-SS06-000	23/23	4.1 - 36.14	2.6E+03	5.3E+02	N/A	NA	NA	NO	NUT
	7439-96-5	Manganese	2.7E+01	6.9E+02	MG_KG	SJS02-SS03-000	23/23	0.05 - 0.4	6.9E+02	4.2E+01	1.8E+02 nc	NA	NA	YES	ASL
	7439-97-6	Mercury	4.0E-02	1.8E+00 L	MG_KG	SJS17-SS03-000	22/23	0.01 - 0.061	1.8E+00	3.0E-01	2.3E+00 nc	NA	NA	NO	BSL
	7440-02-0	Nickel	8.9E-01 J	2.5E+02	MG_KG	SJS02-SS06-000	23/23	0.15 - 3	2.5E+02	6.9E+00	1.6E+02 nc	NA	NA	YES	ASL
	7440-09-7	Potassium	2.2E+02 J	1.9E+03	MG_KG	SJS02-SS06-000	23/23	2.3 - 162	1.9E+03	3.7E+02	N/A	NA	NA	NO	NUT
	7782-49-2	Selenium	5.4E-01 L	1.7E+00 L	MG_KG	SJS17-SS04-000	9/23	0.44 - 0.83	1.7E+00	1.0E+00	3.9E+01 nc	NA	NA	NO	BSL
	7440-22-4	Silver	2.0E-01 J	3.5E+00	MG_KG	SJS02-SS16-000P	3/23	0.15 - 0.65	3.5E+00	6.2E-01	3.9E+01 nc	NA	NA	NO	BSL
	7440-23-5	Sodium	5.0E+00 J	5.3E+02 J	MG_KG	SJS02-SS06-000	10/23	3 - 32.8	5.3E+02	1.7E+02	N/A	NA	NA	NO	NUT
	7440-28-0	Thallium	7.6E-01 J	6.2E+00	MG_KG	SJS02-SS03-000	4/23	0.34 - 1.8	6.2E+00	ND	5.1E-01 nc	NA	NA	YES	ASL
	7440-62-2	Vanadium	3.8E+00 J	1.4E+03	MG_KG	SJS17-SS04-000	23/23	0.1 - 1.8	1.4E+03	2.7E+01	3.9E+01 nc	NA	NA	YES	ASL
	7440-66-6	Zinc	3.2E+01	7.6E+03	MG_KG	SJS02-SS06-000	23/23	0.32 - 1	7.6E+03	3.8E+01	2.3E+03 nc	NA	NA	YES	ASL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background data is lower of UCL for Bohicket or Munden-Tetotum background soil type from *Final Background Investigation Report, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, October 2001).

[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. Adjusted Residential Soil RSL.
RSLs based on non-carcinogenic effects (nc) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL value for hexavalent chromium used for total chromium.
Cobalt is not included in RSL Table. Value is from the April 2005 EPA Region III RBC table.
RSL value for endosulfan used as surrogate for endosulfan II.
RSL value for endrin used as surrogate for endrin aldehyde.
RSL value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Emissions from Surface Soil at Site 2	78-93-3	2-Butanone	7.9E-03	7.9E-03	ug/m^3	SJS02-SS11-000	1/23	(see Table 2.1 for soil detection limits)	7.9E-03	NA	5.2E+02 nc	NA	NA	NO	BSL
	67-64-1	Acetone	4.3E-04 J	2.2E-03	ug/m^3	SJS02-SS10-000	3/23		2.2E-03	NA	3.2E+03 nc	NA	NA	NO	BSL
	75-09-2	Methylene chloride	5.0E-04 J	8.8E-04 J	ug/m^3	SJS17-SS02-000	2/23		8.8E-04	NA	5.2E+00 ca	NA	NA	NO	BSL
	108-88-3	Toluene	1.9E-04 J	3.9E-04 J	ug/m^3	SJS02-SS08-000	2/23		3.9E-04	NA	5.2E+02 nc	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	4.7E-04 J	4.1E-03 J	ug/m^3	SJS02-SS03-000	4/23		4.1E-03	NA	NA	NA	NA	NO	NTX
	83-32-9	Acenaphthene	2.2E-04 J	1.3E-03	ug/m^3	SJS17-SS04-000	6/23		1.3E-03	NA	NA	NA	NA	NO	NTX
	208-96-8	Acenaphthylene	1.3E-04 J	2.9E-03 J	ug/m^3	SJS02-SS03-000	12/23		2.9E-03	NA	7.2E-02 ca	NA	NA	NO	BSL
	120-12-7	Anthracene	4.2E-05 J	7.8E-04	ug/m^3	SJS17-SS04-000	10/23		7.8E-04	NA	NA	NA	NA	NO	NTX
	56-55-3	Benzo(a)anthracene	9.1E-08 J	1.7E-06	ug/m^3	SJS02-SS03-000	18/23		1.7E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	50-32-8	Benzo(a)pyrene	9.8E-08 J	1.6E-06	ug/m^3	SJS17-SS04-000	18/23		1.6E-06	NA	8.7E-04 ca	NA	NA	NO	BSL
	205-99-2	Benzo(b)fluoranthene	4.3E-08 J	1.5E-06	ug/m^3	SJS17-SS03-000	19/23		1.5E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	5.8E-08 J	1.2E-06	ug/m^3	SJS17-SS03-000	17/23		1.2E-06	NA	NA	NA	NA	NO	NTX
	207-08-9	Benzo(k)fluoranthene	4.7E-08 J	1.2E-06	ug/m^3	SJS17-SS03-000	18/23		1.2E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	85-68-7	Butylbenzylphthalate	2.5E-08 J	3.3E-07 J	ug/m^3	SJS17-SS03-000	5/23		3.3E-07	NA	NA	NA	NA	NO	NTX
	86-74-8	Carbazole	4.8E-08 J	2.7E-07 J	ug/m^3	SJS17-SS04-000, SJS02-SS11-000	6/23		2.7E-07	NA	NA	NA	NA	NO	NTX
	218-01-9	Chrysene	9.8E-08 J	2.0E-06	ug/m^3	SJS02-SS03-000	18/23		2.0E-06	NA	8.7E-02 ca	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	3.1E-08 J	3.9E-07 J	ug/m^3	SJS02-SS20-000	7/23		3.9E-07	NA	NA	NA	NA	NO	NTX
	53-70-3	Dibenz(a,h)anthracene	4.1E-08 J	3.3E-07	ug/m^3	SJS17-SS04-000	5/23		3.3E-07	NA	8.0E-04 ca	NA	NA	NO	BSL
	132-64-9	Dibenzofuran	9.6E-05 J	8.5E-04 J	ug/m^3	SJS17-SS04-000	5/23		8.5E-04	NA	NA	NA	NA	NO	NTX
	206-44-0	Fluoranthene	3.4E-08 J	3.8E-06	ug/m^3	SJS02-SS03-000	19/23		3.8E-06	NA	NA	NA	NA	NO	NTX
	86-73-7	Fluorene	7.2E-05 J	5.7E-04 L	ug/m^3	SJS02-SS03-000, SJS17-SS04-000	6/23		5.7E-04	NA	NA	NA	NA	NO	NTX
	193-39-5	Indeno(1,2,3-cd)pyrene	6.5E-08 J	1.1E-06	ug/m^3	SJS17-SS03-000	18/23		1.1E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	91-20-3	Naphthalene	1.9E-04 J	3.5E-03	ug/m^3	SJS17-SS04-000	5/23		3.5E-03	NA	7.2E-02 ca	NA	NA	NO	BSL
	85-01-8	Phenanthrene	3.1E-08 J	3.3E-06	ug/m^3	SJS02-SS03-000	17/23		3.3E-06	NA	NA	NA	NA	NO	NTX
	129-00-0	Pyrene	9.8E-06 J	1.5E-03	ug/m^3	SJS02-SS03-000	19/23		1.5E-03	NA	NA	NA	NA	NO	NTX
	117-81-7	bis(2-Ethylhexyl)phthalate	1.5E-07	7.3E-06 J	ug/m^3	SJS17-SS03-000	8/23		7.3E-06	NA	NA	NA	NA	NO	NTX
	72-54-8	4,4'-DDD	1.2E-09 J	3.2E-06	ug/m^3	SJS02-SS09-000	19/23		3.2E-06	NA	NA	NA	NA	NO	NTX
	72-55-9	4,4'-DDE	1.2E-09 J	5.5E-06 J	ug/m^3	SJS02-SS20-000	22/23		5.5E-06	NA	NA	NA	NA	NO	NTX
	50-29-3	4,4'-DDT	2.3E-09 J	9.1E-06 J	ug/m^3	SJS02-SS20-000	22/22		9.1E-06	NA	2.5E-02 ca	NA	NA	NO	BSL
	11096-82-5	Aroclor-1260	1.1E-08 J	2.0E-06 J	ug/m^3	SJS17-SS03-000	8/23		2.0E-06	NA	4.3E-03 ca	NA	NA	NO	BSL
	60-57-1	Dieldrin	6.0E-10 J	2.9E-09 J	ug/m^3	SJS02-SS02-000	3/23		2.9E-09	NA	5.3E-04 ca	NA	NA	NO	BSL
	33213-65-9	Endosulfan II	6.0E-09 J	4.0E-08 J	ug/m^3	SJS17-SS03-000	3/23		4.0E-08	NA	NA	NA	NA	NO	NTX
	72-20-8	Endrin	1.8E-08 J	1.8E-08 J	ug/m^3	SJS17-SS03-000	1/23		1.8E-08	NA	NA	NA	NA	NO	NTX
	7421-93-4	Endrin aldehyde	1.7E-09 J	5.5E-08 J	ug/m^3	SJS17-SS03-000	3/23		5.5E-08	NA	NA	NA	NA	NO	NTX
	76-44-8	Heptachlor	1.7E-09 J	1.7E-09 J	ug/m^3	SJS02-SS12-000	1/23		1.7E-09	NA	1.9E-03 ca	NA	NA	NO	BSL
	5103-71-9	alpha-Chlordane	6.1E-10 J	3.8E-08 J	ug/m^3	SJS02-SS12-000	8/23		3.8E-08	NA	2.4E-02 ca	NA	NA	NO	BSL
	5103-74-2	gamma-Chlordane	1.5E-09 UJ	2.2E-08 J	ug/m^3	SJS02-SS12-000	6/23		2.2E-08	NA	2.4E-02 ca	NA	NA	NO	BSL
	7429-90-5	Aluminum	1.5E-03	1.4E-02	ug/m^3	SJS02-SS06-000	23/23		1.4E-02	NA	5.2E-01 nc	NA	NA	NO	BSL
	7440-36-0	Antimony	4.0E-07 J	5.3E-06 J	ug/m^3	SJS02-SS03-000	9/21		5.3E-06	NA	2.1E-02 nc	NA	NA	NO	BSL

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-38-2	Arsenic	9.8E-07 J	1.4E-05	ug/m^3	SJS02-SS13-000	22/23		1.4E-05	NA	5.7E-04 ca	NA	NA	NO	BSL
	7440-39-3	Barium	7.4E-06 J	3.6E-04	ug/m^3	SJS02-SS20-000	23/23		3.6E-04	NA	5.2E-01 nc	NA	NA	NO	BSL
	7440-41-7	Beryllium	1.1E-07 J	1.0E-05	ug/m^3	SJS02-SS06-000	15/23		1.0E-05	NA	2.1E-02 nc	NA	NA	NO	BSL
	7440-43-9	Cadmium	7.6E-08 J	7.0E-06 K	ug/m^3	SJS17-SS03-000	18/23		7.0E-06	NA	5.7E-04 ca	NA	NA	NO	BSL
	7440-70-2	Calcium	3.6E-04 J	1.2E-02	ug/m^3	SJS02-SS14-000	23/23		1.2E-02	NA	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	1.9E-06	1.9E-04	ug/m^3	SJS02-SS06-000	23/23		1.9E-04	NA	2.0E-04 ca	NA	NA	NO	BSL
	7440-48-4	Cobalt	4.2E-07 J	4.7E-05	ug/m^3	SJS02-SS06-000	18/23		4.7E-05	NA	6.4E-04 ca	NA	NA	NO	BSL
	7440-50-8	Copper	4.3E-06	3.8E-03 J	ug/m^3	SJS17-SS04-000	23/23		3.8E-03	NA	NA	NA	NA	NO	NTX
	57-12-5	Cyanide	1.5E-07	6.4E-07 J	ug/m^3	SJS02-SS03-000	3/19		6.4E-07	NA	3.1E-01 nc	NA	NA	NO	BSL
	7439-89-6	Iron	1.9E-03	8.0E-02	ug/m^3	SJS02-SS03-000, SJS02-SS06-000	23/23		8.0E-02	NA	NA	NA	NA	NO	NTX
	7439-92-1	Lead	9.9E-06	2.4E-03 K	ug/m^3	SJS17-SS04-000	23/23		2.4E-03	NA	NA	NA	NA	NO	NTX
	7439-95-4	Magnesium	1.7E-04 J	1.9E-03	ug/m^3	SJS02-SS06-000	23/23		1.9E-03	NA	NA	NA	NA	NO	BSL
	7439-96-5	Manganese	2.1E-05	5.2E-04	ug/m^3	SJS02-SS03-000	23/23		5.2E-04	NA	5.2E-03 nc	NA	NA	NO	BSL
	7439-97-6	Mercury	3.0E-08	1.4E-06 L	ug/m^3	SJS17-SS03-000	22/23		1.4E-06	NA	3.1E-02 nc	NA	NA	NO	BSL
	7440-02-0	Nickel	6.7E-07 J	1.9E-04	ug/m^3	SJS02-SS06-000	23/23		1.9E-04	NA	1.0E-02 ca	NA	NA	NO	BSL
	7440-09-7	Potassium	1.6E-04 J	1.4E-03	ug/m^3	SJS02-SS06-000	23/23		1.4E-03	NA	NA	NA	NA	NO	BSL
	7782-49-2	Selenium	4.1E-07 L	1.3E-06 L	ug/m^3	SJS17-SS04-000	9/23		1.3E-06	NA	NA	NA	NA	NO	NTX
	7440-22-4	Silver	1.5E-07 J	2.7E-06	ug/m^3	SJS02-SS16-000P	3/23		2.7E-06	NA	NA	NA	NA	NO	NTX
	7440-23-5	Sodium	3.8E-06 J	4.0E-04 J	ug/m^3	SJS02-SS06-000	10/23		4.0E-04	NA	NA	NA	NA	NO	BSL
	7440-28-0	Thallium	5.8E-07 J	4.7E-06	ug/m^3	SJS02-SS03-000	4/23		4.7E-06	NA	NA	NA	NA	NO	NTX
	7440-62-2	Vanadium	2.9E-06 J	1.1E-03	ug/m^3	SJS17-SS04-000	23/23		1.1E-03	NA	NA	NA	NA	NO	NTX
	7440-66-6	Zinc	2.4E-05	5.7E-03	ug/m^3	SJS02-SS06-000	23/23		5.7E-03	NA	NA	NA	NA	NO	NTX

[1] Minimum/Maximum calculated air concentrations from surface soil concentrations. Air concentrations calculated as Cair = Csoil*1000*(1/PEF + 1/VF).
VF included in equation only for volatile chemicals. VF calculated on Table 2.2A. PEF = 1.32E9 m3/kg.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. Adjusted Residential Air RSL.
RSLs based on non-carcinogenic effects (N) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL value for hexavalent chromium used for total chromium.
Cobalt is not included in RSL Table. Value is from the April 2005 EPA Region III RBC table.
RSL value for endosulfan used as surrogate for endosulfan II.
RSL value for endrin used as surrogate for endrin aldehyde.
RSL value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic

TABLE 2.2A

CALCULATION OF VOLATILIZATION FACTOR - SURFACE SOIL

Site 2 Expanded Remedial Investigation Report

St. Julien's Creek Annex

Chesapeake, Virginia

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)	Soil S Conc (r
Volatile Organics									
2-Butanone	8.95E-02	1.12E-03	9.80E-06	4.50E+00	2.70E-02	2.68E+05	4.26E-05	2.52E+04	3.
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	1.02E-04	1.63E+04	1.
Methylene chloride	1.01E-01	1.33E-01	1.17E-05	2.37E+01	1.42E-01	1.30E+04	2.67E-03	3.18E+03	3.
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E+00	5.26E+02	1.01E-03	5.16E+03	6.
Semivolatile Organics									
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	4.80E-06	7.50E+04	3.
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	3.36E-07	2.83E+05	1.
Acenaphthylene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	3.36E-07	2.83E+05	1.
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	2.63E-08	1.01E+06	7.
Dibenzofuran	6.19E-02	3.98E-03	1.00E-05	5.48E+03	3.29E+01	5.65E+00	4.00E-07	2.60E+05	1.
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	6.15E-08	6.63E+05	1.
Napthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	5.15E-06	7.24E+04	3.
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	1.11E-09	4.93E+06	8.
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	3.43E-13	2.81E+08	3.

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (C_{sat}) =

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source located in Philadelphia, PA (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.
Physical/chemical properties not listed in USEPA, 1996 obtained from USEPA Region 9 Preliminary Remediation Goal support tables, 2002.

TABLE 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Drainage Features and Ponded Area	75-35-4	1,1-Dichloroethene	3.0E-01 J	7.0E-01 J	UG_L	SJS02-SW04-001	2/9	0.5 - 10	7.0E-01	NA	3.4E+02 nc	1.7E+04	VAWQS	NO	BSL
	120-82-1	1,2,4-Trichlorobenzene	1.0E-01 J	1.0E-01 J	UG_L	SJS02-SW04-001	1/8	0.5 - 10	1.0E-01	NA	1.9E+02 ca	9.4E+02	VAWQS	NO	BSL
	75-27-4	Bromodichloromethane	8.0E-01 J	4.2E+00	UG_L	SJS02-SW10-03D	3/9	0.5 - 10	4.2E+00	NA	1.1E+01 ca	4.6E+02	VAWQS	NO	BSL
	75-25-2	Bromoform	4.0E-01 J	4.0E-01 J	UG_L	SJS02-SW07-001	1/9	0.5 - 10	4.0E-01	NA	8.5E+01 ca	3.6E+03	VAWQS	NO	BSL
	75-15-0	Carbon disulfide	2.3E+00 J	2.3E+00 J	UG_L	SJS02-SW03-001	1/9	0.5 - 10	2.3E+00	NA	1.0E+03 nc	--		NO	BSL
	67-66-3	Chloroform	3.5E+00	1.2E+01	UG_L	SJS02-SW10-03D	3/9	0.5 - 10	1.2E+01	NA	1.9E+00 ca	2.9E+04	VAWQS	YES	ASL
	124-48-1	Dibromochloromethane	2.0E-01 J	3.0E-01 J	UG_L	SJS02-SW06-001	2/9	0.5 - 10	3.0E-01	NA	8.0E+00 ca	3.4E+02	VAWQS	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	7.7E-01	7.7E-01	UG_L	SJS02-SW11-03D	1/3	0.5 - 10	7.7E-01	NA	1.2E+02 ca	--		NO	BSL
	79-01-6	Trichloroethene	5.6E+00	1.4E+02	UG_L	SJS02-SW10-03D	7/9	0.5 - 10	1.4E+02	NA	1.7E+01 ca	8.1E+02	VAWQS	YES	ASL
	75-01-4	Vinyl chloride	1.4E+00	2.2E+01	UG_L	SJS02-SW04-001	7/9	0.5 - 10	2.2E+01	NA	1.6E-01 ca	6.1E+01	VAWQS	YES	ASL
	156-59-2	cis-1,2-Dichloroethene	2.0E-01 J	8.4E+01	UG_L	SJS02-SW09	8/8	1 - 10	8.4E+01	NA	3.7E+02 nc	--		NO	BSL
	156-60-5	trans-1,2-Dichloroethene	2.0E-01 J	5.0E-01 J	UG_L	SJS02-SW04-001	4/8	0.5 - 10	5.0E-01	NA	1.1E+02 nc	1.4E+05	VAWQS	NO	BSL
	100-52-7	Benzaldehyde	3.6E+00 J	3.6E+00 J	UG_L	SJS02-SW09	1/1	10 - 10	3.6E+00	NA	3.7E+03 nc	--		NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	3.0E+00 J	8.4E+01	UG_L	SJS02-SW07-001	2/7	10 - 11	8.4E+01	NA	4.8E+01 nc	5.9E+01	VAWQS	YES	ASL
	72-54-8	4,4'-DDD	1.3E-02 J	2.0E-01	UG_L	SJS02-SW04-001	5/7	0.1 - 0.12	2.0E-01	NA	2.8E+00 ca	5.9E-03	VAWQS	NO	BSL
	99-08-1	3-Nitrotoluene	5.0E-01 J	3.5E+00	UG_L	SJS02-SW04-001	4/7	1.3 - 25	3.5E+00	NA	4.2E+01 ca	--		NO	BSL
	7429-90-5	Aluminum	4.9E+01	9.4E+03	UG_L	SJS02-SW06-001	7/7	29 - 45.7	9.4E+03	NA	3.7E+04 nc	--		NO	BSL
	7440-36-0	Antimony	2.0E+00 J	2.0E+00 J	UG_L	SJS02-SW02-000	1/7	2 - 3.7	2.0E+00	NA	1.5E+01 nc	4.3E+03	VAWQS	NO	BSL
	7440-38-2	Arsenic	3.1E+00 J	4.4E+00 J	UG_L	SJS02-SW04-001	2/7	2 - 5	4.4E+00	NA	4.5E-01 nc	--		YES	ASL
	7440-39-3	Barium	1.7E+01 J	7.1E+01 J	UG_L	SJS02-SW02-000P	6/7	0.2 - 2	7.1E+01	NA	7.3E+03 nc	--		NO	BSL
	7440-41-7	Beryllium	3.5E+00 J	3.5E+00 J	UG_L	SJS02-SW06-001	1/7	0.1 - 1	3.5E+00	NA	7.3E+01 nc	--		NO	BSL
	7440-43-9	Cadmium	4.4E-01 J	2.5E+00 J	UG_L	SJS02-SW05-001	6/7	0.3 - 3	2.5E+00	NA	1.8E+01 nc	--		NO	BSL
	7440-70-2	Calcium	3.6E+04	2.1E+05	UG_L	SJS02-SW02-000P	7/7	10.7 - 57.9	2.1E+05	NA	N/A	--		NO	NUT
	7440-47-3	Chromium	2.1E+00 J	1.7E+02	UG_L	SJS02-SW02-000P	6/7	1.1 - 5	1.7E+02	NA	1.1E+02 nc	--		YES	ASL
	7440-48-4	Cobalt	5.5E+01	5.5E+01	UG_L	SJS02-SW06-001	1/7	0.5 - 8	5.5E+01	NA	7.3E+02 nc	--		NO	BSL
	7440-50-8	Copper	6.5E+00	2.0E+02	UG_L	SJS02-SW02-000P	7/7	1.1 - 2.2	2.0E+02	NA	1.5E+03 nc	--		NO	BSL
	57-12-5	Cyanide	1.9E+01 L	1.9E+01 L	UG_L	SJS02-SW03-001	1/6	5 - 5	1.9E+01	NA	7.3E+02 nc	2.2E+05	VAWQS	NO	BSL
	7439-89-6	Iron	7.2E+02	1.9E+04	UG_L	SJS02-SW06-001	7/7	5 - 30.8	1.9E+04	NA	2.6E+04 nc	--		NO	BSL
	7439-92-1	Lead	2.8E+00 J	7.8E+01 L	UG_L	SJS02-SW02-000P	4/7	1 - 3	7.8E+01	NA	1.5E+01	--		YES	ASL
	7439-95-4	Magnesium	6.2E+03	6.7E+05	UG_L	SJS02-SW02-000P	7/7	24.3 - 75.9	6.7E+05	NA	N/A	--		NO	NUT
	7439-96-5	Manganese	6.2E+01	2.5E+03	UG_L	SJS02-SW06-001	7/7	0.3 - 1.2	2.5E+03	NA	8.8E+02 nc	--		YES	ASL
	7440-02-0	Nickel	2.6E+00 J	8.1E+01	UG_L	SJS02-SW06-001	5/7	0.9- 7	8.1E+01	NA	7.3E+02 nc	4.6E+03	VAWQS	NO	BSL
	7440-09-7	Potassium	4.4E+03	2.4E+05 J	UG_L	SJS02-SW02-000P	7/7	13.5 - 135	2.4E+05	NA	N/A	--		NO	NUT
	7440-23-5	Sodium	2.8E+04	5.6E+06	UG_L	SJS02-SW02-000P	7/7	28 - 1480	5.6E+06	NA	N/A	--		NO	NUT
	7440-62-2	Vanadium	1.6E+01 J	3.3E+01 J	UG_L	SJS02-SW02-000P	2/7	0.6 - 4	3.3E+01	NA	1.8E+02 nc	--		NO	BSL
	7440-66-6	Zinc	2.3E+01	1.3E+03	UG_L	SJS02-SW06-001	7/7	1.9 - 8.5	1.3E+03	NA	1.1E+04 nc	--		NO	BSL

TABLE 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. 10 x Adjusted Tap Water RSL.
RSLs based on non-carcinogenic effects (N) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL for 4-Nitrotoluene used as surrogate for 3-Nitrotoluene.
RSL value for hexavalent chromium used for total chromium.
Cobalt is not included in RSL Table. Value is from the April 2005 EPA Region III RBC table.
The tap water value of 15 ug/L for lead is the action level provided in the Drinking Water Regulations and Health Advisories.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic
VAWQS = Virginia Water Quality Standard, January 2006, (for all other surface water bodies, not drinking water supplies)
NA = Not available
ND = Not detected

TABLE 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Drainage Features and Ponded Area	71-55-6	1,1,1-Trichloroethane	7.0E-03 J	7.0E-03 J	MG_KG	SJS02-SD06-001	1/11	0.011 - 0.039	7.0E-03	NA	9.0E+02 nc	NA	NA	NO	BSL
	75-35-4	1,1-Dichloroethene	3.4E-02 J	3.4E-02 J	MG_KG	SJS02-SD21-00-04D-P	1/11	0.011 - 0.039	3.4E-02	NA	2.5E+02 nc	NA	NA	NO	BSL
	540-59-0	1,2-Dichloroethene (total)	3.0E-03 J	9.0E-03 J	MG_KG	SJS02-SD03-000P	2/7	0.011 - 0.037	9.0E-03	NA	7.0E+02 nc	NA	NA	NO	BSL
	78-87-5	1,2-Dichloropropane	8.3E-03 J	8.3E-03 J	MG_KG	SJS02-SD22-00-04D	1/11	0.011 - 0.039	8.3E-03	NA	9.3E+00 ca	NA	NA	NO	BSL
	108-10-1	4-Methyl-2-pentanone	5.0E-03 J	5.0E-03 J	MG_KG	SJS02-SD02-000	1/11	0.011 - 0.039	5.0E-03	NA	5.3E+03 nc	NA	NA	NO	BSL
	67-64-1	Acetone	2.1E-02 J	4.5E-01	MG_KG	SJS02-SD03-000P	4/10	0.011 - 0.039	4.5E-01	NA	6.1E+04 nc	NA	NA	NO	BSL
	71-43-2	Benzene	5.7E-03 J	5.7E-03 J	MG_KG	SJS02-SD21-00-04D	1/11	0.011 - 0.039	5.7E-03	NA	1.1E+01 ca	NA	NA	NO	BSL
	74-83-9	Bromomethane	6.3E-03 J	6.3E-03 J	MG_KG	SJS02-SD09	1/11	0.011 - 0.039	6.3E-03	NA	7.9E+00 nc	NA	NA	NO	BSL
	75-15-0	Carbon disulfide	1.5E-02 J	8.1E-02	MG_KG	SJS02-SD03-000P	4/11	0.011 - 0.039	8.1E-02	NA	6.7E+02 nc	NA	NA	NO	BSL
	75-00-3	Chloroethane	4.2E-03 J	4.2E-03 J	MG_KG	SJS02-SD21-00-04D-P	1/11	0.011 - 0.039	4.2E-03	NA	NA	NA	NA	NO	NTX
	67-66-3	Chloroform	3.0E-03 J	3.0E-03 J	MG_KG	SJS02-SD07-001	1/11	0.011 - 0.039	3.0E-03	NA	3.0E+00 ca	NA	NA	NO	BSL
	108-88-3	Toluene	4.0E-03 J	4.0E-03 J	MG_KG	SJS02-SD04-001	1/11	0.011 - 0.039	4.0E-03	NA	5.0E+03 nc	NA	NA	NO	BSL
	79-01-6	Trichloroethene	4.0E-03 J	9.8E-03 J	MG_KG	SJS02-SD21-00-04D-P	3/11	0.011 - 0.039	9.8E-03	NA	2.8E+01 ca	NA	NA	NO	BSL
	75-01-4	Vinyl chloride	4.4E-03 J	9.8E+00 J	MG_KG	SJS02-SD21-00-04D-P	3/11	0.011 - 4.9	9.8E+00	NA	6.0E-01 ca	NA	NA	YES	ASL
	156-59-2	cis-1,2-Dichloroethene	2.3E+00	2.3E+00	MG_KG	SJS02-SD21-00-04D-P	1/4	0.013 - 0.39	2.3E+00	NA	7.8E+02 nc	NA	NA	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	3.8E-02 J	3.8E-02 J	MG_KG	SJS02-SD21-00-04D-P	1/4	0.013 - 0.039	3.8E-02	NA	1.1E+02 nc	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	2.5E-01 J	2.5E-01 J	MG_KG	SJS02-SD25-00-04D	1/14	0.33 - 9.1	2.5E-01	NA	3.1E+02 nc	NA	NA	NO	BSL
	83-32-9	Acenaphthene	4.9E-01 J	4.9E-01 J	MG_KG	SJS02-SD25-00-04D	1/14	0.33 - 9.1	4.9E-01	NA	3.4E+03 nc	NA	NA	NO	BSL
	120-12-7	Anthracene	1.0E-01 J	1.2E+00	MG_KG	SJS02-SD25-00-04D	4/14	0.33 - 9.1	1.2E+00	NA	1.7E+04 nc	NA	NA	NO	BSL
	56-55-3	Benzo(a)anthracene	8.7E-02 J	3.5E+00	MG_KG	SJS02-SD25-00-04D	10/14	0.33 - 9.1	3.5E+00	NA	1.5E+00 ca	NA	NA	YES	ASL
	50-32-8	Benzo(a)pyrene	7.9E-02 J	3.9E+00	MG_KG	SJS02-SD25-00-04D	10/14	0.33 - 9.1	3.9E+00	NA	1.5E-01 ca	NA	NA	YES	ASL
	205-99-2	Benzo(b)fluoranthene	1.1E-01 J	3.8E+00	MG_KG	SJS02-SD25-00-04D	12/14	0.33 - 9.1	3.8E+00	NA	1.5E+00 ca	NA	NA	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	8.6E-02 J	2.7E+00 J	MG_KG	SJS02-SD25-00-04D	9/14	0.33 - 9.1	2.7E+00	NA	1.7E+03 nc	NA	NA	NO	BSL
	207-08-9	Benzo(k)fluoranthene	5.9E-02 J	1.0E+00	MG_KG	SJS02-SD25-00-04D	9/14	0.33 - 9.1	1.0E+00	NA	1.5E+01 ca	NA	NA	NO	BSL
	85-68-7	Butylbenzylphthalate	4.7E-02 J	4.7E-02 J	MG_KG	SJS02-SD01-000	1/14	0.33 - 9.1	4.7E-02	NA	1.2E+04 nc	NA	NA	NO	BSL
	86-74-8	Carbazole	1.2E-01 J	1.2E-01 J	MG_KG	SJS02-SD25-00-04D	1/14	0.33 - 9.1	1.2E-01	NA	2.4E+02 ca	NA	NA	NO	BSL
	218-01-9	Chrysene	1.2E-01 J	3.3E+00	MG_KG	SJS02-SD25-00-04D	10/14	0.33 - 9.1	3.3E+00	NA	1.5E+02 ca	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	8.9E-02 J	9.4E-02 J	MG_KG	SJS02-SD06-001	2/14	0.33 - 9.1	9.4E-02	NA	6.1E+03 nc	NA	NA	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	5.0E-01 J	5.0E-01 J	MG_KG	SJS02-SD25-00-04D	1/14	0.33 - 9.1	5.0E-01	NA	1.5E-01 ca	NA	NA	YES	ASL
	132-64-9	Dibenzofuran	1.3E-01 J	1.3E-01 J	MG_KG	SJS02-SD25-00-04D	1/14	0.33 - 9.1	1.3E-01	NA	NA	NA	NA	NO	NTX
	84-66-2	Diethylphthalate	2.5E-01 L	2.5E-01 L	MG_KG	SJS02-SD03-000	1/14	0.33 - 9.1	2.5E-01	NA	4.9E+04 nc	NA	NA	NO	BSL
	206-44-0	Fluoranthene	1.8E-01 J	4.3E+00	MG_KG	SJS02-SD25-00-04D	11/14	0.33 - 9.1	4.3E+00	NA	2.3E+03 nc	NA	NA	NO	BSL
	86-73-7	Fluorene	7.9E-02 J	5.5E-01 J	MG_KG	SJS02-SD25-00-04D	2/14	0.33 - 9.1	5.5E-01	NA	2.3E+03 nc	NA	NA	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	8.4E-02 J	1.8E+00 J	MG_KG	SJS02-SD25-00-04D	9/14	0.33 - 9.1	1.8E+00	NA	1.5E+00 ca	NA	NA	YES	ASL
	91-20-3	Naphthalene	2.8E-01 J	2.8E-01 J	MG_KG	SJS02-SD25-00-04D	1/14	0.33 - 9.1	2.8E-01	NA	3.9E+01 nc	NA	NA	NO	BSL
	85-01-8	Phenanthrene	4.7E-02 J	5.3E+00	MG_KG	SJS02-SD25-00-04D	8/14	0.33 - 9.1	5.3E+00	NA	1.7E+03 nc	NA	NA	NO	BSL
	129-00-0	Pyrene	4.8E-02 J	9.4E+00 J	MG_KG	SJS02-SD25-00-04D	13/14	0.33 - 9.1	9.4E+00	NA	1.7E+03 nc	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	1.6E-01 J	6.6E-01	MG_KG	SJS02-SD09	3/14	0.13 - 9.1	6.6E-01	NA	3.5E+02 ca	NA	NA	NO	BSL
	72-54-8	4,4'-DDD	3.7E-03 J	9.8E-01 J	MG_KG	SJS02-SD06-001	12/12	0.0033 - 0.75	9.8E-01	NA	2.0E+01 ca	NA	NA	NO	BSL
	72-55-9	4,4'-DDE	5.7E-03 J	1.3E-01 J	MG_KG	SJS02-SD03-000	14/14	0.0033 - 0.017	1.3E-01	NA	1.4E+01 ca	NA	NA	NO	BSL
	50-29-3	4,4'-DDT	8.8E-03 J	3.2E+00 J	MG_KG	SJS02-SD06-001	14/14	0.0033 - 0.75	3.2E+00	NA	1.7E+01 ca	NA	NA	NO	BSL
	11097-69-1	Aroclor-1254	1.1E-01 J	1.1E-01 J	MG_KG	SJS02-SD02-000	1/14	0.033 - 0.17	1.1E-01	NA	2.2E+00 ca	NA	NA	NO	BSL
	11096-82-5	Aroclor-1260	6.9E-02 J	6.9E-02 J	MG_KG	SJS02-SD03-000P	1/14	0.033 - 0.17	6.9E-02	NA	2.2E+00 ca	NA	NA	NO	BSL
	60-57-1	Dieldrin	9.1E-04 J	3.6E-02	MG_KG	SJS02-SD03-000	7/14	0.0033 - 0.017	3.6E-02	NA	3.0E-01 ca	NA	NA	NO	BSL

TABLE 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7421-93-4	Endrin aldehyde	6.4E-03 J	6.4E-03 J	MG_KG	SJS02-SD25-00-04D	1/14	0.0033 - 0.017	6.4E-03	NA	1.8E+01 nc	NA	NA	NO	BSL
	53494-70-5	Endrin ketone	2.2E-03 J	2.2E-03 J	MG_KG	SJS02-SD26-00-04D	1/14	0.0033 - 0.017	2.2E-03	NA	1.8E+01 nc	NA	NA	NO	BSL
	5103-71-9	alpha-Chlordane	5.5E-03 J	7.9E-02 J	MG_KG	SJS02-SD05-001	10/14	0.0017 - 0.033	7.9E-02	NA	1.6E+01 ca	NA	NA	NO	BSL
	5103-74-2	gamma-Chlordane	9.8E-03 J	9.6E-02 J	MG_KG	SJS02-SD05-001	10/14	0.0017 - 0.033	9.6E-02	NA	1.6E+01 ca	NA	NA	NO	BSL
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1.6E-05 J	4.2E-04 J	MG_KG	SJS02-SD09	6/6	0.00000014 - 0.00000029	4.2E-04	NA	3.9E-03 ca	NA	NA	NO	BSL
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.5E-06 J	2.3E-04 J	MG_KG	SJS02-SD09	6/6	0.000000089 - 0.00000023	2.3E-04	NA	3.2E-03 ca	NA	NA	NO	BSL
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	7.7E-07 J	2.1E-05 J	MG_KG	SJS02-SD09	5/6	0.00000013 - 0.00000033	2.1E-05	NA	3.2E-03 ca	NA	NA	NO	BSL
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	3.0E-07 J	8.5E-06 J	MG_KG	SJS02-SD09	6/6	0.00000019 - 0.00000076	8.5E-06	NA	3.9E-04 ca	NA	NA	NO	BSL
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	7.4E-07 J	2.5E-05 J	MG_KG	SJS02-SD09	6/6	0.00000011 - 0.00000026	2.5E-05	NA	3.2E-04 ca	NA	NA	NO	BSL
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	6.0E-07 J	1.8E-05 J	MG_KG	SJS02-SD09	6/6	0.00000016 - 0.00000066	1.8E-05	NA	3.9E-04 ca	NA	NA	NO	BSL
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	5.0E-07 J	6.0E-05 J	MG_KG	SJS02-SD09	6/6	0.00000011 - 0.00000025	6.0E-05	NA	3.2E-04 ca	NA	NA	NO	BSL
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.1E-06 J	1.6E-05 J	MG_KG	SJS02-SD09	6/6	0.00000016 - 0.00000067	1.6E-05	NA	3.9E-04 ca	NA	NA	NO	BSL
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	4.0E-07 J	2.3E-06 J	MG_KG	SJS02-SD11	4/6	0.00000015 - 0.00000034	2.3E-06	NA	3.2E-04 ca	NA	NA	NO	BSL
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.2E-06 J	3.6E-06 J	MG_KG	SJS02-SD09	5/6	0.00000017 - 0.00000026	3.6E-06	NA	3.9E-05 ca	NA	NA	NO	BSL
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	1.1E-06 J	4.3E-06 J	MG_KG	SJS02-SD09	5/6	0.00000016 - 0.00000024	4.3E-06	NA	1.1E-03 ca	NA	NA	NO	BSL
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	3.6E-07 J	9.3E-06 J	MG_KG	SJS02-SD09	6/6	0.00000012 - 0.00000027	9.3E-06	NA	3.2E-04 ca	NA	NA	NO	BSL
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	4.3E-07 J	7.0E-06 J	MG_KG	SJS02-SD09	6/6	0.00000015 - 0.00000023	7.0E-06	NA	1.1E-04 ca	NA	NA	NO	BSL
	1746-01-6	2,3,7,8-TCDD (dioxin)	3.2E-07 J	9.6E-07 J	MG_KG	SJS02-SD11	5/6	0.00000013 - 0.00000027	9.6E-07	NA	4.5E-05 ca	NA	NA	NO	BSL
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	7.1E-07 NJ	9.7E-06 J	MG_KG	SJS02-SD11	6/6	0.00000014 - 0.00000086	9.7E-06	NA	3.2E-04 ca	NA	NA	NO	BSL
	3268-87-9	Octachlorodibenzo-p-dioxin	6.6E-04 J	4.4E-03 J	MG_KG	SJS02-SD11	6/6	0.0000002 - 0.00000053	4.4E-03	NA	1.3E-01 ca	NA	NA	NO	BSL
	39001-02-0	Octachlorodibenzofuran	2.1E-05 J	5.8E-04 J	MG_KG	SJS02-SD09	5/6	0.00000013 - 0.00000053	5.8E-04	NA	1.1E-01 ca	NA	NA	NO	BSL
	37871-00-4	Total heptachlorodibenzo-p-dioxin	5.1E-05 J	9.0E-04 J	MG_KG	SJS02-SD11	6/6	0.00000014 - 0.00000029	9.0E-04	NA	NA	NA	NA	NO	NTX
	38998-75-3	Total heptachlorodibenzofuran	4.6E-06 J	2.6E-04 J	MG_KG	SJS02-SD11	6/6	0.000000089 - 0.00000023	2.6E-04	NA	NA	NA	NA	NO	NTX
	34465-46-8	Total hexachlorodibenzo-p-dioxin	1.5E-05 J	1.7E-04 J	MG_KG	SJS02-SD11	6/6	0.00000016 - 0.00000066	1.7E-04	NA	NA	NA	NA	NO	NTX
	55684-94-1	Total hexachlorodibenzofuran	4.7E-06 J	3.0E-04 J	MG_KG	SJS02-SD09	6/6	0.00000011 - 0.00000025	3.0E-04	NA	NA	NA	NA	NO	NTX
	36088-22-9	Total pentachlorodibenzo-p-dioxin	4.8E-06 J	2.0E-05 J	MG_KG	SJS02-SD11	5/6	0.00000017 - 0.00000026	2.0E-05	NA	NA	NA	NA	NO	NTX
	30402-15-4	Total pentachlorodibenzofuran	2.0E-06 J	9.1E-05 J	MG_KG	SJS02-SD11	6/6	0.00000015 - 0.00000023	9.1E-05	NA	NA	NA	NA	NO	NTX
	41903-57-5	Total tetrachlorodibenzo-p-dioxin	3.7E-07 J	6.7E-06 J	MG_KG	SJS02-SD09	6/6	0.00000013 - 0.00000027	6.7E-06	NA	NA	NA	NA	NO	NTX
	55722-27-5	Total tetrachlorodibenzofuran	2.1E-06 J	3.6E-05 J	MG_KG	SJS02-SD09	6/6	0.00000014 - 0.00000086	3.6E-05	NA	NA	NA	NA	NO	NTX
	7429-90-5	Aluminum	1.5E+03	3.3E+04	MG_KG	SJS02-SD05-00-04D	14/14	5.7 - 122	3.3E+04	NA	7.8E+04 nc	NA	NA	NO	BSL
	7440-36-0	Antimony	1.2E+00 L	2.8E+01 L	MG_KG	SJS02-SD03-000P	6/14	0.4 - 36.5	2.8E+01	NA	3.1E+01 nc	NA	NA	NO	BSL
	7440-38-2	Arsenic	1.6E+00 K	1.9E+01	MG_KG	SJS02-SD03-000P	14/14	0.3 - 6.1	1.9E+01	NA	3.9E+00 ca	NA	NA	YES	ASL
	7440-39-3	Barium	4.1E+00 J	1.3E+02	MG_KG	SJS02-SD06-00-04D	14/14	0.03 - 122	1.3E+02	NA	1.5E+04 nc	NA	NA	NO	BSL
	7440-41-7	Beryllium	7.0E-02 J	1.5E+00 J	MG_KG	SJS02-SD05-00-04D	12/14	0.01 - 3	1.5E+00	NA	1.6E+02 nc	NA	NA	NO	BSL
	7440-42-8	Boron	7.9E+00	2.7E+01	MG_KG	SJS02-SD03-00-04D	6/6	3.7 - 9.1	2.7E+01	NA	9.9E+05 nc	NA	NA	NO	BSL
	7440-43-9	Cadmium	1.4E-01	1.2E+01	MG_KG	SJS02-SD06-00-04D	14/14	0.04 - 3	1.2E+01	NA	7.0E+01 nc	NA	NA	NO	BSL
	7440-70-2	Calcium	2.1E+02 J	2.4E+04 J	MG_KG	SJS02-SD03-000	14/14	2.8 - 3040	2.4E+04	NA	N/A	NA	NA	NO	NUT
	7440-47-3	Chromium	6.5E+00	2.6E+03	MG_KG	SJS02-SD03-000P	14/14	0.16 - 6.1	2.6E+03	NA	2.3E+02 nc	NA	NA	YES	ASL
	7440-48-4	Cobalt	6.6E-01 J	1.3E+01 J	MG_KG	SJS02-SD05-00-04D	12/14	0.07 - 30.4	1.3E+01	NA	1.6E+03 nc	NA	NA	NO	BSL
	7440-50-8	Copper	4.4E+00 J	2.6E+03 J	MG_KG	SJS02-SD03-000	14/14	0.16 - 15.2	2.6E+03	NA	3.1E+03 nc	NA	NA	NO	BSL
	57-12-5	Cyanide	3.4E-01	5.8E-01	MG_KG	SJS02-SD04-001	4/13	0.13 - 2.1	5.8E-01	NA	1.6E+03 nc	NA	NA	NO	BSL
	7439-89-6	Iron	2.1E+03	3.8E+04	MG_KG	SJS02-SD05-00-04D	14/14	1.83 - 60.8	3.8E+04	NA	5.5E+04 nc	NA	NA	NO	BSL
	7439-92-1	Lead	1.5E+01	5.5E+02	MG_KG	SJS02-SD03-000	14/14	0.15 - 1.8	5.5E+02	NA	4.0E+02	NA	NA	YES	ASL
	7439-95-4	Magnesium	3.1E+02 J	6.9E+03 J	MG_KG	SJS02-SD03-000	14/14	3.6 - 3040	6.9E+03	NA	N/A	NA	NA	NO	NUT
	7439-96-5	Manganese	8.3E+00 K	2.4E+02	MG_KG	SJS02-SD05-00-04D	14/14	0.04 - 9.1	2.4E+02	NA	1.8E+03 nc	NA	NA	NO	BSL

TABLE 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7439-97-6	Mercury	4.0E-02 J	9.4E-01 K	MG_KG	SJS02-SD25-00-04D	13/14	0.02 - 0.19	9.4E-01	NA	6.7E+00 nc	NA	NA	NO	BSL
	7439-98-7	Molybdenum	3.7E+00	8.7E+00	MG_KG	SJS02-SD03-00-04D, SJS02-SD05-00-04D	6/6	1.2 - 3	8.7E+00	NA	3.9E+02 nc	NA	NA	NO	BSL
	7440-02-0	Nickel	2.0E+00	4.6E+01	MG_KG	SJS02-SD05-00-04D	13/14	0.13 - 24.3	4.6E+01	NA	1.6E+03 nc	NA	NA	NO	BSL
	7440-09-7	Potassium	2.1E+02 J	4.1E+03	MG_KG	SJS02-SD05-00-04D	14/14	2 - 3040	4.1E+03	NA	N/A	NA	NA	NO	NUT
	7782-49-2	Selenium	7.1E-01 K	2.4E+00	MG_KG	SJS02-SD05-00-04D	6/14	0.39 - 3	2.4E+00	NA	3.9E+02 nc	NA	NA	NO	BSL
	7440-22-4	Silver	6.8E-01 J	8.7E-01 J	MG_KG	SJS02-SD07-001	3/14	0.13 - 6.1	8.7E-01	NA	3.9E+02 nc	NA	NA	NO	BSL
	7440-23-5	Sodium	1.4E+02	1.8E+04	MG_KG	SJS02-SD03-000	13/14	12.11 - 3040	1.8E+04	NA	N/A	NA	NA	NO	NUT
	7440-28-0	Thallium	2.2E+00 K	2.2E+00 K	MG_KG	SJS02-SD03-000P	1/14	0.42 - 6.1	2.2E+00	NA	5.1E+00 nc	NA	NA	NO	BSL
	7440-62-2	Vanadium	5.0E+00 J	1.5E+02	MG_KG	SJS02-SD26-00-04D	14/14	0.09 - 30.4	1.5E+02	NA	3.9E+02 nc	NA	NA	NO	BSL
	7440-66-6	Zinc	1.9E+01 J	1.5E+03	MG_KG	SJS02-SD06-00-04D	14/14	0.28 - 12.2	1.5E+03	NA	2.3E+04 nc	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. 10 x Adjusted Residential Soil RSL.
RSLs based on non-carcinogenic effects (N) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL value for hexavalent chromium used for total chromium.
Cobalt is not included in RSL Table. Value is from the April 2005 EPA Region III RBC table.
RSL value for endrin used as surrogate for endrin aldehyde and endrin ketone.
RSL value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic

TABLE 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Site 2	78-93-3	2-Butanone	1.4E-02	2.0E-01	MG_KG	SJS02-SS11-000	3/33	0.01 - 0.016	2.0E-01	ND	2.8E+03 nc	NA	NA	NO	BSL
	67-64-1	Acetone	6.0E-03 J	2.1E-01	MG_KG	SJS02-SB04-004	5/33	0.01 - 0.016	2.1E-01	ND	6.1E+03 nc	NA	NA	NO	BSL
	75-15-0	Carbon disulfide	3.3E-02	3.3E-02	MG_KG	SJS02-SB07-001	1/33	0.01 - 0.016	3.3E-02	ND	6.7E+01 nc	NA	NA	NO	BSL
	75-09-2	Methylene chloride	1.6E-03 J	2.8E-03 J	MG_KG	SJS17-SS02-000	2/33	0.01 - 0.016	2.8E-03	ND	1.1E+01 ca	NA	NA	NO	BSL
	108-88-3	Toluene	1.0E-03 J	2.0E-03 J	MG_KG	SJS02-SS08-000	2/33	0.01 - 0.016	2.0E-03	ND	5.0E+02 nc	NA	NA	NO	BSL
	79-01-6	Trichloroethene	1.2E-02	1.2E-02 UJ	MG_KG	SJS02-SB06-001, SJS02-SB07-001	1/33	0.01 - 0.016	1.2E-02	ND	2.8E+00 ca	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	3.5E-02 J	3.1E-01 J	MG_KG	SJS02-SS03-000	4/33	0.33 - 1.7	3.1E-01	ND	3.1E+01 nc	NA	NA	NO	BSL
	83-32-9	Acenaphthene	6.3E-02 J	3.7E-01	MG_KG	SJS17-SS04-000	6/33	0.08 - 1.7	3.7E-01	8.1E-02	3.4E+02 nc	NA	NA	NO	BSL
	208-96-8	Acenaphthylene	3.7E-02 J	8.2E-01 J	MG_KG	SJS02-SS03-000	13/33	0.08 - 1.7	8.2E-01	8.1E-02	1.5E+01 nc	NA	NA	NO	BSL
	120-12-7	Anthracene	4.3E-02 J	7.9E-01	MG_KG	SJS17-SS04-000	12/33	0.08 - 1.7	7.9E-01	8.1E-02	1.7E+03 nc	NA	NA	NO	BSL
	56-55-3	Benzo(a)anthracene	1.2E-01 J	2.3E+00	MG_KG	SJS02-SS03-000	20/33	0.08 - 1.7	2.3E+00	6.9E-03	1.5E-01 ca	NA	NA	YES	ASL
	50-32-8	Benzo(a)pyrene	4.8E-02 J	2.1E+00	MG_KG	SJS17-SS04-000	21/33	0.08 - 1.7	2.1E+00	9.1E-02	1.5E-02 ca	NA	NA	YES	ASL
	205-99-2	Benzo(b)fluoranthene	4.8E-02 J	2.0E+00	MG_KG	SJS17-SS03-000	23/33	0.08 - 1.7	2.0E+00	9.1E-02	1.5E-01 ca	NA	NA	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	7.6E-02 J	1.6E+00	MG_KG	SJS17-SS03-000	19/33	0.08 - 1.7	1.6E+00	9.1E-02	1.7E+02 nc	NA	NA	NO	BSL
	207-08-9	Benzo(k)fluoranthene	6.2E-02 J	1.6E+00	MG_KG	SJS17-SS03-000	20/33	0.08 - 1.7	1.6E+00	9.1E-02	1.5E+00 nc	NA	NA	YES	ASL
	85-68-7	Butylbenzylphthalate	3.3E-02 J	4.3E-01 J	MG_KG	SJS17-SS03-000	5/33	0.33 - 1.7	4.3E-01	ND	1.2E+03 nc	NA	NA	NO	BSL
	86-74-8	Carbazole	6.3E-02 J	3.5E-01 J	MG_KG	SJS17-SS04-000, SJS02-SS11-000	6/33	0.33 - 1.7	3.5E-01	ND	2.4E+01 ca	NA	NA	NO	BSL
	218-01-9	Chrysene	6.5E-02 J	2.7E+00	MG_KG	SJS02-SS03-000	21/33	0.08 - 1.7	2.7E+00	1.0E-01	1.5E+01 ca	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	4.1E-02 J	5.1E-01 J	MG_KG	SJS02-SS20-000	7/33	0.33 - 1.7	5.1E-01	ND	6.1E+02 nc	NA	NA	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	5.4E-02 J	4.4E-01	MG_KG	SJS17-SS04-000	7/33	0.08 - 1.7	4.4E-01	8.1E-02	1.5E-02 ca	NA	NA	YES	ASL
	132-64-9	Dibenzofuran	2.5E-02 J	2.2E-01 J	MG_KG	SJS17-SS04-000	5/33	0.33 - 1.7	2.2E-01	ND	NA	NA	NA	NO	NTX
	206-44-0	Fluoranthene	4.5E-02 J	5.0E+00	MG_KG	SJS02-SS03-000	23/33	0.08 - 1.7	5.0E+00	1.0E-01	2.3E+02 nc	NA	NA	NO	BSL
	86-73-7	Fluorene	4.8E-02 J	3.8E-01 UJ	MG_KG	SJS02-SS03-000, SJS02-SB10-001	6/33	0.08 - 1.7	3.8E-01	8.1E-02	2.3E+02 nc	NA	NA	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	8.6E-02 J	1.5E+00	MG_KG	SJS17-SS03-000	20/33	0.08 - 1.7	1.5E+00	9.1E-02	1.5E-01 ca	NA	NA	YES	ASL
	91-20-3	Naphthalene	1.4E-02 J	2.5E-01	MG_KG	SJS17-SS04-000	5/33	0.08 - 1.7	2.5E-01	8.1E-02	3.9E+00 ca	NA	NA	NO	BSL
	85-01-8	Phenanthrene	3.8E-02 J	4.4E+00	MG_KG	SJS02-SS03-000	20/33	0.08 - 1.7	4.4E+00	9.1E-02	1.7E+02 nc	NA	NA	NO	BSL
	129-00-0	Pyrene	4.8E-02 J	7.2E+00	MG_KG	SJS02-SS03-000	23/33	0.08 - 1.7	7.2E+00	1.3E-01	1.7E+02 nc	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	3.5E-02	1.7E+00 J	MG_KG	SJS17-SS03-000	10/33	0.33 - 1.7	1.7E+00	ND	3.5E+01 ca	NA	NA	NO	BSL
	72-54-8	4,4'-DDD	1.0E-03 J	4.2E+00	MG_KG	SJS02-SS09-000	26/33	0.0033 - 1.9	4.2E+00	4.0E-03	2.0E+00 ca	NA	NA	YES	ASL
	72-55-9	4,4'-DDE	4.4E-04 J	7.2E+00 J	MG_KG	SJS02-SS20-000	32/33	0.0033 - 2	7.2E+00	1.8E-02	1.4E+00 ca	NA	NA	YES	ASL
	50-29-3	4,4'-DDT	6.9E-04 J	2.9E+02 J	MG_KG	SJS02-SB08-001	32/32	0.0033 - 38	2.9E+02	7.8E-03	1.7E+00 ca	NA	NA	YES	ASL
	11096-82-5	Aroclor-1260	1.5E-02 J	2.7E+00 J	MG_KG	SJS17-SS03-000	9/33	0.033 - 0.35	2.7E+00	ND	2.2E-01 ca	NA	NA	YES	ASL
	60-57-1	Dieldrin	7.9E-04 J	3.8E-03 J	MG_KG	SJS02-SS02-000	4/33	0.0033 - 0.035	3.8E-03	4.0E-03	3.0E-02 ca	NA	NA	NO	BSL
	33213-65-9	Endosulfan II	7.9E-03 J	5.3E-02 J	MG_KG	SJS17-SS03-000	3/33	0.0033 - 0.035	5.3E-02	5.0E-03	3.7E+01 nc	NA	NA	NO	BSL
	72-20-8	Endrin	2.4E-02 J	2.4E-02 J	MG_KG	SJS17-SS03-000	1/33	0.0033 - 0.035	2.4E-02	5.1E-03	1.8E+00 nc	NA	NA	NO	BSL
	7421-93-4	Endrin aldehyde	2.2E-03 J	7.3E-02 J	MG_KG	SJS17-SS03-000	3/33	0.0033 - 0.035	7.3E-02	4.2E-03	1.8E+00 nc	NA	NA	NO	BSL
	76-44-8	Heptachlor	2.2E-03 J	2.2E-03 J	MG_KG	SJS02-SS12-000	1/33	0.0017 - 0.018	2.2E-03	ND	1.1E-01 ca	NA	NA	NO	BSL
	5103-71-9	alpha-Chlordane	8.1E-04 J	5.0E-02 J	MG_KG	SJS02-SS12-000	8/33	0.0017 - 0.2	5.0E-02	2.8E-03	1.6E+00 ca	NA	NA	NO	BSL

TABLE 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	5103-74-2	gamma-Chlordane	2.0E-03 UJ	3.8E-02 J	MG_KG	SJS02-SB08-001	7/33	0.0017 - 0.94	3.8E-02	2.0E-03	1.6E+00 ca	NA	NA	NO	BSL
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxi	8.0E-06 J	1.2E-04 J	MG_KG	SJS02-SB15-001	5/5	0.00000011 - 0.000000869	1.2E-04	NA	3.9E-04 ca	NA	NA	NO	BSL
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.0E-07 NJ	4.4E-05 J	MG_KG	SJS02-SB15-001	4/5	0.000000044 - 0.000000407	4.4E-05	NA	3.2E-04 ca	NA	NA	NO	BSL
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.2E-06 J	3.2E-06 J	MG_KG	SJS02-SB15-001	1/5	0.000000064 - 0.000000599	3.2E-06	NA	3.2E-04 ca	NA	NA	NO	BSL
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	4.0E-07 NJ	2.0E-06 J	MG_KG	SJS02-SB15-001	3/5	0.000000086 - 0.000000287	2.0E-06	NA	3.9E-05 ca	NA	NA	NO	BSL
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1.1E-06 J	8.7E-06 J	MG_KG	SJS02-SB15-001	3/5	0.000000053 - 0.000001651	8.7E-06	NA	3.2E-05 ca	NA	NA	NO	BSL
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	5.6E-07 J	4.5E-06 J	MG_KG	SJS02-SB15-001	4/5	0.000000075 - 0.00000025	4.5E-06	NA	3.9E-05 ca	NA	NA	NO	BSL
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.6E-06 I	3.9E-06 NJ	MG_KG	SJS02-SB15-001	2/5	0.000000051 - 0.000001585	3.9E-06	NA	3.2E-05 ca	NA	NA	NO	BSL
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	6.2E-07 J	5.3E-06 J	MG_KG	SJS02-SB15-001	5/5	0.000000076 - 0.000000255	5.3E-06	NA	3.9E-05 ca	NA	NA	NO	BSL
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.5E-06 J	1.5E-06 J	MG_KG	SJS02-SB15-001	1/5	0.000000094 - 0.000000236	1.5E-06	NA	3.9E-06 ca	NA	NA	NO	BSL
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	4.4E-06 J	4.4E-06 J	MG_KG	SJS02-SB15-001	1/5	0.000000071 - 0.000000528	4.4E-06	NA	1.1E-04 ca	NA	NA	NO	BSL
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	5.1E-07 J	3.7E-06 J	MG_KG	SJS02-SB15-001	2/5	0.000000057 - 0.000001769	3.7E-06	NA	3.2E-05 ca	NA	NA	NO	BSL
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	4.8E-07 J	4.4E-06 J	MG_KG	SJS02-SB15-001	3/5	0.000000068 - 0.000000507	4.4E-06	NA	1.1E-05 ca	NA	NA	NO	BSL
	1746-01-6	2,3,7,8-TCDD (dioxin)	3.3E-07 NJ	3.3E-07 NJ	MG_KG	SJS02-SB15-001	1/5	0.00000008 - 0.000000158	3.3E-07	NA	4.5E-06 ca	NA	NA	NO	BSL
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	7.8E-07 NJ	6.4E-06 J	MG_KG	SJS02-SB15-001	3/5	0.000000086 - 0.00000034	6.4E-06	NA	3.2E-05 ca	NA	NA	NO	BSL
	3268-87-9	Octachlorodibenzo-p-dioxin	2.2E-04 J	1.5E-03 J	MG_KG	SJS02-SB19-001	5/5	0.000000079 - 0.000000542	1.5E-03	NA	1.3E-02 ca	NA	NA	NO	BSL
	39001-02-0	Octachlorodibenzofuran	6.8E-07 J	7.9E-05 J	MG_KG	SJS02-SB15-001	4/5	0.000000076 - 0.00000032	7.9E-05	NA	1.1E-02 ca	NA	NA	NO	BSL
	37871-00-4	Total heptachlorodibenzo-p-dioxin	2.1E-05 J	2.8E-04 J	MG_KG	SJS02-SB15-001	5/5	0.00000011 - 0.000000869	2.8E-04	NA	NA	NA	NA	NO	NTX
	38998-75-3	Total heptachlorodibenzofuran	4.3E-07	4.7E-05 J	MG_KG	SJS02-SB15-001	4/5	0.000000044 - 0.000000407	4.7E-05	NA	NA	NA	NA	NO	NTX
	34465-46-8	Total hexachlorodibenzo-p-dioxin	4.8E-06 J	3.9E-05 J	MG_KG	SJS02-SB15-001	5/5	0.000000075 - 0.00000025	3.9E-05	NA	NA	NA	NA	NO	NTX
	55684-94-1	Total hexachlorodibenzofuran	2.8E-06 J	7.4E-05 J	MG_KG	SJS02-SB15-001	3/5	0.000000051 - 0.000001585	7.4E-05	NA	NA	NA	NA	NO	NTX
	36088-22-9	Total pentachlorodibenzo-p-dioxin	5.4E-07 J	3.2E-06 J	MG_KG	SJS02-SB15-001	2/5	0.000000094 - 0.000000236	3.2E-06	NA	NA	NA	NA	NO	NTX
	30402-15-4	Total pentachlorodibenzofuran	2.7E-06 J	2.9E-05 J	MG_KG	SJS02-SB15-001	3/5	0.000000068 - 0.000000507	2.9E-05	NA	NA	NA	NA	NO	NTX
	41903-57-5	Total tetrachlorodibenzo-p-dioxin	3.0E-07 J	3.3E-06 J	MG_KG	SJS02-SB15-001	2/5	0.00000008 - 0.000000158	3.3E-06	NA	NA	NA	NA	NO	NTX
	55722-27-5	Total tetrachlorodibenzofuran	1.9E-06 J	3.1E-05 J	MG_KG	SJS02-SB15-001	3/5	0.000000086 - 0.00000034	3.1E-05	NA	NA	NA	NA	NO	NTX
	7429-90-5	Aluminum	2.0E+03	2.2E+04	MG_KG	SJS02-SB07-001	36/36	3.5 - 15.54	2.2E+04	7.7E+03	7.8E+03 nc	NA	NA	YES	ASL
	7440-36-0	Antimony	5.3E-01 J	7.8E+01	MG_KG	SJS02-SB12-001	14/32	0.33 - 2.95	7.8E+01	6.0E-01	3.1E+00 nc	NA	NA	YES	ASL
	7440-38-2	Arsenic	1.2E+00 K	4.2E+01	MG_KG	SJS02-SB12-001	35/36	0.33 - 2.06	4.2E+01	5.7E+00	3.9E-01 ca	NA	NA	YES	ASL
	7440-39-3	Barium	8.4E+00 J	4.7E+02	MG_KG	SJS02-SS20-000	36/36	0.03 - 0.68	4.7E+02	6.1E+01	1.5E+03 nc	NA	NA	NO	BSL
	7440-41-7	Beryllium	1.0E-01 J	1.3E+01	MG_KG	SJS02-SS06-000	26/36	0.02 - 0.25	1.3E+01	2.8E-01	1.6E+01 nc	NA	NA	NO	BSL
	7440-43-9	Cadmium	1.0E-01 J	1.1E+01	MG_KG	SJS02-SB12-001	25/36	0.05 - 1.02	1.1E+01	ND	7.0E+00 nc	NA	NA	YES	ASL
	7440-70-2	Calcium	2.7E+02 J	1.6E+04	MG_KG	SJS02-SB12-001	35/36	0.72 - 21.84	1.6E+04	1.2E+03	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	2.5E+00	3.4E+02	MG_KG	SJS02-SB13-001	36/36	0.13 - 1.76	3.4E+02	7.0E+00	2.3E+01 nc	NA	NA	YES	ASL
	7440-48-4	Cobalt	5.0E-01 J	9.5E+01	MG_KG	SJS02-SB13-001	29/36	0.08 - 2.01	9.5E+01	2.2E+00	1.6E+02 nc	NA	NA	NO	BSL
	7440-50-8	Copper	2.5E+00 J	5.0E+03 J	MG_KG	SJS17-SS04-000	36/36	0.18 - 1.51	5.0E+03	5.1E+00	3.1E+02 nc	NA	NA	YES	ASL
	57-12-5	Cyanide	2.0E-01	8.5E-01 J	MG_KG	SJS02-SS03-000	4/29	0.18 - 0.68	8.5E-01	ND	1.6E+02 nc	NA	NA	NO	BSL
	7439-89-6	Iron	1.9E+03	2.1E+05	MG_KG	SJS02-SB12-001	36/36	0.24 - 6.8	2.1E+05	3.7E+03	5.5E+03 nc	NA	NA	YES	ASL
	7439-92-1	Lead	3.1E+00	8.9E+03	MG_KG	SJS02-SB12-001	36/36	0.17 - 2.3	8.9E+03	1.2E+01	4.0E+02	NA	NA	YES	ASL
	7439-95-4	Magnesium	1.3E+02 J	1.2E+04	MG_KG	SJS02-SB12-001	35/36	3.41 - 45.43	1.2E+04	5.3E+02	NA	NA	NA	NO	NUT

TABLE 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7439-96-5	Manganese	5.9E+00	1.3E+03	MG_KG	SJS02-SB12-001	36/36	0.04 - 0.5	1.3E+03	1.4E+01	1.8E+02 nc	NA	NA	YES	ASL
	7439-97-6	Mercury	3.0E-02 J	6.3E+00	MG_KG	SJS02-SB13-001	34/36	0.01 - 0.17	6.3E+00	1.0E-01	2.3E+00 nc	NA	NA	YES	ASL
	7440-02-0	Nickel	8.9E-01 J	2.5E+02	MG_KG	SJS02-SS06-000	35/36	0.15 - 3	2.5E+02	6.9E+00	1.6E+02 nc	NA	NA	YES	ASL
	7440-09-7	Potassium	1.5E+02 J	2.3E+03	MG_KG	SJS02-SB15-001	36/36	2.2 - 162	2.3E+03	3.7E+02	NA	NA	NA	NO	NUT
	7782-49-2	Selenium	5.3E-01 J	1.7E+00 L	MG_KG	SJS17-SS04-000	11/36	0.34 - 1.7	1.7E+00	7.0E-01	3.9E+01 nc	NA	NA	NO	BSL
	7440-22-4	Silver	2.0E-01 J	3.5E+00	MG_KG	SJS02-SS16-000P	5/36	0.15 - 1.7	3.5E+00	5.2E-01	3.9E+01 nc	NA	NA	NO	BSL
	7440-23-5	Sodium	5.0E+00 J	1.8E+03	MG_KG	SJS02-SB12-001	19/36	3 - 166.73	1.8E+03	1.7E+02	NA	NA	NA	NO	NUT
	7440-28-0	Thallium	7.6E-01 J	6.2E+00	MG_KG	SJS02-SS03-000	5/36	0.33 - 1.9	6.2E+00	ND	7.0E-01 nc	NA	NA	YES	ASL
	7440-62-2	Vanadium	3.8E+00 J	1.4E+03	MG_KG	SJS17-SS04-000	36/36	0.1 - 2.26	1.4E+03	2.7E+01	3.9E+01 nc	NA	NA	YES	ASL
	7440-66-6	Zinc	4.2E+00 J	9.1E+03	MG_KG	SJS02-SB13-001	35/36	0.23 - 2.89	9.1E+03	1.3E+01	2.3E+03 nc	NA	NA	YES	ASL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background data is lower of UCL for Bohicket or Munden-Tetotum background soil type from *Final Background Investigation Report, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, October 2001).

[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. Adjusted Residential Soil RSL.
RSLs based on non-carcinogenic effects (N) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL value for hexavalent chromium used for total chromium.
Cobalt is not included in RSL Table. Value is from the April 2005 EPA Region III RBC table.
RSL value for endosulfan used as surrogate for endosulfan II.
RSL value for endrin used as surrogate for endrin aldehyde.
RSL value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic

TABLE 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Emissions from Soil at Site 2	78-93-3	2-Butanone	5.6E-04		7.9E-03		ug/m^3	SJS02-SS11-000	3/32	(see Table 2.1 for soil detection limits)	7.9E-03	NA	5.2E+02 nc	NA	NA	NO	BSL
	67-64-1	Acetone	3.7E-04	J	1.3E-02		ug/m3	SJS02-SB04-004	5/32		1.3E-02	NA	3.2E+03 nc	NA	NA	NO	BSL
	75-15-0	Carbon disulfide	2.5E-02		2.5E-02		ug/m3	SJS02-SB07-001	1/32		2.5E-02	NA	7.3E+01 nc	NA	NA	NO	BSL
	75-09-2	Methylene chloride	5.0E-04	J	8.8E-04	J	ug/m3	SJS17-SS02-000	2/32		8.8E-04	NA	5.2E+00 ca	NA	NA	NO	BSL
	108-88-3	Toluene	1.9E-04	J	3.9E-04	J	ug/m3	SJS02-SS08-000	2/32		3.9E-04	NA	5.2E+02 nc	NA	NA	NO	BSL
	79-01-6	Trichloroethene	3.9E-03		3.9E-03	UJ	ug/m3	SJS02-SB06-001 SJS02-SB07-001	1/32		3.9E-03	NA	1.2E+00 ca	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	4.7E-04	J	4.1E-03	J	ug/m3	SJS02-SS03-000	4/32		4.1E-03	NA	NA	NA	NA	NO	NTX
	83-32-9	Acenaphthene	2.2E-04	J	1.3E-03		ug/m3	SJS17-SS04-000	6/32		1.3E-03	NA	NA	NA	NA	NO	NTX
	208-96-8	Acenaphthylene	1.3E-04	J	2.9E-03	J	ug/m3	SJS02-SS03-000	13/32		2.9E-03	NA	7.2E-02 ca	NA	NA	NO	BSL
	120-12-7	Anthracene	4.2E-05	J	7.8E-04		ug/m3	SJS17-SS04-000	12/32		7.8E-04	NA	NA	NA	NA	NO	NTX
	56-55-3	Benzo(a)anthracene	9.1E-08	J	1.7E-06		ug/m3	SJS02-SS03-000	20/32		1.7E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	50-32-8	Benzo(a)pyrene	3.6E-08	J	1.6E-06		ug/m3	SJS17-SS04-000	21/32		1.6E-06	NA	8.7E-04 ca	NA	NA	NO	BSL
	205-99-2	Benzo(b)fluoranthene	3.6E-08	J	1.5E-06		ug/m3	SJS17-SS03-000	23/32		1.5E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	5.8E-08	J	1.2E-06		ug/m3	SJS17-SS03-000	19/32		1.2E-06	NA	NA	NA	NA	NO	NTX
	207-08-9	Benzo(k)fluoranthene	4.7E-08	J	1.2E-06		ug/m3	SJS17-SS03-000	20/32		1.2E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	85-68-7	Butylbenzylphthalate	2.5E-08	J	3.3E-07	J	ug/m3	SJS17-SS03-000	5/32		3.3E-07	NA	NA	NA	NA	NO	NTX
	86-74-8	Carbazole	4.8E-08	J	2.7E-07	J	ug/m3	SJS17-SS04-000, SJS02-SS11-000	6/32		2.7E-07	NA	NA	NA	NA	NO	NTX
	218-01-9	Chrysene	4.9E-08	J	2.0E-06		ug/m3	SJS02-SS03-000	21/32		2.0E-06	NA	8.7E-02 ca	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	3.1E-08	J	3.9E-07	J	ug/m3	SJS02-SS20-000	7/32		3.9E-07	NA	NA	NA	NA	NO	NTX
	53-70-3	Dibenz(a,h)anthracene	4.1E-08	J	3.3E-07		ug/m3	SJS17-SS04-000	7/32		3.3E-07	NA	8.0E-04 ca	NA	NA	NO	BSL
	132-64-9	Dibenzofuran	9.6E-05	J	8.5E-04	J	ug/m3	SJS17-SS04-000	5/32		8.5E-04	NA	NA	NA	NA	NO	NTX
	206-44-0	Fluoranthene	3.4E-08	J	3.8E-06		ug/m3	SJS02-SS03-000	23/32		3.8E-06	NA	NA	NA	NA	NO	NTX
	86-73-7	Fluorene	7.2E-05	J	5.7E-04	UJ	ug/m3	SJS02-SS03-000, SJS02-SB10-001	6/32		5.7E-04	NA	NA	NA	NA	NO	NTX
	193-39-5	Indeno(1,2,3-cd)pyrene	6.5E-08	J	1.1E-06		ug/m3	SJS17-SS03-000	20/32		1.1E-06	NA	8.7E-03 ca	NA	NA	NO	BSL
	91-20-3	Naphthalene	1.9E-04	J	3.5E-03		ug/m3	SJS17-SS04-000	5/32		3.5E-03	NA	7.2E-02 ca	NA	NA	NO	BSL
	85-01-8	Phenanthrene	2.9E-08	J	3.3E-06		ug/m3	SJS02-SS03-000	20/32		3.3E-06	NA	NA	NA	NA	NO	NTX
	129-00-0	Pyrene	9.8E-06	J	1.5E-03		ug/m3	SJS02-SS03-000	23/32		1.5E-03	NA	NA	NA	NA	NO	NTX
	117-81-7	bis(2-Ethylhexyl)phthalate	1.5E-07		7.3E-06	J	ug/m3	SJS17-SS03-000	10/32		7.3E-06	NA	NA	NA	NA	NO	NTX
	72-54-8	4,4'-DDD	7.6E-10	J	3.2E-06		ug/m3	SJS02-SS09-000	26/32		3.2E-06	NA	NA	NA	NA	NO	NTX
	72-55-9	4,4'-DDE	3.3E-10	J	5.5E-06	J	ug/m3	SJS02-SS20-000	31/32		5.5E-06	NA	NA	NA	NA	NO	NTX
	50-29-3	4,4'-DDT	5.2E-10	J	2.2E-04	J	ug/m3	SJS02-SB08-001	31/31		2.2E-04	NA	2.5E-02 ca	NA	NA	NO	BSL
	11096-82-5	Aroclor-1260	1.1E-08	J	2.0E-06	J	ug/m3	SJS17-SS03-000	9/32		2.0E-06	NA	4.3E-03 ca	NA	NA	NO	BSL
	60-57-1	Dieldrin	6.0E-10	J	2.9E-09	J	ug/m3	SJS02-SS02-000	4/32		2.9E-09	NA	5.3E-04 ca	NA	NA	NO	BSL
	33213-65-9	Endosulfan II	6.0E-09	J	4.0E-08	J	ug/m3	SJS17-SS03-000	3/32		4.0E-08	NA	NA	NA	NA	NO	NTX
	72-20-8	Endrin	1.8E-08	J	1.8E-08	J	ug/m3	SJS17-SS03-000	1/32		1.8E-08	NA	NA	NA	NA	NO	NTX
	7421-93-4	Endrin aldehyde	1.7E-09	J	5.5E-08	J	ug/m3	SJS17-SS03-000	3/32		5.5E-08	NA	NA	NA	NA	NO	NTX
	76-44-8	Heptachlor	1.7E-09	J	1.7E-09	J	ug/m3	SJS02-SS12-000	1/32		1.7E-09	NA	1.9E-03 ca	NA	NA	NO	BSL
	5103-71-9	alpha-Chlordane	6.1E-10	J	3.8E-08	J	ug/m3	SJS02-SS12-000	8/32		3.8E-08	NA	2.4E-02 ca	NA	NA	NO	BSL
	5103-74-2	gamma-Chlordane	1.5E-09	UJ	2.9E-08	J	ug/m3	SJS02-SB08-001	7/32		2.9E-08	NA	2.4E-02 ca	NA	NA	NO	BSL

TABLE 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	6.0E-12 J	8.9E-11 J	ug/m3	SJS02-SB15-001	5/5		8.9E-11	NA	7.4E-06 ca	NA	NA	NO	BSL
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.3E-13 NJ	3.3E-11 J	ug/m3	SJS02-SB15-001	4/5		3.3E-11	NA	7.4E-06 ca	NA	NA	NO	BSL
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.4E-12 J	2.4E-12 J	ug/m3	SJS02-SB15-001	1/5		2.4E-12	NA	7.4E-06 ca	NA	NA	NO	BSL
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	3.0E-13 NJ	1.5E-12 J	ug/m3	SJS02-SB15-001	3/5		1.5E-12	NA	7.4E-07 ca	NA	NA	NO	BSL
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	8.4E-13 J	6.6E-12 J	ug/m3	SJS02-SB15-001	3/5		6.6E-12	NA	7.4E-07 ca	NA	NA	NO	BSL
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	4.2E-13 J	3.4E-12 J	ug/m3	SJS02-SB15-001	4/5		3.4E-12	NA	7.4E-07 ca	NA	NA	NO	BSL
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.2E-12 I	2.9E-12 NJ	ug/m3	SJS02-SB15-001	2/5		2.9E-12	NA	7.4E-07 ca	NA	NA	NO	BSL
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	4.7E-13 J	4.0E-12 J	ug/m3	SJS02-SB15-001	5/5		4.0E-12	NA	7.4E-07 ca	NA	NA	NO	BSL
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.1E-12 J	1.1E-12 J	ug/m3	SJS02-SB15-001	1/5		1.1E-12	NA	7.4E-08 ca	NA	NA	NO	BSL
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	3.3E-12 J	3.3E-12 J	ug/m3	SJS02-SB15-001	1/5		3.3E-12	NA	2.5E-06 ca	NA	NA	NO	BSL
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	3.8E-13 J	2.8E-12 J	ug/m3	SJS02-SB15-001	2/5		2.8E-12	NA	7.4E-07 ca	NA	NA	NO	BSL
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	3.6E-13 J	3.3E-12 J	ug/m3	SJS02-SB15-001	3/5		3.3E-12	NA	2.5E-07 ca	NA	NA	NO	BSL
	1746-01-6	2,3,7,8-TCDD (dioxin)	2.5E-13 NJ	2.5E-13 NJ	ug/m3	SJS02-SB15-001	1/5		2.5E-13	NA	6.4E-08 ca	NA	NA	NO	BSL
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	5.9E-13 NJ	4.8E-12 J	ug/m3	SJS02-SB15-001	3/5		4.8E-12	NA	7.4E-07 ca	NA	NA	NO	BSL
	3268-87-9	Octachlorodibenzo-p-dioxin	1.7E-10 J	1.1E-09 J	ug/m3	SJS02-SB19-001	5/5		1.1E-09	NA	2.5E-04 ca	NA	NA	NO	BSL
	39001-02-0	Octachlorodibenzofuran	5.2E-13 J	6.0E-11 J	ug/m3	SJS02-SB15-001	4/5		6.0E-11	NA	2.5E-04 ca	NA	NA	NO	BSL
	37871-00-4	Total heptachlorodibenzo-p-dioxin	1.6E-11 J	2.1E-10 J	ug/m3	SJS02-SB15-001	5/5		2.1E-10	NA	NA	NA	NA	NO	NTX
	38998-75-3	Total heptachlorodibenzofuran	3.3E-13	3.5E-11 J	ug/m3	SJS02-SB15-001	4/5		3.5E-11	NA	NA	NA	NA	NO	NTX
	34465-46-8	Total hexachlorodibenzo-p-dioxin	3.6E-12 J	3.0E-11 J	ug/m3	SJS02-SB15-001	5/5		3.0E-11	NA	NA	NA	NA	NO	NTX
	55684-94-1	Total hexachlorodibenzofuran	2.1E-12 J	5.6E-11 J	ug/m3	SJS02-SB15-001	3/5		5.6E-11	NA	NA	NA	NA	NO	NTX
	36088-22-9	Total pentachlorodibenzo-p-dioxin	4.1E-13 J	2.4E-12 J	ug/m3	SJS02-SB15-001	2/5		2.4E-12	NA	NA	NA	NA	NO	NTX
	30402-15-4	Total pentachlorodibenzofuran	2.1E-12 J	2.2E-11 J	ug/m3	SJS02-SB15-001	3/5		2.2E-11	NA	NA	NA	NA	NO	NTX
	41903-57-5	Total tetrachlorodibenzo-p-dioxin	2.3E-13 J	2.5E-12 J	ug/m3	SJS02-SB15-001	2/5		2.5E-12	NA	NA	NA	NA	NO	NTX
	55722-27-5	Total tetrachlorodibenzofuran	1.5E-12 J	2.3E-11 J	ug/m3	SJS02-SB15-001	3/5		2.3E-11	NA	NA	NA	NA	NO	NTX
	7429-90-5	Aluminum	1.5E-03	1.6E-02	ug/m3	SJS02-SB07-001	35/35		1.6E-02	NA	5.2E-01 nc	NA	NA	NO	BSL
	7440-36-0	Antimony	4.0E-07 J	5.9E-05	ug/m3	SJS02-SB12-001	14/31		5.9E-05	NA	2.1E-02 nc	NA	NA	NO	BSL
	7440-38-2	Arsenic	9.1E-07 K	3.2E-05	ug/m3	SJS02-SB12-001	34/35		3.2E-05	NA	5.7E-04 ca	NA	NA	NO	BSL
	7440-39-3	Barium	6.4E-06 J	3.6E-04	ug/m3	SJS02-SS20-000	35/35		3.6E-04	NA	5.2E-01 nc	NA	NA	NO	BSL
	7440-41-7	Beryllium	7.6E-08 J	1.0E-05	ug/m3	SJS02-SS06-000	25/35		1.0E-05	NA	2.1E-02 nc	NA	NA	NO	BSL
	7440-43-9	Cadmium	7.6E-08 J	8.5E-06	ug/m3	SJS02-SB12-001	24/35		8.5E-06	NA	5.7E-04 ca	NA	NA	NO	BSL
	7440-70-2	Calcium	2.0E-04 J	1.2E-02	ug/m3	SJS02-SB12-001	34/35		1.2E-02	NA	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	1.9E-06	2.5E-04	ug/m3	SJS02-SB13-001	35/35		2.5E-04	NA	2.0E-04 ca	NA	NA	YES	ASL
	7440-48-4	Cobalt	3.8E-07 J	7.2E-05	ug/m3	SJS02-SB13-001	28/35		7.2E-05	NA	6.4E-04 ca	NA	NA	NO	BSL
	7440-50-8	Copper	1.9E-06 J	3.8E-03 J	ug/m3	SJS17-SS04-000	35/35		3.8E-03	NA	NA	NA	NA	NO	NTX
	57-12-5	Cyanide	1.5E-07	6.4E-07 J	ug/m3	SJS02-SS03-000	4/28		6.4E-07	NA	3.1E-01 nc	NA	NA	NO	BSL
	7439-89-6	Iron	1.4E-03	1.6E-01	ug/m3	SJS02-SB12-001	35/35		1.6E-01	NA	NA	NA	NA	NO	NTX
	7439-92-1	Lead	2.3E-06	6.7E-03	ug/m3	SJS02-SB12-001	35/35		6.7E-03	NA	NA	NA	NA	NO	NTX
	7439-95-4	Magnesium	9.5E-05 J	9.3E-03	ug/m3	SJS02-SB12-001	34/35		9.3E-03	NA	NA	NA	NA	NO	NUT
	7439-96-5	Manganese	4.5E-06	9.5E-04	ug/m3	SJS02-SB12-001	35/35		9.5E-04	NA	5.2E-03 nc	NA	NA	NO	BSL

TABLE 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7439-97-6	Mercury	2.3E-08 J	4.8E-06	ug/m3	SJS02-SB13-001	33/35		4.8E-06	NA	3.1E-02 nc	NA	NA	NO	BSL
	7440-02-0	Nickel	6.7E-07 J	1.9E-04	ug/m3	SJS02-SS06-000	34/35		1.9E-04	NA	1.0E-02 ca	NA	NA	NO	BSL
	7440-09-7	Potassium	1.1E-04 J	1.7E-03	ug/m3	SJS02-SB15-001	35/35		1.7E-03	NA	NA	NA	NA	NO	NUT
	7782-49-2	Selenium	4.0E-07 J	1.3E-06 L	ug/m3	SJS17-SS04-000	11/35		1.3E-06	NA	NA	NA	NA	NO	NTX
	7440-22-4	Silver	1.5E-07 J	2.7E-06	ug/m3	SJS02-SS16-000P	5/35		2.7E-06	NA	NA	NA	NA	NO	NTX
	7440-23-5	Sodium	3.8E-06 J	1.3E-03	ug/m3	SJS02-SB12-001	18/35		1.3E-03	NA	NA	NA	NA	NO	NUT
	7440-28-0	Thallium	5.8E-07 J	4.7E-06	ug/m3	SJS02-SS03-000	5/35		4.7E-06	NA	NA	NA	NA	NO	NTX
	7440-62-2	Vanadium	2.9E-06 J	1.1E-03	ug/m3	SJS17-SS04-000	35/35		1.1E-03	NA	NA	NA	NA	NO	NTX
	7440-66-6	Zinc	3.2E-06 J	6.9E-03	ug/m3	SJS02-SB13-001	34/35		6.9E-03	NA	NA	NA	NA	NO	NTX

* Surface soil & subsurface soil combined

[1] Minimum/Maximum calculated air concentrations from surface soil concentrations. Air concentrations calculated as Cair = Csoil*1000*(1/PEF + 1/VF).
VF included in equation only for volatile chemicals. VF calculated on Table 2.6A. PEF = 1.32E9 m3/kg.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. Adjusted Residential Air RSL.
RSLs based on non-carcinogenic effects (N) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL value for hexavalent chromium used for total chromium.
Cobalt is not included in RSL Table. Value is from the April 2005 EPA Region III RBC table.
RSL value for endosulfan used as surrogate for endosulfan II.
RSL value for endrin used as surrogate for endrin aldehyde.
RSL value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic

TABLE 2.6A

CALCULATION OF VOLATILIZATION FACTOR - SURFACE SOIL

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)	Soil Sa Conce (((m
Volatile Organics									
2-Butanone	8.95E-02	1.12E-03	9.80E-06	4.50E+00	2.70E-02	2.68E+05	4.26E-05	2.52E+04	3.4
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	1.02E-04	1.63E+04	1.0
Carbon disulfide	1.04E-01	5.89E-01	1.00E-05	1.00E+00	6.00E-03	1.18E+03	1.50E-02	1.34E+03	2.5
Methylene chloride	1.01E-01	1.33E-01	1.17E-05	2.37E+01	1.42E-01	1.30E+04	2.67E-03	3.18E+03	3.4
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E+00	5.26E+02	1.01E-03	5.16E+03	6.5
Trichloroethene	7.90E-02	4.03E-01	9.10E-06	6.77E+01	4.06E-01	1.28E+03	2.91E-03	3.04E+03	7.4
Semivolatile Organics									
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	4.80E-06	7.50E+04	3.2
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	3.36E-07	2.83E+05	1.8
Acenaphthylene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	3.36E-07	2.83E+05	1.8
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	2.63E-08	1.01E+06	7.6
Dibenzofuran	6.19E-02	3.98E-03	1.00E-05	5.48E+03	3.29E+01	5.65E+00	4.00E-07	2.60E+05	1.8
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	6.15E-08	6.63E+05	1.6
Napthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	5.15E-06	7.24E+04	3.7
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	1.11E-09	4.93E+06	8.5
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	3.43E-13	2.81E+08	3.0

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (C_{sat}) =

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source located in Philadelphia, PA (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.
Physical/chemical properties not listed in USEPA, 1996 obtained from USEPA Region 9 Preliminary Remediation Goal support tables, 2002.

TABLE 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Shallow Aquifer Tap Water and Water in Excavation	79-00-5	1,1,2-Trichloroethane	1.0E+01	1.7E+02 L	UG_L	SJS02-MW10S-04D	4/28	0.5 - 25000	1.7E+02	NA	2.4E-01 ca	5.0E+00	MCL	YES	ASL
	75-35-4	1,1-Dichloroethene	4.7E+01	1.5E+03 L	UG_L	SJS02-MW07S-04D	5/29	0.5 - 25000	1.5E+03	NA	3.4E+01 nc	7.0E+00	MCL	YES	ASL
	95-50-1	1,2-Dichlorobenzene	1.3E-01	7.8E+00 L	UG_L	SJS02-GW5S-001	6/28	0.5 - 25000	7.8E+00	NA	3.7E+01 nc	6.0E+02	MCL	NO	BSL
	106-46-7	1,4-Dichlorobenzene	8.0E-01 J	8.0E-01 J	UG_L	SJS02-GW5S-001	1/28	0.5 - 25000	8.0E-01	NA	4.3E-01 ca	7.5E+01	MCL	YES	ASL
	67-64-1	Acetone	5.5E+00 J	1.7E+01	UG_L	SJS02-MW08S-03D	3/6	5 - 130000	1.7E+01	NA	2.2E+03 nc	--		NO	BSL
	75-15-0	Carbon disulfide	3.4E+00	9.7E+00 L	UG_L	SJS02-MW10S-04D	3/12	0.5 - 13000	9.7E+00	NA	1.0E+02 nc	--		NO	BSL
	108-90-7	Chlorobenzene	1.0E-01 J	2.4E+00	UG_L	SJS02-GW5S-001	4/28	0.5 - 25000	2.4E+00	NA	9.1E+00 nc	1.0E+02	MCL	NO	BSL
	67-66-3	Chloroform	7.1E-01	1.3E+02 L	UG_L	SJS02-MW10S-04D	6/28	0.5 - 25000	1.3E+02	NA	1.9E-01 ca	8.0E+01	MCL	YES	ASL
	74-87-3	Chloromethane	1.3E-01 J	1.6E+00 L	UG_L	SJS02-MW07S-04D	3/29	0.5 - 25000	1.6E+00	NA	1.8E+00 nc	--		NO	BSL
	110-82-7	Cyclohexane	1.3E+00	1.3E+00	UG_L	SJS02-MW13S-04D-P	1/8	0.5 - 13000	1.3E+00	NA	1.3E+03 nc	--		NO	BSL
	124-48-1	Dibromochloromethane	4.4E+01 L	4.4E+01 L	UG_L	SJS02-MW10S-04D	1/18	0.5 - 25000	4.4E+01	NA	8.00E-01 ca	8.0E+01	MCL	YES	ASL
	100-41-4	Ethylbenzene	2.0E+00	2.2E+01 L	UG_L	SJS02-MW10S-04D	3/13	0.5 - 1	2.2E+01	NA	1.5E+00 ca	7.0E+02	MCL	YES	ASL
	98-82-8	Isopropylbenzene	5.6E-01 L	2.5E+00 L	UG_L	SJS02-MW10S-04D	2/9	0.5 - 0.5	2.5E+00	NA	6.8E+01 nc	--		NO	BSL
	108-87-2	Methylcyclohexane	8.0E-01 J	8.0E-01 J	UG_L	SJS02-MW13S-04D	1/8	0.5 - 13000	8.0E-01	NA	6.3E+02 nc	--		NO	BSL
	75-09-2	Methylene chloride	4.1E+00 L	2.6E+01 L	UG_L	SJS02-MW07S-04D	2/29	0.5 - 25000	2.6E+01	NA	4.8E+00 ca	5.0E+00	MCL	YES	ASL
	100-42-5	Styrene	3.5E-01 J	3.9E+00 L	UG_L	SJS02-MW10S-04D	2/12	0.5 - 13000	3.9E+00	NA	1.6E+02 nc	1.0E+02	MCL	NO	BSL
	127-18-4	Tetrachloroethene	2.1E+01	3.9E+01 L	UG_L	SJS02-MW10S-04D	5/29	0.5 - 25000	3.9E+01	NA	1.1E-01 ca	5.0E+00	MCL	YES	ASL
	108-88-3	Toluene	4.9E+00	6.7E+01 L	UG_L	SJS02-MW10S-04D	3/13	0.5 - 1	6.7E+01	NA	2.3E+02 nc	1.0E+03	MCL	NO	BSL
	79-01-6	Trichloroethene	3.2E-01 J	3.3E+05 J	UG_L	SJS02-MW10S-04D	15/29	0.5 - 25000	3.3E+05	NA	1.7E+00 ca	5.0E+00	MCL	YES	ASL
	75-01-4	Vinyl chloride	3.5E-01 J	3.2E+04	UG_L	SJS02-MW15S-07B	7/28	0.5 - 25000	3.2E+04	NA	1.6E-02 ca	2.0E+00	MCL	YES	ASL
	1330-20-7	Xylene, total	1.1E+01	4.9E+01 L	UG_L	SJS02-MW10S-04D	3/13	0.5 - 1	4.9E+01	NA	2.0E+01 nc	1.0E+04	MCL	YES	ASL
	156-59-2	cis-1,2-Dichloroethene	3.0E-01 J	1.3E+05	UG_L	SJS02-MW15S-07B	15/29	0.5 - 25000	1.3E+05	NA	3.7E+01 nc	7.0E+01	MCL	YES	ASL
	10061-01-5	cis-1,3-Dichloropropene	2.3E+00 L	2.3E+00 L	UG_L	SJS02-MW10S-04D	1/28	0.5 - 25000	2.3E+00	NA	4.30E-01 ca	--		YES	ASL
	156-60-5	trans-1,2-Dichloroethene	1.6E+02 J	7.2E+02 L	UG_L	SJS02-MW10S-04D	5/29	0.5 - 25000	7.2E+02	NA	1.1E+01 nc	1.0E+02	MCL	YES	ASL
	92-52-4	1,1-Biphenyl	2.0E+00 J	1.6E+01	UG_L	SJS02-MW10S-04D	2/8	5 - 11	1.6E+01	NA	1.8E+02 nc	--		NO	BSL
	95-50-1	1,2-Dichlorobenzene	6.0E+00 J	6.0E+00 J	UG_L	SJS02-GW5S-001	1/4	10 - 12	6.0E+00	NA	3.7E+01 nc	6.0E+02	MCL	NO	BSL
	105-67-9	2,4-Dimethylphenol	2.0E+00 J	2.6E+00 J	UG_L	SJS02-MW10S-04D	2/12	5 - 12	2.6E+00	NA	7.3E+01 nc	--		NO	BSL
	91-57-6	2-Methylnaphthalene	8.0E+00	7.5E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	7.5E+01	2.5E+00	1.5E+01 nc	--		YES	ASL
	106-44-5	4-Methylphenol	2.1E+00 J	2.1E+00 J	UG_L	SJS02-MW10S-04D	1/12	5 - 12	2.1E+00	NA	1.8E+01 nc	--		NO	BSL
	83-32-9	Acenaphthene	2.0E+00 J	8.5E+01	UG_L	SJS02-MW10S-04D	3/12	5 - 12	8.5E+01	1.5E+01	2.2E+02 nc	--		NO	BSL
	98-86-2	Acetophenone	1.7E+00 J	1.7E+00 J	UG_L	SJS02-MW10S-04D	1/8	5 - 11	1.7E+00	ND	3.7E+02 nc	--		NO	BSL
	120-12-7	Anthracene	8.0E-01 J	1.1E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	1.1E+01	1.7E+00	1.1E+03 nc	--		NO	BSL
	105-60-2	Caprolactam	2.7E+00 J	3.4E+00 J	UG_L	SJS02-MW12S-04D	2/8	5 - 11	3.4E+00	ND	1.8E+03 nc	--		NO	BSL
	86-74-8	Carbazole	6.0E+00	2.4E+02	UG_L	SJS02-MW10S-04D	2/12	5 - 220	2.4E+02	2.0E+00	3.4E+00 ca	--		YES	ASL
	84-74-2	Di-n-butylphthalate	7.0E-01 J	4.0E+00 J	UG_L	SJS02-GW4S-001P	2/12	5 - 12	4.0E+00	ND	3.7E+02 nc	--		NO	BSL

TABLE 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	132-64-9	Dibenzofuran	5.0E+00	5.4E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	5.4E+01	8.0E+00	NA	--		NO	NTX
	206-44-0	Fluoranthene	5.9E+00 J	5.9E+00 J	UG_L	SJS02-MW10S-04D	1/12	5 - 12	5.9E+00	ND	1.5E+02 nc	--		NO	BSL
	86-73-7	Fluorene	5.0E+00	6.2E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	6.2E+01	9.0E+00	1.5E+02 nc	--		NO	BSL
	91-20-3	Naphthalene	1.2E+02	1.3E+03	UG_L	SJS02-MW10S-04D	2/12	5 - 220	1.3E+03	1.9E+01	1.4E-01 nc	--		YES	ASL
	85-01-8	Phenanthrene	4.0E+00 J	5.6E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	5.6E+01	8.6E+00	1.1E+02 nc	--		NO	BSL
	108-95-2	Phenol	3.0E+00 J	3.0E+00 J	UG_L	SJS02-MW13S-04D	1/12	5 - 12	3.0E+00	ND	1.1E+03 nc	--		NO	BSL
	129-00-0	Pyrene	4.1E+00 J	4.1E+00 J	UG_L	SJS02-MW10S-04D	1/12	5 - 12	4.1E+00	ND	1.1E+02 nc	--		NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalat	5.0E-01 J	1.1E+00 J	UG_L	SJS02-MW10S-04D	4/12	5 - 12	1.1E+00	1.0E+00	4.8E+00 ca	--		NO	BSL
	1031-07-8	Endosulfan sulfate	8.6E-03 J	1.1E-02 J	UG_L	SJS02-GW2S-003	2/12	0.1 - 0.13	1.1E-02	ND	2.2E+01 nc	--		NO	BSL
	76-44-8	Heptachlor	7.0E-02 J	9.2E-02	UG_L	SJS02-GW4S-001P	2/12	0.05 - 6.6E-02	9.2E-02	ND	1.5E-02 ca	4.0E-01	MCL	YES	ASL
	1024-57-3	Heptachlor epoxide	1.1E+00	1.1E+00	UG_L	SJS02-MW08S-03D-P	1/12	0.05 - 0.25	1.1E+00	ND	7.4E-03 ca	2.0E-01	MCL	YES	ASL
	606-20-2	2,6-Dinitrotoluene	2.0E+01	2.0E+01	UG_L	SJS02-MW10S-04D	1/8	0.26 - 1.2	2.0E+01	ND	3.70E+00 nc	--		YES	ASL
	2691-41-0	HMX	4.0E-01 J	4.0E-01 J	UG_L	SJS02-GW4S-001P	1/8	0.52 - 2.6	4.0E-01	ND	1.8E+02 nc	--		NO	BSL
	121-82-4	RDX	7.9E-01	2.7E+00	UG_L	SJS02-GW4S-001P	2/12	0.2 - 2.6	2.7E+00	ND	6.1E-01 ca	--		YES	ASL
	7429-90-5	Aluminum	6.8E+01 J	3.0E+02	UG_L	SJS02-GW5S-001	7/12	38.2 - 200	3.0E+02	1.7E+03	3.7E+03 nc	50 to 200	SMCL	NO	BSL
	7440-38-2	Arsenic	2.8E+00 J	3.1E+01	UG_L	SJS02-MW09S-03D	3/12	2 - 10	3.1E+01	8.0E+00	4.5E-02 ca	1.0E+01	MCL	YES	ASL
	7440-39-3	Barium	3.0E+01 J	5.7E+02	UG_L	SJS02-GW2S-003	12/12	0.20 - 200	5.7E+02	7.7E+01	7.3E+02 nc	2.0E+03	MCL	NO	BSL
	7440-41-7	Beryllium	2.0E-01 J	2.6E-01 L	UG_L	SJS02-MW11S-04D	3/12	0.10 - 5	2.6E-01	1.4E+00	7.3E+00 nc	4.0E+00	MCL	NO	BSL
	7440-42-8	Boron	5.0E+01	1.7E+02 J	UG_L	SJS02-MW13S-04D	4/4	15 - 15	1.7E+02	ND	7.3E+02 nc	--		NO	BSL
	7440-70-2	Calcium	1.8E+04	2.3E+05	UG_L	SJS02-GW2S-003	12/12	57.9 - 5000	2.3E+05	5.3E+05	N/A	--		NO	NUT
	7440-47-3	Chromium	1.3E+00 L	3.2E+00 J	UG_L	SJS02-GW2S-003	4/12	1.10 - 10	3.2E+00	3.2E+00	1.1E+01 nc	1.0E+02	MCL	NO	BSL
	7440-48-4	Cobalt	1.9E+00 J	3.6E+01 J	UG_L	SJS02-GW4S-001P	9/12	0.5 - 50	3.6E+01	1.6E+01	7.3E+01 nc	--		NO	BSL
	7440-50-8	Copper	1.6E+01 J	3.6E+01	UG_L	SJS02-GW3S-003	2/12	1.10 - 25	3.6E+01	6.3E+00	1.5E+02 nc	1.3E+03	MCL	NO	BSL
	57-12-5	Cyanide	4.7E+00 L	1.3E+01 L	UG_L	SJS02-MW06S-03D	2/12	5 - 10	1.3E+01	ND	7.3E+01 nc	2.0E+02		NO	BSL
	7439-89-6	Iron	5.5E+01 J	1.2E+05	UG_L	SJS02-GW2S-003	12/12	30.8 - 100	1.2E+05	1.1E+05	2.6E+03 nc	3.0E+02	SMCL	YES	ASL
	7439-92-1	Lead	4.8E+00	1.7E+01	UG_L	SJS02-GW3S-003	2/12	1 - 3	1.7E+01	3.5E+00	1.5E+01	1.5E+01	MCL	YES	ASL
	7439-95-4	Magnesium	5.0E+03 J	1.3E+05	UG_L	SJS02-GW2S-003	12/12	24.3 - 5000	1.3E+05	3.0E+05	N/A	--		NO	NUT
	7439-96-5	Manganese	1.3E+02	1.9E+03	UG_L	SJS02-MW08S-03D-P	12/12	0.3 - 15	1.9E+03	1.4E+04	8.8E+01 nc	5.0E+01	SMCL	YES	ASL
	7440-02-0	Nickel	9.1E-01 J	3.0E+01 J	UG_L	SJS02-GW3S-003	4/12	0.90 - 40	3.0E+01	2.0E+01	7.3E+01 nc	--		NO	BSL
	7440-09-7	Potassium	2.3E+03 J	2.8E+04	UG_L	SJS02-MW11S-04D	12/12	13.5 - 5000	2.8E+04	8.5E+04	N/A	--		NO	NUT
	7440-22-4	Silver	1.5E+00 J	5.9E+00 J	UG_L	SJS02-MW09S-03D	2/12	0.90 - 10	5.9E+00	1.9E+00	1.8E+01 nc	1.0E+02	SMCL	NO	BSL
	7440-23-5	Sodium	1.5E+04	6.2E+05	UG_L	SJS02-GW2S-003	12/12	148 - 5000	6.2E+05	8.1E+05	N/A	--		NO	NUT
	7440-62-2	Vanadium	9.2E-01 J	2.5E+00 L	UG_L	SJS02-MW13S-04D-P	4/12	0.60 - 50	2.5E+00	1.4E+01	1.8E+01 nc	--		NO	BSL
	7440-66-6	Zinc	2.7E+01	6.4E+02	UG_L	SJS02-GW3S-003	7/12	1.90 - 20	6.4E+02	2.4E+02	1.1E+03 nc	5.0E+02	SMCL	NO	BSL

TABLE 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations. Unfiltered (total) metals analysis.

[2] Maximum concentration is used for screening.

[3] Background value is UTL for Columbia Aquifer from *Final Background Investigation Report Addendum for Groundwater, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, August 2004).

[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. Adjusted Tap Water RSL.
RSLs based on non-carcinogenic effects (N) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL value for hexavalent chromium used for total chromium.
Cobalt is not included in RSL Table. Value is from the April 2005 EPA Region III RBC table.
The tap water value of 15 ug/L for lead is the action level provided in the Drinking Water Regulations and Health Advisories.
RSL value for endosulfan used as surrogate for endosulfan sulfate.
RSL value for pyrene used as surrogate for phenanthrene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
ND = Not Detected
NA = Not applicable or not available

TABLE 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Shallow Aquifer Water Vapors at Showerhead and Water Vapors at Excavation Pit	79-00-5	1,1,2-Trichloroethane	1.0E+01	1.7E+02 L	UG_L	SJS02-MW10S-04D	4/28	0.5 - 25000	1.7E+02	NA	2.4E-01 ca	5.0E+00	MCL	YES	ASL
	75-35-4	1,1-Dichloroethene	4.7E+01	1.5E+03 L	UG_L	SJS02-MW07S-04D	5/29	0.5 - 25000	1.5E+03	NA	3.4E+01 nc	7.0E+00	MCL	YES	ASL
	95-50-1	1,2-Dichlorobenzene	1.3E-01	7.8E+00 L	UG_L	SJS02-GW5S-001	6/28	0.5 - 25000	7.8E+00	NA	3.7E+01 nc	6.0E+02	MCL	NO	BSL
	106-46-7	1,4-Dichlorobenzene	8.0E-01 J	8.0E-01 J	UG_L	SJS02-GW5S-001	1/28	0.5 - 25000	8.0E-01	NA	4.3E-01 ca	7.5E+01	MCL	YES	ASL
	67-64-1	Acetone	5.5E+00 J	1.7E+01	UG_L	SJS02-MW08S-03D	3/6	5 - 130000	1.7E+01	NA	2.2E+03 nc	--		NO	BSL
	75-15-0	Carbon disulfide	3.4E+00	9.7E+00 L	UG_L	SJS02-MW10S-04D	3/12	0.5 - 13000	9.7E+00	NA	1.0E+02 nc	--		NO	BSL
	108-90-7	Chlorobenzene	1.0E-01 J	2.4E+00	UG_L	SJS02-GW5S-001	4/28	0.5 - 25000	2.4E+00	NA	9.1E+00 nc	1.0E+02	MCL	NO	BSL
	67-66-3	Chloroform	7.1E-01	1.3E+02 L	UG_L	SJS02-MW10S-04D	6/28	0.5 - 25000	1.3E+02	NA	1.9E-01 ca	8.0E+01	MCL	YES	ASL
	74-87-3	Chloromethane	1.3E-01 J	1.6E+00 L	UG_L	SJS02-MW07S-04D	3/29	0.5 - 25000	1.6E+00	NA	1.8E+00 nc	--		NO	BSL
	110-82-7	Cyclohexane	1.3E+00	1.3E+00	UG_L	SJS02-MW13S-04D-P	1/8	0.5 - 13000	1.3E+00	NA	1.3E+03 nc	--		NO	BSL
	124-48-1	Dibromochloromethane	4.4E+01 L	4.4E+01 L	UG_L	SJS02-MW10S-04D	1/18	0.5 - 25000	4.4E+01	NA	8.00E-01 ca	8.0E+01	MCL	YES	ASL
	100-41-4	Ethylbenzene	2.0E+00	2.2E+01 L	UG_L	SJS02-MW10S-04D	3/13	0.5 - 1	2.2E+01	NA	1.5E+00 ca	7.0E+02	MCL	YES	ASL
	98-82-8	Isopropylbenzene	5.6E-01 L	2.5E+00 L	UG_L	SJS02-MW10S-04D	2/9	0.5 - 0.5	2.5E+00	NA	6.8E+01 nc	--		NO	BSL
	108-87-2	Methylcyclohexane	8.0E-01 J	8.0E-01 J	UG_L	SJS02-MW13S-04D	1/8	0.5 - 13000	8.0E-01	NA	6.3E+02 nc	--		NO	BSL
	75-09-2	Methylene chloride	4.1E+00 L	2.6E+01 L	UG_L	SJS02-MW07S-04D	2/29	0.5 - 25000	2.6E+01	NA	4.8E+00 ca	5.0E+00	MCL	YES	ASL
	100-42-5	Styrene	3.5E-01 J	3.9E+00 L	UG_L	SJS02-MW10S-04D	2/12	0.5 - 13000	3.9E+00	NA	1.6E+02 nc	1.0E+02	MCL	NO	BSL
	127-18-4	Tetrachloroethene	2.1E+01	3.9E+01 L	UG_L	SJS02-MW10S-04D	5/29	0.5 - 25000	3.9E+01	NA	1.1E-01 ca	5.0E+00	MCL	YES	ASL
	108-88-3	Toluene	4.9E+00	6.7E+01 L	UG_L	SJS02-MW10S-04D	3/13	0.5 - 1	6.7E+01	NA	2.3E+02 nc	1.0E+03	MCL	NO	BSL
	79-01-6	Trichloroethene	3.2E-01 J	3.3E+05 J	UG_L	SJS02-MW10S-04D	15/29	0.5 - 25000	3.3E+05	NA	1.7E+00 ca	5.0E+00	MCL	YES	ASL
	75-01-4	Vinyl chloride	3.5E-01 J	3.2E+04	UG_L	SJS02-MW15S-07B	7/28	0.5 - 25000	3.2E+04	NA	1.6E-02 ca	2.0E+00	MCL	YES	ASL
	1330-20-7	Xylene, total	1.1E+01	4.9E+01 L	UG_L	SJS02-MW10S-04D	3/13	0.5 - 1	4.9E+01	NA	2.0E+01 nc	1.0E+04	MCL	YES	ASL
	156-59-2	cis-1,2-Dichloroethene	3.0E-01 J	1.3E+05	UG_L	SJS02-MW15S-07B	15/29	0.5 - 25000	1.3E+05	NA	3.7E+01 nc	7.0E+01	MCL	YES	ASL
	10061-01-5	cis-1,3-Dichloropropene	2.3E+00 L	2.3E+00 L	UG_L	SJS02-MW10S-04D	1/28	0.5 - 25000	2.3E+00	NA	4.30E-01 ca	--		YES	ASL
	156-60-5	trans-1,2-Dichloroethene	1.6E+02 J	7.2E+02 L	UG_L	SJS02-MW10S-04D	5/29	0.5 - 25000	7.2E+02	NA	1.1E+01 nc	1.0E+02	MCL	YES	ASL
	92-52-4	1,1-Biphenyl	2.0E+00 J	1.6E+01	UG_L	SJS02-MW10S-04D	2/8	5 - 11	1.6E+01	NA	1.8E+02 nc	--		NO	BSL
	95-50-1	1,2-Dichlorobenzene	6.0E+00 J	6.0E+00 J	UG_L	SJS02-GW5S-001	1/4	10 - 12	6.0E+00	NA	3.7E+01 nc	6.0E+02	MCL	NO	BSL
	91-57-6	2-Methylnaphthalene	8.0E+00	7.5E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	7.5E+01	2.5E+00	1.5E+01 nc	--		YES	ASL
	83-32-9	Acenaphthene	2.0E+00 J	8.5E+01	UG_L	SJS02-MW10S-04D	3/12	5 - 12	8.5E+01	1.5E+01	2.2E+02 nc	--		NO	BSL
	98-86-2	Acetophenone	1.7E+00 J	1.7E+00 J	UG_L	SJS02-MW10S-04D	1/8	5 - 11	1.7E+00	ND	3.7E+02 nc	--		NO	BSL
	120-12-7	Anthracene	8.0E-01 J	1.1E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	1.1E+01	1.7E+00	1.1E+03 nc	--		NO	BSL
	86-73-7	Fluorene	5.0E+00	6.2E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	6.2E+01	9.0E+00	1.5E+02 nc	--		NO	BSL
	91-20-3	Naphthalene	1.2E+02	1.3E+03	UG_L	SJS02-MW10S-04D	2/12	5 - 220	1.3E+03	1.9E+01	1.4E-01 nc	--		YES	ASL
	85-01-8	Phenanthrene	4.0E+00 J	5.6E+01	UG_L	SJS02-MW10S-04D	2/12	5 - 12	5.6E+01	8.6E+00	1.1E+02 nc	--		NO	BSL
	129-00-0	Pyrene	4.1E+00 J	4.1E+00 J	UG_L	SJS02-MW10S-04D	1/12	5 - 12	4.1E+00	ND	1.1E+02 nc	--		NO	BSL

TABLE 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background value is UTL for Columbia Aquifer from *Final Background Investigation Report Addendum for Groundwater, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, August 2004).

[4] Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008. Adjusted Tap Water RSL.
RSLs based on non-carcinogenic effects (N) were adjusted to a HQ of 0.1 by dividing by 10 to account for exposure to multiple constituents.
RSL value for pyrene used as surrogate for phenanthrene.

[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
ca = Carcinogenic
nc = Noncarcinogenic
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
ND = Not Detected
NA = Not applicable or not available

TABLE 3.1.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95 % UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Site 2	Benzo(a)anthracene	MG_KG	5.7E-01	8.0E-01	(G)	2.3E+00		8.0E-01	MG_KG	App. Gamma	(1,3,4)
	Benzo(a)pyrene	MG_KG	5.4E-01	7.4E-01	(G)	2.1E+00		7.4E-01	MG_KG	App. Gamma	(1,3,4)
	Benzo(b)fluoranthene	MG_KG	6.1E-01	8.1E-01	(G)	2.0E+00		8.1E-01	MG_KG	App. Gamma	(1,3,4)
	Benzo(k)fluoranthene	MG_KG	4.2E-01	6.7E-01	(T)	1.6E+00		6.7E-01	MG_KG	95% UCL-T	(1)
	Dibenz(a,h)anthracene	MG_KG	3.7E-01	6.4E-01	(NP)	4.4E-01		4.4E-01	MG_KG	Max	(5,6)
	Indeno(1,2,3-cd)pyrene	MG_KG	4.1E-01	6.1E-01	(T)	1.5E+00		6.1E-01	MG_KG	95% UCL-T	(1)
	4,4'-DDD	MG_KG	2.5E-01	6.0E-01	(T)	4.2E+00		6.0E-01	MG_KG	97.5% Cheb	(1)
	4,4'-DDE	MG_KG	6.6E-01	1.3E+00	(G)	7.2E+00	J	1.3E+00	MG_KG	Adj. Gamma	(1,3,4)
	4,4'-DDT	MG_KG	9.6E-01	5.0E+00	(T)	1.2E+01	J	5.0E+00	MG_KG	97.5% Cheb	(1)
	Aroclor-1260	MG_KG	1.7E-01	1.3E+00	(NP)	2.7E+00	J	1.3E+00	MG_KG	99% Cheb-m	(5)
	Aluminum	MG_KG	5.6E+03	6.8E+03	(G)	1.9E+04		6.8E+03	MG_KG	App. Gamma	(1,3,4)
	Antimony	MG_KG	1.5E+00	5.7E+00	(NP)	7.0E+00	J	5.7E+00	MG_KG	99% Cheb-m	(5)
	Arsenic	MG_KG	6.0E+00	8.2E+00	(G)	1.8E+01		8.2E+00	MG_KG	App. Gamma	(1,3,4)
	Cadmium	MG_KG	1.2E+00	2.9E+00	(T)	9.3E+00	K	2.9E+00	MG_KG	95% Cheb-m	(1)
	Chromium	MG_KG	4.5E+01	1.9E+02	(NP)	2.5E+02		1.9E+02	MG_KG	99% Cheb-m	(5)
	Copper	MG_KG	4.9E+02	9.2E+02	(T)	5.0E+03	J	9.2E+02	MG_KG	95% Cheb	(1)
	Iron	MG_KG	1.8E+04	7.9E+04	(NP)	1.1E+05		7.9E+04	MG_KG	99% Cheb-m	(5)
	Lead	MG_KG	4.4E+02	1.1E+03	(T)	3.1E+03	K	1.1E+03	MG_KG	95% Cheb	(1)
	Manganese	MG_KG	1.6E+02	2.7E+02	(T)	6.9E+02		2.7E+02	MG_KG	95% UCL-T	(1)
	Nickel	MG_KG	3.7E+01	8.1E+01	(T)	2.5E+02		8.1E+01	MG_KG	95% Cheb	(1)
	Thallium	MG_KG	9.1E-01	2.3E+00	(NP)	6.2E+00		2.3E+00	MG_KG	95% Cheb-m	(5)
	Vanadium	MG_KG	9.4E+01	6.9E+02	(NP)	1.4E+03		6.9E+02	MG_KG	99% Cheb-m	(5)
	Zinc	MG_KG	7.8E+02	1.4E+03	(G)	7.6E+03		1.4E+03	MG_KG	App. Gamma	(1,3,4)

TABLE 3.1.RME

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95 % UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootstrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma). Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.2.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Drainage Features and Ponded Area	Chloroform	UG_L	3.6E+00	8.6E+00	(G)	1.2E+01		8.6E+00	UG_L	App. Gamma	(1,3,4)
	Trichloroethene	UG_L	4.6E+01	1.3E+02	(G)	1.4E+02		1.3E+02	UG_L	App. Gamma	(1,3,4)
	Vinyl chloride	UG_L	5.6E+00	1.2E+01	(G)	2.2E+01		1.2E+01	UG_L	App. Gamma	(1,3,4)
	bis(2-Ethylhexyl)phthalate	UG_L	1.6E+01	8.1E+01	(T)	8.4E+01		8.1E+01	UG_L	99% Cheb	(1)
	Arsenic	UG_L	2.3E+00	3.2E+00	(TN	4.4E+00	J	3.2E+00	UG_L	95% Stud-t	(2)
	Chromium	UG_L	3.8E+01	2.8E+02	(NP)	1.7E+02		1.7E+02	UG_L	Max	(5,6)
	Lead	UG_L	2.1E+01	7.4E+01	(G)	7.8E+01	L	7.4E+01	UG_L	App. Gamma	(1,3,4)
	Manganese	UG_L	4.7E+02	1.1E+03	(T)	2.5E+03		1.1E+03	UG_L	95% Cheb	(1)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootstrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma). Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

TABLE 3.2.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.3.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Drainage Features and Ponded Area	Vinyl chloride	MG_KG	9.0E-01	9.8E+00	(NP)	9.8E+00	J	9.8E+00	MG_KG	99% Cheb-m	(5)
	Benzo(a)anthracene	MG_KG	9.1E-01	2.1E+00	(T)	3.5E+00		2.1E+00	MG_KG	99% Cheb	(1)
	Benzo(a)pyrene	MG_KG	9.4E-01	1.8E+00	(G)	3.9E+00		1.8E+00	MG_KG	App. Gamma	(1,3,4)
	Benzo(b)fluoranthene	MG_KG	7.7E-01	1.3E+00	(G)	3.8E+00		1.3E+00	MG_KG	App. Gamma	(1,3,4)
	Dibenz(a,h)anthracene	MG_KG	7.4E-01	2.0E+00	(NP)	5.0E-01	J	5.0E-01	MG_KG	Max	(5,6)
	Indeno(1,2,3-cd)pyrene	MG_KG	7.3E-01	1.5E+00	(T)	1.8E+00	J	1.8E+00	MG_KG	95% Cheb	(1)
	Arsenic	MG_KG	1.1E+01	1.3E+01	(N)	1.9E+01		1.3E+01	MG_KG	95% Stud-t	(2)
	Chromium	MG_KG	7.7E+02	1.5E+03	(G)	2.6E+03		1.5E+03	MG_KG	App. Gamma	(1,3,4)
	Lead	MG_KG	2.8E+02	6.0E+02	(NP)	5.5E+02		5.5E+02	MG_KG	Max	(5,6)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootstrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma). Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

TABLE 3.3.RME

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.4.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Site 2 Residential	Benzo(a)anthracene	MG_KG	4.6E-01	8.6E-01	(NP)	2.3E+00		8.6E-01	MG_KG	95% Cheb-m	(5)
	Benzo(a)pyrene	MG_KG	4.3E-01	5.8E-01	(T)	2.1E+00		5.8E-01	MG_KG	95% UCL-T	(1)
	Benzo(b)fluoranthene	MG_KG	5.1E-01	6.7E-01	(G)	2.0E+00		6.7E-01	MG_KG	App. Gamma	(1,3,4)
	Benzo(k)fluoranthene	MG_KG	3.5E-01	6.3E-01	(NP)	1.6E+00		6.3E-01	MG_KG	95% Cheb-m	(5)
	Dibenz(a,h)anthracene	MG_KG	3.1E-01	5.1E-01	(NP)	4.4E-01		5.1E-01	MG_KG	95% Cheb-m	(5)
	Indeno(1,2,3-cd)pyrene	MG_KG	3.5E-01	6.0E-01	(NP)	1.5E+00		6.0E-01	MG_KG	95% Cheb-m	(5)
	4,4'-DDD	MG_KG	2.4E-01	1.6E+00	(NP)	4.2E+00		1.6E+00	MG_KG	99% Cheb-m	(5)
	4,4'-DDE	MG_KG	6.1E-01	3.9E+00	(T)	7.2E+00	J	3.9E+00	MG_KG	97.5% Cheb	(1)
	4,4'-DDT	MG_KG	9.7E+00	9.9E+00	(T)	2.9E+02	J	9.9E+00	MG_KG	97.5% Cheb	(1)
	Aroclor-1260	MG_KG	1.2E-01	9.3E-01	(NP)	2.7E+00	C	9.3E-01	MG_KG	99% Cheb-m	(5)
	Aluminum	MG_KG	7.4E+03	9.0E+03	(G)	2.2E+04		9.0E+03	MG_KG	App. Gamma	(1,3,4)
	Antimony	MG_KG	5.3E+00	3.4E+01	(NP)	7.8E+01		3.4E+01	MG_KG	99% Cheb-m	(5)
	Arsenic	MG_KG	6.8E+00	9.0E+00	(G)	4.2E+01		9.0E+00	MG_KG	App. Gamma	(1,3,4)
	Cadmium	MG_KG	1.4E+00	3.9E+00	(T)	1.1E+01		3.9E+00	MG_KG	95% Cheb	(1)
	Chromium	MG_KG	4.9E+01	7.8E+01	(T)	3.4E+02		7.8E+01	MG_KG	95% UCL-T	(1)
	Copper	MG_KG	4.9E+02	1.7E+03	(T)	5.0E+03	J	1.7E+03	MG_KG	97.5% Cheb	(1)
	Iron	MG_KG	2.3E+04	9.1E+04	(NP)	2.1E+05		9.1E+04	MG_KG	99% Cheb-m	(5)
	Lead	MG_KG	6.4E+02	1.8E+03	(T)	8.9E+03		1.8E+03	MG_KG	95% Cheb	(1)
	Manganese	MG_KG	1.8E+02	3.4E+02	(T)	1.3E+03		3.4E+02	MG_KG	95% UCL-T	(1)
	Mercury	MG_KG	5.1E-01	7.5E-01	(G)	6.3E+00		7.5E-01	MG_KG	App. Gamma	(1,3,4)
	Nickel	MG_KG	3.9E+01	9.1E+01	(T)	2.5E+02		9.1E+01	MG_KG	95% Cheb	(1)
	Thallium	MG_KG	7.4E-01	1.7E+00	(NP)	6.2E+00		1.7E+00	MG_KG	95% Cheb-m	(5)
	Vanadium	MG_KG	7.0E+01	4.5E+02	(NP)	1.4E+03		4.5E+02	MG_KG	99% Cheb-m	(5)
	Zinc	MG_KG	9.9E+02	3.0E+03	(T)	9.1E+03		3.0E+03	MG_KG	95% Cheb	(1)

TABLE 3.4.RME

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

* Surface soil & subsurface soil combined.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootstrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma). Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.5.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Emissions from Soil* at Site 2	Chromium	ug/m^3	3.7E-05	5.9E-05 (T)	2.5E-04	5.9E-05	ug/m^3	95% UCL-T	(1)

* Surface soil & subsurface soil combined.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootstrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma). Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.6.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer											
Tap Water	1,1,2-Trichloroethane	UG_L	6.9E+02	5.6E+03	(NP)	1.7E+02	L	1.7E+02	UG_L	Max	(5,6)
and	1,1-Dichloroethene	UG_L	7.4E+02	8.3E+03	(NP)	1.5E+03	L	1.5E+03	UG_L	Max	(5,6)
Water in Excavation	1,4-Dichlorobenzene	UG_L	6.9E+02	5.6E+03	(NP)	8.0E-01	J	8.0E-01	UG_L	Max	(5,6)
	Chloroform	UG_L	6.8E+02	5.6E+03	(NP)	1.3E+02	L	1.3E+02	UG_L	Max	(5,6)
	Dibromochloromethane	UG_L	1.1E+03	8.7E+03	(NP)	4.4E+01	L	4.4E+01	UG_L	Max	(5,6)
	Ethylbenzene	UG_L	2.5E+00	1.9E+01	(NP)	2.2E+01	L	1.9E+01	UG_L	99% Cheb-m	(5)
	Methylene chloride	UG_L	8.8E+01	7.5E+02	(NP)	2.6E+01	L	2.6E+01	UG_L	Max	(5,6)
	Tetrachloroethene	UG_L	6.6E+02	5.4E+03	(NP)	3.9E+01	L	3.9E+01	UG_L	Max	(5,6)
	Trichloroethene	UG_L	4.5E+04	7.4E+04	(NP)	3.3E+05	J	7.4E+04	UG_L	95% Hall	(5)
	Vinyl chloride	UG_L	1.7E+03	1.0E+04	(NP)	3.2E+04		1.0E+04	UG_L	95% Hall	(5)
	Xylene, total	UG_L	5.8E+00	4.3E+01	(NP)	4.9E+01	L	4.3E+01	UG_L	99% Cheb-m	(5)
	cis-1,2-Dichloroethene	UG_L	1.0E+04	4.6E+04	(NP)	1.3E+05		4.6E+04	UG_L	95% Hall	(5)
	cis-1,3-Dichloropropene	UG_L	6.8E+02	5.6E+03	(NP)	2.3E+00	L	2.3E+00	UG_L	Max	(5,6)
	trans-1,2-Dichloroethene	UG_L	7.3E+02	8.2E+03	(NP)	7.2E+02	L	7.2E+02	UG_L	Max	(5,6)
	2-Methylnaphthalene	UG_L	1.1E+01	3.6E+01	(NP)	7.5E+01		3.6E+01	UG_L	95% Cheb-m	(5)
	Carbazole	UG_L	2.4E+01	2.2E+02	(NP)	2.4E+02		2.2E+02	UG_L	99% Cheb-m	(5)
	Naphthalene	UG_L	1.2E+02	1.2E+03	(NP)	1.3E+03		1.2E+03	UG_L	99% Cheb-m	(5)
	Heptachlor	UG_L	3.5E-02	6.4E-02	(NP)	9.2E-02		6.4E-02	UG_L	95% Cheb-m	(5)
	Heptachlor epoxide	UG_L	1.2E-01	1.0E+00	(NP)	1.1E+00		1.0E+00	UG_L	99% Cheb-m	(5)
	2,6-Dinitrotolune	UG_L	2.8E+00	2.7E+01	(NP)	2.0E+01		2.0E+01	UG_L	Max	(5,6)
	RDX	UG_L	7.1E-01	1.9E+00	(T)	2.7E+00		1.9E+00	UG_L	95% Cheb	(1)
	Arsenic	UG_L	5.9E+00	1.1E+01	(G)	3.1E+01		1.1E+01	UG_L	App. Gamma	(1,3,4)

TABLE 3.6.RME

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
	Iron	UG_L	2.3E+04	6.9E+04	(G)	1.2E+05	6.9E+04	UG_L	Adj. Gamma	(1,3,4)
	Lead	UG_L	2.4E+00	1.6E+01	(NP)	1.7E+01	1.6E+01	UG_L	99% Cheb-m	(5)
	Manganese	UG_L	8.4E+02	1.1E+03	(N)	1.9E+03	1.1E+03	UG_L	95% Stud-t	(2)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootstrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma). Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

UG/L = micrograms liter
L = Biased Low
J = Estimated Value
K = Biased High

TABLE 3.7.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer Water Vapors at Showerhead and Water Vapors at Excavation Pit	1,1,2-Trichloroethane	UG_L	6.9E+02	5.6E+03	(NP)	1.7E+02	L	1.7E+02	UG_L	Max	(5,6)
	1,1-Dichloroethene	UG_L	7.4E+02	8.3E+03	(NP)	1.5E+03	L	1.5E+03	UG_L	Max	(5,6)
	1,4-Dichlorobenzene	UG_L	6.9E+02	5.6E+03	(NP)	8.0E-01	J	8.0E-01	UG_L	Max	(5,6)
	Chloroform	UG_L	6.8E+02	5.6E+03	(NP)	1.3E+02	L	1.3E+02	UG_L	Max	(5,6)
	Dibromochloromethane	UG_L	1.1E+03	8.7E+03	(NP)	4.4E+01	L	4.4E+01	UG_L	Max	(5,6)
	Ethylbenzene	UG_L	2.5E+00	1.9E+01	(NP)	2.2E+01	L	1.9E+01	UG_L	99% Cheb-m	(5)
	Methylene chloride	UG_L	8.8E+01	7.5E+02	(NP)	2.6E+01	L	2.6E+01	UG_L	Max	(5,6)
	Tetrachloroethene	UG_L	6.6E+02	5.4E+03	(NP)	3.9E+01	L	3.9E+01	UG_L	Max	(5,6)
	Trichloroethene	UG_L	4.5E+04	7.4E+04	(NP)	3.3E+05	J	7.4E+04	UG_L	95% Hall	(5)
	Vinyl chloride	UG_L	1.7E+03	1.0E+04	(NP)	3.2E+04		1.0E+04	UG_L	95% Hall	(5)
	Xylene, total	UG_L	5.8E+00	4.3E+01	(NP)	4.9E+01	L	4.3E+01	UG_L	99% Cheb-m	(5)
	cis-1,2-Dichloroethene	UG_L	1.0E+04	4.6E+04	(NP)	1.3E+05		4.6E+04	UG_L	95% Hall	(5)
	cis-1,3-Dichloropropene	UG_L	6.8E+02	5.6E+03	(NP)	2.3E+00	L	2.3E+00	UG_L	Max	(5,6)
	trans-1,2-Dichloroethene	UG_L	7.3E+02	8.2E+03	(NP)	7.2E+02	L	7.2E+02	UG_L	Max	(5,6)
	2-Methylnaphthalene	UG_L	1.1E+01	3.6E+01	(NP)	7.5E+01		3.6E+01	UG_L	95% Cheb-m	(5)
	Naphthalene	UG_L	1.2E+02	1.2E+03	(NP)	1.3E+03		1.2E+03	UG_L	99% Cheb-m	(5)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

TABLE 3.7.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootstrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma). Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

UG/L = micrograms liter
L = Biased Low
J = Estimated Value
K = Biased High

TABLE 3.1.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95 % UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Site 2	Benzo(a)anthracene	MG_KG	5.7E-01	8.0E-01	(G)	2.3E+00		5.7E-01	MG_KG	Mean-N	(1,3,4)
	Benzo(a)pyrene	MG_KG	5.4E-01	7.4E-01	(G)	2.1E+00		5.4E-01	MG_KG	Mean-N	(1,3,4)
	Benzo(b)fluoranthene	MG_KG	6.1E-01	8.1E-01	(G)	2.0E+00		6.1E-01	MG_KG	Mean-N	(1,3,4)
	Benzo(k)fluoranthene	MG_KG	4.2E-01	6.7E-01	(T)	1.6E+00		4.0E-01	MG_KG	Mean-T	(1)
	Dibenz(a,h)anthracene	MG_KG	3.7E-01	6.4E-01	(NP)	4.4E-01		3.7E-01	MG_KG	Mean-N	(5,6)
	Indeno(1,2,3-cd)pyrene	MG_KG	4.1E-01	6.1E-01	(T)	1.5E+00		4.0E-01	MG_KG	Mean-T	(1)
	4,4'-DDD	MG_KG	2.5E-01	6.0E-01	(T)	4.2E+00		1.3E-01	MG_KG	Mean-T	(1)
	4,4'-DDE	MG_KG	6.6E-01	1.3E+00	(G)	7.2E+00	J	6.6E-01	MG_KG	Mean-N	(1,3,4)
	4,4'-DDT	MG_KG	9.6E-01	5.0E+00	(T)	1.2E+01	J	1.0E+00	MG_KG	Mean-T	(1)
	Aroclor-1260	MG_KG	1.7E-01	1.3E+00	(NP)	2.7E+00	C	1.7E-01	MG_KG	Mean-N	(5)
	Aluminum	MG_KG	5.6E+03	6.8E+03	(G)	1.9E+04		5.6E+03	MG_KG	Mean-N	(1,3,4)
	Antimony	MG_KG	1.5E+00	5.7E+00	(NP)	7.0E+00	J	1.5E+00	MG_KG	Mean-N	(5)
	Arsenic	MG_KG	6.0E+00	8.2E+00	(G)	1.8E+01		6.0E+00	MG_KG	Mean-N	(1,3,4)
	Cadmium	MG_KG	1.2E+00	2.9E+00	(T)	9.3E+00	K	1.2E+00	MG_KG	Mean-T	(1)
	Chromium	MG_KG	4.5E+01	1.9E+02	(NP)	2.5E+02		4.5E+01	MG_KG	Mean-N	(5)
	Copper	MG_KG	4.9E+02	9.2E+02	(T)	5.0E+03	J	3.0E+02	MG_KG	Mean-T	(1)
	Iron	MG_KG	1.8E+04	7.9E+04	(NP)	1.1E+05		1.8E+04	MG_KG	Mean-N	(5)
	Lead	MG_KG	4.4E+02	1.1E+03	(T)	3.1E+03	K	4.0E+02	MG_KG	Mean-T	(1)
	Manganese	MG_KG	1.6E+02	2.7E+02	(T)	6.9E+02		1.6E+02	MG_KG	Mean-T	(1)
	Nickel	MG_KG	3.7E+01	8.1E+01	(T)	2.5E+02		3.2E+01	MG_KG	Mean-T	(1)
	Thallium	MG_KG	9.1E-01	2.3E+00	(NP)	6.2E+00		9.1E-01	MG_KG	Mean-N	(5)
	Vanadium	MG_KG	9.4E+01	6.9E+02	(NP)	1.4E+03		9.4E+01	MG_KG	Mean-N	(5)
	Zinc	MG_KG	7.8E+02	1.4E+03	(G)	7.6E+03		7.8E+02	MG_KG	Mean-N	(1,3,4)

TABLE 3.1.CTE

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95 % UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.2.CTE

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Drainage Features and Ponded Area	Chloroform	UG_L	3.6E+00	8.6E+00	(G)	1.2E+01		3.6E+00	UG_L	Mean-N	(1,3,4)
	Trichloroethene	UG_L	4.6E+01	1.3E+02	(G)	1.4E+02		4.6E+01	UG_L	Mean-N	(1,3,4)
	Vinyl chloride	UG_L	5.6E+00	1.2E+01	(G)	2.2E+01		5.6E+00	UG_L	Mean-N	(1,3,4)
	bis(2-Ethylhexyl)phthalate	UG_L	1.6E+01	8.1E+01	(T)	8.4E+01		1.2E+01	UG_L	Mean-T	(1)
	Arsenic	UG_L	2.3E+00	3.2E+00	(N)	4.4E+00	J	2.3E+00	UG_L	Mean-N	(2)
	Chromium	UG_L	3.8E+01	2.8E+02	(NP)	1.7E+02		3.8E+01	UG_L	Mean-N	(5)
	Lead	UG_L	2.1E+01	7.4E+01	(G)	7.8E+01	L	2.1E+01	UG_L	Mean-N	(1,3,4)
	Manganese	UG_L	4.7E+02	1.1E+03	(T)	2.5E+03		3.5E+02	UG_L	Mean-T	(1)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.3.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Drainage Features and Ponded Area	Vinyl chloride	MG_KG	9.0E-01	9.8E+00	(NP)	9.8E+00	J	9.0E-01	MG_KG	Mean-N	(5)
	Benzo(a)anthracene	MG_KG	9.1E-01	2.1E+00	(T)	3.5E+00		8.1E-01	MG_KG	Mean-T	(1)
	Benzo(a)pyrene	MG_KG	9.4E-01	1.8E+00	(G)	3.9E+00		9.4E-01	MG_KG	Mean-N	(1,3,4)
	Benzo(b)fluoranthene	MG_KG	7.7E-01	1.3E+00	(G)	3.8E+00		7.7E-01	MG_KG	Mean-N	(1,3,4)
	Dibenz(a,h)anthracene	MG_KG	7.4E-01	2.0E+00	(NP)	5.0E-01	J	7.4E-01	MG_KG	Mean-N	(5,6)
	Indeno(1,2,3-cd)pyrene	MG_KG	7.3E-01	1.5E+00	(T)	1.8E+00	J	6.2E-01	MG_KG	Mean-T	(1)
	Arsenic	MG_KG	1.1E+01	1.3E+01	(N)	1.9E+01		1.1E+01	MG_KG	Mean-N	(2)
	Chromium	MG_KG	7.7E+02	1.5E+03	(G)	2.6E+03		7.7E+02	MG_KG	Mean-N	(1,3,4)
	Lead	MG_KG	2.8E+02	6.0E+02	(NP)	5.5E+02		2.8E+02	MG_KG	Mean-N	(5,6)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.4.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Site 2 Residential	Benzo(a)anthracene	MG_KG	4.6E-01	8.6E-01	(NP)	2.3E+00		4.6E-01	MG_KG	Mean-N	(5)
	Benzo(a)pyrene	MG_KG	4.3E-01	5.8E-01	(T)	2.1E+00		4.2E-01	MG_KG	Mean-T	(1)
	Benzo(b)fluoranthene	MG_KG	5.1E-01	6.7E-01	(G)	2.0E+00		5.1E-01	MG_KG	Mean-N	(1,3,4)
	Benzo(k)fluoranthene	MG_KG	3.5E-01	6.3E-01	(NP)	1.6E+00		3.5E-01	MG_KG	Mean-N	(5)
	Dibenz(a,h)anthracene	MG_KG	3.1E-01	5.1E-01	(NP)	4.4E-01		3.1E-01	MG_KG	Mean-N	(5)
	Indeno(1,2,3-cd)pyrene	MG_KG	3.5E-01	6.0E-01	(NP)	1.5E+00		3.5E-01	MG_KG	Mean-N	(5)
	4,4'-DDD	MG_KG	2.4E-01	1.6E+00	(NP)	4.2E+00		2.4E-01	MG_KG	Mean-N	(5)
	4,4'-DDE	MG_KG	6.1E-01	3.9E+00	(T)	7.2E+00	J	8.8E-01	MG_KG	Mean-T	(1)
	4,4'-DDT	MG_KG	9.7E+00	9.9E+00	(T)	2.9E+02	J	1.9E+00	MG_KG	Mean-T	(1)
	Aroclor-1260	MG_KG	1.2E-01	9.3E-01	(NP)	2.7E+00	C	1.2E-01	MG_KG	Mean-N	(5)
	Aluminum	MG_KG	7.4E+03	9.0E+03	(G)	2.2E+04		7.4E+03	MG_KG	Mean-N	(1,3,4)
	Antimony	MG_KG	5.3E+00	3.4E+01	(NP)	7.8E+01		5.3E+00	MG_KG	Mean-N	(5)
	Arsenic	MG_KG	6.8E+00	9.0E+00	(G)	4.2E+01		6.8E+00	MG_KG	Mean-N	(1,3,4)
	Cadmium	MG_KG	1.4E+00	3.9E+00	(T)	1.1E+01		1.5E+00	MG_KG	Mean-T	(1)
	Chromium	MG_KG	4.9E+01	7.8E+01	(T)	3.4E+02		4.4E+01	MG_KG	Mean-T	(1)
	Copper	MG_KG	4.9E+02	1.7E+03	(T)	5.0E+03	J	4.3E+02	MG_KG	Mean-T	(1)
	Iron	MG_KG	2.3E+04	9.1E+04	(NP)	2.1E+05		2.3E+04	MG_KG	Mean-N	(5)
	Lead	MG_KG	6.4E+02	1.8E+03	(T)	8.9E+03		6.3E+02	MG_KG	Mean-T	(1)
	Manganese	MG_KG	1.8E+02	3.4E+02	(T)	1.3E+03		1.8E+02	MG_KG	Mean-T	(1)
	Mercury	MG_KG	5.1E-01	7.5E-01	(G)	6.3E+00		5.1E-01	MG_KG	Mean-N	(1,3,4)
	Nickel	MG_KG	3.9E+01	9.1E+01	(T)	2.5E+02		3.7E+01	MG_KG	Mean-T	(1)
	Thallium	MG_KG	7.4E-01	1.7E+00	(NP)	6.2E+00		7.4E-01	MG_KG	Mean-N	(5)
	Vanadium	MG_KG	7.0E+01	4.5E+02	(NP)	1.4E+03		7.0E+01	MG_KG	Mean-N	(5)
	Zinc	MG_KG	9.9E+02	3.0E+03	(T)	9.1E+03		1.1E+03	MG_KG	Mean-T	(1)

TABLE 3.4.CTE

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

* Surface soil & subsurface soil combined.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.5.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Emissions from Soil* at Site 2	Chromium	ug/m^3	3.7E-05	5.9E-05 (T)	2.5E-04	3.3E-05	ug/m^3	Mean-T	(1)

* Surface soil & subsurface soil combined.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
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(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

mg/kg = milligrams per kilogram.
G = Gamma distribution.
N = Normal distribution.
NP = Non-parametric distribution.
T = Lognormal distribution.

TABLE 3.6.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer Tap Water	1,1,2-Trichloroethane	UG_L	6.9E+02	5.6E+03	(NP)	1.7E+02	L	1.7E+02	UG_L	Max	(5,6)
	1,1-Dichloroethene	UG_L	7.4E+02	8.3E+03	(NP)	1.5E+03	L	7.4E+02	UG_L	Mean-N	(5)
	1,4-Dichlorobenzene	UG_L	6.9E+02	5.6E+03	(NP)	8.0E-01	J	8.0E-01	UG_L	Max	(5,6)
	Chloroform	UG_L	6.8E+02	5.6E+03	(NP)	1.3E+02	L	1.3E+02	UG_L	Max	(5,6)
	Dibromochloromethane	UG_L	1.1E+03	8.7E+03	(NP)	4.4E+01	L	4.4E+01	UG_L	Max	(5,6)
	Ethylbenzene	UG_L	2.5E+00	1.9E+01	(NP)	2.2E+01	L	2.5E+00	UG_L	Mean-N	(5)
	Methylene chloride	UG_L	8.8E+01	7.5E+02	(NP)	2.6E+01	L	2.6E+01	UG_L	Max	(5,6)
	Tetrachloroethene	UG_L	6.6E+02	5.4E+03	(NP)	3.9E+01	L	3.9E+01	UG_L	Max	(5,6)
	Trichloroethene	UG_L	4.5E+04	7.4E+04	(NP)	3.3E+05	J	4.5E+04	UG_L	Mean-N	(5)
	Vinyl chloride	UG_L	1.7E+03	1.0E+04	(NP)	3.2E+04		1.7E+03	UG_L	Mean-N	(5)
	Xylene, total	UG_L	5.8E+00	4.3E+01	(NP)	4.9E+01	L	5.8E+00	UG_L	Mean-N	(5)
	cis-1,2-Dichloroethene	UG_L	1.0E+04	4.6E+04	(NP)	1.3E+05		1.0E+04	UG_L	Mean-N	(5)
	cis-1,3-Dichloropropene	UG_L	6.8E+02	5.6E+03	(NP)	2.3E+00	L	2.3E+00	UG_L	Max	(5,6)
	trans-1,2-Dichloroethene	UG_L	7.3E+02	8.2E+03	(NP)	7.2E+02	L	7.2E+02	UG_L	Max	(5,6)
	2-Methylnaphthalene	UG_L	1.1E+01	3.6E+01	(NP)	7.5E+01		1.1E+01	UG_L	Mean-N	(5)
	Carbazole	UG_L	2.4E+01	2.2E+02	(NP)	2.4E+02		2.4E+01	UG_L	Mean-N	(5)
	Naphthalene	UG_L	1.2E+02	1.2E+03	(NP)	1.3E+03		1.2E+02	UG_L	Mean-N	(5)
	Heptachlor	UG_L	3.5E-02	6.4E-02	(NP)	9.2E-02		3.5E-02	UG_L	Mean-N	(5)
	Heptachlor epoxide	UG_L	1.2E-01	1.0E+00	(NP)	1.1E+00		1.2E-01	UG_L	Mean-N	(5)

TABLE 3.6.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
	2,6-Dinitrotolune	UG_L	2.8E+00	2.7E+01	(NP)	2.0E+01	2.8E+00	UG_L	Mean-N	(5)
	RDX	UG_L	7.1E-01	1.9E+00	(T)	2.7E+00	7.3E-01	UG_L	Mean-T	(1)
	Arsenic	UG_L	5.9E+00	1.1E+01	(G)	3.1E+01	5.9E+00	UG_L	Mean-N	(1,3,4)
	Iron	UG_L	2.3E+04	6.9E+04	(G)	1.2E+05	2.3E+04	UG_L	Mean-N	(1,3,4)
	Lead	UG_L	2.4E+00	1.6E+01	(NP)	1.7E+01	2.4E+00	UG_L	Mean-N	(5)
	Manganese	UG_L	8.4E+02	1.1E+03	(N)	1.9E+03	8.4E+02	UG_L	Mean-N	(2)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
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(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

UG/L = micrograms liter
L = Biased Low
J = Estimated Value
K = Biased High

TABLE 3.7.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer Water Vapors at Showerhead	1,1,2-Trichloroethane	UG_L	6.9E+02	5.6E+03	(NP)	1.7E+02	L	1.7E+02	UG_L	Max	(5,6)
	1,1-Dichloroethene	UG_L	7.4E+02	8.3E+03	(NP)	1.5E+03	L	7.4E+02	UG_L	Mean-N	(5)
	1,4-Dichlorobenzene	UG_L	6.9E+02	5.6E+03	(NP)	8.0E-01	J	8.0E-01	UG_L	Max	(5,6)
	Chloroform	UG_L	6.8E+02	5.6E+03	(NP)	1.3E+02	L	1.3E+02	UG_L	Max	(5,6)
	Dibromochloromethane	UG_L	1.1E+03	8.7E+03	(NP)	4.4E+01	L	4.4E+01	UG_L	Max	(5,6)
	Ethylbenzene	UG_L	2.5E+00	1.9E+01	(NP)	2.2E+01	L	2.5E+00	UG_L	Mean-N	(5)
	Methylene chloride	UG_L	8.8E+01	7.5E+02	(NP)	2.6E+01	L	2.6E+01	UG_L	Max	(5,6)
	Tetrachloroethene	UG_L	6.6E+02	5.4E+03	(NP)	3.9E+01	L	3.9E+01	UG_L	Max	(5,6)
	Trichloroethene	UG_L	4.5E+04	7.4E+04	(NP)	3.3E+05	J	4.5E+04	UG_L	Mean-N	(5)
	Vinyl chloride	UG_L	1.7E+03	1.0E+04	(NP)	3.2E+04		1.7E+03	UG_L	Mean-N	(5)
	Xylene, total	UG_L	5.8E+00	4.3E+01	(NP)	4.9E+01	L	5.8E+00	UG_L	Mean-N	(5)
	cis-1,2-Dichloroethene	UG_L	1.0E+04	4.6E+04	(NP)	1.3E+05		1.0E+04	UG_L	Mean-N	(5)
	cis-1,3-Dichloropropene	UG_L	6.8E+02	5.6E+03	(NP)	2.3E+00	L	2.3E+00	UG_L	Max	(5,6)
	trans-1,2-Dichloroethene	UG_L	7.3E+02	8.2E+03	(NP)	7.2E+02	L	7.2E+02	UG_L	Max	(5,6)
	2-Methylnaphthalene	UG_L	1.1E+01	3.6E+01	(NP)	7.5E+01		1.1E+01	UG_L	Mean-N	(5)
	Naphthalene	UG_L	1.2E+02	1.2E+03	(NP)	1.3E+03		1.2E+02	UG_L	Mean-N	(5)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 4.0 used to determine distribution of data and calculate EPC (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Servic

TABLE 3.7.CTE

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

Statistics: Mean value of Normally-distributed data (Mean-N); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Anderson-Darling Test indicates data are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum value used because calculated 95% UCL exceeds maximum concentration.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

UG/L = micrograms liter
L = Biased Low
J = Estimated Value
K = Biased High

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser	Adult	At Site 2	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	- -	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2002	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Trespasser	Adolescent	At Site 2	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	- -	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2002	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Landscaper	Adult	At Site 2	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	- -	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2002	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 2002	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 2002	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser	Adult	At Site 2	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	At Site 2	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,300	cm2	EPA, 2004, (4)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2004, (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				BW	Body Weight	51	kg	EPA, 1997,(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Landscaper	Adult	At Site 2	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	25	years	(2)	
				BW	Body Weight	70	kg	EPA, 1997,(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

Notes:

(1) Professional Judgment assuming 2 day per week for 26 weeks per year for a trespasser and 1 day per week for 26 weeks for a landscaper.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) SA is the total of the head, hands, forearms, lower legs and feet for the 7 through 18 year old, EPA, 2004, Exhibit C-1.

(5) SSAF is the 95th percentile for soil adherence for Soccer Players # 1 (teens).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter	Parameter Definition	Value	Units	Rationale/	Intake Equation/
Ingestion	Trespaser/Visitor	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.2.RME	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.08	liters/day	EPA, 1989	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.2.RME	µg/l	- -	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.08	liters/day	EPA, 1989	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Trespasser/Visitor	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.2.RME	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA,2004, (4)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1989	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Landscaper	Adult	At Site 2	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	25	years	(2)	
				BW	Body Weight	70	kg	EPA, 1997,(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

Notes:

(1) Professional Judgment assuming 2 day per week for 26 weeks per year for a trespasser and 1 day per week for 26 weeks for a landscaper.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) SA is the total of the head, hands, forearms, lower legs and feet for the 7 through 18 year old, EPA, 2004, Exhibit C-1.

(5) SSAF is the 95th percentile for soil adherence for Soccer Players # 1 (teens).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.1.CT	mg/kg	- -	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Trespasser	Adolescent	At Site 2	CS	Chemical Concentration in Soil	see Table 3.1.CT	mg/kg	- -	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Trespasser	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.1.CT	mg/kg		CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	1,306	cm^2	EPA, 2004 (4)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2004 (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Trespasser	Adolescent	At Site 2	CS	Chemical Concentration in Soil	see Table 3.1.CT	mg/kg		CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	1,212	cm^2	EPA, 2004 (4)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm^2-day	EPA, 2004 (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				BW	Body Weight	51	kg	EPA, 1997(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming 1 day per week for 26 weeks per year (one-half the RME scenario).

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) CT SA includes head and hands.

(5) SSAF is the geometric mean for soil adherence for Soccer Players # 1 (teens).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespasser	Adult	Emissions from Surface Soil at Site 2	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	- -	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3	calculated	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1996	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 1991	
				ET	Exposure Time	2	hr/day	(1)	
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Trespasser	Adolescent	Emissions from Surface Soil at Site 2	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	- -	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3	calculated	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1996	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 1991	
				ET	Exposure Time	2	hr/day	(1)	
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	51	kg	EPA, 1997,(4)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Landscaper	Adult	Emissions from Surface Soil at Site 2	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	- -	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3	calculated	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1996	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 1991	
				ET	Exposure Time	2	hr/day	(1)	
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	70	kg	EPA, 1997,(4)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

Notes:

(1) Professional judgement assuming trespasser would spend a maximum of 2 hours at the site.

(2) Professional Judgement assuming 2 days per week for 26 weeks per year.

(3) Professional Judgement assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 9 year old and 18 year old male body weight.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespasser	Adult	Emissions from Surface Soil at Site 2	CS	Chemical Concentration in Soil	See Table 3.2.CT	mg/kg	- -	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3	calculated	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1996	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 1991	
				ET	Exposure Time	2	hr/day	(1)	
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Trespasser	Adolescent	Emissions from Surface Soil at Site 2	CS	Chemical Concentration in Soil	See Table 3.2.CT	mg/kg	- -	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3	calculated	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1996	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 1991	
				ET	Exposure Time	2	hr/day	(1)	
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	51	kg	EPA, 1997,(4)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:

(1) Professional judgement assuming trespasser would spend 2 hours at the site.

(2) Professional Judgement assuming 1 day per week for 26 weeks per year (one-half the RME estimate).

(3) Professional Judgement assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 9 year old and 18 year old male body weight.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter	Parameter Definition	Value	Units	Rationale/	Intake Equation/
Ingestion	Trespaser/Visitor	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.08	liters/day	EPA, 1989	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.08	liters/day	EPA, 1989	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Trespasser/Visitor	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA,2004, (4)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1989	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter	Parameter Definition	Value	Units	Rationale/	Intake Equation/
Ingestion	Trespaser/Visitor	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.08	liters/day	EPA, 1989	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
Dermal	Trespasser/Visitor	Adolescent	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	4,046	cm^2	EPA, 2004 (4)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	51	kg	EPA, 1997,(3)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Professional Judgment assuming 1 day per week for 52 weeks per year, and 1 hour per day.

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(4) The skin surface area includes hands, forearms, lower legs, and feet.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.CT	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA, 2004, (4)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser	Adolescent	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.CT	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	4,046	cm^2	EPA, 2004 (4)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	51	kg	EPA, 1997, (3)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Professional Judgment assuming 1/2 of the RME value

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(4) The skin surface area includes hands, forearms, lower legs, and feet .

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area assumes 25% of total surface area of 20,000.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser/Visitor	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Trespasser/Visitor	Adolescent	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (6)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Trespasser/Visitor	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA, 2004, (4)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2004, (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (cont)	Trespasser/Visitor	Adolescents	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,046	cm^2	EPA, 2004, (4)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2004 (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	51	kg	EPA, 1997, (6)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming 1/2 soil ingestion rate.

(2) Professional Judgement assuming 2 days per week for 26 weeks per year.

(3) Professional Judgment assuming adolescents from 9 to 18 years of age.

(4) The skin surface area includes hands, forearms, lower legs, and feet.

(5) RME SSAF is geometric mean soil adherence factor for reed gatherers.

(6) Body weight is average value for the 9 year old and 18 year old male body weight.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.4.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser/Visitor	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Trespasser/Visitor	Adolescent	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Trespasser/Visitor	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA, 2004 (4)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA,1997, (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

TABLE 4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser/Visitor	Adolescents	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,046	cm^2	EPA, 2004 (4)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA,1997, (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	9	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming 1/2 soil ingestion rate.

(2) Professional Judgement assuming one day per week for 26 weeks per year.

(3) Professional Judgment assuming adolescents from 9 to 18 years of age.

(4) The skin surface area includes hands, forearms, lower legs, and feet.

(5) SSAF is geometric mean soil adherence factor for reed gatherers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.5.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	330	mg/day	EPA, 2002	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
	Industrial Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Resident	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	200	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S-A	Ingestion Rate of Soil, Adult	100	mg/day	EPA, 1991	CS x IR-S-Adj x EF x CF3 x 1/AT
				IR-S-C	Ingestion Rate of Soil, Child	200	mg/day	EPA, 1991	
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	114.29	mg-year/kg-day	calculated	IR-S-Adj (mg-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Construction Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

TABLE 4.5.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Industrial Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm2	EPA, 2004	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Resident	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm2	EPA, 2004	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal									
	Resident	Child/Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5	mg/kg	- -	CDI (mg/kg-day) =
				SA-A	Skin Surface Area Available for Contact, Ad	5,700	cm2	EPA, 2004	CS x DA-Adj x DABS x CF3 x EF x 1/AT
				SA-C	Skin Surface Area Available for Contact, Ch	2,800	cm2	EPA, 2004	
				SSAF-A	Soil to Skin Adherence Factor, Adult	0.07	mg/cm2-day	EPA, 2004	DA-Adj (mg-year/kd-day) =
				SSAF-C	Soil to Skin Adherence Factor, Child	0.2	mg/cm2-day	EPA, 2004	
				DA-Adj	Dermal Absorption, Age-adjusted	602	mg-year/kg-day	calculated	(ED-C x SA-C x SSAF-C / BW-C) +
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	(ED-A x SA-A x SSAF-A / BW-A)
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Assumed duration of construction project may be 1/2 a year.

(2) RME SA includes face, hands, forearms, and lower legs.

(3) Soil to skin adherence factor is based on maximum adherence factor for construction workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Soil*-includes surface and subsurface soil

TABLE 4.5.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	200	mg/day	(1)	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
	Industrial Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	6.6	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,409	days	EPA, 1989	
	Resident	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

TABLE 4.5.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S-A	Ingestion Rate of Soil, Adult	50	mg/day	EPA, 1991	CS x IR-S-Adj x EF x CF3 x 1/AT
				IR-S-C	Ingestion Rate of Soil, Child	100	mg/day	EPA, 1991	
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	46.43	mg-year/kg-day	calculated	IR-S-Adj (mg-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1991	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
				ED-A	Exposure Duration, Adult	9	years	EPA, 1991	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Construction Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,100	cm^2	EPA, 2004, (3)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.1	mg/cm^2-day	EPA, 2004, (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

TABLE 4.5.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Industrial Worker	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.02	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	6.6	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,409	days	EPA, 1989	
	Resident	Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	

TABLE 4.5.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal									
	Resident	Child/Adult	At Site 2	CS	Chemical Concentration in Soil	see Table 3.5 CT	mg/kg	- -	CDI (mg/kg-day) =
				SA-A	Skin Surface Area Available for Contact, Ad	5,700	cm^2	EPA, 2004	CS x DA-Adj x DABS x CF3 x EF x 1/AT
				SA-C	Skin Surface Area Available for Contact, Ch	2,800	cm^2	EPA, 2004	
				SSAF-A	Soil to Skin Adherence Factor, Adult	0.01	mg/cm^2-day	EPA, 2004	DA-Adj (mg-year/kd-day) =
				SSAF-C	Soil to Skin Adherence Factor, Child	0.04	mg/cm^2-day	EPA, 2004	
				DA-Adj	Dermal Absorption, Age-adjusted	263	mg-year/kg-day	calculated	(ED-C x SA-C x SSAF-C / BW-C) + (ED-A x SA-A / BW-A)]
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	(ED-A x SA-A x SSAF-A / BW-A)
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Recommendation from EPA Region III Risk Assessor.

(2) Assumed duration of construction project may be 1/2 a year.

(3) Surface area includes head and hands.

(4) Soil to skin adherence factor is based on geometric mean adherence factor for construction workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Soil*-includes surface and subsurface soil

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Worker	Adult	Emissions from Soil at Site 2	CS	Chemical Concentration in Soil	see Table 3.6	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1997	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1997	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 2002	
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
	Industrial Worker	Adult	Emissions from Soil at Site 2	CS	Chemical Concentration in Soil	see Table 3.6	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1997	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1997	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 2002	
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
	Resident	Adult	Emissions from Soil at Site 2	CS	Chemical Concentration in Soil	see Table 3.6	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1997	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1997	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 2002	
				EF	Exposure Frequency	350	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Resident	Child	Emissions from Soil at Site 2	CS	Chemical Concentration in Soil	see Table 3.6	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	EPA, 1997	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1997	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	15	m^3/day	EPA, 1997	
				EF	Exposure Frequency	350	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Adult/Child		CS	Chemical Concentration in Soil	see Table 3.6	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
			Emissions from Soil at Site 2	CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x CF x IN-Adj x EF x 1/AT
				IN-Adj	Inhalation Rate, Adjusted	12.86	m^3-yr/kg-day	- -	
				EF	Exposure Frequency	350	days/year	EPA, 2002	IN-Adj (m^3-yr/kg-day) = (IN-A x ED-A / BW-A)
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	(IN-C x ED-C / BW-C)

Notes:

(1) Assumed duration of construction project may be 1/2 a year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

Soil*-includes surface and subsurface soil

TABLE 4.6.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDANCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Site 2 Groundwater	CW	Chemical Concentration in Water	See Table 3.7.CTE			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1.4	liters/day	EPA, 1993	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Site 2 Groundwater	CW	Chemical Concentration in Water	See Table 3.7.CTE			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2004	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Site 2 Groundwater	CW	Chemical Concentration in Water	See Table 3.1.CTE			CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.58	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 2004	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDANCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (cont'd)	Industrial Worker	Adult	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.7.CTE	µg/l		CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	219	days/year	EPA, 2004	
				ED	Exposure Duration	9	years	EPA, 2004	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Resident	Adult	Site 2 Groundwater	CW	Chemical Concentration in Water	See Table 3.7.CTE			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDANCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
		Child	Site 2 Groundwater	CW	Chemical Concentration in Water	See Table 3.7.CTE			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	0.33	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	
Dermal	Resident	Child/Adult	Site 2 Groundwater	CW	Chemical Concentration in Water	See Table 3.7.CTE			CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adul	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Chil	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDANCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Construction Worker	Adult	Site 2 Groundwater	CW	Chemical Concentration in Water	See Table 3.7.CTE	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	4.0	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	(2)	x CF1 x CF2
				EF	Exposure Frequency	219	days	EPA, 1991	
				ED	Exposure Duration	1	years	(2)	
				BW	Body Weight	70	kg	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Assumes construction worker would be exposed to groundwater for 1/2 a day.

(2) Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Shallow Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.7.RME			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Shallow Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.7.RME			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Shallow Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.7.RME			CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (cont'd)	Industrial Worker	Adult	Shallow Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.7.RME	µg/l		CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	EPA, 1989	
Dermal	Resident	Adult	Shallow Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.7.RME			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	24	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Shallow Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.7.RME			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	1.0	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (cont'd)	Resident	Child/Adult	Shallow Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.7.RME			CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2004	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Shallow Aquifer	CW	Chemical Concentration in Water	See Table 3.7.RME	µg/l	- -	CDI (mg/kg-day) =
(cont'd)			Tap Water	DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	8.0	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	3,300	cm2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	(1)	x CF1 x CF2
				EF	Exposure Frequency	250	days	EPA, 1991	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.7.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Water Vapors at showerhead	CW	Chemical Concentration in Water	See Table 3.8.CT			Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	Foster & Chrostowski Shower Inhalation Model
				ED	Exposure Duration	9	years	EPA, 1993	for InhExp
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Construction Worker	Adult	Water Vapors at Excavation Pit	CW	Chemical Concentration in Water	See Table 3.8.CT			Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x IN x ET x EF x ED x 1/BW x 1/AT
				IN	Inhalation Rate	2.5	m^3/hour	EPA, 1991	
				ET	Exposure Time	4	hr/day	(1)	CA calculated using two-film model
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming 1/2 the RME value for the CT.

(2) Assumed duration of construction project may be 1/2 a year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Shallow Aquifer Water Vapors at showerhead	CW	Chemical Concentration in Water	See Table 3.8.RME			Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	Foster & Chrostowski Shower Inhalation Model
				ED	Exposure Duration	24	years	EPA, 1991	for InhExp
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Construction Worker	Adult	Water Vapors at Excavation Pit	CW	Chemical Concentration in Water	See Table 3.8.RME	µg/l		Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x IN x EF x ED x 1/BW x 1/AT
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	
				EF	Exposure Frequency	250	days	EPA, 1991	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional Judgement based on construction activities that would occur 8 hrs per day for the RME.

(2) Assumed duration of construction project may be 1/2 a year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.8.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDANCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Aquifer

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.9.CTE			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1.4	liters/day	EPA, 1993	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.9.CTE			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2004	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.9.CTE			CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.58	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 2004	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.8.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDANCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Aquifer

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.9.CTE			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.9.CTE			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	0.33	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.8.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDANCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Aquifer

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.9.CTE			CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Deep Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.9.RME			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Deep Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.9.RME			CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Deep Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.9.RME			CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.9.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Deep Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.9.RME			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	24	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	
Dermal	Resident	Child	Deep Aquifer Tap Water	CW	Chemical Concentration in Water	See Table 3.9.RME			CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	1.0	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.9.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Resident	Child/Adult	Deep Aquifer	CW	Chemical Concentration in Water	See Table 3.9.RME			CDI (mg/kg-day) = DA-Adj x EF x 1/AT
			Tap Water	DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2004	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.9.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Water Vapors at showerhead	CW	Chemical Concentration in Water	See Table 3.10.CTE			Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	Foster & Chrostowski Shower Inhalation Model
				ED	Exposure Duration	9	years	EPA, 1993	for InhExp
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Deep Aquifer Water Vapors at showerhead	CW	Chemical Concentration in Water	See Table 3.10.RME			Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	Foster & Chrostowski Shower Inhalation Model
				ED	Exposure Duration	24	years	EPA, 1991	for InhExp
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

TABLE 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.CT	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA, 2004 (2)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	(1)	x CF1 x CF2
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.CT	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	1,852	cm^2	EPA, 2004 (2)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	(1)	x CF1 x CF2
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Resident	Child/Adult	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.3.CT	µg/l	- -	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1	hr/event	(1)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	5,672	cm^2	EPA, 2004 (2)	x CF1 x CF2
				SA-C	Skin Surface Area, Child	1,852	cm^2	EPA, 2004 (2)	
				EV	Event Frequency	1	events/day	(1)	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	26	days/year	(1)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 2004	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Assumes trespassing one hour per day, one day per week for 26 weeks per year.

(2) The skin surface area includes hands, forearms, lower legs, and feet .

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area assumes 25% of total surface area of 20,000.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.11.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.08	liters/day	EPA, 1989	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.08	liters/day	EPA, 1989	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Drainage Features and Ponded Area	CSW	Chemical Concentration in Surface Water	see Table 3.3	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW-A	Ingestion Rate of Surface Water, Adult	0.08	l/hour	EPA, 1996	CSW x IR-W-Adj x EF x CF1 x 1/AT
				IR-SW-C	Ingestion Rate of Surface Water, Child	0.08	l/hour	EPA, 1996	
				IR-W-Adj	Ingestion Rate of Surface Water, Age-adjuste	0.17	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kg-day) =
				ET	Exposure Time	2.6	hr/day	EPA, 1989	(ED-C x IR-SW-C x ET/ BW-C)
				EF	Exposure Frequency	52	days/year	(1)	+ (ED-A x IR-SW-A x ET/ BW-A)
				ED-A	Exposure Duration, Adult	30	years	EPA, 1991	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA, 2004 (2)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	(1)	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	1,852	cm^2	EPA, 2004 (2)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	(1)	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Resident	Child/Adult	Drainage Features and Ponded Area	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	- -	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	1	hr/event	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1	hr/event	(1)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	5,672	cm^2	EPA, 2004	x CF1 x CF2
				SA-C	Skin Surface Area, Child	1,852	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	(1)	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	52	days/year	(1)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Assumes trespassing one hour per day, one day per week for 52 weeks per year.

(2) The skin surface area includes hands, forearms, lower legs, and feet.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area assumes 25% of total surface area of 20,000.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.11.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	EPA, 1997	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Resident	Child	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	100	mg/day	EPA, 1997	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1989	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
	Resident	Adult/Child	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed-A	Ingestion Rate of Sediment, Adult	50	mg/day	EPA, 1997	CSed x IR-S-Adj x EF x CF3 x 1/AT-C
				IR-Sed-C	Ingestion Rate of Sediment, Child	100	mg/day	EPA, 1997	IR-Sed-Adj (mg-year/kd-day) =
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	46	mg-year/kg-day	calculated	
				EF	Exposure Frequency	26	days/year	(1)	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
				ED-A	Exposure Duration	9	years	EPA, 1989	
				ED-C	Exposure Duration	6	years	EPA, 1989	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW-A	Body Weight, Adult	70	kg	EPA, 1997	
				BW-C	Body Weight, Child	15	kg	EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.11.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA, 2004 (2)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2004 (3)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Resident	Child	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	1,852	cm^2	EPA, 2004 (2)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	3.3	mg/cm^2-day	EPA, 2004 (3)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
	Resident	Child/Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.CT	mg/kg	- -	CDI (mg/kg-day) =
				SA - A	Skin Surface Area Available for Contact, Adul	5,672	cm^2	EPA, 2004	CS x DA-Adj x DABS x CF3 x EF x 1/AT-C
				SA - C	Skin Surface Area Available for Contact, Child	1,852	cm^2	EPA, 2004	
				SSAF - A	Soil to Skin Adherence Factor, Adult	0.3	mg/cm^2-day	EPA, 2004	DA-Adj (mg-year/kd-day) =
				SSAF - C	Soil to Skin Adherence Factor, Child	3.3	mg/cm^2-day	EPA, 2004	
				DA-Adj	Dermal Absorption, Age-adjusted	2,663	mg-year/kg-day	calculated	
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	(ED-C x SA-C x SSAF-C / BW-C) + (ED-A x SA-A / BW-A)]
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	(ED-A x SA-A x SSAF-A / BW-A)
				EF	Exposure Frequency	26	days/year	(2)	
				ED - A	Exposure Duration, Adult	9	years	EPA, 1991	
				ED -C	Exposure Duration, Child	6	years	EPA, 1991	
				BW - A	Body Weight - Adult	70	kg	EPA, 1991	
				BW - C	Body Weight - Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Assumes trespassing one hour per day, one day per week for 26 weeks per year.

(2) The skin surface area includes hands, forearms, lower legs, and feet.

(3) 95th percentile of a median contact activity was selected; construction workers and children playing in wet soil (Exhibit 3-3 in EPA 2004).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area assumes 25% of total surface area of 20,000.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.12.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Resident	Child	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	100	mg/day	EPA, 1997	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1989	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
	Resident	Adult/Child	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed-A	Ingestion Rate of Sediment, Adult	50	mg/day	EPA, 1997	CSed x IR-S-Adj x EF x CF3 x 1/AT-C
				IR-Sed-C	Ingestion Rate of Sediment, Child	100	mg/day	EPA, 1997	IR-Sed-Adj (mg-year/kd-day) =
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	57	mg-year/kg-day	calculated	
				EF	Exposure Frequency	52	days/year	(2)	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
				ED-A	Exposure Duration	24	years	EPA, 1989	
				ED-C	Exposure Duration	6	years	EPA, 1989	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW-A	Body Weight, Adult	70	kg	EPA, 1997	
				BW-C	Body Weight, Child	15	kg	EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.12.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,672	cm^2	EPA, 2004 (3)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.6	mg/cm^2-day	EPA, 2004 (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(3)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Resident	Child	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	1,852	cm^2	EPA, 2004 (3)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	21	mg/cm^2-day	EPA, 2004 (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(3)	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
	Resident	Child/Adult	Drainage Features and Ponded Area	CSed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	- -	CDI (mg/kg-day) =
				SA - A	Skin Surface Area Available for Contact, Adult	5,672	cm^2	EPA, 2004 (3)	CS x DA-Adj x DABS x CF3 x EF x 1/AT-C
				SA - C	Skin Surface Area Available for Contact, Child	1,852	cm^2	EPA, 2004 (3)	
				SSAF - A	Soil to Skin Adherence Factor, Adult	0.6	mg/cm^2-day	EPA, 2004 (4)	DA-Adj (mg-year/kd-day) =
				SSAF - C	Soil to Skin Adherence Factor, Child	21	mg/cm^2-day	EPA, 2004 (4)	
				DA-Adj	Dermal Absorption, Age-adjusted	16,428	mg-year/kg-day	calculated	
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995; 2001	(ED-C x SA-C x SSAF-C / BW-C) +
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	(ED-A x SA-A x SSAF-A / BW-A)
				EF	Exposure Frequency	52	days/year	(3)	
				ED - A	Exposure Duration, Adult	24	years	EPA, 1991	
				ED -C	Exposure Duration, Child	6	years	EPA, 1991	
				BW - A	Body Weight - Adult	70	kg	EPA, 1991	
				BW - C	Body Weight - Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:
(1) Professional Judgement assuming 1/2 soil ingestion rate.
(2) Assumes trespassing one hour per day, one day per week for 52 weeks per year.
(3) The skin surface area includes hands, forearms, lower legs, and feet.
(4) Geometric mean of a high end contact activity was selected; Pipe layers in wet soil and children playing in mud (Exhibit 3-3 in EPA 2004).

Sources:
EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,
EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.
EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area assumes 25% of total surface area of 20,000.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units	(1)	Value	Units			Source(s)	Date(s) (3) (MM/DD/YYYY)
Acenapthene	Chronic	6.0E-02	mg/kg-day	N/A	6.0E-02	mg/kg-day	Liver	3000/1	IRIS	10/09/07
	Subchronic	6.0E-01	mg/kg-day	8.9E-01	6.0E-01	mg/kg-day	Liver	3.0E+02	HEAST	07/01/97
Aluminum	Chronic	1.0E+00	mg/kg-day	NA	1.0E+00	mg/kg-day	CNS	100	PPRTV	09/02/07
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	Chronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Longevity, Blood Glucose, and Cholesterol	1000/1	IRIS	09/02/07
	Subchronic	2.0E-04	mg/kg-day	15%	3.0E-05	mg/kg-day	Blood	300	PPRTV	6/22/2004
Aroclor 1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	Chronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin, Vascular	3/1	IRIS	9/2/2007
	Subchronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin, Vascular	3	HEAST	7/1/1997
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	Chronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Liver	1000/1	IRIS	9/2/2007
	Subchronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Reproductive	3000	NCEA	3/28/1996
Bromodichloromethane	Chronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Kidney	1000/1	IRIS	9/2/2007
	Subchronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Kidney	1000	HEAST	7/1/1997
Cadmium (food)	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidney	10/2	IRIS	9/3/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	Chronic	1.0E-01	mg/kg-day	NA	1.0E-01	mg/kg-day	Fetus	100/1	IRIS	9/4/2007
	Subchronic	1.0E-01	mg/kg-day	NA	1.0E-01	mg/kg-day	Fetus	1.0E+02	HEAST	7/1/1997
Chloroform	Chronic	1.0E-02	mg/kg-day	NA	1.0E-02	mg/kg-day	Liver	1000/1	IRIS	9/2/2007
	Subchronic	1.0E-02	mg/kg-day	NA	1.0E-02	mg/kg-day	Liver	1000	HEAST	7/1/1997
Chromium (VI)	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None reported	300/3	IRIS	9/2/2007
	Subchronic	2.0E-02	mg/kg-day	0.025	5.0E-04	mg/kg-day	None reported	100	HEAST	7/1/1997
Copper	Chronic	4.0E-02	mg/kg-day	NA	4.0E-02	mg/kg-day	Gastrointestinal	NA	HEAST	7/1/1997
	Subchronic	4.0E-02	mg/kg-day	N/A	4.0E-02	mg/kg-day	Gastrointestinal	NA	HEAST	7/1/1997
DDD-4,4'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE-4,4'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT-4,4'*	Chronic	5.0E-04	mg/kg-day	0.9	5.0E-04	mg/kg-day	Liver	100/1	IRIS	9/2/2007
	Subchronic	5.0E-04	mg/kg-day	0.9	5.0E-04	mg/kg-day	Liver	100	HEAST	7/1/1997
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	Chronic	1.0E-03	mg/kg-day	NA	1.0E-03	mg/kg-day	Kidney	1000/1	PPRTV	
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	Chronic	2.0E-02	mg/kg-day	N/A	2.0E-02	mg/kg-day	Liver	1000/1	IRIS	10/09/07
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	Chronic	3.0E-02	mg/kg/day	NA	3.0E-02	mg/kg/day	Liver, Developmental	1000	NCEA	4/29/1997
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units	(1)	Value	Units			Source(s)	Date(s) (3) (MM/DD/YYYY)
1,1-Dichloroethene	Chronic	5.0E-02	mg/kg-day	NA	5.0E-02	mg/kg-day	Liver	100/1	IRIS	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	Chronic	1.0E-02	mg/kg-day	NA	1.0E-02	mg/kg-day	Blood	3000	PPRTV	3/1/2006
	Subchronic	1.0E-01	mg/kg-day	NA	1.0E-01	mg/kg-day	Blood	300	PPRTV	3/2/2006
trans-1,2-Dichloroethene	Chronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Blood	1000/1	IRIS	9/2/2007
	Subchronic	2.0E-01	mg/kg-day	NA	2.0E-01	mg/kg-day	Blood	100	HEAST	7/1/1997
cis-1,3-Dichloropropene	Chronic	3.0E-02	mg/kg-day	NA	3.00E-02	mg/kg-day	Chronic irritation	100/1	IRIS	10/10/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotolune	Chronic	1.0E-03	mg/kg-day	NA	1.0E-03	mg/kg-day			PPRTV	12/13/2004
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	Chronic	4.0E-02	mg/kg-day	89%	4.0E-02	mg/kg-day	Blood	3000/1	IRIS	10/09/07
	Subchronic	4.0E-01	mg/kg-day	89%	4.0E-01	mg/kg-day	Blood	300	HEAST	07/01/97
Heptachlor	Chronic	5.0E-04	mg/kg-day	NA	5.0E-04	mg/kg-day	Liver	300/1	IRIS	9/2/2007
	Subchronic	N/A	mg/kg-day	NA	N/A	mg/kg-day	N/A	N/A	N/A	N/A
Heptachlor epoxide	Chronic	1.3E-05	mg/kg-day	NA	1.3E-05	mg/kg-day	Liver	1000/1	IRIS	9/3/2007
	Subchronic	1.3E-05	mg/kg-day	NA	1.3E-05	mg/kg-day	Liver	1000	HEAST	7/1/1997
Indeno(1,2,3-C,D)Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Chronic	7.0E-01	mg/kg-day	NA	7.0E-01	mg/kg-day	Gastrointestinal	1	PPRTV	9/2/2007
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	CNS	1/1	IRIS	09/02/07
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (food)	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1/1	IRIS	9/3/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (Mercuric chloride)	Chronic	3.0E-04	mg/kg-day	0.07	2.1E-05	mg/kg-day	Immune System	1000/1	IRIS	9/2/2007
	Subchronic	3.0E-04	mg/kg-day	0.07	2.1E-05	mg/kg-day	Immune System	1000	HEAST	7/1/1997
Methylene chloride	Chronic	6.0E-02	mg/kg-day	NA	6.0E-02	mg/kg-day	Liver	100/1	IRIS	9/2/2007
	Subchronic	6.0E-02	mg/kg-day	NA	6.0E-02	mg/kg-day	Liver	100	HEAST	7/1/1997
2-Methylnaphthalene	Chronic	4.0E-03	mg/kg-day	NA	4.0E-03	mg/kg-day	Lung	1000/1	IRIS	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Decreased Body Weight	3000/1	IRIS	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Decreased Body and Organ Weights	300	IRIS	9/2/2007
	Subchronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Decreased Weight	300	HEAST	7/1/1997

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

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St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (3) (MM/DD/YYYY)
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	Chronic	3.0E-03	mg/kg-day	0.8	2.4E-03	mg/kg-day	Prostrate	100/1	IRIS	9/2/2007
	Subchronic	3.0E-03	mg/kg-day	0.8	2.4E-03	mg/kg-day	Prostrate	100/1	HEAST	7/1/1997
Tetrachloroethene	Chronic	1.0E-02	mg/kg-day	NA	1.0E-02	mg/kg-day	Liver, whole body	1000/1	IRIS	9/2/2007
	Subchronic	1.0E-01	mg/kg-day	NA	1.0E-01	mg/kg-day	Liver, whole body	100	HEAST	07/01/97
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin, Vascular, Liver, Blood, Hair	3/1	RBC	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	Chronic	4.0E-03	mg/kg-day	NA	4.0E-03	mg/kg-day	Blood	1000/1	IRIS	9/2/2007
	Subchronic	4.0E-02	mg/kg-day	NA	4.0E-02	mg/kg-day	Blood	100	HEAST	7/1/1997
Trichloroethene (older NCEA value, used in HHRA calculations)	Chronic	6.0E-03	mg/kg-day	NA	6.0E-03	mg/kg-day	Liver	3000	NCEA	3/5/1992
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (draft 2001 value, used for uncertainty evaluation)	Chronic	3.0E-04	mg/kg-day	NA	3.0E-04	mg/kg-day	Liver, Kidney, Fetus	3000	NCEA	8/1/2001
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	Chronic	1.0E-03	mg/kg-day	0.026	2.6E-05	mg/kg-day	Kidney	300	NCEA	5/1/2000
	Subchronic	7.0E-03	mg/kg-day	0.026	1.8E-04	mg/kg-day	Lifetime	100	HEAST	7/1/1997
Vinyl Chloride	Chronic	3.0E-03	mg/kg-day	NA	3.0E-03	mg/kg-day	Liver	30/1	IRIS	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	Chronic	2.0E-01	mg/kg-day	N/A	2.0E-01	mg/kg-day	Body Weight, Mortality	1000/1	IRIS	10/09/07
	Subchronic	N/A	mg/kg-day	N/A	N/A	mg/kg-day	N/A	N/A	N/A	N/A
Zinc	Chronic	3.0E-01	mg/kg-day	NA	3.0E-01	mg/kg-day	Blood	3/1	IRIS	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA

Footnote Instructions:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual, Part Definitions:

Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%.

Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted Dermal RfD = RfD (oral) x Absorption Efficiency or ABS_{GI}

(3) For IRIS values, provided the date IRIS was searched.

For NCEA values, provided the date of the NCEA article provided.

For HEAST values, provided the date of HEAST document.

NA = Not Available

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

USEPA R3 = Region 3 Risk-Based Concentration Table.

CNS = Central Nervous System

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Acenapthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	Chronic	7.0E-01	mg/m3	2.0E-01	mg/kg-day	Nervous System	30/1	IRIS	9/19/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	Chronic	4.9E-02	mg/m3	1.4E-02	mg/kg/day	Liver, Kidney	10	NCEA	1/22/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (VI)	Chronic	8.0E-06	mg/m3	3.0E-05	mg/kg/day	Nasal	90/1	IRIS	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	Chronic	2.3E-01	mg/m3	6.5E-02	mg/kg/day	Liver	100/1	IRIS	11/1/2007
	Subchronic	2.5E+00	mg/m3	7.1E-01	mg/kg-day	Liver	30	HEAST	7/1/1997
1,1-Dichloroethene	Chronic	2.0E-01	mg/m^3	6.0E-02	mg/kg-day	Liver	30/1	IRIS	9/2/2007
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	Chronic	6.0E-02	mg/m^3	1.7E-02	mg/kg-day	Liver, Lung	3000/1	PPRTV	10/1/2002
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
cis-1,3-Dichloropropene	Chronic	2.0E-02	mg/m^3	5.7E-03	mg/kg-day	Nasal	30/1	IRIS	10/10/2007
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,6-Dinitrotolune	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	Chronic	1.1E+00	mg/m3	3.0E-01	mg/kg/day	Liver	30/1	ATSDR	9/2/2007
	Subchronic	3.0E+00	mg/m3	8.6E-01	mg/kg-day	Liver	100/1	HEAST	7/1/1997
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	3.0E-03	mg/m^3	9.0E-04	mg/kg-day	Respiratory System	3000/1	IRIS	9/2/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Acenapthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	Chronic	2.8E-01	mg/m3	8.0E-02	mg/kg-day	Kidney, Liver	NA	RBC	4/6/2007
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (CalEPA value, used in HHRA calculation	Chronic	6.0E-01	mg/m3	1.7E-01	mg/kg-day	Nervous System, Eyes	NA	CalEPA	3/4/2008
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (draft 2001 value used for uncertainty evaluation)	Chronic	4.00E-02	mg/m3	1.0E-02	mg/kg-day	CNS, Liver, Endocrine system	1000	NCEA	8/1/2001
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	Chronic	9.8E-02	mg/m3	2.8E-02	mg/kg/day	Liver	30/1	IRIS	6/16/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (Total)	Chronic	1.0E-01	mg/m3	3.0E-02	mg/kg-day	CNS	300/1	IRIS	10/10/07
	Subchronic	N/A	mg/m3	N/A	mg/kg-day	N/A	N/A	N/A	N/A

(1) Adjustment Factor applied to Inhalation Reference Concentration (RfC) to calculate Inhalation Reference Dose = RfC x $20m^3$/day x 1/70kg

(2) For IRIS values, provided the date IRIS was searched.

For HEAST values, provided the date of HEAST document.

For NCEA values, provided the date of the article provided by NCEA.

CalEPA = California EPA

CNS - Central Nervous System

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NA = Not Applicable

NCEA = National Center for Environmental Assessment

PPRTV = Provisional Peer-Reviewed Toxicity Assessment

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
Site 2 Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (2)
Acenapthene	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	2.0E+00	1/mg/kg-day	0.80 - 0.96	2.0E+00	1/mg/kg-day	B2	IRIS	9/2/2007
Arsenic	1.5E+00	1/mg/kg-day	0.95	1.5E+00	1/mg/kg-day	A	IRIS	9/2/2007
Benzo(a)anthracene	7.3E-01	1/mg/kg-day	0.89	7.3E-01	1/mg/kg-day	B2	NCEA	7/1/1993
Benzo(a)pyrene	7.3E+00	1/mg/kg-day	0.89	7.3E+00	1/mg/kg-day	B2	IRIS	9/2/2007
Benzo(b)fluoranthene	7.3E-01	1/mg/kg-day	0.89	7.3E-01	1/mg/kg-day	B2	NCEA	7/1/1993
Bis(2-Ethylhexyl)phthalate	1.4E-02	1/mg/kg-day	NA	1.4E-02	1/mg/kg-day	B2	IRIS	9/2/2007
Bromodichloromethane	6.2E-02	1/mg/kg-day	NA	6.2E-02	1/mg/kg-day	B2	IRIS	9/2/2007
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	2.0E-02	1/mg/kg-day	0.89	2.0E-02	1/mg/kg-day	B2	HEAST	8/22/2000
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	B2	IRIS	9/2/2007
Chromium (VI)	NA	NA	NA	NA	NA	D	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA
DDD-4,4'	2.4E-01	1/mg/kg-day	NA	2.4E-01	1/mg/kg-day	B2	IRIS	9/2/2007
DDE-4,4'	3.4E-01	1/mg/kg-day	NA	3.4E-01	1/mg/kg-day	B2	IRIS	9/2/2007
DDT-4,4'	3.4E-01	1/mg/kg-day	0.9	3.4E-01	1/mg/kg-day	B2	IRIS	9/2/2007
Dibenzo(a,h)anthracene	7.3E+00	1/mg/kg-day	0.89	7.3E+00	1/mg/kg-day	B2	NCEA	7/1/1993
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	8.4E-02	1/mg/kg-day	NA	8.4E-02	1/mg/kg-day	C	IRIS	9/2/2007

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
Site 2 Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (2)
1,4-Dichlorobenzene	2.4E-02	1/mg/kg-day	NA	2.4E-02	1/mg/kg-day	NA	HEAST	7/1/1997
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	D	IRIS	9/2/2007
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	1.0E-01	1/mg/kg-day	NA	1.0E-01	1/mg/kg-day	B2	IRIS	10/10/2007
2,6-Dinitrotolune	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	4.5E+00	1/mg/kg-day	NA	4.5E+00	1/mg/kg-day	B2	IRIS	9/2/2007
Heptachlor epoxide	9.1E+00	1/mg/kg-day	NA	9.1E+00	1/mg/kg-day	B2	IRIS	9/2/2007
Indeno(1,2 3-C,D)Pyrene	7.3E-01	1/mg/kg-day	0.89	7.3E-01	1/mg/kg-day	B2	NCEA	7/1/1993
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	D	IRIS	9/2/2007
Mercury	NA	NA	NA	NA	NA	D	IRIS	9/2/2007
Methylene chloride	7.5E-03	1/mg/kg-day	NA	7.5E-03	1/mg/kg-day	B2	IRIS	9/2/2007
2-Methylnaphthalene	NA	NA	NA	NA	NA	D	IRIS	9/2/2007
Naphthalene	NA	NA	NA	NA	NA	D	IRIS	9/2/2007
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	D	IRIS	9/2/2007
RDX	1.1E-01	1/mg/kg-day	NA	1.1E-01	1/mg/kg-day	C	IRIS	9/2/2007
Tetrachloroethene	5.4E-01	1/mg/kg-day	NA	5.4E-01	1/mg/kg-day	B2	CalEPA	4/26/2004
Thallium	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
Site 2 Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (2)
Trichloroethene (Cal-EPA, value, used in HHRA calculations)	1.3E-02	1/mg/kg-day	NA	1.3E-02	(mg/kg-day)	B2 - C	CalEPA	3/4/2008
Trichloroethene (draft 2001 value, used for uncertainty evaluation)	4.0E-01	1/mg/kg-day	NA	4.0E-01	(mg/kg-day)	B2 - C	NCEA	8/1/2001
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride (adult)	7.2E-01	1/mg/kg-day	NA	7.2E-01	1/mg/kg-day	A	IRIS	9/2/2007
Vinyl Chloride (incl early life)	1.4E+00	1/mg/kg-day	NA	1.4E+00	1/mg/kg-day	A	IRIS	6/16/2003
Xylenes	NA	NA	N/A	NA	NA	D	IRIS	10/9/2007
Zinc	NA	NA	NA	NA	NA	NA	NA	NA

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final).
Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 5
Section 4.2 and Exhibit 4-1.

(2) For IRIS values, provided the date IRIS was searched.
For HEAST values, provided the date of HEAST document.
For NCEA values, provided article date provided by NCEA.

CalEPA = California EPA
NA = Not Available
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 2 Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor (1)		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (2)
Acenapthene	NA	NA	NA	NA	NA	NA	NA
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	1.0E-04	1/ug/m3	2.0E+00	1/mg/kg-day	B2	IRIS	9/19/2007
Arsenic	4.3E-03	1/ug/m3	1.5E+01	1/mg/kg-day	A	IRIS	9/2/2007
Benz(a)anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	8.86E-04	1/ug/m3	3.1E+00	1/mg/kg-day	B2	NCEA	7/1/1993
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA
Cadmium	1.8E-03	1/ug/m3	6.3E+00	1/mg/kg-day	B1	IRIS	9/2/2007
Carbazole	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA
Chloroform	2.3E-05	1/ug/m3	8.1E-02	1/mg/kg-day	B2	IRIS	9/2/2007
Chromium VI	1.2E-02	1/ug/m3	4.1E+01	1/mg/kg-day	A	IRIS	9/2/2007
Copper	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	9.7E-05	1/ug/m3	3.4E-01	1/mg/kg-day	B2	IRIS	9/2/2007
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	6.3E-06	1/ug/m3	4.0E-02	1/mg/kg-day	C	Reg. III RBC	10/16/2007
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	D	IRIS	9/2/2007
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 2 Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor (1)		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (2)
cis-1,3-Dichloropropene	4.0E-06	1/ug/m3	1.0E-02	1/mg/kg-day	B2	IRIS	10/10/2007
2,6-Dinitrotolune	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2 3-C,D)Pyrene	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	4.7E-07	1/ug/m3	1.7E-03	1/mg/kg-day	B2	IRIS	9/2/2007
2-Methylnaphthalene	NA	NA	NA	NA	D	IRIS	9/2/2007
Naphthalene	NA	NA	NA	NA	D	IRIS	9/2/2007
Nickel	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	C	IRIS	9/2/2007
Phenanthrene	NA	NA	NA	NA	D	IRIS	9/2/2007
Tetrachloroethene	5.7E-06	1/ug/m3	2.0E-02	1/mg/kg-day	NA	CalEPA	4/26/2004
Thallium	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (CalEPA value, used in HHRA calculations)	2.0E-06	1/ug/m3	7.0E-03	1/mg/kg-day	B2-C	CalEPA	3/4/2008
Trichloroethene (draft 2001 value, used for uncertainty evaluation)	1.1E-04	1/ug/m3	4.0E-01	1/mg/kg-day	NA	NCEA	8/1/2001
Vanadium	NA	NA	NA	NA	NA	NA	NA

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 2 Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor (1)		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (2)
Vinyl Chloride (adult)	4.4E-06	1/ug/m3	1.5E-02	1/mg/kg-day	A	IRIS	9/2/2007
Vinyl Chloride (incl early life)	8.8E-06	1/ug/m3	3.0E-02	1/mg/kg-day	A	IRIS	9/3/2007
Xylenes	NA	NA	NA	NA	NA	NA	NA

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m^3/day x 1000ug/mg

(2) For IRIS values, provided the date IRIS was searched.

For HEAST values, provided the date of HEAST document.

For NCEA values, provided article date provided by NCEA.

For RBC values, provided the date of last change in the Tables.

CalEPA = California EPA

HEAST= Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

NA = Not available

NCEA = National Center for Environmental Assessment

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 2	Ingestion	Benzo(a)anthracene	8.0E-01	mg/kg	5.6E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.1E-08	1.6E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	7.4E-01	mg/kg	5.1E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.8E-07	1.5E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	8.1E-01	mg/kg	5.7E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.1E-08	1.7E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	4.4E-01	mg/kg	3.1E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.2E-07	9.0E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.1E-01	mg/kg	4.2E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.1E-08	1.2E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	6.0E-01	mg/kg	4.2E-08	mg/kg/day	2.4E-01	1/(mg/kg-day)	1.0E-08	1.2E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	1.3E+00	mg/kg	9.3E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.1E-08	2.7E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	5.0E+00	mg/kg	3.5E-07	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.2E-07	1.0E-06	mg/kg/day	5.0E-04	mg/kg/day	2.0E-03
				Aroclor-1260	1.3E+00	mg/kg	9.2E-08	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.8E-07	2.7E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.8E+03	mg/kg	4.7E-04	mg/kg/day	NA	NA	NA	1.4E-03	mg/kg/day	1.0E+00	mg/kg/day	1.4E-03
				Antimony	5.7E+00	mg/kg	4.0E-07	mg/kg/day	NA	NA	NA	1.2E-06	mg/kg/day	4.0E-04	mg/kg/day	2.9E-03
				Arsenic	8.2E+00	mg/kg	5.7E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	8.6E-07	1.7E-06	mg/kg/day	3.0E-04	mg/kg/day	5.6E-03
				Cadmium	2.9E+00	mg/kg	2.0E-07	mg/kg/day	NA	NA	NA	5.9E-07	mg/kg/day	1.0E-03	mg/kg/day	5.9E-04
				Chromium	1.9E+02	mg/kg	1.3E-05	mg/kg/day	NA	NA	NA	3.8E-05	mg/kg/day	3.0E-03	mg/kg/day	1.3E-02
				Copper	9.2E+02	mg/kg	6.4E-05	mg/kg/day	NA	NA	NA	1.9E-04	mg/kg/day	4.0E-02	mg/kg/day	4.7E-03
				Iron	7.9E+04	mg/kg	5.5E-03	mg/kg/day	NA	NA	NA	1.6E-02	mg/kg/day	7.0E-01	mg/kg/day	2.3E-02
				Lead	1.1E+03	mg/kg	7.4E-05	mg/kg/day	NA	NA	NA	2.2E-04	mg/kg/day	NA	NA	NA
				Manganese	2.7E+02	mg/kg	1.9E-05	mg/kg/day	NA	NA	NA	5.4E-05	mg/kg/day	2.0E-02	mg/kg/day	2.7E-03
				Nickel	8.1E+01	mg/kg	5.7E-06	mg/kg/day	NA	NA	NA	1.7E-05	mg/kg/day	2.0E-02	mg/kg/day	8.3E-04
				Thallium	2.3E+00	mg/kg	1.6E-07	mg/kg/day	NA	NA	NA	4.8E-07	mg/kg/day	7.0E-05	mg/kg/day	6.8E-03
				Vanadium	6.9E+02	mg/kg	4.8E-05	mg/kg/day	NA	NA	NA	1.4E-04	mg/kg/day	1.0E-03	mg/kg/day	1.4E-01
				Zinc	1.4E+03	mg/kg	9.5E-05	mg/kg/day	NA	NA	NA	2.8E-04	mg/kg/day	3.0E-01	mg/kg/day	9.3E-04
			Exp. Route Total								1.9E-06					2.1E-01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal Absorption	Benzo(a)anthracene	8.0E-01	mg/kg	2.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-08	8.4E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	7.4E-01	mg/kg	2.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.9E-07	7.8E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	8.1E-01	mg/kg	2.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-08	8.6E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	4.4E-01	mg/kg	1.6E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.2E-07	4.6E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.1E-01	mg/kg	2.2E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-08	6.4E-08	mg/kg/day	NA	NA	NA
				4,4'-DDD	6.0E-01	mg/kg	5.0E-09	mg/kg/day	2.4E-01	1/(mg/kg-day)	1.2E-09	1.5E-08	mg/kg/day	NA	NA	NA
				4,4'-DDE	1.3E+00	mg/kg	1.1E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.8E-09	3.2E-08	mg/kg/day	NA	NA	NA
				4,4'-DDT	5.0E+00	mg/kg	4.1E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.4E-08	1.2E-07	mg/kg/day	5.0E-04	mg/kg/day	2.4E-04
				Aroclor-1260	1.3E+00	mg/kg	5.1E-08	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.0E-07	1.5E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.8E+03	mg/kg	1.9E-05	mg/kg/day	NA	NA	NA	5.5E-05	mg/kg/day	1.0E+00	mg/kg/day	5.5E-05
				Antimony	5.7E+00	mg/kg	1.6E-08	mg/kg/day	NA	NA	NA	4.6E-08	mg/kg/day	6.0E-05	mg/kg/day	7.7E-04
				Arsenic	8.2E+00	mg/kg	6.9E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.0E-07	2.0E-07	mg/kg/day	3.0E-04	mg/kg/day	6.7E-04
				Cadmium	2.9E+00	mg/kg	8.1E-10	mg/kg/day	NA	NA	NA	2.4E-09	mg/kg/day	2.5E-05	mg/kg/day	9.5E-05
				Chromium	1.9E+02	mg/kg	5.3E-07	mg/kg/day	NA	NA	NA	1.5E-06	mg/kg/day	7.5E-05	mg/kg/day	2.0E-02
				Copper	9.2E+02	mg/kg	2.6E-06	mg/kg/day	NA	NA	NA	7.5E-06	mg/kg/day	4.0E-02	mg/kg/day	1.9E-04
				Iron	7.9E+04	mg/kg	2.2E-04	mg/kg/day	NA	NA	NA	6.4E-04	mg/kg/day	7.0E-01	mg/kg/day	9.1E-04
				Lead	1.1E+03	mg/kg	3.0E-06	mg/kg/day	NA	NA	NA	8.6E-06	mg/kg/day	NA	NA	NA
				Manganese	2.7E+02	mg/kg	7.4E-07	mg/kg/day	NA	NA	NA	2.2E-06	mg/kg/day	8.0E-04	mg/kg/day	2.7E-03
				Nickel	8.1E+01	mg/kg	2.3E-07	mg/kg/day	NA	NA	NA	6.6E-07	mg/kg/day	8.0E-04	mg/kg/day	8.2E-04
				Thallium	2.3E+00	mg/kg	6.5E-09	mg/kg/day	NA	NA	NA	1.9E-08	mg/kg/day	7.0E-05	mg/kg/day	2.7E-04
				Vanadium	6.9E+02	mg/kg	1.9E-06	mg/kg/day	NA	NA	NA	5.6E-06	mg/kg/day	2.6E-05	mg/kg/day	2.2E-01
				Zinc	1.4E+03	mg/kg	3.8E-06	mg/kg/day	NA	NA	NA	1.1E-05	mg/kg/day	3.0E-01	mg/kg/day	3.7E-05
			Exp. Route Total								5.9E-07					2.4E-01
		Exposure Point Total									2.5E-06					4.5E-01
	Exposure Medium Total										2.5E-06					4.5E-01
	Air	Emissions from Surface Soil at Site 2	Inhalation	Chromium	1.4E-07	mg/m3	1.7E-10	mg/kg/day	4.1E+01	1/(mg/kg-day)	6.8E-09	4.8E-10	mg/kg/day	3.0E-05	mg/kg/day	1.6E-05
			Exp. Route Total								6.8E-09					1.6E-05
		Exposure Point Total									6.8E-09					1.6E-05
	Exposure Medium Total										6.8E-09					1.6E-05
Medium Total											2.5E-06					4.5E-01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Drainage Features and Ponded Area	Ingestion	Bromodichloromethane	4.3E+00	ug/L	2.4E-07	mg/kg/day	6.2E-02	1/mg/kg/day	1.5E-08	7.0E-07	mg/kg/day	2.0E-02	mg/kg/day	3.5E-05
				Chloroform	8.6E+00	ug/L	4.8E-07	mg/kg/day	NA	NA	NA	1.4E-06	mg/kg/day	1.0E-02	mg/kg/day	1.4E-04
				Trichloroethene	1.3E+02	ug/L	7.4E-06	mg/kg/day	1.3E-02	1/mg/kg/day	9.6E-08	2.2E-05	mg/kg/day	6.0E-03	mg/kg/day	3.6E-03
				Vinyl chloride	1.2E+01	ug/L	6.6E-07	mg/kg/day	7.2E-01	1/mg/kg/day	4.8E-07	1.9E-06	mg/kg/day	3.0E-03	mg/kg/day	6.4E-04
				cis-1,2-Dichloroethene	5.4E+01	ug/L	3.0E-06	mg/kg/day	NA	NA	NA	8.8E-06	mg/kg/day	1.0E-02	mg/kg/day	8.8E-04
				bis(2-Ethylhexyl)phthalate	8.1E+01	ug/L	4.5E-06	mg/kg/day	1.4E-02	1/mg/kg/day	6.4E-08	1.3E-05	mg/kg/day	2.0E-02	mg/kg/day	6.6E-04
				Arsenic	3.2E+00	ug/L	1.8E-07	mg/kg/day	1.5E+00	1/mg/kg/day	2.7E-07	5.2E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
				Chromium	1.7E+02	ug/L	9.3E-06	mg/kg/day	NA	NA	NA	2.7E-05	mg/kg/day	3.0E-03	mg/kg/day	9.0E-03
				Lead	7.4E+01	ug/L	4.1E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	6.0E-05	mg/kg/day	NA	NA	NA	1.8E-04	mg/kg/day	2.0E-02	mg/kg/day	8.8E-03
			Exp. Route Total								9.2E-07					2.5E-02
			Dermal	Bromodichloromethane	4.3E+00	ug/L	2.0E-07	mg/kg/day	6.2E-02	1/mg/kg/day	1.3E-08	5.9E-07	mg/kg/day	2.0E-02	mg/kg/day	3.0E-05
				Chloroform	8.6E+00	ug/L	4.5E-07	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	1.0E-02	mg/kg/day	1.3E-04
				Trichloroethene	1.3E+02	ug/L	1.3E-05	mg/kg/day	1.3E-02	1/mg/kg/day	1.7E-07	3.9E-05	mg/kg/day	6.0E-03	mg/kg/day	6.4E-03
				Vinyl chloride	1.2E+01	ug/L	3.9E-07	mg/kg/day	7.2E-01	1/mg/kg/day	2.8E-07	1.1E-06	mg/kg/day	3.0E-03	mg/kg/day	3.8E-04
				cis-1,2-Dichloroethene	5.4E+01	ug/L	2.8E-06	mg/kg/day	NA	NA	NA	8.3E-06	mg/kg/day	1.0E-02	mg/kg/day	8.3E-04
				bis(2-Ethylhexyl)phthalate	8.1E+01	ug/L	7.3E-05	mg/kg/day	1.4E-02	1/mg/kg/day	1.0E-06	2.1E-04	mg/kg/day	2.0E-02	mg/kg/day	1.1E-02
				Arsenic	3.2E+00	ug/L	1.3E-08	mg/kg/day	1.5E+00	1/mg/kg/day	1.9E-08	3.7E-08	mg/kg/day	3.0E-04	mg/kg/day	1.2E-04
				Chromium	1.7E+02	ug/L	1.3E-06	mg/kg/day	NA	NA	NA	3.8E-06	mg/kg/day	7.5E-05	mg/kg/day	5.1E-02
				Lead	7.4E+01	ug/L	2.9E-07	mg/kg/day	NA	NA	NA	8.6E-07	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	4.3E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	8.0E-04	mg/kg/day	1.6E-02
			Exp. Route Total								1.5E-06					8.5E-02
		Exposure Point Total									1.5E-06					8.5E-02
	Exposure Medium Total										2.4E-06					1.1E-01
Medium Total											2.4E-06					1.1E-01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.8E+00	mg/kg	3.4E-07	mg/kg/day	7.2E-01	1/mg/kg/day	2.5E-07	9.9E-07	mg/kg/day	3.0E-03	mg/kg/day	3.3E-04
				Benzo(a)anthracene	2.1E+00	mg/kg	7.4E-08	mg/kg/day	7.3E-01	1/mg/kg/day	5.4E-08	2.2E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	6.2E-08	mg/kg/day	7.3E+00	1/mg/kg/day	4.5E-07	1.8E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	4.5E-08	mg/kg/day	7.3E-01	1/mg/kg/day	3.3E-08	1.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	1.7E-08	mg/kg/day	7.3E+00	1/mg/kg/day	1.3E-07	5.1E-08	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	4.7E-07	mg/kg/day	1.5E+00	1/mg/kg/day	7.0E-07	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	4.5E-03
				Chromium	1.5E+03	mg/kg	5.4E-05	mg/kg/day	NA	NA	NA	1.6E-04	mg/kg/day	3.0E-03	mg/kg/day	5.2E-02
				Lead	5.5E+02	mg/kg	1.9E-05	mg/kg/day	NA	NA	NA	5.5E-05	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	3.0E-06	mg/kg/day	NA	NA	NA	8.6E-06	mg/kg/day	1.0E-03	mg/kg/day	8.6E-03
			Exp. Route Total								1.6E-06					6.6E-02
			Dermal	Vinyl chloride	9.8E+00	mg/kg	1.2E-06	mg/kg/day	7.2E-01	1/mg/kg/day	8.3E-07	3.4E-06	mg/kg/day	3.0E-03	mg/kg/day	1.1E-03
				Benzo(a)anthracene	2.1E+00	mg/kg	3.3E-07	mg/kg/day	7.3E-01	1/mg/kg/day	2.4E-07	9.5E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	2.7E-07	mg/kg/day	7.3E+00	1/mg/kg/day	2.0E-06	8.0E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	2.0E-07	mg/kg/day	7.3E-01	1/mg/kg/day	1.4E-07	5.8E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	7.7E-08	mg/kg/day	7.3E+00	1/mg/kg/day	5.6E-07	2.3E-07	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	4.8E-07	mg/kg/day	1.5E+00	1/mg/kg/day	7.2E-07	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	4.6E-03
				Chromium	1.5E+03	mg/kg	1.8E-05	mg/kg/day	NA	NA	NA	5.4E-05	mg/kg/day	7.5E-05	mg/kg/day	7.1E-01
				Lead	5.5E+02	mg/kg	6.5E-06	mg/kg/day	NA	NA	NA	1.9E-05	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	1.0E-06	mg/kg/day	NA	NA	NA	2.9E-06	mg/kg/day	2.6E-05	mg/kg/day	1.1E-01
			Exp. Route Total								4.5E-06					8.3E-01
		Exposure Point Total									6.1E-06					9.0E-01
	Exposure Medium Total										6.1E-06					9.0E-01
Medium Total											6.1E-06					9.0E-01
									Total of Receptor Risks Across All Media		1.1E-05			Total of Receptor Hazards Across All Media		1.5E+00

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 2	Ingestion	Benzo(a)anthracene	5.7E-01	mg/kg	5.1E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.7E-09	4.0E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.4E-01	mg/kg	4.9E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.5E-08	3.8E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.1E-01	mg/kg	5.5E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.0E-09	4.3E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.7E-01	mg/kg	3.3E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.4E-08	2.6E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.0E-01	mg/kg	3.6E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.6E-09	2.8E-08	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.3E-01	mg/kg	1.2E-09	mg/kg/day	2.4E-01	1/(mg/kg-day)	2.9E-10	9.3E-09	mg/kg/day	NA	NA	NA
				4,4'-DDE	6.6E-01	mg/kg	5.9E-09	mg/kg/day	3.4E-01	1/(mg/kg-day)	2.0E-09	4.6E-08	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.0E+00	mg/kg	9.4E-09	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.2E-09	7.3E-08	mg/kg/day	5.0E-04	mg/kg/day	1.5E-04
				Aroclor-1260	1.7E-01	mg/kg	1.5E-09	mg/kg/day	2.0E+00	1/(mg/kg-day)	3.0E-09	1.2E-08	mg/kg/day	NA	NA	NA
				Aluminum	5.6E+03	mg/kg	5.0E-05	mg/kg/day	NA	NA	NA	3.9E-04	mg/kg/day	1.0E+00	mg/kg/day	3.9E-04
				Antimony	1.5E+00	mg/kg	1.3E-08	mg/kg/day	NA	NA	NA	1.0E-07	mg/kg/day	4.0E-04	mg/kg/day	2.6E-04
				Arsenic	6.0E+00	mg/kg	5.4E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	8.1E-08	4.2E-07	mg/kg/day	3.0E-04	mg/kg/day	1.4E-03
				Cadmium	1.2E+00	mg/kg	1.0E-08	mg/kg/day	NA	NA	NA	8.1E-08	mg/kg/day	1.0E-03	mg/kg/day	8.1E-05
				Chromium	4.5E+01	mg/kg	4.1E-07	mg/kg/day	NA	NA	NA	3.2E-06	mg/kg/day	3.0E-03	mg/kg/day	1.1E-03
				Copper	3.0E+02	mg/kg	2.7E-06	mg/kg/day	NA	NA	NA	2.1E-05	mg/kg/day	4.0E-02	mg/kg/day	5.2E-04
				Iron	1.8E+04	mg/kg	1.6E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	7.0E-01	mg/kg/day	1.8E-03
				Lead	4.0E+02	mg/kg	3.6E-06	mg/kg/day	NA	NA	NA	2.8E-05	mg/kg/day	NA	NA	NA
				Manganese	1.6E+02	mg/kg	1.4E-06	mg/kg/day	NA	NA	NA	1.1E-05	mg/kg/day	2.0E-02	mg/kg/day	5.5E-04
				Nickel	3.2E+01	mg/kg	2.9E-07	mg/kg/day	NA	NA	NA	2.2E-06	mg/kg/day	2.0E-02	mg/kg/day	1.1E-04
				Thallium	9.1E-01	mg/kg	8.1E-09	mg/kg/day	NA	NA	NA	6.3E-08	mg/kg/day	7.0E-05	mg/kg/day	9.0E-04
				Vanadium	9.4E+01	mg/kg	8.5E-07	mg/kg/day	NA	NA	NA	6.6E-06	mg/kg/day	1.0E-03	mg/kg/day	6.6E-03
				Zinc	7.8E+02	mg/kg	7.0E-06	mg/kg/day	NA	NA	NA	5.5E-05	mg/kg/day	3.0E-01	mg/kg/day	1.8E-04
			Exp. Route Total								1.6E-07					1.4E-02

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 2	Dermal Absorption	Benzo(a)anthracene	5.7E-01	mg/kg	6.4E-10	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.7E-10	5.0E-09	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.4E-01	mg/kg	6.1E-10	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.5E-09	4.8E-09	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.1E-01	mg/kg	6.9E-10	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.0E-10	5.4E-09	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.7E-01	mg/kg	4.2E-10	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.1E-09	3.3E-09	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.0E-01	mg/kg	4.5E-10	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.3E-10	3.5E-09	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.3E-01	mg/kg	3.5E-11	mg/kg/day	2.4E-01	1/(mg/kg-day)	8.3E-12	2.7E-10	mg/kg/day	NA	NA	NA
				4,4'-DDE	6.6E-01	mg/kg	1.7E-10	mg/kg/day	3.4E-01	1/(mg/kg-day)	5.9E-11	1.3E-09	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.0E+00	mg/kg	2.7E-10	mg/kg/day	3.4E-01	1/(mg/kg-day)	9.3E-11	2.1E-09	mg/kg/day	5.0E-04	mg/kg/day	4.3E-06
				Aroclor-1260	1.7E-01	mg/kg	2.0E-10	mg/kg/day	2.0E+00	1/(mg/kg-day)	4.1E-10	1.6E-09	mg/kg/day	NA	NA	NA
				Aluminum	5.6E+03	mg/kg	4.9E-07	mg/kg/day	NA	NA	NA	3.8E-06	mg/kg/day	1.0E+00	mg/kg/day	3.8E-06
				Antimony	1.5E+00	mg/kg	1.3E-10	mg/kg/day	NA	NA	NA	9.9E-10	mg/kg/day	6.0E-05	mg/kg/day	1.7E-05
				Arsenic	6.0E+00	mg/kg	1.6E-09	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.3E-09	1.2E-08	mg/kg/day	3.0E-04	mg/kg/day	4.0E-05
				Cadmium	1.2E+00	mg/kg	1.0E-11	mg/kg/day	NA	NA	NA	7.9E-11	mg/kg/day	2.5E-05	mg/kg/day	3.2E-06
				Chromium	4.5E+01	mg/kg	3.9E-09	mg/kg/day	NA	NA	NA	3.1E-08	mg/kg/day	7.5E-05	mg/kg/day	4.1E-04
				Copper	3.0E+02	mg/kg	2.6E-08	mg/kg/day	NA	NA	NA	2.0E-07	mg/kg/day	4.0E-02	mg/kg/day	5.1E-06
				Iron	1.8E+04	mg/kg	1.6E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	7.0E-01	mg/kg/day	1.8E-05
				Lead	4.0E+02	mg/kg	3.5E-08	mg/kg/day	NA	NA	NA	2.7E-07	mg/kg/day	NA	NA	NA
				Manganese	1.6E+02	mg/kg	1.4E-08	mg/kg/day	NA	NA	NA	1.1E-07	mg/kg/day	8.0E-04	mg/kg/day	1.3E-04
				Nickel	3.2E+01	mg/kg	2.8E-09	mg/kg/day	NA	NA	NA	2.2E-08	mg/kg/day	8.0E-04	mg/kg/day	2.7E-05
				Thallium	9.1E-01	mg/kg	7.9E-11	mg/kg/day	NA	NA	NA	6.1E-10	mg/kg/day	7.0E-05	mg/kg/day	8.8E-06
				Vanadium	9.4E+01	mg/kg	8.2E-09	mg/kg/day	NA	NA	NA	6.4E-08	mg/kg/day	2.6E-05	mg/kg/day	2.5E-03
				Zinc	7.8E+02	mg/kg	6.8E-08	mg/kg/day	NA	NA	NA	5.3E-07	mg/kg/day	3.0E-01	mg/kg/day	1.8E-06
			Exp. Route Total								1.2E-08					3.1E-03
		Exposure Point Total									1.7E-07					1.7E-02
	Exposure Medium Total										1.7E-07					1.7E-02
Medium Total											1.7E-07					1.7E-02
										Total of Receptor Risks Across All Media	1.7E-07				Total of Receptor Hazards Across All Media	1.7E-02

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	4.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.9E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.4E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.6E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.3E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.4E-07	mg/kg/day	5.0E-04	mg/kg/day	1.9E-03
				Aroclor-1260	1.3E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.8E-08	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.5E-03	mg/kg/day	1.0E+00	mg/kg/day	3.5E-03
				Antimony	5.4E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.5E-06	mg/kg/day	4.0E-04	mg/kg/day	6.1E-03
				Arsenic	7.0E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.2E-06	mg/kg/day	3.0E-04	mg/kg/day	1.1E-02
				Cadmium	1.6E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.2E-07	mg/kg/day	1.0E-03	mg/kg/day	7.2E-04
				Chromium	4.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.1E-05	mg/kg/day	3.0E-03	mg/kg/day	6.9E-03
				Copper	4.5E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.1E-04	mg/kg/day	4.0E-02	mg/kg/day	5.2E-03
				Iron	2.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-02	mg/kg/day	7.0E-01	mg/kg/day	1.5E-02
				Lead	6.6E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.0E-04	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.0E-05	mg/kg/day	2.0E-02	mg/kg/day	4.0E-03
				Mercury	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-07	mg/kg/day	3.0E-04	mg/kg/day	7.9E-04
				Nickel	3.9E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.8E-05	mg/kg/day	2.0E-02	mg/kg/day	8.9E-04
				Thallium	7.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.4E-07	mg/kg/day	7.0E-05	mg/kg/day	4.9E-03
				Vanadium	7.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.3E-05	mg/kg/day	1.0E-03	mg/kg/day	3.3E-02
				Zinc	1.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.1E-04	mg/kg/day	3.0E-01	mg/kg/day	1.7E-03
			Exp. Route Total								0.0E+00					9.5E-02

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	4.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.2E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.9E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.5E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.1E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-08	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.9E-09	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.5E-08	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.2E-08	mg/kg/day	5.0E-04	mg/kg/day	6.4E-05
				Aroclor-1260	1.3E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.2E-09	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.9E-05	mg/kg/day	1.0E+00	mg/kg/day	3.9E-05
				Antimony	5.4E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.8E-08	mg/kg/day	6.0E-05	mg/kg/day	4.7E-04
				Arsenic	7.0E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-07	mg/kg/day	3.0E-04	mg/kg/day	3.7E-04
				Cadmium	1.6E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.2E-10	mg/kg/day	2.5E-05	mg/kg/day	3.3E-05
				Chromium	4.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-07	mg/kg/day	7.5E-05	mg/kg/day	3.1E-03
				Copper	4.5E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-06	mg/kg/day	4.0E-02	mg/kg/day	5.9E-05
				Iron	2.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-04	mg/kg/day	7.0E-01	mg/kg/day	1.8E-04
				Lead	6.6E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.4E-06	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.1E-07	mg/kg/day	8.0E-04	mg/kg/day	1.1E-03
				Mercury	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.7E-09	mg/kg/day	2.10E-05	mg/kg/day	3.4E-06
				Nickel	3.9E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.0E-07	mg/kg/day	8.0E-04	mg/kg/day	2.9E-03
				Thallium	7.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.9E-09	mg/kg/day	7.0E-05	mg/kg/day	1.5E-04
				Vanadium	7.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.7E-07	mg/kg/day	2.6E-05	mg/kg/day	1.2E-06
				Zinc	1.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.8E-06	mg/kg/day	3.0E-01	mg/kg/day	1.9E-05
			Exp. Route Total								0.0E+00					8.5E-03
		Exposure Point Total									0.0E+00					1.0E-01
	Exposure Medium Total										0.0E+00					1.0E-01
Medium Total											0.0E+00					1.0E-01

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.0E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	4.6E-08	mg/kg/day	3.0E-03	mg/kg/day	1.5E-05
				Benzo(a)anthracene	8.1E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	4.1E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	9.4E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	4.8E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	7.7E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.9E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	7.4E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.8E-08	mg/kg/day	NA	NA	NA
				Arsenic	1.1E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	5.4E-07	mg/kg/day	3.0E-04	mg/kg/day	1.8E-03
				Chromium	7.7E+02	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.9E-05	mg/kg/day	3.0E-03	mg/kg/day	1.3E-02
				Lead	2.8E+02	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.4E-05	mg/kg/day	NA	NA	NA
				Vanadium	6.4E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.2E-06	mg/kg/day	1.0E-03	mg/kg/day	3.2E-03
			Exp. Route Total								0.0E+00					1.8E-02
			Dermal	Vinyl chloride	9.0E-01	mg/kg	3.7E-04	mg/kg/day	NA	1/mg/kg/day	NA	1.6E-07	mg/kg/day	3.0E-03	mg/kg/day	5.2E-05
				Benzo(a)anthracene	8.1E-01	mg/kg	4.4E-04	mg/kg/day	NA	1/mg/kg/day	NA	1.8E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	9.4E-01	mg/kg	5.1E-04	mg/kg/day	NA	1/mg/kg/day	NA	2.1E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	7.7E-01	mg/kg	4.1E-04	mg/kg/day	NA	1/mg/kg/day	NA	1.7E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	7.4E-01	mg/kg	4.0E-04	mg/kg/day	NA	1/mg/kg/day	NA	1.7E-07	mg/kg/day	NA	NA	NA
				Arsenic	1.1E+01	mg/kg	1.3E-03	mg/kg/day	NA	1/mg/kg/day	NA	5.5E-07	mg/kg/day	3.0E-04	mg/kg/day	1.8E-03
				Chromium	7.7E+02	mg/kg	3.2E-02	mg/kg/day	NA	1/mg/kg/day	NA	1.3E-05	mg/kg/day	7.5E-05	mg/kg/day	1.8E-01
				Lead	2.8E+02	mg/kg	1.2E-02	mg/kg/day	NA	1/mg/kg/day	NA	4.8E-06	mg/kg/day	NA	NA	NA
				Vanadium	6.4E+01	mg/kg	2.7E-03	mg/kg/day	NA	1/mg/kg/day	NA	1.1E-06	mg/kg/day	2.6E-05	mg/kg/day	4.3E-02
			Exp. Route Total								0.0E+00					2.2E-01
		Exposure Point Total									0.0E+00					2.4E-01
	Exposure Medium Total										0.0E+00					2.4E-01
Medium Total											0.0E+00					2.4E-01

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	2.2E-03	mg/kg/day	4.0E-03	mg/kg/day	5.4E-01
				1,1-Dichloroethene	7.4E+02	ug/L	NA	NA	NA	NA	NA	9.4E-03	mg/kg/day	5.0E-02	mg/kg/day	1.9E-01
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	1.0E-05	mg/kg/day	3.0E-02	mg/kg/day	3.4E-04
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	1.7E-03	mg/kg/day	1.0E-02	mg/kg/day	1.7E-01
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	5.6E-04	mg/kg/day	2.0E-02	mg/kg/day	2.8E-02
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	3.3E-04	mg/kg/day	6.0E-02	mg/kg/day	5.6E-03
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	5.0E-04	mg/kg/day	1.0E-02	mg/kg/day	5.0E-02
				Trichloroethene	4.5E+04	ug/L	NA	NA	NA	NA	NA	5.7E-01	mg/kg/day	6.0E-03	mg/kg/day	9.5E+01
				Vinyl chloride	1.7E+03	ug/L	NA	NA	NA	NA	NA	2.2E-02	mg/kg/day	3.0E-03	mg/kg/day	7.3E+00
				Xylene, total	5.8E+00	ug/L	NA	NA	NA	NA	NA	7.4E-05	mg/kg/day	2.0E-01	mg/kg/day	3.7E-04
				cis-1,2-Dichloroethene	1.0E+04	ug/L	NA	NA	NA	NA	NA	1.3E-01	mg/kg/day	1.0E-02	mg/kg/day	1.3E+01
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	2.9E-05	mg/kg/day	3.0E-02	mg/kg/day	9.8E-04
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	9.2E-03	mg/kg/day	2.0E-02	mg/kg/day	4.6E-01
				2-Methylnaphthalene	1.1E+01	ug/L	NA	NA	NA	NA	NA	1.4E-04	mg/kg/day	4.0E-03	mg/kg/day	3.4E-02
				Acenaphthene	1.2E+01	ug/L	NA	NA	NA	NA	NA	1.5E-04	mg/kg/day	6.0E-02	mg/kg/day	2.5E-03
				Carbazole	2.4E+01	ug/L	NA	NA	NA	NA	NA	3.1E-04	mg/kg/day	NA	NA	NA
				Dibenzofuran	8.8E+00	ug/L	NA	NA	NA	NA	NA	1.1E-04	mg/kg/day	1.0E-03	mg/kg/day	1.1E-01
				Fluorene	9.4E+00	ug/L	NA	NA	NA	NA	NA	1.2E-04	mg/kg/day	4.0E-02	mg/kg/day	3.0E-03
				Naphthalene	1.2E+02	ug/L	NA	NA	NA	NA	NA	1.6E-03	mg/kg/day	2.0E-02	mg/kg/day	7.8E-02
				Phenanthrene	8.8E+00	ug/L	NA	NA	NA	NA	NA	1.1E-04	mg/kg/day	NA	NA	NA
				Heptachlor	3.5E-02	ug/L	NA	NA	NA	NA	NA	4.5E-07	mg/kg/day	5.0E-04	mg/kg/day	9.0E-04
				Heptachlor epoxide	1.2E-01	ug/L	NA	NA	NA	NA	NA	1.5E-06	mg/kg/day	1.3E-05	mg/kg/day	1.2E-01
				2,6-Dinitrotolune	2.8E+00	ug/L	NA	NA	NA	NA	NA	3.7E-05	mg/kg/day	1.0E-03	mg/kg/day	3.7E-02
				RDX	7.3E-01	ug/L	NA	NA	NA	NA	NA	9.3E-06	mg/kg/day	3.0E-03	mg/kg/day	3.1E-03
				Arsenic	5.9E+00	ug/L	NA	NA	NA	NA	NA	7.6E-05	mg/kg/day	3.0E-04	mg/kg/day	2.5E-01
				Iron	2.3E+04	ug/L	NA	NA	NA	NA	NA	2.9E-01	mg/kg/day	7.0E-01	mg/kg/day	4.1E-01
				Lead	2.4E+00	ug/L	NA	NA	NA	NA	NA	3.0E-05	mg/kg/day	NA	NA	NA
				Manganese	8.4E+02	ug/L	NA	NA	NA	NA	NA	1.1E-02	mg/kg/day	2.0E-02	mg/kg/day	5.4E-01
			Exp. Route Total								0.0E+00					1.2E+02

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	1.9E-04	mg/kg/day	4.0E-03	mg/kg/day	4.8E-02
				1,1-Dichloroethene	7.4E+02	ug/L	NA	NA	NA	NA	NA	1.2E-03	mg/kg/day	5.0E-02	mg/kg/day	2.4E-02
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	6.5E-06	mg/kg/day	3.0E-02	mg/kg/day	2.2E-04
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	1.4E-04	mg/kg/day	1.0E-02	mg/kg/day	1.4E-02
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	3.6E-05	mg/kg/day	2.0E-02	mg/kg/day	1.8E-03
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	1.2E-05	mg/kg/day	6.0E-02	mg/kg/day	2.0E-04
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	2.8E-04	mg/kg/day	1.0E-02	mg/kg/day	2.8E-02
				Trichloroethene	4.5E+04	ug/L	NA	NA	NA	NA	NA	9.3E-02	mg/kg/day	6.0E-03	mg/kg/day	1.5E+01
				Vinyl chloride	1.7E+03	ug/L	NA	NA	NA	NA	NA	1.1E-03	mg/kg/day	3.0E-03	mg/kg/day	3.5E-01
				Xylene, total	5.8E+00	ug/L	NA	NA	NA	NA	NA	4.5E-05	mg/kg/day	2.0E-01	mg/kg/day	2.3E-04
				cis-1,2-Dichloroethene	1.0E+04	ug/L	NA	NA	NA	NA	NA	1.1E-02	mg/kg/day	1.0E-02	mg/kg/day	1.1E+00
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	1.5E-06	mg/kg/day	3.0E-02	mg/kg/day	5.0E-05
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	7.7E-04	mg/kg/day	2.0E-02	mg/kg/day	3.8E-02
				2-Methylnaphthalene	1.1E+01	ug/L	NA	NA	NA	NA	NA	8.6E-05	mg/kg/day	4.0E-03	mg/kg/day	2.2E-02
				Acenaphthene	1.2E+01	ug/L	NA	NA	NA	NA	NA	1.9E-04	mg/kg/day	6.0E-02	mg/kg/day	3.2E-03
				Carbazole	2.4E+01	ug/L	NA	NA	NA	NA	NA	2.8E-04	mg/kg/day	NA	mg/kg/day	NA
				Dibenzofuran	8.8E+00	ug/L	NA	NA	NA	NA	NA	1.8E-04	mg/kg/day	1.0E-03	mg/kg/day	1.8E-01
				Fluorene	9.4E+00	ug/L	NA	NA	NA	NA	NA	2.2E-04	mg/kg/day	4.0E-02	mg/kg/day	5.4E-03
				Naphthalene	1.2E+02	ug/L	NA	NA	NA	NA	NA	9.8E-04	mg/kg/day	2.0E-02	mg/kg/day	4.9E-02
				Phenanthrene	8.8E+00	ug/L	NA	NA	NA	NA	NA	2.9E-04	mg/kg/day	NA	mg/kg/day	NA
				Heptachlor	3.5E-02	ug/L	NA	NA	NA	NA	NA	2.0E-07	mg/kg/day	5.0E-04	mg/kg/day	4.0E-04
				Heptachlor epoxide	1.2E-01	ug/L	NA	NA	NA	NA	NA	6.8E-07	mg/kg/day	1.3E-05	mg/kg/day	5.2E-02
				2,6-Dinitrotolune	2.8E+00	ug/L	NA	NA	NA	NA	NA	1.4E-06	mg/kg/day	1.0E-03	mg/kg/day	1.4E-03
				RDX	7.3E-01	ug/L	NA	NA	NA	NA	NA	4.2E-08	mg/kg/day	2.4E-03	mg/kg/day	1.7E-05
				Arsenic	5.9E+00	ug/L	NA	NA	NA	NA	NA	9.8E-07	mg/kg/day	3.0E-04	mg/kg/day	3.3E-03
				Iron	2.3E+04	ug/L	NA	NA	NA	NA	NA	3.7E-03	mg/kg/day	7.0E-01	mg/kg/day	5.3E-03
				Lead	2.4E+00	ug/L	NA	NA	NA	NA	NA	3.9E-07	mg/kg/day	NA	mg/kg/day	NA
				Manganese	8.4E+02	ug/L	NA	NA	NA	NA	NA	1.4E-04	mg/kg/day	8.0E-04	mg/kg/day	1.7E-01
			Exp. Route Total								0.0E+00					1.8E+01
		Medium Total									0.0E+00					1.4E+02
Exposure Medium Total											0.0E+00					1.4E+02
Medium Total											0.0E+00					1.4E+02
Total of Receptor Risks Across All Media											0.0E+00	Total of Receptor Hazards Across All Media				1.4E+02

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to groundwater while bathing calculated on Table 7.2.CTE Supplement A.

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 2	Ingestion	Benzo(a)anthracene	8.0E-01	mg/kg	2.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-08	2.2E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	7.4E-01	mg/kg	2.6E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.9E-07	2.1E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	8.1E-01	mg/kg	2.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-08	2.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	4.4E-01	mg/kg	1.6E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.2E-07	1.2E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.1E-01	mg/kg	2.2E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-08	1.7E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	6.0E-01	mg/kg	2.2E-08	mg/kg/day	2.4E-01	1/(mg/kg-day)	5.2E-09	1.7E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	1.3E+00	mg/kg	4.8E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.6E-08	3.7E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	5.0E+00	mg/kg	1.8E-07	mg/kg/day	3.4E-01	1/(mg/kg-day)	6.1E-08	1.4E-06	mg/kg/day	5.0E-04	mg/kg/day	2.8E-03
				Aroclor-1260	1.3E+00	mg/kg	4.7E-08	mg/kg/day	2.0E+00	1/(mg/kg-day)	9.5E-08	3.7E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.8E+03	mg/kg	2.4E-04	mg/kg/day	NA	NA	NA	1.9E-03	mg/kg/day	1.0E+00	mg/kg/day	1.9E-03
				Antimony	5.7E+00	mg/kg	2.1E-07	mg/kg/day	NA	NA	NA	1.6E-06	mg/kg/day	4.0E-04	mg/kg/day	4.0E-03
				Arsenic	8.2E+00	mg/kg	2.9E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.4E-07	2.3E-06	mg/kg/day	3.0E-04	mg/kg/day	7.6E-03
				Cadmium	2.9E+00	mg/kg	1.0E-07	mg/kg/day	NA	NA	NA	8.1E-07	mg/kg/day	1.0E-03	mg/kg/day	8.1E-04
				Chromium	1.9E+02	mg/kg	6.8E-06	mg/kg/day	NA	NA	NA	5.3E-05	mg/kg/day	3.0E-03	mg/kg/day	1.8E-02
				Copper	9.2E+02	mg/kg	3.3E-05	mg/kg/day	NA	NA	NA	2.6E-04	mg/kg/day	4.0E-02	mg/kg/day	6.4E-03
				Iron	7.9E+04	mg/kg	2.8E-03	mg/kg/day	NA	NA	NA	2.2E-02	mg/kg/day	7.0E-01	mg/kg/day	3.1E-02
				Lead	1.1E+03	mg/kg	3.8E-05	mg/kg/day	NA	NA	NA	3.0E-04	mg/kg/day	NA	NA	NA
				Manganese	2.7E+02	mg/kg	9.6E-06	mg/kg/day	NA	NA	NA	7.5E-05	mg/kg/day	2.0E-02	mg/kg/day	3.7E-03
				Nickel	8.1E+01	mg/kg	2.9E-06	mg/kg/day	NA	NA	NA	2.3E-05	mg/kg/day	2.0E-02	mg/kg/day	1.1E-03
				Thallium	2.3E+00	mg/kg	8.4E-08	mg/kg/day	NA	NA	NA	6.6E-07	mg/kg/day	7.0E-05	mg/kg/day	9.4E-03
				Vanadium	6.9E+02	mg/kg	2.5E-05	mg/kg/day	NA	NA	NA	1.9E-04	mg/kg/day	1.0E-03	mg/kg/day	1.9E-01
				Zinc	1.4E+03	mg/kg	4.9E-05	mg/kg/day	NA	NA	NA	3.8E-04	mg/kg/day	3.0E-01	mg/kg/day	1.3E-03
			Exp. Route Total								9.9E-07					2.8E-01

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal Absorption	Benzo(a)anthracene	8.0E-01	mg/kg	5.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.3E-08	4.6E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	7.4E-01	mg/kg	5.5E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.0E-07	4.3E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	8.1E-01	mg/kg	6.0E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.4E-08	4.7E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	4.4E-01	mg/kg	3.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.4E-07	2.5E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.1E-01	mg/kg	4.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.3E-08	3.5E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	6.0E-01	mg/kg	1.0E-08	mg/kg/day	2.4E-01	1/(mg/kg-day)	2.5E-09	8.0E-08	mg/kg/day	NA	NA	NA
				4,4'-DDE	1.3E+00	mg/kg	2.3E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	7.7E-09	1.8E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	5.0E+00	mg/kg	8.5E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	2.9E-08	6.6E-07	mg/kg/day	5.0E-04	mg/kg/day	1.3E-03
				Aroclor-1260	1.3E+00	mg/kg	1.1E-07	mg/kg/day	2.0E+00	1/(mg/kg-day)	2.1E-07	8.2E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.8E+03	mg/kg	3.9E-05	mg/kg/day	NA	NA	NA	3.0E-04	mg/kg/day	1.0E+00	mg/kg/day	3.0E-04
				Antimony	5.7E+00	mg/kg	3.3E-08	mg/kg/day	NA	NA	NA	2.5E-07	mg/kg/day	6.0E-05	mg/kg/day	4.2E-03
				Arsenic	8.2E+00	mg/kg	1.4E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.1E-07	1.1E-06	mg/kg/day	3.0E-04	mg/kg/day	3.6E-03
				Cadmium	2.9E+00	mg/kg	1.7E-09	mg/kg/day	NA	NA	NA	1.3E-08	mg/kg/day	2.5E-05	mg/kg/day	5.2E-04
				Chromium	1.9E+02	mg/kg	1.1E-06	mg/kg/day	NA	NA	NA	8.4E-06	mg/kg/day	7.5E-05	mg/kg/day	1.1E-01
				Copper	9.2E+02	mg/kg	5.3E-06	mg/kg/day	NA	NA	NA	4.1E-05	mg/kg/day	4.0E-02	mg/kg/day	1.0E-03
				Iron	7.9E+04	mg/kg	4.5E-04	mg/kg/day	NA	NA	NA	3.5E-03	mg/kg/day	7.0E-01	mg/kg/day	5.0E-03
				Lead	1.1E+03	mg/kg	6.1E-06	mg/kg/day	NA	NA	NA	4.7E-05	mg/kg/day	NA	NA	NA
				Manganese	2.7E+02	mg/kg	1.5E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	8.0E-04	mg/kg/day	1.5E-02
				Nickel	8.1E+01	mg/kg	4.6E-07	mg/kg/day	NA	NA	NA	3.6E-06	mg/kg/day	8.0E-04	mg/kg/day	4.5E-03
				Thallium	2.3E+00	mg/kg	1.3E-08	mg/kg/day	NA	NA	NA	1.0E-07	mg/kg/day	7.0E-05	mg/kg/day	1.5E-03
				Vanadium	6.9E+02	mg/kg	4.0E-06	mg/kg/day	NA	NA	NA	3.1E-05	mg/kg/day	2.6E-05	mg/kg/day	1.2E+00
				Zinc	1.4E+03	mg/kg	7.8E-06	mg/kg/day	NA	NA	NA	6.1E-05	mg/kg/day	3.0E-01	mg/kg/day	2.0E-04
			Exp. Route Total								1.2E-06					1.3E+00
		Exposure Point Total									2.2E-06					1.6E+00
	Exposure Medium Total										2.2E-06					1.6E+00
	Air	Emissions from Surface Soil at Site 2	Inhalation	Chromium	1.4E-07	mg/m3	8.5E-11	mg/kg/day	4.1E+01	1/(mg/kg-day)	3.5E-09	6.6E-10	mg/kg/day	3.0E-05	mg/kg/day	2.2E-05
			Exp. Route Total								3.5E-09					2.2E-05
		Exposure Point Total									3.5E-09					2.2E-05
	Exposure Medium Total										3.5E-09					2.2E-05
Medium Total											2.2E-06					1.6E+00

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Features and Ponded Area	Ingestion	Bromodichloromethane	4.3E+00	ug/L	1.2E-07	mg/kg/day	6.2E-02	1/mg/kg/day	7.7E-09	9.7E-07	mg/kg/day	2.0E-02	mg/kg/day	4.8E-05
				Chloroform	8.6E+00	ug/L	2.5E-07	mg/kg/day	NA	NA	NA	1.9E-06	mg/kg/day	1.0E-02	mg/kg/day	1.9E-04
				Trichloroethene	1.3E+02	ug/L	3.8E-06	mg/kg/day	1.3E-02	1/mg/kg/day	4.9E-08	3.0E-05	mg/kg/day	6.0E-03	mg/kg/day	4.9E-03
				Vinyl chloride	1.2E+01	ug/L	3.4E-07	mg/kg/day	7.2E-01	1/mg/kg/day	2.5E-07	2.7E-06	mg/kg/day	3.0E-03	mg/kg/day	8.8E-04
				cis-1,2-Dichloroethene	5.4E+01	ug/L	1.5E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	1.0E-02	mg/kg/day	1.2E-03
				bis(2-Ethylhexyl)phthalate	8.1E+01	ug/L	2.3E-06	mg/kg/day	1.4E-02	1/mg/kg/day	3.3E-08	1.8E-05	mg/kg/day	2.0E-02	mg/kg/day	9.1E-04
				Arsenic	3.2E+00	ug/L	9.2E-08	mg/kg/day	1.5E+00	1/mg/kg/day	1.4E-07	7.2E-07	mg/kg/day	3.0E-04	mg/kg/day	2.4E-03
				Chromium	1.7E+02	ug/L	4.8E-06	mg/kg/day	NA	NA	NA	3.7E-05	mg/kg/day	3.0E-03	mg/kg/day	1.2E-02
				Lead	7.4E+01	ug/L	2.1E-06	mg/kg/day	NA	NA	NA	1.7E-05	mg/kg/day	NA	mg/kg/day	NA
				Manganese	1.1E+03	ug/L	3.1E-05	mg/kg/day	NA	NA	NA	2.4E-04	mg/kg/day	2.0E-02	mg/kg/day	1.2E-02
			Exp. Route Total								4.7E-07					3.5E-02
			Dermal	Bromodichloromethane	4.3E+00	ug/L	7.5E-08	mg/kg/day	6.2E-02	1/mg/kg/day	4.6E-09	5.8E-07	mg/kg/day	2.0E-02	mg/kg/day	2.9E-05
				Chloroform	8.6E+00	ug/L	1.7E-07	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	1.0E-02	mg/kg/day	1.3E-04
				Trichloroethene	1.3E+02	ug/L	4.9E-06	mg/kg/day	1.3E-02	1/mg/kg/day	6.3E-08	3.8E-05	mg/kg/day	6.0E-03	mg/kg/day	6.3E-03
				Vinyl chloride	1.2E+01	ug/L	1.4E-07	mg/kg/day	7.2E-01	1/mg/kg/day	1.0E-07	1.1E-06	mg/kg/day	3.0E-03	mg/kg/day	3.7E-04
				cis-1,2-Dichloroethene	5.4E+01	ug/L	1.0E-06	mg/kg/day	NA	NA	NA	8.1E-06	mg/kg/day	1.0E-02	mg/kg/day	8.1E-04
				bis(2-Ethylhexyl)phthalate	8.1E+01	ug/L	2.7E-05	mg/kg/day	1.4E-02	1/mg/kg/day	3.7E-07	2.1E-04	mg/kg/day	2.0E-02	mg/kg/day	1.0E-02
				Arsenic	3.2E+00	ug/L	4.7E-09	mg/kg/day	1.5E+00	1/mg/kg/day	7.0E-09	3.6E-08	mg/kg/day	3.0E-04	mg/kg/day	1.2E-04
				Chromium	1.7E+02	ug/L	4.8E-07	mg/kg/day	NA	NA	NA	3.8E-06	mg/kg/day	7.5E-05	mg/kg/day	5.0E-02
				Lead	7.4E+01	ug/L	1.1E-07	mg/kg/day	NA	NA	NA	8.4E-07	mg/kg/day	NA	mg/kg/day	NA
				Manganese	1.1E+03	ug/L	1.6E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	8.0E-04	mg/kg/day	1.5E-02
			Exp. Route Total								5.5E-07					8.3E-02
		Exposure Point Total									5.5E-07					8.3E-02
	Exposure Medium Total										1.0E-06					1.2E-01

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.8E+00	mg/kg	1.8E-07	mg/kg/day	7.2E-01	1/mg/kg/day	1.3E-07	1.4E-06	mg/kg/day	3.0E-03	mg/kg/day	4.5E-04
				Benzo(a)anthracene	2.1E+00	mg/kg	3.8E-08	mg/kg/day	7.3E-01	1/mg/kg/day	2.8E-08	3.0E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	3.2E-08	mg/kg/day	7.3E+00	1/mg/kg/day	2.3E-07	2.5E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	2.3E-08	mg/kg/day	7.3E-01	1/mg/kg/day	1.7E-08	1.8E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	9.0E-09	mg/kg/day	7.3E+00	1/mg/kg/day	6.6E-08	7.0E-08	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	2.4E-07	mg/kg/day	1.5E+00	1/mg/kg/day	3.6E-07	1.9E-06	mg/kg/day	3.0E-04	mg/kg/day	6.2E-03
				Chromium	1.5E+03	mg/kg	2.8E-05	mg/kg/day	NA	NA	NA	2.2E-04	mg/kg/day	3.0E-03	mg/kg/day	7.2E-02
				Lead	5.5E+02	mg/kg	9.8E-06	mg/kg/day	NA	NA	NA	7.6E-05	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	1.5E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	1.0E-03	mg/kg/day	1.2E-02
			Exp. Route Total								8.3E-07					9.1E-02
			Dermal	Vinyl chloride	9.8E+00	mg/kg	4.3E-07	mg/kg/day	7.2E-01	1/mg/kg/day	3.1E-07	3.3E-06	mg/kg/day	3.0E-03	mg/kg/day	1.1E-03
				Benzo(a)anthracene	2.1E+00	mg/kg	1.2E-07	mg/kg/day	7.3E-01	1/mg/kg/day	8.8E-08	9.3E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	1.0E-07	mg/kg/day	7.3E+00	1/mg/kg/day	7.4E-07	7.8E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	7.3E-08	mg/kg/day	7.3E-01	1/mg/kg/day	5.3E-08	5.7E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	2.8E-08	mg/kg/day	7.3E+00	1/mg/kg/day	2.1E-07	2.2E-07	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	1.8E-07	mg/kg/day	1.5E+00	1/mg/kg/day	2.6E-07	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	4.5E-03
				Chromium	1.5E+03	mg/kg	6.7E-06	mg/kg/day	NA	NA	NA	5.2E-05	mg/kg/day	7.5E-05	mg/kg/day	7.0E-01
				Lead	5.5E+02	mg/kg	2.4E-06	mg/kg/day	NA	NA	NA	1.8E-05	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	3.7E-07	mg/kg/day	NA	NA	NA	2.9E-06	mg/kg/day	2.6E-05	mg/kg/day	1.1E-01
			Exp. Route Total								1.7E-06					8.2E-01
		Exposure Point Total									2.5E-06					9.1E-01
	Exposure Medium Total										2.5E-06					9.1E-01
Medium Total											2.5E-06					9.1E-01
									Total of Receptor Risks Across All Media		5.7E-06			Total of Receptor Hazards Across All Media		2.6E+00

Table 7.2.CTE Supplement A
Calculation of DAevent
Adult Resident, Shallow Groundwater, Tap Water
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Groundwater Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+02	6.4E-03	3.4E-02	6.0E-01	1.4E+00	1.0E+00	0.25	1.2E-06	2
1,1-Dichloroethene	7.4E+02	1.2E-02	1.1E+00	3.7E-01	8.9E-01	1.0E+00	0.25	7.4E-06	2
1,4-Dichlorobenzene	8.0E-01	4.2E-02	9.9E-02	7.1E-01	1.7E+00	1.0E+00	0.25	3.9E-08	2
Chloroform	1.3E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.25	8.6E-07	2
Dibromochloromethane	4.4E+01	2.9E-03	1.6E-02	1.5E+00	3.7E+00	1.0E+00	0.25	2.2E-07	2
Methylene chloride	2.6E+01	3.5E-03	1.3E-01	3.2E-01	7.6E-01	1.0E+00	0.25	7.1E-08	2
Tetrachloroethene	3.9E+01	3.3E-02	7.2E-01	9.1E-01	2.2E+00	1.0E+00	0.25	1.7E-06	2
Trichloroethene	4.5E+04	1.2E-02	4.0E-01	5.8E-01	1.4E+00	1.0E+00	0.25	5.6E-04	2
Vinyl chloride	1.7E+03	5.6E-03	1.1E+00	2.4E-01	5.7E-01	1.0E+00	0.25	6.4E-06	2
Xylene, total	5.8E+00	5.3E-02	2.0E-01	4.2E-01	1.0E+00	1.0E+00	0.25	2.8E-07	2
cis-1,2-Dichloroethene	1.0E+04	7.7E-03	1.7E-01	3.7E-01	8.9E-01	1.0E+00	0.25	6.7E-05	2
cis-1,3-Dichloropropene	2.3E+00	4.3E-03	1.8E-02	4.5E-01	1.1E+00	1.0E+00	0.25	9.2E-09	2
trans-1,2-Dichloroethene	7.2E+02	7.7E-03	3.8E-01	3.7E-01	8.9E-01	1.0E+00	0.25	4.7E-06	2
2-Methylnaphthalene	1.1E+01	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	0.25	5.2E-07	2
Acenaphthene	1.2E+01	8.4E-02	4.0E-01	7.7E-01	1.8E+00	1.0E+00	0.25	1.2E-06	2
Carbazole	2.4E+01	5.2E-02	2.6E-01	9.1E-01	2.2E+00	1.0E+00	0.25	1.7E-06	2
Dibenzofuran	8.8E+00	9.5E-02	4.7E-01	9.2E-01	2.2E+00	1.0E+00	0.25	1.1E-06	2
Fluorene	9.4E+00	1.1E-01	5.3E-01	9.0E-01	2.2E+00	1.0E+00	0.25	1.3E-06	2
Naphthalene	1.2E+02	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	0.25	5.9E-06	2
Phenanthrene	8.8E+00	1.4E-01	7.4E-01	1.1E+00	4.1E+00	1.0E+00	0.25	1.8E-06	2
Heptachlor	3.5E-02	8.6E-03	1.2E-02	1.3E+01	3.2E+01	8.0E-01	0.25	1.2E-09	2
Heptachlor epoxide	1.2E-01	8.6E-03	8.6E-04	1.3E+01	3.2E+01	8.0E-01	0.25	4.1E-09	2
2,6-Dinitrotolune	2.8E+00	2.1E-03	1.9E-02	1.1E+00	2.7E+00	1.0E+00	0.25	8.8E-09	2
RDX	7.3E-01	3.5E-04	NA	NA	NA	NA	0.25	2.5E-10	1
Arsenic	5.9E+00	1.0E-03	NA	NA	NA	NA	0.25	5.9E-09	1
Iron	2.3E+04	1.0E-03	NA	NA	NA	NA	0.25	2.3E-05	1
Lead	2.4E+00	1.0E-03	NA	NA	NA	NA	0.25	2.4E-09	1
Manganese	8.4E+02	1.0E-03	NA	NA	NA	NA	0.25	8.4E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
tevent<t*: DAevent (mg/cm2-event) =
2 x FA x Kp x CW x (sqrt((6 x τ_{event} x tevent)/π)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
FA x Kp x CW x (tevent/(1+B) + 2 x τ_{event} x $((1 + 3xB + 3xB^2)/(1+B)^2)$ x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 2001, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005.
NA - not applicable.

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Landscaper
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 2	Ingestion	Benzo(a)anthracene	8.0E-01	mg/kg	2.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-08	8.4E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	7.4E-01	mg/kg	2.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.0E-07	7.8E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	8.1E-01	mg/kg	3.0E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.2E-08	8.6E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	4.4E-01	mg/kg	1.6E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.2E-07	4.7E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.1E-01	mg/kg	2.2E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-08	6.5E-08	mg/kg/day	NA	NA	NA
				4,4'-DDD	6.0E-01	mg/kg	2.2E-08	mg/kg/day	2.4E-01	1/(mg/kg-day)	5.2E-09	6.4E-08	mg/kg/day	NA	NA	NA
				4,4'-DDE	1.3E+00	mg/kg	4.8E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.6E-08	1.4E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	5.0E+00	mg/kg	1.8E-07	mg/kg/day	3.4E-01	1/(mg/kg-day)	6.1E-08	5.3E-07	mg/kg/day	5.0E-04	mg/kg/day	1.1E-03
				Aroclor-1260	1.3E+00	mg/kg	4.8E-08	mg/kg/day	2.0E+00	1/(mg/kg-day)	9.6E-08	1.4E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.8E+03	mg/kg	2.5E-04	mg/kg/day	NA	NA	NA	7.2E-04	mg/kg/day	1.0E+00	mg/kg/day	7.2E-04
				Antimony	5.7E+00	mg/kg	2.1E-07	mg/kg/day	NA	NA	NA	6.1E-07	mg/kg/day	4.0E-04	mg/kg/day	1.5E-03
				Arsenic	8.2E+00	mg/kg	3.0E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.5E-07	8.7E-07	mg/kg/day	3.0E-04	mg/kg/day	2.9E-03
				Cadmium	2.9E+00	mg/kg	1.1E-07	mg/kg/day	NA	NA	NA	3.1E-07	mg/kg/day	1.0E-03	mg/kg/day	3.1E-04
				Chromium	1.9E+02	mg/kg	6.9E-06	mg/kg/day	NA	NA	NA	2.0E-05	mg/kg/day	3.0E-03	mg/kg/day	6.7E-03
				Copper	9.2E+02	mg/kg	3.4E-05	mg/kg/day	NA	NA	NA	9.8E-05	mg/kg/day	4.0E-02	mg/kg/day	2.4E-03
				Iron	7.9E+04	mg/kg	2.9E-03	mg/kg/day	NA	NA	NA	8.4E-03	mg/kg/day	7.0E-01	mg/kg/day	1.2E-02
				Lead	1.1E+03	mg/kg	3.9E-05	mg/kg/day	NA	NA	NA	1.1E-04	mg/kg/day	NA	NA	NA
				Manganese	2.7E+02	mg/kg	9.7E-06	mg/kg/day	NA	NA	NA	2.8E-05	mg/kg/day	2.0E-02	mg/kg/day	1.4E-03
				Nickel	8.1E+01	mg/kg	2.9E-06	mg/kg/day	NA	NA	NA	8.6E-06	mg/kg/day	2.0E-02	mg/kg/day	4.3E-04
				Thallium	2.3E+00	mg/kg	8.5E-08	mg/kg/day	NA	NA	NA	2.5E-07	mg/kg/day	7.0E-05	mg/kg/day	3.6E-03
				Vanadium	6.9E+02	mg/kg	2.5E-05	mg/kg/day	NA	NA	NA	7.3E-05	mg/kg/day	1.0E-03	mg/kg/day	7.3E-02
				Zinc	1.4E+03	mg/kg	5.0E-05	mg/kg/day	NA	NA	NA	1.4E-04	mg/kg/day	3.0E-01	mg/kg/day	4.8E-04
			Exp. Route Total								1.0E-06					1.1E-01
			Dermal Absorption	Benzo(a)anthracene	8.0E-01	mg/kg	2.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.8E-08	7.2E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	7.4E-01	mg/kg	2.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.7E-07	6.7E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	8.1E-01	mg/kg	2.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.9E-08	7.4E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	4.4E-01	mg/kg	1.4E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.0E-07	4.0E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.1E-01	mg/kg	1.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.4E-08	5.5E-08	mg/kg/day	NA	NA	NA
				4,4'-DDD	6.0E-01	mg/kg	4.3E-09	mg/kg/day	2.4E-01	1/(mg/kg-day)	1.0E-09	1.3E-08	mg/kg/day	NA	NA	NA
				4,4'-DDE	1.3E+00	mg/kg	9.5E-09	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.2E-09	2.8E-08	mg/kg/day	NA	NA	NA
				4,4'-DDT	5.0E+00	mg/kg	3.6E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.2E-08	1.0E-07	mg/kg/day	5.0E-04	mg/kg/day	2.1E-04
				Aroclor-1260	1.3E+00	mg/kg	4.4E-08	mg/kg/day	2.0E+00	1/(mg/kg-day)	8.8E-08	1.3E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.8E+03	mg/kg	1.6E-05	mg/kg/day	NA	NA	NA	4.7E-05	mg/kg/day	1.0E+00	mg/kg/day	4.7E-05
				Antimony	5.7E+00	mg/kg	1.4E-08	mg/kg/day	NA	NA	NA	4.0E-08	mg/kg/day	6.0E-05	mg/kg/day	6.7E-04
				Arsenic	8.2E+00	mg/kg	5.9E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	8.9E-08	1.7E-07	mg/kg/day	3.0E-04	mg/kg/day	5.7E-04

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Landscaper
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	2.9E+00	mg/kg	7.0E-10	mg/kg/day	NA	NA	NA	2.0E-09	mg/kg/day	2.5E-05	mg/kg/day	8.2E-05
				Chromium	1.9E+02	mg/kg	4.5E-07	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	7.5E-05	mg/kg/day	1.8E-02
				Copper	9.2E+02	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	6.4E-06	mg/kg/day	4.0E-02	mg/kg/day	1.6E-04
				Iron	7.9E+04	mg/kg	1.9E-04	mg/kg/day	NA	NA	NA	5.5E-04	mg/kg/day	7.0E-01	mg/kg/day	7.9E-04
				Lead	1.1E+03	mg/kg	2.5E-06	mg/kg/day	NA	NA	NA	7.4E-06	mg/kg/day	NA	NA	NA
				Manganese	2.7E+02	mg/kg	6.4E-07	mg/kg/day	NA	NA	NA	1.9E-06	mg/kg/day	8.0E-04	mg/kg/day	2.3E-03
				Nickel	8.1E+01	mg/kg	1.9E-07	mg/kg/day	NA	NA	NA	5.7E-07	mg/kg/day	8.0E-04	mg/kg/day	7.1E-04
				Thallium	2.3E+00	mg/kg	5.6E-09	mg/kg/day	NA	NA	NA	1.6E-08	mg/kg/day	7.0E-05	mg/kg/day	2.3E-04
				Vanadium	6.9E+02	mg/kg	1.7E-06	mg/kg/day	NA	NA	NA	4.8E-06	mg/kg/day	2.6E-05	mg/kg/day	1.9E-01
				Zinc	1.4E+03	mg/kg	3.3E-06	mg/kg/day	NA	NA	NA	9.6E-06	mg/kg/day	3.0E-01	mg/kg/day	3.2E-05
			Exp. Route Total								5.1E-07					2.1E-01
		Exposure Point Total									1.5E-06					3.2E-01
	Exposure Medium Total										1.5E-06					3.2E-01
	Air	Emissions from Surface Soil at Site 2	Inhalation	Chromium	1.4E-07	mg/m3	8.6E-11	mg/kg/day	4.1E+01	1/(mg/kg-day)	3.5E-09	2.5E-10	mg/kg/day	3.0E-05	mg/kg/day	8.4E-06
			Exp. Route Total								3.5E-09					8.4E-06
		Exposure Point Total									3.5E-09					8.4E-06
	Exposure Medium Total										3.5E-09					8.4E-06
Medium Total											1.5E-06					3.2E-01

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	4.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.0E-06	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.8E-06	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-06	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.5E-06	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-06	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.0E-06	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.8E-06	mg/kg/day	5.0E-04	mg/kg/day	1.8E-02
				Aroclor-1260	1.3E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.4E-07	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.2E-02	mg/kg/day	1.0E+00	mg/kg/day	3.2E-02
				Antimony	5.4E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.3E-05	mg/kg/day	4.0E-04	mg/kg/day	5.7E-02
				Arsenic	7.0E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.0E-05	mg/kg/day	3.0E-04	mg/kg/day	1.0E-01
				Cadmium	1.6E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.7E-06	mg/kg/day	1.0E-03	mg/kg/day	6.7E-03
				Chromium	4.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.9E-04	mg/kg/day	3.0E-03	mg/kg/day	6.4E-02
				Copper	4.5E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.9E-03	mg/kg/day	4.0E-02	mg/kg/day	4.8E-02
				Iron	2.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.0E-01	mg/kg/day	7.0E-01	mg/kg/day	1.4E-01
				Lead	6.6E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.8E-03	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.5E-04	mg/kg/day	2.0E-02	mg/kg/day	3.7E-02
				Mercury	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-06	mg/kg/day	3.0E-04	mg/kg/day	7.4E-03
				Nickel	3.9E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.7E-04	mg/kg/day	2.0E-02	mg/kg/day	8.3E-03
				Thallium	7.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.2E-06	mg/kg/day	7.0E-05	mg/kg/day	4.6E-02
				Vanadium	7.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.0E-04	mg/kg/day	1.0E-03	mg/kg/day	3.0E-01
				Zinc	1.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.7E-03	mg/kg/day	3.0E-01	mg/kg/day	1.6E-02
			Exp. Route Total								0.0E+00					8.9E-01

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	4.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.9E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.6E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.0E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.6E-08	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.4E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.0E-07	mg/kg/day	5.0E-04	mg/kg/day	5.9E-04
				Aroclor-1260	1.3E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.4E-08	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.6E-04	mg/kg/day	1.0E+00	mg/kg/day	3.6E-04
				Antimony	5.4E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.6E-07	mg/kg/day	6.0E-05	mg/kg/day	4.3E-03
				Arsenic	7.0E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.0E-06	mg/kg/day	3.0E-04	mg/kg/day	3.4E-03
				Cadmium	1.6E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.5E-09	mg/kg/day	2.5E-05	mg/kg/day	3.0E-04
				Chromium	4.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-06	mg/kg/day	7.5E-05	mg/kg/day	2.9E-02
				Copper	4.5E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-05	mg/kg/day	4.0E-02	mg/kg/day	5.4E-04
				Iron	2.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-03	mg/kg/day	7.0E-01	mg/kg/day	1.6E-03
				Lead	6.6E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.1E-05	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.4E-06	mg/kg/day	8.0E-04	mg/kg/day	1.0E-02
				Mercury	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.5E-08	mg/kg/day	2.1E-05	mg/kg/day	3.1E-05
				Nickel	3.9E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.9E-06	mg/kg/day	8.0E-04	mg/kg/day	2.7E-02
				Thallium	7.5E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.6E-08	mg/kg/day	7.0E-05	mg/kg/day	1.4E-03
				Vanadium	7.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.4E-06	mg/kg/day	2.6E-05	mg/kg/day	1.1E-05
				Zinc	1.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.3E-05	mg/kg/day	3.0E-01	mg/kg/day	1.8E-04
			Exp. Route Total								0.0E+00					7.8E-02
		Exposure Point Total									0.0E+00					9.7E-01
	Exposure Medium Total										0.0E+00					9.7E-01
Medium Total											0.0E+00					9.7E-01

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.0E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	4.3E-07	mg/kg/day	3.0E-03	mg/kg/day	1.4E-04
				Benzo(a)anthracene	8.1E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.8E-07	mg/kg/day	NA	0.0E+00	NA
				Benzo(a)pyrene	9.4E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	4.4E-07	mg/kg/day	NA	0.0E+00	NA
				Benzo(b)fluoranthene	7.7E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.7E-07	mg/kg/day	NA	0.0E+00	NA
				Dibenz(a,h)anthracene	7.4E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.5E-07	mg/kg/day	NA	0.0E+00	NA
				Arsenic	1.1E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	5.0E-06	mg/kg/day	3.0E-04	mg/kg/day	1.7E-02
				Chromium	7.7E+02	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.7E-04	mg/kg/day	3.0E-03	mg/kg/day	1.2E-01
				Lead	2.8E+02	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.3E-04	mg/kg/day	NA	mg/kg/day	NA
				Vanadium	6.4E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	3.0E-05	mg/kg/day	1.0E-03	mg/kg/day	3.0E-02
			Exp. Route Total								0.0E+00					1.7E-01
			Dermal	Vinyl chloride	9.0E-01	mg/kg	3.7E-04	mg/kg/day	NA	1/mg/kg/day	NA	2.6E-06	mg/kg/day	3.0E-03	mg/kg/day	8.7E-04
				Benzo(a)anthracene	8.1E-01	mg/kg	4.4E-04	mg/kg/day	NA	1/mg/kg/day	NA	3.1E-06	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	9.4E-01	mg/kg	5.1E-04	mg/kg/day	NA	1/mg/kg/day	NA	3.5E-06	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	7.7E-01	mg/kg	4.1E-04	mg/kg/day	NA	1/mg/kg/day	NA	2.9E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	7.4E-01	mg/kg	4.0E-04	mg/kg/day	NA	1/mg/kg/day	NA	2.8E-06	mg/kg/day	NA	NA	NA
				Arsenic	1.1E+01	mg/kg	1.3E-03	mg/kg/day	NA	1/mg/kg/day	NA	9.2E-06	mg/kg/day	3.0E-04	mg/kg/day	3.1E-02
				Chromium	7.7E+02	mg/kg	3.2E-02	mg/kg/day	NA	1/mg/kg/day	NA	2.2E-04	mg/kg/day	7.5E-05	mg/kg/day	3.0E+00
				Lead	2.8E+02	mg/kg	1.2E-02	mg/kg/day	NA	1/mg/kg/day	NA	8.1E-05	mg/kg/day	NA	NA	NA
				Vanadium	6.4E+01	mg/kg	2.7E-03	mg/kg/day	NA	1/mg/kg/day	NA	1.9E-05	mg/kg/day	2.6E-05	mg/kg/day	7.1E-01
			Exp. Route Total								0.0E+00					3.7E+00
		Exposure Point Total									0.0E+00					3.9E+00
	Exposure Medium Total										0.0E+00					3.9E+00
Medium Total											0.0E+00					3.9E+00

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	7.3E-03	mg/kg/day	4.0E-03	mg/kg/day	1.8E+00
				1,1-Dichloroethene	7.4E+02	ug/L	NA	NA	NA	NA	NA	3.1E-02	mg/kg/day	5.0E-02	mg/kg/day	6.3E-01
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	3.4E-05	mg/kg/day	3.0E-02	mg/kg/day	1.1E-03
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	5.6E-03	mg/kg/day	1.0E-02	mg/kg/day	5.6E-01
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	1.9E-03	mg/kg/day	2.0E-02	mg/kg/day	9.4E-02
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	1.1E-03	mg/kg/day	6.0E-02	mg/kg/day	1.9E-02
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	1.7E-03	mg/kg/day	1.0E-02	mg/kg/day	1.7E-01
				Trichloroethene	4.5E+04	ug/L	NA	NA	NA	NA	NA	1.9E+00	mg/kg/day	6.0E-03	mg/kg/day	3.2E+02
				Vinyl chloride	1.7E+03	ug/L	NA	NA	NA	NA	NA	7.3E-02	mg/kg/day	3.0E-03	mg/kg/day	2.4E+01
				Xylene, total	5.8E+00	ug/L	NA	NA	NA	NA	NA	2.5E-04	mg/kg/day	2.0E-01	mg/kg/day	1.2E-03
				cis-1,2-Dichloroethene	1.0E+04	ug/L	NA	NA	NA	NA	NA	4.5E-01	mg/kg/day	1.0E-02	mg/kg/day	4.5E+01
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	9.8E-05	mg/kg/day	3.0E-02	mg/kg/day	3.3E-03
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	3.1E-02	mg/kg/day	2.0E-02	mg/kg/day	1.5E+00
				2-Methylnaphthalene	1.1E+01	ug/L	NA	NA	NA	NA	NA	4.6E-04	mg/kg/day	4.0E-03	mg/kg/day	1.1E-01
				Acenaphthene	1.2E+01	ug/L	NA	NA	NA	NA	NA	4.9E-04	mg/kg/day	6.0E-02	mg/kg/day	8.2E-03
				Carbazole	2.4E+01	ug/L	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA	NA	NA
				Dibenzofuran	8.8E+00	ug/L	NA	NA	NA	NA	NA	3.7E-04	mg/kg/day	1.0E-03	mg/kg/day	3.7E-01
				Fluorene	9.4E+00	ug/L	NA	NA	NA	NA	NA	4.0E-04	mg/kg/day	4.0E-02	mg/kg/day	1.0E-02
				Naphthalene	1.2E+02	ug/L	NA	NA	NA	NA	NA	5.2E-03	mg/kg/day	2.0E-02	mg/kg/day	2.6E-01
				Phenanthrene	8.8E+00	ug/L	NA	NA	NA	NA	NA	3.8E-04	mg/kg/day	NA	NA	NA
				Heptachlor	3.5E-02	ug/L	NA	NA	NA	NA	NA	1.5E-06	mg/kg/day	5.0E-04	mg/kg/day	3.0E-03
				Heptachlor epoxide	1.2E-01	ug/L	NA	NA	NA	NA	NA	5.1E-06	mg/kg/day	1.3E-05	mg/kg/day	3.9E-01
				2,6-Dinitrotolune	2.8E+00	ug/L	NA	NA	NA	NA	NA	1.2E-04	mg/kg/day	1.0E-03	mg/kg/day	1.2E-01
				RDX	7.3E-01	ug/L	NA	NA	NA	NA	NA	3.1E-05	mg/kg/day	3.0E-03	mg/kg/day	1.0E-02
				Arsenic	5.9E+00	ug/L	NA	NA	NA	NA	NA	2.5E-04	mg/kg/day	3.0E-04	mg/kg/day	8.4E-01
				Iron	2.3E+04	ug/L	NA	NA	NA	NA	NA	9.6E-01	mg/kg/day	7.0E-01	mg/kg/day	1.4E+00
				Lead	2.4E+00	ug/L	NA	NA	NA	NA	NA	1.0E-04	mg/kg/day	NA	NA	NA
				Manganese	8.4E+02	ug/L	NA	NA	NA	NA	NA	3.6E-02	mg/kg/day	2.0E-02	mg/kg/day	1.8E+00
			Exp. Route Total								0.0E+00					4.0E+02

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	3.8E-04	mg/kg/day	4.0E-03	mg/kg/day	9.4E-02
				1,1-Dichloroethene	7.4E+02	ug/L	NA	NA	NA	NA	NA	3.7E-03	mg/kg/day	5.0E-02	mg/kg/day	7.4E-02
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	1.3E-05	mg/kg/day	3.0E-02	mg/kg/day	4.2E-04
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	2.8E-04	mg/kg/day	1.0E-02	mg/kg/day	2.8E-02
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	7.0E-05	mg/kg/day	2.0E-02	mg/kg/day	3.5E-03
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	2.3E-05	mg/kg/day	6.0E-02	mg/kg/day	3.8E-04
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	5.5E-04	mg/kg/day	1.0E-02	mg/kg/day	5.5E-02
				Trichloroethene	4.5E+04	ug/L	NA	NA	NA	NA	NA	1.8E-01	mg/kg/day	6.0E-03	mg/kg/day	3.0E+01
				Vinyl chloride	1.7E+03	ug/L	NA	NA	NA	NA	NA	2.1E-03	mg/kg/day	3.0E-03	mg/kg/day	7.0E-01
				Xylene, total	5.8E+00	ug/L	NA	NA	NA	NA	NA	8.9E-05	mg/kg/day	2.0E-01	mg/kg/day	4.5E-04
				cis-1,2-Dichloroethene	1.0E+04	ug/L	NA	NA	NA	NA	NA	2.2E-02	mg/kg/day	1.0E-02	mg/kg/day	2.2E+00
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	3.0E-06	mg/kg/day	3.0E-02	mg/kg/day	9.9E-05
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	1.5E-03	mg/kg/day	2.0E-02	mg/kg/day	7.6E-02
				2-Methylnaphthalene	1.1E+01	ug/L	NA	NA	NA	NA	NA	1.7E-04	mg/kg/day	4.0E-03	mg/kg/day	4.2E-02
				Acenaphthene	1.2E+01	ug/L	NA	NA	NA	NA	NA	3.8E-04	mg/kg/day	6.0E-02	mg/kg/day	6.3E-03
				Carbazole	2.4E+01	ug/L	NA	NA	NA	NA	NA	5.4E-04	mg/kg/day	NA	NA	NA
				Dibenzofuran	8.8E+00	ug/L	NA	NA	NA	NA	NA	3.6E-04	mg/kg/day	1.0E-03	mg/kg/day	3.6E-01
				Fluorene	9.4E+00	ug/L	NA	NA	NA	NA	NA	4.3E-04	mg/kg/day	4.0E-02	mg/kg/day	1.1E-02
				Naphthalene	1.2E+02	ug/L	NA	NA	NA	NA	NA	1.9E-03	mg/kg/day	2.0E-02	mg/kg/day	9.6E-02
				Phenanthrene	8.8E+00	ug/L	NA	NA	NA	NA	NA	5.7E-04	mg/kg/day	NA	NA	NA
				Heptachlor	3.5E-02	ug/L	NA	NA	NA	NA	NA	3.9E-07	mg/kg/day	5.0E-04	mg/kg/day	7.9E-04
				Heptachlor epoxide	1.2E-01	ug/L	NA	NA	NA	NA	NA	1.3E-06	mg/kg/day	1.3E-05	mg/kg/day	1.0E-01
				2,6-Dinitrotolune	2.8E+00	ug/L	NA	NA	NA	NA	NA	2.8E-06	mg/kg/day	1.0E-03	mg/kg/day	2.8E-03
				RDX	7.3E-01	ug/L	NA	NA	NA	NA	NA	7.1E-08	mg/kg/day	2.4E-03	mg/kg/day	3.0E-05
				Arsenic	5.9E+00	ug/L	NA	NA	NA	NA	NA	1.7E-06	mg/kg/day	3.0E-04	mg/kg/day	5.6E-03
				Iron	2.3E+04	ug/L	NA	NA	NA	NA	NA	6.4E-03	mg/kg/day	7.0E-01	mg/kg/day	9.1E-03
				Lead	2.4E+00	ug/L	NA	NA	NA	NA	NA	6.6E-07	mg/kg/day	NA	NA	NA
				Manganese	8.4E+02	ug/L	NA	NA	NA	NA	NA	2.4E-04	mg/kg/day	8.0E-04	mg/kg/day	2.9E-01
			Exp. Route Total								0.0E+00					3.5E+01
		Medium Total									0.0E+00					4.3E+02
	Exposure Medium Total										0.0E+00					4.3E+02
Medium Total											0.0E+00					4.3E+02
										Total of Receptor Risks Across All Media	0.0E+00				Total of Receptor Hazards Across All Media	4.4E+02

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to groundwater while bathing calculated on Table 7.3.CTE Supplement A.

Table 7.3.CTE Supplement A
Calculation of DAevent
Child Resident, Shallow Groundwater, Tap Water
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Groundwater Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+02	6.4E-03	3.4E-02	6.0E-01	1.4E+00	1.0E+00	0.33	1.3E-06	2
1,1-Dichloroethene	7.4E+02	1.2E-02	1.1E+00	3.7E-01	8.9E-01	1.0E+00	0.33	1.3E-05	3
1,4-Dichlorobenzene	8.0E-01	4.2E-02	9.9E-02	7.1E-01	1.7E+00	1.0E+00	0.33	4.5E-08	2
Chloroform	1.3E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.33	9.9E-07	2
Dibromochloromethane	4.4E+01	2.9E-03	1.6E-02	1.5E+00	3.7E+00	1.0E+00	0.33	2.5E-07	2
Methylene chloride	2.6E+01	3.5E-03	1.3E-01	3.2E-01	7.6E-01	1.0E+00	0.33	8.2E-08	2
Tetrachloroethene	3.9E+01	3.3E-02	7.2E-01	9.1E-01	2.2E+00	1.0E+00	0.33	1.9E-06	2
Trichloroethene	4.5E+04	1.2E-02	4.0E-01	5.8E-01	1.4E+00	1.0E+00	0.33	6.5E-04	2
Vinyl chloride	1.7E+03	5.6E-03	1.1E+00	2.4E-01	5.7E-01	1.0E+00	0.33	7.4E-06	2
Xylene, total	5.8E+00	5.3E-02	2.0E-01	4.2E-01	1.0E+00	1.0E+00	0.33	3.2E-07	2
cis-1,2-Dichloroethene	1.0E+04	7.7E-03	1.7E-01	3.7E-01	8.9E-01	1.0E+00	0.33	7.7E-05	2
cis-1,3-Dichloropropene	2.3E+00	4.3E-03	1.8E-02	4.5E-01	1.1E+00	1.0E+00	0.33	1.1E-08	2
trans-1,2-Dichloroethene	7.2E+02	7.7E-03	3.8E-01	3.7E-01	8.9E-01	1.0E+00	0.33	5.4E-06	2
2-Methylnaphthalene	1.1E+01	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	0.33	6.0E-07	2
Acenaphthene	1.2E+01	8.4E-02	4.0E-01	7.7E-01	1.8E+00	1.0E+00	0.33	1.3E-06	2
Carbazole	2.4E+01	5.2E-02	2.6E-01	9.1E-01	2.2E+00	1.0E+00	0.33	1.9E-06	2
Dibenzofuran	8.8E+00	9.5E-02	4.7E-01	9.2E-01	2.2E+00	1.0E+00	0.33	1.3E-06	2
Fluorene	9.4E+00	1.1E-01	5.3E-01	9.0E-01	2.2E+00	1.0E+00	0.33	1.5E-06	2
Naphthalene	1.2E+02	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	0.33	6.8E-06	2
Phenanthrene	8.8E+00	1.4E-01	7.4E-01	1.1E+00	4.1E+00	1.0E+00	0.33	2.0E-06	2
Heptachlor	3.5E-02	8.6E-03	1.2E-02	1.3E+01	3.2E+01	8.0E-01	0.33	1.4E-09	2
Heptachlor epoxide	1.2E-01	8.6E-03	8.6E-04	1.3E+01	3.2E+01	8.0E-01	0.33	4.7E-09	2
2,6-Dinitrotolune	2.8E+00	2.1E-03	1.9E-02	1.1E+00	2.7E+00	1.0E+00	0.33	1.0E-08	2
RDX	7.3E-01	3.5E-04	NA	NA	NA	NA	0.33	2.5E-10	1
Arsenic	5.9E+00	1.0E-03	NA	NA	NA	NA	0.33	5.9E-09	1
Iron	2.3E+04	1.0E-03	NA	NA	NA	NA	0.33	2.3E-05	1
Lead	2.4E+00	1.0E-03	NA	NA	NA	NA	0.33	2.4E-09	1
Manganese	8.4E+02	1.0E-03	NA	NA	NA	NA	0.33	8.4E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
tevent<t*: DAevent (mg/cm2-event) =
2 x FA x Kp x CW x (sqrt((6 x τ_{event} x tevent)/π)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
FA x Kp x CW x (tevent/(1+B) + 2 x τ_{event} x $((1 + 3xB + 3xB^2)/(1+B)^2)$ x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 2001, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005.
NA - not applicable.

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	8.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-06	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.1E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.1E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.4E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.3E-06	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.8E-06	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.5E-05	mg/kg/day	5.0E-04	mg/kg/day	2.9E-02
				Aroclor-1260	9.6E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-06	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-02	mg/kg/day	1.0E+00	mg/kg/day	1.3E-02
				Antimony	3.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.8E-05	mg/kg/day	4.0E-04	mg/kg/day	1.2E-01
				Arsenic	9.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-05	mg/kg/day	3.0E-04	mg/kg/day	4.2E-02
				Cadmium	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.7E-06	mg/kg/day	1.0E-03	mg/kg/day	5.7E-03
				Chromium	8.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-04	mg/kg/day	3.0E-03	mg/kg/day	3.7E-02
				Copper	1.8E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.5E-03	mg/kg/day	4.0E-02	mg/kg/day	6.2E-02
				Iron	9.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-01	mg/kg/day	7.0E-01	mg/kg/day	1.8E-01
				Lead	1.9E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.6E-03	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.5E-04	mg/kg/day	2.0E-02	mg/kg/day	2.2E-02
				Mercury	7.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-06	mg/kg/day	3.0E-04	mg/kg/day	3.5E-03
				Nickel	9.6E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-04	mg/kg/day	2.0E-02	mg/kg/day	6.6E-03
				Thallium	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.3E-06	mg/kg/day	7.0E-05	mg/kg/day	3.3E-02
				Vanadium	4.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.4E-04	mg/kg/day	1.0E-03	mg/kg/day	6.4E-01
				Zinc	3.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.3E-03	mg/kg/day	3.0E-01	mg/kg/day	1.4E-02
			Exp. Route Total								0.0E+00					1.2E+00

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	8.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.2E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.2E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.8E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.7E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.4E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.8E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.9E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.7E-06	mg/kg/day	5.0E-04	mg/kg/day	3.5E-03
				Aroclor-1260	9.6E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.3E-07	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.0E-04	mg/kg/day	1.0E+00	mg/kg/day	5.0E-04
				Antimony	3.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.9E-06	mg/kg/day	6.0E-05	mg/kg/day	3.2E-02
				Arsenic	9.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.5E-06	mg/kg/day	3.0E-04	mg/kg/day	5.0E-03
				Cadmium	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.3E-08	mg/kg/day	2.5E-05	mg/kg/day	9.1E-04
				Chromium	8.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.4E-06	mg/kg/day	7.5E-05	mg/kg/day	5.9E-02
				Copper	1.8E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.9E-05	mg/kg/day	4.0E-02	mg/kg/day	2.5E-03
				Iron	9.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.1E-03	mg/kg/day	7.0E-01	mg/kg/day	7.3E-03
				Lead	1.9E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.0E-04	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.8E-05	mg/kg/day	8.0E-04	mg/kg/day	2.2E-02
				Mercury	7.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.2E-08	mg/kg/day	2.10E-05	mg/kg/day	5.3E-05
				Nickel	9.6E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.3E-06	mg/kg/day	8.0E-04	mg/kg/day	7.5E-02
				Thallium	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.3E-08	mg/kg/day	7.0E-05	mg/kg/day	3.6E-03
				Vanadium	4.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.5E-05	mg/kg/day	2.6E-05	mg/kg/day	8.5E-05
				Zinc	3.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.7E-04	mg/kg/day	3.0E-01	mg/kg/day	5.7E-04
			Exp. Route Total								0.0E+00					2.1E-01
		Exposure Point Total									0.0E+00					1.4E+00
	Exposure Medium Total										0.0E+00					1.4E+00
	Air	Emissions from Soil at Site 2	Inhalation	Chromium	6.1E-08	mg/m3	7.1E-11	mg/kg/day	NA	1/(mg/kg-day)	NA	1.7E-08	mg/kg/day	3.0E-05	mg/kg/day	5.6E-04
			Exp. Route Total								NA					5.6E-04
		Exposure Point Total									NA					5.6E-04
	Exposure Medium Total										NA					5.6E-04
Medium Total											0.0E+00					1.4E+00

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Drainage Features and Ponded Area	Ingestion	Bromodichloromethane	4.3E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.0E-07	mg/kg/day	2.0E-02	mg/kg/day	3.5E-05
				Chloroform	8.6E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.4E-06	mg/kg/day	1.0E-02	mg/kg/day	1.4E-04
				Trichloroethene	1.3E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-05	mg/kg/day	6.0E-03	mg/kg/day	3.6E-03
				Vinyl chloride	1.2E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.9E-06	mg/kg/day	3.0E-03	mg/kg/day	6.4E-04
				cis-1,2-Dichloroethene	5.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.8E-06	mg/kg/day	1.0E-02	mg/kg/day	8.8E-04
				bis(2-Ethylhexyl)phthalate	8.1E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-05	mg/kg/day	2.0E-02	mg/kg/day	6.6E-04
				Arsenic	3.2E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.2E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
				Chromium	1.7E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.7E-05	mg/kg/day	3.0E-03	mg/kg/day	9.0E-03
				Lead	7.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-05	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.8E-04	mg/kg/day	2.0E-02	mg/kg/day	8.8E-03
			Exp. Route Total								0.0E+00					2.5E-02
			Dermal	Bromodichloromethane	4.3E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.9E-07	mg/kg/day	2.0E-02	mg/kg/day	3.0E-05
				Chloroform	8.6E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-06	mg/kg/day	1.0E-02	mg/kg/day	1.3E-04
				Trichloroethene	1.3E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.9E-05	mg/kg/day	6.0E-03	mg/kg/day	6.4E-03
				Vinyl chloride	1.2E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-06	mg/kg/day	3.0E-03	mg/kg/day	3.8E-04
				cis-1,2-Dichloroethene	5.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.3E-06	mg/kg/day	1.0E-02	mg/kg/day	8.3E-04
				bis(2-Ethylhexyl)phthalate	8.1E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.1E-04	mg/kg/day	2.0E-02	mg/kg/day	1.1E-02
				Arsenic	3.2E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.7E-08	mg/kg/day	3.0E-04	mg/kg/day	1.2E-04
				Chromium	1.7E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.8E-06	mg/kg/day	7.5E-05	mg/kg/day	5.1E-02
				Lead	7.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.6E-07	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-05	mg/kg/day	8.0E-04	mg/kg/day	1.6E-02
			Exp. Route Total								0.0E+00					8.5E-02
		Exposure Point Total									0.0E+00					1.1E-01
	Exposure Medium Total										0.0E+00					1.1E-01
Medium Total											0.0E+00					1.1E-01

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.8E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	9.9E-07	mg/kg/day	3.0E-03	mg/kg/day	3.3E-04
				Benzo(a)anthracene	2.1E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	2.2E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.8E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	5.1E-08	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	4.5E-03
				Chromium	1.5E+03	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.6E-04	mg/kg/day	3.0E-03	mg/kg/day	5.2E-02
				Lead	5.5E+02	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	5.5E-05	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	8.6E-06	mg/kg/day	1.0E-03	mg/kg/day	8.6E-03
			Exp. Route Total								0.0E+00					6.6E-02
			Dermal	Vinyl chloride	9.8E+00	mg/kg	4.0E-03	mg/kg/day	NA	1/mg/kg/day	NA	6.8E-06	mg/kg/day	3.0E-03	mg/kg/day	2.3E-03
				Benzo(a)anthracene	2.1E+00	mg/kg	1.1E-03	mg/kg/day	NA	1/mg/kg/day	NA	1.9E-06	mg/kg/day	NA	mg/kg/day	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	9.6E-04	mg/kg/day	NA	1/mg/kg/day	NA	1.6E-06	mg/kg/day	NA	mg/kg/day	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	6.9E-04	mg/kg/day	NA	1/mg/kg/day	NA	1.2E-06	mg/kg/day	NA	mg/kg/day	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	2.7E-04	mg/kg/day	NA	1/mg/kg/day	NA	4.5E-07	mg/kg/day	NA	mg/kg/day	NA
				Arsenic	1.3E+01	mg/kg	1.7E-03	mg/kg/day	NA	1/mg/kg/day	NA	2.8E-06	mg/kg/day	3.0E-04	mg/kg/day	9.3E-03
				Chromium	1.5E+03	mg/kg	6.4E-02	mg/kg/day	NA	1/mg/kg/day	NA	1.1E-04	mg/kg/day	7.5E-05	mg/kg/day	1.4E+00
				Lead	5.5E+02	mg/kg	2.3E-02	mg/kg/day	NA	1/mg/kg/day	NA	3.8E-05	mg/kg/day	NA	mg/kg/day	NA
				Vanadium	8.5E+01	mg/kg	3.5E-03	mg/kg/day	NA	1/mg/kg/day	NA	5.9E-06	mg/kg/day	2.6E-05	mg/kg/day	2.3E-01
			Exp. Route Total								0.0E+00					1.7E+00
		Exposure Point Total									0.0E+00					1.7E+00
	Exposure Medium Total										0.0E+00					1.7E+00
Medium Total											0.0E+00					1.7E+00

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	4.7E-03	mg/kg/day	4.0E-03	mg/kg/day	1.2E+00
				1,1-Dichloroethene	1.5E+03	ug/L	NA	NA	NA	NA	NA	4.1E-02	mg/kg/day	5.0E-02	mg/kg/day	8.2E-01
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	2.2E-05	mg/kg/day	3.0E-02	mg/kg/day	7.3E-04
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	3.6E-03	mg/kg/day	1.0E-02	mg/kg/day	3.6E-01
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	1.2E-03	mg/kg/day	2.0E-02	mg/kg/day	6.0E-02
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	7.1E-04	mg/kg/day	6.0E-02	mg/kg/day	1.2E-02
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	1.1E-03	mg/kg/day	1.0E-02	mg/kg/day	1.1E-01
				Trichloroethene	7.4E+04	ug/L	NA	NA	NA	NA	NA	2.0E+00	mg/kg/day	6.0E-03	mg/kg/day	3.4E+02
				Vinyl chloride	1.0E+04	ug/L	NA	NA	NA	NA	NA	2.7E-01	mg/kg/day	3.0E-03	mg/kg/day	9.1E+01
				Xylene, total	4.3E+01	ug/L	NA	NA	NA	NA	NA	1.2E-03	mg/kg/day	2.0E-01	mg/kg/day	5.9E-03
				cis-1,2-Dichloroethene	4.6E+04	ug/L	NA	NA	NA	NA	NA	1.3E+00	mg/kg/day	1.0E-02	mg/kg/day	1.3E+02
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	6.3E-05	mg/kg/day	3.0E-02	NA	2.1E-03
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	9.9E-01
				2-Methylnaphthalene	3.6E+01	ug/L	NA	NA	NA	NA	NA	9.9E-04	mg/kg/day	4.0E-03	mg/kg/day	2.5E-01
				Acenaphthene	4.1E+01	ug/L	NA	NA	NA	NA	NA	1.1E-03	mg/kg/day	6.0E-02	mg/kg/day	1.9E-02
				Carbazole	2.2E+02	ug/L	NA	NA	NA	NA	NA	6.0E-03	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	NA	NA	NA	NA	NA	7.3E-04	mg/kg/day	1.0E-03	mg/kg/day	7.3E-01
				Fluorene	3.0E+01	ug/L	NA	NA	NA	NA	NA	8.3E-04	mg/kg/day	4.0E-02	mg/kg/day	2.1E-02
				Naphthalene	1.2E+03	ug/L	NA	NA	NA	NA	NA	3.3E-02	mg/kg/day	2.0E-02	mg/kg/day	1.6E+00
				Phenanthrene	2.8E+01	ug/L	NA	NA	NA	NA	NA	7.6E-04	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	NA	NA	NA	NA	NA	1.7E-06	mg/kg/day	5.0E-04	mg/kg/day	3.5E-03
				Heptachlor epoxide	1.0E+00	ug/L	NA	NA	NA	NA	NA	2.8E-05	mg/kg/day	1.3E-05	mg/kg/day	2.1E+00
				2,6-Dinitrotolune	2.0E+01	ug/L	NA	NA	NA	NA	NA	5.5E-04	mg/kg/day	1.0E-03	mg/kg/day	5.5E-01
				RDX	1.9E+00	ug/L	NA	NA	NA	NA	NA	5.3E-05	mg/kg/day	3.0E-03	mg/kg/day	1.8E-02
				Arsenic	1.1E+01	ug/L	NA	NA	NA	NA	NA	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	9.8E-01
				Iron	6.9E+04	ug/L	NA	NA	NA	NA	NA	1.9E+00	mg/kg/day	7.0E-01	mg/kg/day	2.7E+00
				Lead	1.6E+01	ug/L	NA	NA	NA	NA	NA	4.4E-04	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	NA	NA	NA	NA	NA	3.0E-02	mg/kg/day	2.0E-02	mg/kg/day	1.5E+00
			Exp. Route Total								0.0E+00					5.7E+02

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	4.4E-04	mg/kg/day	4.0E-03	mg/kg/day	1.1E-01
				1,1-Dichloroethene	1.5E+03	ug/L	NA	NA	NA	NA	NA	5.7E-03	mg/kg/day	5.0E-02	mg/kg/day	1.1E-01
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	1.5E-05	mg/kg/day	3.0E-02	mg/kg/day	4.9E-04
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	3.2E-04	mg/kg/day	1.0E-02	mg/kg/day	3.2E-02
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	8.2E-05	mg/kg/day	2.0E-02	mg/kg/day	4.1E-03
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	2.7E-05	mg/kg/day	6.0E-02	mg/kg/day	4.5E-04
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	6.4E-04	mg/kg/day	1.0E-02	mg/kg/day	6.4E-02
				Trichloroethene	7.4E+04	ug/L	NA	NA	NA	NA	NA	3.5E-01	mg/kg/day	6.0E-03	mg/kg/day	5.9E+01
				Vinyl chloride	1.0E+04	ug/L	NA	NA	NA	NA	NA	1.4E-02	mg/kg/day	3.0E-03	mg/kg/day	4.8E+00
				Xylene, total	4.3E+01	ug/L	NA	NA	NA	NA	NA	7.7E-04	mg/kg/day	2.0E-01	mg/kg/day	3.9E-03
				cis-1,2-Dichloroethene	4.6E+04	ug/L	NA	NA	NA	NA	NA	1.1E-01	mg/kg/day	1.0E-02	mg/kg/day	1.1E+01
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	3.4E-06	mg/kg/day	3.0E-02	NA	1.1E-04
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	1.8E-03	mg/kg/day	2.0E-02	mg/kg/day	8.8E-02
				2-Methylnaphthalene	3.6E+01	ug/L	NA	NA	NA	NA	NA	6.6E-04	mg/kg/day	4.0E-03	mg/kg/day	1.7E-01
				Acenaphthene	4.1E+01	ug/L	NA	NA	NA	NA	NA	1.6E-03	mg/kg/day	6.0E-02	mg/kg/day	2.6E-02
				Carbazole	2.2E+02	ug/L	NA	NA	NA	NA	NA	5.7E-03	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	NA	NA	NA	NA	NA	1.3E-03	mg/kg/day	1.0E-03	mg/kg/day	1.3E+00
				Fluorene	3.0E+01	ug/L	NA	NA	NA	NA	NA	1.6E-03	mg/kg/day	4.0E-02	mg/kg/day	4.0E-02
				Naphthalene	1.2E+03	ug/L	NA	NA	NA	NA	NA	2.2E-02	mg/kg/day	2.0E-02	mg/kg/day	1.1E+00
				Phenanthrene	2.8E+01	ug/L	NA	NA	NA	NA	NA	2.1E-03	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	NA	NA	NA	NA	NA	8.3E-07	mg/kg/day	5.0E-04	mg/kg/day	1.7E-03
				Heptachlor epoxide	1.0E+00	ug/L	NA	NA	NA	NA	NA	1.3E-05	mg/kg/day	1.3E-05	mg/kg/day	1.0E+00
				2,6-Dinitrotolune	2.0E+01	ug/L	NA	NA	NA	NA	NA	2.3E-05	mg/kg/day	1.0E-03	mg/kg/day	2.3E-02
				RDX	1.9E+00	ug/L	NA	NA	NA	NA	NA	1.7E-07	mg/kg/day	2.4E-03	mg/kg/day	6.9E-05
				Arsenic	1.1E+01	ug/L	NA	NA	NA	NA	NA	2.7E-06	mg/kg/day	3.0E-04	mg/kg/day	8.9E-03
				Iron	6.9E+04	ug/L	NA	NA	NA	NA	NA	1.7E-02	mg/kg/day	7.0E-01	mg/kg/day	2.4E-02
				Lead	1.6E+01	ug/L	NA	NA	NA	NA	NA	4.0E-06	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	NA	NA	NA	NA	NA	2.7E-04	mg/kg/day	8.0E-04	mg/kg/day	3.4E-01
			Exp. Route Total								0.0E+00					7.9E+01
		Medium Total									0.0E+00					6.5E+02
Exposure Medium Total											0.0E+00					6.5E+02

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Water Vapors at Showerhead	Inhalation	1,1,2-Trichloroethane	1.7E+02	ug/L	3.6E-06	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-05	mg/kg/day	NA	NA	NA
				1,1-Dichloroethene	1.5E+03	ug/L	2.6E-05	mg/kg/day	NA	1/(mg/kg-day)	NA	7.5E-05	mg/kg/day	6.0E-02	mg/kg/day	1.3E-03
				1,4-Dichlorobenzene	8.0E-01	ug/L	1.1E-08	mg/kg/day	4.0E-02	1/(mg/kg-day)	4.5E-10	3.3E-08	mg/kg/day	6.5E-02	mg/kg/day	5.0E-07
				Chloroform	1.3E+02	ug/L	2.0E-06	mg/kg/day	8.1E-02	1/(mg/kg-day)	1.6E-07	5.8E-06	mg/kg/day	1.4E-02	mg/kg/day	4.2E-04
				Dibromochloromethane	4.4E+01	ug/L	5.1E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	1.5E-06	mg/kg/day	NA	NA	NA
				Methylene chloride	2.6E+01	ug/L	4.8E-07	mg/kg/day	1.7E-03	1/(mg/kg-day)	7.9E-10	1.4E-06	mg/kg/day	3.0E-01	mg/kg/day	4.6E-06
				Tetrachloroethene	3.9E+01	ug/L	5.1E-07	mg/kg/day	2.0E-02	1/(mg/kg-day)	1.0E-08	1.5E-06	mg/kg/day	8.0E-02	mg/kg/day	1.9E-05
				Trichloroethene	7.4E+04	ug/L	1.1E-03	mg/kg/day	7.0E-03	1/(mg/kg-day)	7.6E-06	3.2E-03	mg/kg/day	1.7E-01	mg/kg/day	1.9E-02
				Vinyl chloride	1.0E+04	ug/L	2.1E-04	mg/kg/day	1.5E-02	1/(mg/kg-day)	3.2E-06	6.3E-04	mg/kg/day	2.8E-02	mg/kg/day	2.2E-02
				Xylene, total	4.3E+01	ug/L	7.1E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	2.1E-06	mg/kg/day	3.0E-02	mg/kg/day	6.9E-05
				cis-1,2-Dichloroethene	4.6E+04	ug/L	8.0E-04	mg/kg/day	NA	1/(mg/kg-day)	NA	2.3E-03	mg/kg/day	NA	NA	NA
				cis-1,3-Dichloropropene	2.3E+00	ug/L	3.7E-08	mg/kg/day	1.0E-02	1/(mg/kg-day)	3.7E-10	1.1E-07	mg/kg/day	5.7E-03	mg/kg/day	1.9E-05
				trans-1,2-Dichloroethene	7.2E+02	ug/L	1.2E-05	mg/kg/day	NA	1/(mg/kg-day)	NA	3.6E-05	mg/kg/day	1.7E-02	mg/kg/day	2.1E-03
				2-Methylnaphthalene	3.6E+01	ug/L	5.4E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	1.6E-06	mg/kg/day	NA	NA	NA
				Acenaphthene	4.1E+01	ug/L	5.5E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	1.6E-06	mg/kg/day	NA	NA	NA
				Fluorene	3.0E+01	ug/L	4.0E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-06	mg/kg/day	NA	NA	NA
				Naphthalene	1.2E+03	ug/L	1.8E-05	mg/kg/day	NA	1/(mg/kg-day)	NA	5.1E-05	mg/kg/day	9.0E-04	mg/kg/day	5.7E-02
				Phenanthrene	2.8E+01	ug/L	3.5E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	1.0E-06	mg/kg/day	NA	NA	NA
			Total								1.1E-05					1.0E-01
		Exposure Point Total									1.1E-05					1.0E-01
	Exposure Medium Total										1.1E-05					1.0E-01
Medium Total											1.1E-05					6.5E+02
									Total of Receptor Risks Across All Media		1.1E-05			Total of Receptor Hazards Across All Media		6.5E+02

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to surface water calculated on Table 7.4.RME Supplement A.

DAevent for exposure to groundwater while bathing calculated on Table 7.4.RME Supplement B.

Inhalation of volatiles from groundwater from shower calculated on Table 7.4.RME Supplement D.

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.0E-01	mg/kg	4.2E-08	mg/kg/day	1.4E+00	1/mg/kg/day	5.9E-08	NA	mg/kg/day	NA	NA	NA
				Benzo(a)anthracene	8.1E-01	mg/kg	3.8E-08	mg/kg/day	7.3E-01	1/mg/kg/day	2.8E-08	NA	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	9.4E-01	mg/kg	4.4E-08	mg/kg/day	7.3E+00	1/mg/kg/day	3.2E-07	NA	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	7.7E-01	mg/kg	3.6E-08	mg/kg/day	7.3E-01	1/mg/kg/day	2.6E-08	NA	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	7.4E-01	mg/kg	3.5E-08	mg/kg/day	7.3E+00	1/mg/kg/day	2.5E-07	NA	mg/kg/day	NA	NA	NA
				Arsenic	1.1E+01	mg/kg	5.0E-07	mg/kg/day	1.5E+00	1/mg/kg/day	7.4E-07	NA	mg/kg/day	NA	NA	NA
				Chromium	7.7E+02	mg/kg	3.6E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Lead	2.8E+02	mg/kg	1.3E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Vanadium	6.4E+01	mg/kg	3.0E-06	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.4E-06					0.0E+00
			Dermal	Vinyl chloride	9.0E-01	mg/kg	2.4E-07	mg/kg/day	1.4E+00	1/mg/kg/day	3.4E-07	NA	mg/kg/day	NA	NA	NA
				Benzo(a)anthracene	8.1E-01	mg/kg	2.9E-07	mg/kg/day	7.3E-01	1/mg/kg/day	2.1E-07	NA	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	9.4E-01	mg/kg	3.3E-07	mg/kg/day	7.3E+00	1/mg/kg/day	2.4E-06	NA	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	7.7E-01	mg/kg	2.7E-07	mg/kg/day	7.3E-01	1/mg/kg/day	2.0E-07	NA	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	7.4E-01	mg/kg	2.6E-07	mg/kg/day	7.3E+00	1/mg/kg/day	1.9E-06	NA	mg/kg/day	NA	NA	NA
				Arsenic	1.1E+01	mg/kg	8.6E-07	mg/kg/day	1.5E+00	1/mg/kg/day	1.3E-06	NA	mg/kg/day	NA	NA	NA
				Chromium	7.7E+02	mg/kg	2.1E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Lead	2.8E+02	mg/kg	7.6E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Vanadium	6.4E+01	mg/kg	1.7E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								6.4E-06					0.0E+00
		Exposure Point Total									7.8E-06					0.0E+00
	Exposure Medium Total										7.8E-06					0.0E+00
Medium Total											7.8E-06					0.0E+00

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	9.0E-04	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				1,1-Dichloroethene	7.4E+02	ug/L	3.9E-03	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				1,4-Dichlorobenzene	8.0E-01	ug/L	4.2E-06	mg/kg/day	2.4E-02	1/mg/kg/day	1.0E-07	NA	mg/kg/day	NA	NA	NA
				Chloroform	1.3E+02	ug/L	6.9E-04	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Dibromochloromethane	4.4E+01	ug/L	2.3E-04	mg/kg/day	8.4E-02	1/mg/kg/day	2.0E-05	NA	mg/kg/day	NA	NA	NA
				Methylene chloride	2.6E+01	ug/L	1.4E-04	mg/kg/day	7.5E-03	1/mg/kg/day	1.0E-06	NA	mg/kg/day	NA	NA	NA
				Tetrachloroethene	3.9E+01	ug/L	2.1E-04	mg/kg/day	5.4E-01	1/mg/kg/day	1.1E-04	NA	mg/kg/day	NA	NA	NA
				Trichloroethene	4.5E+04	ug/L	2.4E-01	mg/kg/day	1.3E-02	1/mg/kg/day	3.1E-03	NA	mg/kg/day	NA	NA	NA
				Vinyl chloride	1.7E+03	ug/L	9.0E-03	mg/kg/day	1.4E+00	1/mg/kg/day	1.3E-02	NA	mg/kg/day	NA	NA	NA
				Xylene, total	5.8E+00	ug/L	3.1E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,2-Dichloroethene	1.0E+04	ug/L	5.5E-02	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,3-Dichloropropene	2.3E+00	ug/L	1.2E-05	mg/kg/day	1.0E-01	1/mg/kg/day	1.2E-06	NA	mg/kg/day	NA	NA	NA
				trans-1,2-Dichloroethene	7.2E+02	ug/L	3.8E-03	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				2-Methylnaphthalene	1.1E+01	ug/L	5.7E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Acenaphthene	1.2E+01	ug/L	6.1E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Carbazole	2.4E+01	ug/L	1.3E-04	mg/kg/day	2.0E-02	1/mg/kg/day	2.6E-06	NA	mg/kg/day	NA	NA	NA
				Dibenzofuran	8.8E+00	ug/L	4.6E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Fluorene	9.4E+00	ug/L	5.0E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Naphthalene	1.2E+02	ug/L	6.5E-04	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Phenanthrene	8.8E+00	ug/L	4.7E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Heptachlor	3.5E-02	ug/L	1.9E-07	mg/kg/day	4.5E+00	1/mg/kg/day	8.4E-07	NA	mg/kg/day	NA	NA	NA
				Heptachlor epoxide	1.2E-01	ug/L	6.3E-07	mg/kg/day	9.1E+00	1/mg/kg/day	5.8E-06	NA	mg/kg/day	NA	NA	NA
				2,6-Dinitrotolune	2.8E+00	ug/L	1.5E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				RDX	7.3E-01	ug/L	3.9E-06	mg/kg/day	1.1E-01	1/mg/kg/day	4.2E-07	NA	mg/kg/day	NA	NA	NA
				Arsenic	5.9E+00	ug/L	3.1E-05	mg/kg/day	1.5E+00	1/mg/kg/day	4.7E-05	NA	mg/kg/day	NA	NA	NA
				Iron	2.3E+04	ug/L	1.2E-01	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Lead	2.4E+00	ug/L	1.3E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	8.4E+02	ug/L	4.4E-03	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.6E-02					0.0E+00

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	5.7E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				1,1-Dichloroethene	7.4E+02	ug/L	4.7E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				1,4-Dichlorobenzene	8.0E-01	ug/L	1.9E-06	mg/kg/day	2.4E-02	NA	4.6E-08	NA	mg/kg/day	NA	NA	NA
				Chloroform	1.3E+02	ug/L	4.2E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Dibromochloromethane	4.4E+01	ug/L	1.1E-05	mg/kg/day	8.4E-02	NA	8.9E-07	NA	mg/kg/day	NA	NA	NA
				Methylene chloride	2.6E+01	ug/L	3.5E-06	mg/kg/day	7.5E-03	NA	2.6E-08	NA	mg/kg/day	NA	NA	NA
				Tetrachloroethene	3.9E+01	ug/L	8.3E-05	mg/kg/day	5.4E-01	NA	4.5E-05	NA	mg/kg/day	NA	NA	NA
				Trichloroethene	4.5E+04	ug/L	2.8E-02	mg/kg/day	1.3E-02	NA	3.6E-04	NA	mg/kg/day	NA	NA	NA
				Vinyl chloride	1.7E+03	ug/L	3.2E-04	mg/kg/day	1.4E+00	NA	4.4E-04	NA	mg/kg/day	NA	NA	NA
				Xylene, total	5.8E+00	ug/L	1.4E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,2-Dichloroethene	1.0E+04	ug/L	3.3E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,3-Dichloropropene	2.3E+00	ug/L	4.5E-07	mg/kg/day	1.0E-01	NA	4.5E-08	NA	mg/kg/day	NA	NA	NA
				trans-1,2-Dichloroethene	7.2E+02	ug/L	2.3E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				2-Methylnaphthalene	1.1E+01	ug/L	2.6E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Acenaphthene	1.2E+01	ug/L	5.7E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Carbazole	2.4E+01	ug/L	8.2E-05	mg/kg/day	2.0E-02	NA	1.6E-06	NA	mg/kg/day	NA	NA	NA
				Dibenzofuran	8.8E+00	ug/L	5.4E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Fluorene	9.4E+00	ug/L	6.4E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Naphthalene	1.2E+02	ug/L	2.9E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Phenanthrene	8.8E+00	ug/L	8.6E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Heptachlor	3.5E-02	ug/L	6.0E-08	mg/kg/day	4.5E+00	NA	2.7E-07	NA	mg/kg/day	NA	NA	NA
				Heptachlor epoxide	1.2E-01	ug/L	2.0E-07	mg/kg/day	9.1E+00	NA	1.8E-06	NA	mg/kg/day	NA	NA	NA
				2,6-Dinitrotolune	2.8E+00	ug/L	4.3E-07	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				RDX	7.3E-01	ug/L	1.1E-08	mg/kg/day	1.1E-01	NA	1.3E-09	NA	mg/kg/day	NA	NA	NA
				Arsenic	5.9E+00	ug/L	2.7E-07	mg/kg/day	1.5E+00	NA	4.0E-07	NA	mg/kg/day	NA	NA	NA
				Iron	2.3E+04	ug/L	1.0E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Lead	2.4E+00	ug/L	1.1E-07	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	8.4E+02	ug/L	3.8E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								8.5E-04					0.0E+00
		Medium Total									8.5E-04					0.0E+00
Exposure Medium Total											8.5E-04					0.0E+00
Medium Total											1.7E-02					0.0E+00
									Total of Receptor Risks Across All Media		1.7E-02		Total of Receptor Hazards Across All Media			0.0E+00

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to groundwater while bathing calculated on Table 7.2.CTE Supplement A and Table 7.3.CTE Supplement A.

Table 7.4.RME Supplement A
Calculation of DAevent
Resident Adult/Child, Surface Water
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Surface Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	B (unitless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Bromodichloromethane	4.3E+00	4.6E-03	2.3E-02	8.8E-01	2.1E+00	1.0E+00	1	5.2E-08	2
Chloroform	8.6E+00	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	1.1E-07	2
Trichloroethene	1.3E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	1	3.3E-06	2
Vinyl chloride	1.2E+01	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	1	9.8E-08	3
cis-1,2-Dichloroethene	5.4E+01	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	1	7.2E-07	3
bis(2-Ethylhexyl)phthalate	8.1E+01	2.5E-02	1.9E-01	1.7E+01	4.0E+01	8.0E-01	1	1.8E-05	2
Arsenic	3.2E+00	1.0E-03	NA	NA	NA	NA	1	3.2E-09	1
Chromium	1.7E+02	2.0E-03	NA	NA	NA	NA	1	3.3E-07	1
Iron	7.4E+01	1.0E-03	NA	NA	NA	NA	1	7.4E-08	1
Manganese	1.1E+03	1.0E-03	NA	NA	NA	NA	1	1.1E-06	1

Values for trans-1,2-dichloroethene applied as surrogates for cis-1,2-dichloroethene.

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

tevent<t*: DAevent (mg/cm2-event) =

2 x FA x Kp x CW x (sqrt((6 x τ_{event} x tevent)/π)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =

FA x Kp x CW x (tevent/(1+B) + 2 x τ_{event} x ((1 + 3xB + $3xB^2$)/$(1+B)^2$) x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:

Permeability constants from EPA 2001, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005.

NA - not applicable.

Table 7.4.RME Supplement B
Calculation of DAevent
Adult Resident, Shallow Groundwater, Tap Water
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Groundwater Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+02	6.4E-03	3.4E-02	6.0E-01	1.4E+00	1.0E+00	0.58	1.8E-06	2
1,1-Dichloroethene	1.5E+03	1.2E-02	1.1E+00	3.7E-01	8.9E-01	1.0E+00	0.58	2.3E-05	2
1,4-Dichlorobenzene	8.0E-01	4.2E-02	9.9E-02	7.1E-01	1.7E+00	1.0E+00	0.58	6.0E-08	2
Chloroform	1.3E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	1.3E-06	2
Dibromochloromethane	4.4E+01	2.9E-03	1.6E-02	1.5E+00	3.7E+00	1.0E+00	0.58	3.3E-07	2
Methylene chloride	2.6E+01	3.5E-03	1.3E-01	3.2E-01	7.6E-01	1.0E+00	0.58	1.1E-07	2
Tetrachloroethene	3.9E+01	3.3E-02	7.2E-01	9.1E-01	2.2E+00	1.0E+00	0.58	2.6E-06	2
Trichloroethene	7.4E+04	1.2E-02	4.0E-01	5.8E-01	1.4E+00	1.0E+00	0.58	1.4E-03	2
Vinyl chloride	1.0E+04	5.6E-03	1.1E+00	2.4E-01	5.7E-01	1.0E+00	0.58	5.8E-05	2
Xylene, total	4.3E+01	5.3E-02	2.0E-01	4.2E-01	1.0E+00	1.0E+00	0.58	3.1E-06	2
cis-1,2-Dichloroethene	4.6E+04	7.7E-03	1.7E-01	3.7E-01	8.9E-01	1.0E+00	0.58	4.6E-04	2
cis-1,3-Dichloropropene	2.3E+00	4.3E-03	1.8E-02	4.5E-01	1.1E+00	1.0E+00	0.58	1.4E-08	2
trans-1,2-Dichloroethene	7.2E+02	7.7E-03	3.8E-01	3.7E-01	8.9E-01	1.0E+00	0.58	7.1E-06	2
2-Methylnaphthalene	3.6E+01	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	0.58	2.7E-06	2
Acenaphthene	4.1E+01	8.4E-02	4.0E-01	7.7E-01	1.8E+00	1.0E+00	0.58	6.3E-06	2
Carbazole	2.2E+02	5.2E-02	2.6E-01	9.1E-01	2.2E+00	1.0E+00	0.58	2.3E-05	2
Dibenzofuran	2.7E+01	9.5E-02	4.7E-01	9.2E-01	2.2E+00	1.0E+00	0.58	5.1E-06	2
Fluorene	3.0E+01	1.1E-01	5.3E-01	9.0E-01	2.2E+00	1.0E+00	0.58	6.4E-06	2
Naphthalene	1.2E+03	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	0.58	8.8E-05	2
Phenanthrene	2.8E+01	1.4E-01	7.4E-01	1.1E+00	4.1E+00	1.0E+00	0.58	8.4E-06	2
Heptachlor	6.4E-02	8.6E-03	1.2E-02	1.3E+01	3.2E+01	8.0E-01	0.58	3.4E-09	2
Heptachlor epoxide	1.0E+00	8.6E-03	8.6E-04	1.3E+01	3.2E+01	8.0E-01	0.58	5.4E-08	2
2,6-Dinitrotolune	2.0E+01	2.1E-03	1.9E-02	1.1E+00	2.7E+00	1.0E+00	0.58	9.4E-08	2
RDX	1.9E+00	3.48E-04	NA	NA	NA	NA	0.58	6.7E-10	1
Arsenic	1.1E+01	1.0E-03	NA	NA	NA	NA	0.58	1.1E-08	1
Iron	6.9E+04	1.0E-03	NA	NA	NA	NA	0.58	6.9E-05	1
Lead	1.6E+01	1.0E-03	NA	NA	NA	NA	0.58	1.6E-08	1
Manganese	1.1E+03	1.0E-03	NA	NA	NA	NA	0.58	1.1E-06	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
tevent<t*: DAevent (mg/cm2-event) =
2 x FA x Kp x CW x (sqrt((6 x τ_{event} x tevent)/π)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
FA x Kp x CW x (tevent/(1+B) + 2 x τ_{event} x ((1 + 3xB + $3xB^2$)/$(1+B)^2$) x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 2001, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005.
NA - not applicable.

Table 7.4.RME Supplement C
Calculation of DAevent
Adult Resident, Shallow Groundwater, Tap Water
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	MW[2]	log Kow[2]	Kow	log Kp[1]	Kp[1] (cm/hr)	B[1]	log D_{sc}/l_{sc}[1]	D_{sc}/l_{sc}[1]	l_{sc} (cm)	D_{sc} (cm^2/hr)	τ_{event}[1] (hr)	c[1]	b[1]	t*[1] (hr)
Dibromochloromethane	208.28	2.16	1.45E+02	-2.54E+00	2.88E-03	1.60E-02	-3.97E+00	1.08E-04	1.00E-03	1.08E-07	1.54E+00	3.44E-01	3.13E-01	3.70E+00
Acenaphthene	154.21	3.92	8.32E+03	-1.08E+00	8.39E-02	4.01E-01	-3.66E+00	2.17E-04	1.00E-03	2.17E-07	7.68E-01	6.39E-01	6.10E-01	1.84E+00
Carbazole	167.21	3.72	5.25E+03	-1.28E+00	5.23E-02	2.60E-01	-3.74E+00	1.83E-04	1.00E-03	1.83E-07	9.08E-01	5.25E-01	4.86E-01	2.18E+00
Dibenzofuran	168.19	4.12	1.32E+04	-1.02E+00	9.49E-02	4.73E-01	-3.74E+00	1.81E-04	1.00E-03	1.81E-07	9.20E-01	7.00E-01	6.82E-01	2.21E+00
Fluorene	166.22	4.18	1.51E+04	-9.72E-01	1.07E-01	5.29E-01	-3.73E+00	1.86E-04	1.00E-03	1.86E-07	8.97E-01	7.47E-01	7.41E-01	2.15E+00
2,6-Dinitrotolune	182.14	2.1	1.26E+02	-2.43E+00	3.68E-03	1.91E-02	-3.82E+00	1.51E-04	1.00E-03	1.51E-07	1.10E+00	3.46E-01	3.15E-01	2.64E+00

1. Equations from Risk Assessment Guidance for Superfund Volume 1; Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005. July 2004.
2. Values from Risk Assessment Information System (September 2007). http://rais.ornl.gov/cgi-bin/tox/TOX_9801

Table 7.4 RME Supplement D
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Exposure Point Concentration Cwo (mg/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (mg/l)	S (mg/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
1,1,2-Trichloroethane	1.7E+02	6.3E+01	3.4E-02	1.6E+03	1.7E+01	1.7E+01	4.2E-02	6.0E-02	5.0E-02	**1.1E-05**
1,1-Dichloroethene	1.5E+03	9.7E+01	1.1E+00	1.3E+03	1.3E+01	1.3E+01	3.4E-02	4.3E-01	3.6E-01	**7.8E-05**
1,4-Dichlorobenzene	8.0E-01	1.5E+02	9.9E-02	1.0E+03	1.1E+01	1.1E+01	2.8E-02	1.8E-04	1.5E-04	**3.4E-08**
Chloroform	1.3E+02	1.2E+02	2.9E-02	1.2E+03	1.2E+01	1.2E+01	3.0E-02	3.3E-02	2.8E-02	**6.1E-06**
Dibromochloromethane	4.4E+01	2.1E+02	1.6E-02	8.8E+02	9.2E+00	9.1E+00	2.3E-02	8.4E-03	7.0E-03	**1.5E-06**
Methylene chloride	2.6E+01	8.5E+01	1.3E-01	1.4E+03	1.4E+01	1.4E+01	3.6E-02	7.9E-03	6.6E-03	**1.5E-06**
Tetrachloroethene	3.9E+01	1.7E+02	7.2E-01	9.9E+02	1.0E+01	1.0E+01	2.6E-02	8.5E-03	7.1E-03	**1.6E-06**
Trichloroethene	7.4E+04	1.3E+02	4.0E-01	1.1E+03	1.2E+01	1.2E+01	2.9E-02	1.8E+01	1.5E+01	**3.3E-03**
Vinyl chloride	1.0E+04	6.3E+01	1.1E+00	1.6E+03	1.7E+01	1.7E+01	4.2E-02	3.5E+00	3.0E+00	**6.5E-04**
Xylene, total	4.3E+01	1.1E+02	2.0E-01	1.2E+03	1.3E+01	1.3E+01	3.3E-02	1.2E-02	9.8E-03	**2.2E-06**
cis-1,2-Dichloroethene	4.6E+04	9.7E+01	1.7E-01	1.3E+03	1.3E+01	1.3E+01	3.4E-02	1.3E+01	1.1E+01	**2.4E-03**
cis-1,3-Dichloropropene	2.3E+00	1.1E+02	3.4E-02	1.2E+03	1.3E+01	1.3E+01	3.2E-02	6.1E-04	5.1E-04	**1.1E-07**
trans-1,2-Dichloroethene	7.2E+02	9.7E+01	3.8E-01	1.3E+03	1.3E+01	1.3E+01	3.4E-02	2.0E-01	1.7E-01	**3.8E-05**
2-Methylnaphthalene	3.6E+01	1.3E+02	1.8E-02	1.1E+03	1.2E+01	1.2E+01	2.9E-02	8.8E-03	7.4E-03	**1.6E-06**
Acenaphthene	4.1E+01	1.5E+02	4.0E-01	1.0E+03	1.1E+01	1.1E+01	2.7E-02	9.2E-03	7.6E-03	**1.7E-06**
Fluorene	3.0E+01	1.7E+02	5.3E-01	9.9E+02	1.0E+01	1.0E+01	2.6E-02	6.6E-03	5.5E-03	**1.2E-06**
Naphthalene	1.2E+03	1.3E+02	1.8E-02	1.1E+03	1.2E+01	1.2E+01	2.9E-02	2.9E-01	2.4E-01	**5.3E-05**
Phenanthrene	2.8E+01	1.8E+02	7.0E-01	9.5E+02	9.9E+00	9.9E+00	2.5E-02	5.8E-03	4.8E-03	**1.1E-06**

Variables*	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
Variables*	**Units**	**Exposure Assumptions**
BW = body weight	kg	70
Ds = duration of shower	min	30
Dt = total duration in shower room	min	60
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$	
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$	
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$	
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	**Einh =**	**If t>Ds**	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constants from Risk Assessment Information System (September 2007). http://rais.ornl.gov/cgi-bin/tox/TOX_9801
* Values for variables are default EPA Region III values, which have been provided by EPA on past projects.

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	8.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-05	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.6E-06	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.7E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.6E-06	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	7.9E-06	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-05	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.4E-05	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.4E-04	mg/kg/day	5.0E-04	mg/kg/day	2.7E-01
				Aroclor-1260	9.6E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-05	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-01	mg/kg/day	1.0E+00	mg/kg/day	1.2E-01
				Antimony	3.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.4E-04	mg/kg/day	4.0E-04	mg/kg/day	1.1E+00
				Arsenic	9.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-04	mg/kg/day	3.0E-04	mg/kg/day	3.9E-01
				Cadmium	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.3E-05	mg/kg/day	1.0E-03	mg/kg/day	5.3E-02
				Chromium	8.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.0E-03	mg/kg/day	3.0E-03	mg/kg/day	3.5E-01
				Copper	1.8E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.3E-02	mg/kg/day	4.0E-02	mg/kg/day	5.8E-01
				Iron	9.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E+00	mg/kg/day	7.0E-01	mg/kg/day	1.7E+00
				Lead	1.9E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-02	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.2E-03	mg/kg/day	2.0E-02	mg/kg/day	2.1E-01
				Mercury	7.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.9E-06	mg/kg/day	3.0E-04	mg/kg/day	3.3E-02
				Nickel	9.6E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-03	mg/kg/day	2.0E-02	mg/kg/day	6.1E-02
				Thallium	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.2E-05	mg/kg/day	7.0E-05	mg/kg/day	3.1E-01
				Vanadium	4.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.0E-03	mg/kg/day	1.0E-03	mg/kg/day	6.0E+00
				Zinc	3.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.0E-02	mg/kg/day	3.0E-01	mg/kg/day	1.3E-01
			Exp. Route Total								0.0E+00					1.1E+01

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

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Chesapeake, Virginia

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Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	8.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.1E-06	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.8E-06	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.2E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-06	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.9E-06	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.8E-06	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.5E-06	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-05	mg/kg/day	5.0E-04	mg/kg/day	2.3E-02
				Aroclor-1260	9.6E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.8E-06	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.3E-03	mg/kg/day	1.0E+00	mg/kg/day	3.3E-03
				Antimony	3.5E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-05	mg/kg/day	6.0E-05	mg/kg/day	2.1E-01
				Arsenic	9.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.9E-06	mg/kg/day	3.0E-04	mg/kg/day	3.3E-02
				Cadmium	4.2E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.5E-07	mg/kg/day	2.5E-05	mg/kg/day	6.0E-03
				Chromium	8.1E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.9E-05	mg/kg/day	7.5E-05	mg/kg/day	3.9E-01
				Copper	1.8E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.5E-04	mg/kg/day	4.0E-02	mg/kg/day	1.6E-02
				Iron	9.4E+04	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.4E-02	mg/kg/day	7.0E-01	mg/kg/day	4.8E-02
				Lead	1.9E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.8E-04	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.2E-04	mg/kg/day	8.0E-04	mg/kg/day	1.5E-01
				Mercury	7.7E-01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.8E-07	mg/kg/day	2.1E-05	mg/kg/day	3.5E-04
				Nickel	9.6E+01	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.4E-05	mg/kg/day	8.0E-04	mg/kg/day	4.9E-01
				Thallium	1.7E+00	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.1E-07	mg/kg/day	7.0E-05	mg/kg/day	2.4E-02
				Vanadium	4.7E+02	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.7E-04	mg/kg/day	2.6E-05	mg/kg/day	5.6E-04
				Zinc	3.1E+03	mg/kg	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.1E-03	mg/kg/day	3.0E-01	mg/kg/day	3.8E-03
			Exp. Route Total								0.0E+00					1.4E+00
		Exposure Point Total									0.0E+00					1.3E+01
	Exposure Medium Total										0.0E+00					1.3E+01
	Air	Emissions from Soil at Site 2	Inhalation	Chromium	6.1E-08	mg/m3	3.3E-10	mg/kg/day	NA	1/(mg/kg-day)	NA	1.5E-08	mg/kg/day	3.0E-05	mg/kg/day	4.9E-04
			Exp. Route Total								NA					4.9E-04
		Exposure Point Total									NA					4.9E-04
	Exposure Medium Total										NA					4.9E-04
Medium Total											0.0E+00					1.3E+01

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Drainage Features and Ponded Area	Ingestion	Bromodichloromethane	4.3E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.3E-06	mg/kg/day	2.0E-02	mg/kg/day	1.6E-04
				Chloroform	8.6E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.5E-06	mg/kg/day	1.0E-02	mg/kg/day	6.5E-04
				Trichloroethene	1.3E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.0E-04	mg/kg/day	6.0E-03	mg/kg/day	1.7E-02
				Vinyl chloride	1.2E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.0E-06	mg/kg/day	3.0E-03	mg/kg/day	3.0E-03
				cis-1,2-Dichloroethene	5.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	4.1E-05	mg/kg/day	1.0E-02	mg/kg/day	4.1E-03
				bis(2-Ethylhexyl)phthalate	8.1E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	6.2E-05	mg/kg/day	2.0E-02	mg/kg/day	3.1E-03
				Arsenic	3.2E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.4E-06	mg/kg/day	3.0E-04	mg/kg/day	8.1E-03
				Chromium	1.7E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-04	mg/kg/day	3.0E-03	mg/kg/day	4.2E-02
				Lead	7.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.6E-05	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	8.2E-04	mg/kg/day	2.0E-02	mg/kg/day	4.1E-02
			Exp. Route Total								0.0E+00					1.2E-01
			Dermal	Bromodichloromethane	4.3E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	9.1E-07	mg/kg/day	2.0E-02	mg/kg/day	4.5E-05
				Chloroform	8.6E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	2.0E-06	mg/kg/day	1.0E-02	mg/kg/day	2.0E-04
				Trichloroethene	1.3E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.9E-05	mg/kg/day	6.0E-03	mg/kg/day	9.8E-03
				Vinyl chloride	1.2E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.7E-06	mg/kg/day	3.0E-03	mg/kg/day	5.7E-04
				cis-1,2-Dichloroethene	5.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-05	mg/kg/day	1.0E-02	mg/kg/day	1.3E-03
				bis(2-Ethylhexyl)phthalate	8.1E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	3.2E-04	mg/kg/day	2.0E-02	mg/kg/day	1.6E-02
				Arsenic	3.2E+00	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.7E-08	mg/kg/day	3.0E-04	mg/kg/day	1.9E-04
				Chromium	1.7E+02	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	5.8E-06	mg/kg/day	7.5E-05	mg/kg/day	7.8E-02
				Lead	7.4E+01	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.3E-06	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	UG/L	NA	mg/kg/day	NA	1/(mg/kg-day)	NA	1.9E-05	mg/kg/day	8.0E-04	mg/kg/day	2.4E-02
			Exp. Route Total								0.0E+00					1.3E-01
		Exposure Point Total									0.0E+00					2.5E-01
	Exposure Medium Total										0.0E+00					2.5E-01
Medium Total											0.0E+00					2.5E-01

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.8E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	9.3E-06	mg/kg/day	3.0E-03	mg/kg/day	3.1E-03
				Benzo(a)anthracene	2.1E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	2.0E-06	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.7E-06	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.2E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	4.7E-07	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.3E-05	mg/kg/day	3.0E-04	mg/kg/day	4.2E-02
				Chromium	1.5E+03	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	1.5E-03	mg/kg/day	3.0E-03	mg/kg/day	4.9E-01
				Lead	5.5E+02	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	5.2E-04	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	NA	mg/kg/day	NA	1/mg/kg/day	NA	8.0E-05	mg/kg/day	1.0E-03	mg/kg/day	8.0E-02
			Exp. Route Total								0.0E+00					6.2E-01
			Dermal	Vinyl chloride	9.8E+00	mg/kg	4.0E-03	mg/kg/day	NA	1/mg/kg/day	NA	3.6E-04	mg/kg/day	3.0E-03	mg/kg/day	1.2E-01
				Benzo(a)anthracene	2.1E+00	mg/kg	1.1E-03	mg/kg/day	NA	1/mg/kg/day	NA	1.0E-04	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	9.6E-04	mg/kg/day	NA	1/mg/kg/day	NA	8.5E-05	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	6.9E-04	mg/kg/day	NA	1/mg/kg/day	NA	6.2E-05	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	2.7E-04	mg/kg/day	NA	1/mg/kg/day	NA	2.4E-05	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	1.7E-03	mg/kg/day	NA	1/mg/kg/day	NA	1.5E-04	mg/kg/day	3.0E-04	mg/kg/day	4.9E-01
				Chromium	1.5E+03	mg/kg	6.4E-02	mg/kg/day	NA	1/mg/kg/day	NA	5.7E-03	mg/kg/day	7.5E-05	mg/kg/day	7.6E+01
				Lead	5.5E+02	mg/kg	2.3E-02	mg/kg/day	NA	1/mg/kg/day	NA	2.0E-03	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	3.5E-03	mg/kg/day	NA	1/mg/kg/day	NA	3.1E-04	mg/kg/day	2.6E-05	mg/kg/day	1.2E+01
			Exp. Route Total								0.0E+00					8.9E+01
		Exposure Point Total									0.0E+00					8.9E+01
	Exposure Medium Total										0.0E+00					8.9E+01
Medium Total											0.0E+00					8.9E+01

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

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					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	1.1E-02	mg/kg/day	4.0E-03	mg/kg/day	2.7E+00
				1,1-Dichloroethene	1.5E+03	ug/L	NA	NA	NA	NA	NA	9.6E-02	mg/kg/day	5.0E-02	mg/kg/day	1.9E+00
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	5.1E-05	mg/kg/day	3.0E-02	mg/kg/day	1.7E-03
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	8.3E-03	mg/kg/day	1.0E-02	mg/kg/day	8.3E-01
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	2.8E-03	mg/kg/day	2.0E-02	mg/kg/day	1.4E-01
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	1.7E-03	mg/kg/day	6.0E-02	mg/kg/day	2.8E-02
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	2.5E-03	mg/kg/day	1.0E-02	mg/kg/day	2.5E-01
				Trichloroethene	7.4E+04	ug/L	NA	NA	NA	NA	NA	4.7E+00	mg/kg/day	6.0E-03	mg/kg/day	7.9E+02
				Vinyl chloride	1.0E+04	ug/L	NA	NA	NA	NA	NA	6.4E-01	mg/kg/day	3.0E-03	mg/kg/day	2.1E+02
				Xylene, total	4.3E+01	ug/L	NA	NA	NA	NA	NA	2.8E-03	mg/kg/day	2.0E-01	mg/kg/day	1.4E-02
				cis-1,2-Dichloroethene	4.6E+04	ug/L	NA	NA	NA	NA	NA	3.0E+00	mg/kg/day	1.0E-02	mg/kg/day	3.0E+02
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	1.5E-04	mg/kg/day	3.0E-02	mg/kg/day	4.9E-03
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	4.6E-02	mg/kg/day	2.0E-02	mg/kg/day	2.3E+00
				2-Methylnaphthalene	3.6E+01	ug/L	NA	NA	NA	NA	NA	2.3E-03	mg/kg/day	4.0E-03	mg/kg/day	5.8E-01
				Acenaphthene	4.1E+01	ug/L	NA	NA	NA	NA	NA	2.6E-03	mg/kg/day	6.0E-02	mg/kg/day	4.3E-02
				Carbazole	2.2E+02	ug/L	NA	NA	NA	NA	NA	1.4E-02	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	NA	NA	NA	NA	NA	1.7E-03	mg/kg/day	1.0E-03	mg/kg/day	1.7E+00
				Fluorene	3.0E+01	ug/L	NA	NA	NA	NA	NA	1.9E-03	mg/kg/day	4.0E-02	mg/kg/day	4.8E-02
				Naphthalene	1.2E+03	ug/L	NA	NA	NA	NA	NA	7.6E-02	mg/kg/day	2.0E-02	mg/kg/day	3.8E+00
				Phenanthrene	2.8E+01	ug/L	NA	NA	NA	NA	NA	1.8E-03	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	NA	NA	NA	NA	NA	4.1E-06	mg/kg/day	5.0E-04	mg/kg/day	8.1E-03
				Heptachlor epoxide	1.0E+00	ug/L	NA	NA	NA	NA	NA	6.5E-05	mg/kg/day	1.3E-05	mg/kg/day	5.0E+00
				2,6-Dinitrotolune	2.0E+01	ug/L	NA	NA	NA	NA	NA	1.3E-03	mg/kg/day	1.0E-03	NA	1.3E+00
				RDX	1.9E+00	ug/L	NA	NA	NA	NA	NA	1.2E-04	mg/kg/day	3.0E-03	mg/kg/day	4.1E-02
				Arsenic	1.1E+01	ug/L	NA	NA	NA	NA	NA	6.9E-04	mg/kg/day	3.0E-04	mg/kg/day	2.3E+00
				Iron	6.9E+04	ug/L	NA	NA	NA	NA	NA	4.4E+00	mg/kg/day	7.0E-01	mg/kg/day	6.3E+00
				Lead	1.6E+01	ug/L	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	NA	NA	NA	NA	NA	7.0E-02	mg/kg/day	2.0E-02	mg/kg/day	3.5E+00
			Exp. Route Total								0.0E+00					1.3E+03

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	NA	NA	NA	NA	NA	2.7E-03	mg/kg/day	4.0E-03	mg/kg/day	6.7E-01
				1,1-Dichloroethene	1.5E+03	ug/L	NA	NA	NA	NA	NA	3.7E-02	mg/kg/day	5.0E-02	mg/kg/day	7.5E-01
				1,4-Dichlorobenzene	8.0E-01	ug/L	NA	NA	NA	NA	NA	9.0E-05	mg/kg/day	3.0E-02	mg/kg/day	3.0E-03
				Chloroform	1.3E+02	ug/L	NA	NA	NA	NA	NA	2.0E-03	mg/kg/day	1.0E-02	mg/kg/day	2.0E-01
				Dibromochloromethane	4.4E+01	ug/L	NA	NA	NA	NA	NA	5.0E-04	mg/kg/day	2.0E-02	mg/kg/day	2.5E-02
				Methylene chloride	2.6E+01	ug/L	NA	NA	NA	NA	NA	1.7E-04	mg/kg/day	6.0E-02	mg/kg/day	2.8E-03
				Tetrachloroethene	3.9E+01	ug/L	NA	NA	NA	NA	NA	3.9E-03	mg/kg/day	1.0E-02	mg/kg/day	3.9E-01
				Trichloroethene	7.4E+04	ug/L	NA	NA	NA	NA	NA	2.2E+00	mg/kg/day	6.0E-03	mg/kg/day	3.6E+02
				Vinyl chloride	1.0E+04	ug/L	NA	NA	NA	NA	NA	8.6E-02	mg/kg/day	3.0E-03	mg/kg/day	2.9E+01
				Xylene, total	4.3E+01	ug/L	NA	NA	NA	NA	NA	4.7E-03	mg/kg/day	2.0E-01	mg/kg/day	2.4E-02
				cis-1,2-Dichloroethene	4.6E+04	ug/L	NA	NA	NA	NA	NA	7.1E-01	mg/kg/day	1.0E-02	mg/kg/day	7.1E+01
				cis-1,3-Dichloropropene	2.3E+00	ug/L	NA	NA	NA	NA	NA	2.1E-05	mg/kg/day	3.0E-02	NA	7.0E-04
				trans-1,2-Dichloroethene	7.2E+02	ug/L	NA	NA	NA	NA	NA	1.1E-02	mg/kg/day	2.0E-02	mg/kg/day	5.5E-01
				2-Methylnaphthalene	3.6E+01	ug/L	NA	NA	NA	NA	NA	4.1E-03	mg/kg/day	4.0E-03	mg/kg/day	1.0E+00
				Acenaphthene	4.1E+01	ug/L	NA	NA	NA	NA	NA	9.5E-03	mg/kg/day	6.0E-02	mg/kg/day	1.6E-01
				Carbazole	2.2E+02	ug/L	NA	NA	NA	NA	NA	3.5E-02	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	NA	NA	NA	NA	NA	7.7E-03	mg/kg/day	1.0E-03	mg/kg/day	7.7E+00
				Fluorene	3.0E+01	ug/L	NA	NA	NA	NA	NA	9.7E-03	mg/kg/day	4.0E-02	mg/kg/day	2.4E-01
				Naphthalene	1.2E+03	ug/L	NA	NA	NA	NA	NA	1.3E-01	mg/kg/day	2.0E-02	mg/kg/day	6.7E+00
				Phenanthrene	2.8E+01	ug/L	NA	NA	NA	NA	NA	1.3E-02	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	NA	NA	NA	NA	NA	5.1E-06	mg/kg/day	5.0E-04	mg/kg/day	1.0E-02
				Heptachlor epoxide	1.0E+00	ug/L	NA	NA	NA	NA	NA	8.1E-05	mg/kg/day	1.3E-05	mg/kg/day	6.2E+00
				2,6-Dinitrotolune	2.0E+01	ug/L	NA	NA	NA	NA	NA	4.8E-05	mg/kg/day	1.0E-03	mg/kg/day	4.8E-02
				RDX	1.9E+00	ug/L	NA	NA	NA	NA	NA	7.8E-07	mg/kg/day	2.4E-03	mg/kg/day	3.2E-04
				Arsenic	1.1E+01	ug/L	NA	NA	NA	NA	NA	1.2E-05	mg/kg/day	3.0E-04	mg/kg/day	4.1E-02
				Iron	6.9E+04	ug/L	NA	NA	NA	NA	NA	7.9E-02	mg/kg/day	7.0E-01	mg/kg/day	1.1E-01
				Lead	1.6E+01	ug/L	NA	NA	NA	NA	NA	1.9E-05	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	NA	NA	NA	NA	NA	1.3E-03	mg/kg/day	8.0E-04	mg/kg/day	1.6E+00
			Exp. Route Total								0.0E+00					4.8E+02
		Medium Total									0.0E+00					1.8E+03
Exposure Medium Total											0.0E+00					1.8E+03
									Total of Receptor Risks Across All Media		0.0E+00	Total of Receptor Hazards Across All Media				1.9E+03

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to surface water calculated on Table 7.4.RME Supplement A.

DAevent for exposure to groundwater while bathing calculated on Table 7.5.RME Supplement A.

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	4.7E-01	mg/kg	6.6E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.8E-09	4.6E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	5.9E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.3E-08	4.2E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	7.3E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.3E-09	5.1E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	4.4E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.2E-08	3.1E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	4.9E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.6E-09	3.5E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	3.5E-09	mg/kg/day	2.4E-01	1/(mg/kg-day)	8.4E-10	2.4E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	1.3E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	4.5E-09	9.2E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	2.9E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	9.8E-09	2.0E-06	mg/kg/day	5.0E-04	mg/kg/day	4.0E-03
				Aroclor-1260	1.3E-01	mg/kg	1.8E-09	mg/kg/day	2.0E+00	1/(mg/kg-day)	3.5E-09	1.2E-07	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	1.1E-04	mg/kg/day	NA	NA	NA	7.4E-03	mg/kg/day	1.0E+00	mg/kg/day	7.4E-03
				Antimony	5.4E+00	mg/kg	7.5E-08	mg/kg/day	NA	NA	NA	5.2E-06	mg/kg/day	2.0E-04	mg/kg/day	2.6E-02
				Arsenic	7.0E+00	mg/kg	9.8E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.5E-07	6.9E-06	mg/kg/day	3.0E-04	mg/kg/day	2.3E-02
				Cadmium	1.6E+00	mg/kg	2.2E-08	mg/kg/day	NA	NA	NA	1.5E-06	mg/kg/day	1.0E-03	mg/kg/day	1.5E-03
				Chromium	4.5E+01	mg/kg	6.3E-07	mg/kg/day	NA	NA	NA	4.4E-05	mg/kg/day	2.0E-02	mg/kg/day	2.2E-03
				Copper	4.5E+02	mg/kg	6.3E-06	mg/kg/day	NA	NA	NA	4.4E-04	mg/kg/day	4.0E-02	mg/kg/day	1.1E-02
				Iron	2.4E+04	mg/kg	3.3E-04	mg/kg/day	NA	NA	NA	2.3E-02	mg/kg/day	7.0E-01	mg/kg/day	3.3E-02
				Lead	6.6E+02	mg/kg	9.2E-06	mg/kg/day	NA	NA	NA	6.4E-04	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	2.4E-06	mg/kg/day	NA	NA	NA	1.7E-04	mg/kg/day	2.0E-02	mg/kg/day	8.5E-03
				Mercury	5.2E-01	mg/kg	7.3E-09	mg/kg/day	NA	NA	NA	5.1E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
				Nickel	3.9E+01	mg/kg	5.4E-07	mg/kg/day	NA	NA	NA	3.8E-05	mg/kg/day	2.0E-02	mg/kg/day	1.9E-03
				Thallium	7.5E-01	mg/kg	1.0E-08	mg/kg/day	NA	NA	NA	7.3E-07	mg/kg/day	7.0E-05	mg/kg/day	1.0E-02
				Vanadium	7.1E+01	mg/kg	1.0E-06	mg/kg/day	NA	NA	NA	7.0E-05	mg/kg/day	7.0E-03	mg/kg/day	1.0E-02
				Zinc	1.1E+03	mg/kg	1.6E-05	mg/kg/day	NA	NA	NA	1.1E-03	mg/kg/day	3.0E-01	mg/kg/day	3.6E-03
			Exp. Route Total								2.5E-07					1.4E-01

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal Absorption	Benzo(a)anthracene	4.7E-01	mg/kg	9.0E-10	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.6E-10	6.3E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	8.1E-10	mg/kg/day	7.3E+00	1/(mg/kg-day)	5.9E-09	5.7E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	1.0E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	7.3E-10	7.0E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	6.0E-10	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.4E-09	4.2E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	6.7E-10	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.9E-10	4.7E-08	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	1.1E-10	mg/kg/day	2.4E-01	1/(mg/kg-day)	2.6E-11	7.7E-09	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	4.1E-10	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.4E-10	2.9E-08	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	9.1E-10	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.1E-10	6.3E-08	mg/kg/day	5.0E-04	mg/kg/day	1.3E-04
				Aroclor-1260	1.3E-01	mg/kg	2.6E-10	mg/kg/day	2.0E+00	1/(mg/kg-day)	5.2E-10	1.8E-08	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	1.1E-06	mg/kg/day	NA	NA	NA	7.7E-05	mg/kg/day	1.0E+00	mg/kg/day	7.7E-05
				Antimony	5.4E+00	mg/kg	7.9E-10	mg/kg/day	NA	NA	NA	5.5E-08	mg/kg/day	3.0E-05	mg/kg/day	1.8E-03
				Arsenic	7.0E+00	mg/kg	3.1E-09	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.6E-09	2.2E-07	mg/kg/day	3.0E-04	mg/kg/day	7.2E-04
				Cadmium	1.6E+00	mg/kg	2.3E-11	mg/kg/day	NA	NA	NA	1.6E-09	mg/kg/day	2.5E-05	mg/kg/day	6.5E-05
				Chromium	4.5E+01	mg/kg	6.6E-09	mg/kg/day	NA	NA	NA	4.6E-07	mg/kg/day	5.0E-04	mg/kg/day	9.3E-04
				Copper	4.5E+02	mg/kg	6.7E-08	mg/kg/day	NA	NA	NA	4.7E-06	mg/kg/day	4.0E-02	mg/kg/day	1.2E-04
				Iron	2.4E+04	mg/kg	3.5E-06	mg/kg/day	NA	NA	NA	2.4E-04	mg/kg/day	7.0E-01	mg/kg/day	3.5E-04
				Lead	6.6E+02	mg/kg	9.7E-08	mg/kg/day	NA	NA	NA	6.8E-06	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	2.6E-08	mg/kg/day	NA	NA	NA	1.8E-06	mg/kg/day	8.0E-04	mg/kg/day	2.2E-03
				Mercury	5.2E-01	mg/kg	7.6E-11	mg/kg/day	NA	NA	NA	5.3E-09	mg/kg/day	2.10E-05	mg/kg/day	6.7E-06
				Nickel	3.9E+01	mg/kg	5.7E-09	mg/kg/day	NA	NA	NA	4.0E-07	mg/kg/day	8.0E-04	mg/kg/day	5.7E-03
				Thallium	7.5E-01	mg/kg	1.1E-10	mg/kg/day	NA	NA	NA	7.7E-09	mg/kg/day	7.0E-05	mg/kg/day	4.3E-05
				Vanadium	7.1E+01	mg/kg	1.0E-08	mg/kg/day	NA	NA	NA	7.3E-07	mg/kg/day	1.8E-04	mg/kg/day	2.4E-06
				Zinc	1.1E+03	mg/kg	1.6E-07	mg/kg/day	NA	NA	NA	1.1E-05	mg/kg/day	3.0E-01	mg/kg/day	3.8E-05
			Exp. Route Total								1.8E-08					1.2E-02
		Exposure Point Total									2.7E-07					1.6E-01
	Exposure Medium Total										2.7E-07					1.6E-01
Medium Total											2.7E-07					1.6E-01

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Water in Excavation	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	2.2E-06	mg/kg/day	NA	NA	NA	1.6E-04	mg/kg/day	4.0E-02	mg/kg/day	3.9E-03
				1,1-Dichloroethene	7.4E+02	ug/L	1.2E-05	mg/kg/day	NA	NA	NA	8.1E-04	mg/kg/day	5.0E-02	mg/kg/day	1.6E-02
				1,4-Dichlorobenzene	8.0E-01	ug/L	7.1E-08	mg/kg/day	2.4E-02	1/(mg/kg-day)	1.7E-09	4.9E-06	mg/kg/day	3.0E-02	mg/kg/day	1.6E-04
				Chloroform	1.3E+02	ug/L	1.8E-06	mg/kg/day	NA	NA	NA	1.2E-04	mg/kg/day	1.0E-02	NA	1.2E-02
				Dibromochloromethane	4.4E+01	ug/L	3.6E-07	mg/kg/day	8.4E-02	1/(mg/kg-day)	3.0E-08	2.5E-05	mg/kg/day	2.0E-02	mg/kg/day	1.3E-03
				Methylene chloride	2.6E+01	ug/L	1.6E-07	mg/kg/day	7.5E-03	1/(mg/kg-day)	1.2E-09	1.1E-05	mg/kg/day	6.0E-02	mg/kg/day	1.8E-04
				Tetrachloroethene	3.9E+01	ug/L	2.7E-06	mg/kg/day	5.4E-01	1/(mg/kg-day)	1.5E-06	1.9E-04	mg/kg/day	1.0E-01	mg/kg/day	1.9E-03
				Trichloroethene	4.5E+04	ug/L	9.6E-04	mg/kg/day	1.3E-02	1/(mg/kg-day)	1.2E-05	6.7E-02	mg/kg/day	6.0E-03	mg/kg/day	1.1E+01
				Vinyl chloride	1.7E+03	ug/L	1.1E-05	mg/kg/day	7.2E-01	1/(mg/kg-day)	7.6E-06	8.1E-04	mg/kg/day	3.0E-03	mg/kg/day	2.7E-01
				Xylene, total	5.8E+00	ug/L	5.4E-07	mg/kg/day	NA	NA	NA	3.8E-05	mg/kg/day	2.0E-01	mg/kg/day	1.9E-04
				cis-1,2-Dichloroethene	1.0E+04	ug/L	1.4E-04	mg/kg/day	NA	NA	NA	9.7E-03	mg/kg/day	1.0E-01	mg/kg/day	9.7E-02
				cis-1,3-Dichloropropene	2.3E+00	ug/L	1.9E-08	mg/kg/day	1.0E-01	1/(mg/kg-day)	1.9E-09	1.4E-06	mg/kg/day	3.0E-02	mg/kg/day	4.5E-05
				trans-1,2-Dichloroethene	7.2E+02	ug/L	8.7E-06	mg/kg/day	NA	NA	NA	6.1E-04	mg/kg/day	2.0E-01	mg/kg/day	3.1E-03
				2-Methylnaphthalene	1.1E+01	ug/L	1.0E-06	mg/kg/day	NA	NA	NA	7.2E-05	mg/kg/day	4.0E-03	mg/kg/day	1.8E-02
				Acenaphthene	1.2E+01	ug/L	1.9E-06	mg/kg/day	NA	NA	NA	1.4E-04	mg/kg/day	6.0E-01	mg/kg/day	2.3E-04
				Carbazole	2.4E+01	ug/L	2.8E-06	mg/kg/day	2.0E-02	1/(mg/kg-day)	5.6E-08	2.0E-04	mg/kg/day	NA	NA	NA
				Dibenzofuran	8.8E+00	ug/L	1.8E-06	mg/kg/day	NA	NA	NA	1.3E-04	mg/kg/day	1.0E-03	mg/kg/day	1.3E-01
				Fluorene	9.4E+00	ug/L	2.1E-06	mg/kg/day	NA	NA	NA	1.5E-04	mg/kg/day	4.0E-01	mg/kg/day	3.7E-04
				Naphthalene	1.2E+02	ug/L	1.2E-05	mg/kg/day	NA	NA	NA	8.2E-04	mg/kg/day	2.0E-02	mg/kg/day	4.1E-02
				Phenanthrene	8.8E+00	ug/L	2.9E-06	mg/kg/day	NA	NA	NA	2.0E-04	mg/kg/day	NA	NA	NA
				Heptachlor	3.5E-02	ug/L	2.0E-09	mg/kg/day	4.5E+00	1/(mg/kg-day)	8.8E-09	1.4E-07	mg/kg/day	5.0E-04	mg/kg/day	2.7E-04
				Heptachlor epoxide	1.2E-01	ug/L	6.7E-09	mg/kg/day	9.1E+00	1/(mg/kg-day)	6.1E-08	4.6E-07	mg/kg/day	1.3E-05	mg/kg/day	3.6E-02
				2,6-Dinitrotolune	2.8E+00	ug/L	1.5E-08	mg/kg/day	NA	NA	NA	1.1E-06	mg/kg/day	1.0E-03	mg/kg/day	1.1E-03
				RDX	7.3E-01	ug/L	1.0E-10	mg/kg/day	1.1E-01	1/(mg/kg-day)	1.1E-11	7.1E-09	mg/kg/day	2.4E-03	mg/kg/day	3.0E-06
				Arsenic	5.9E+00	ug/L	2.4E-09	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.6E-09	1.7E-07	mg/kg/day	3.0E-04	mg/kg/day	5.6E-04
				Iron	2.3E+04	ug/L	9.1E-06	mg/kg/day	NA	NA	NA	6.4E-04	mg/kg/day	7.0E-01	mg/kg/day	9.1E-04
				Lead	2.4E+00	ug/L	9.5E-10	mg/kg/day	NA	NA	NA	6.7E-08	mg/kg/day	NA	NA	NA
				Manganese	8.4E+02	ug/L	3.4E-07	mg/kg/day	NA	NA	NA	2.4E-05	mg/kg/day	8.0E-04	mg/kg/day	3.0E-02
			Exp. Route Total								2.2E-05					1.2E+01
		Medium Total									2.2E-05					1.2E+01
	Exposure Medium Total										2.2E-05					1.2E+01

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Water Vapors at Excavation Pit	Inhalation	1,1,2-Trichloroethane	1.7E+02	ug/L	1.0E-06	mg/kg/day	NA	mg/kg/day	NA	7.1E-05	mg/kg/day	NA	mg/kg/day	NA
				1,1-Dichloroethene	7.4E+02	ug/L	5.0E-06	mg/kg/day	NA	mg/kg/day	NA	3.5E-04	mg/kg/day	6.0E-02	mg/kg/day	5.8E-03
				1,4-Dichlorobenzene	8.0E-01	ug/L	4.8E-09	mg/kg/day	4.0E-02	mg/kg/day	1.9E-10	3.4E-07	mg/kg/day	7.1E-01	mg/kg/day	4.7E-07
				Chloroform	1.3E+02	ug/L	8.3E-07	mg/kg/day	8.1E-02	mg/kg/day	6.7E-08	5.8E-05	mg/kg/day	1.4E-02	mg/kg/day	4.2E-03
				Dibromochloromethane	4.4E+01	ug/L	2.2E-07	mg/kg/day	NA	NA	NA	1.6E-05	mg/kg/day	NA	NA	NA
				Methylene chloride	2.6E+01	ug/L	1.8E-07	mg/kg/day	1.7E-03	mg/kg/day	3.0E-10	1.3E-05	mg/kg/day	8.6E-01	mg/kg/day	1.5E-05
				Tetrachloroethene	3.9E+01	ug/L	2.3E-07	mg/kg/day	2.0E-02	mg/kg/day	4.6E-09	1.6E-05	mg/kg/day	8.0E-02	mg/kg/day	2.0E-04
				Trichloroethene	4.5E+04	ug/L	2.8E-04	mg/kg/day	7.0E-03	mg/kg/day	2.0E-06	2.0E-02	mg/kg/day	1.7E-01	mg/kg/day	1.2E-01
				Vinyl chloride	1.7E+03	ug/L	1.3E-05	mg/kg/day	1.5E-02	mg/kg/day	1.9E-07	9.9E-04	mg/kg/day	2.8E-02	mg/kg/day	3.5E-02
				Xylene, total	5.8E+00	ug/L	3.8E-08	mg/kg/day	NA	NA	NA	2.7E-06	mg/kg/day	3.0E-02	mg/kg/day	8.9E-05
				cis-1,2-Dichloroethene	1.0E+04	ug/L	7.0E-05	mg/kg/day	NA	NA	NA	4.9E-03	mg/kg/day	NA	NA	NA
				cis-1,3-Dichloropropene	2.3E+00	ug/L	1.4E-08	mg/kg/day	1.0E-02	mg/kg/day	1.4E-10	1.0E-06	mg/kg/day	5.7E-03	mg/kg/day	1.8E-04
				trans-1,2-Dichloroethene	7.2E+02	ug/L	4.9E-06	mg/kg/day	NA	NA	NA	3.4E-04	mg/kg/day	1.7E-02	mg/kg/day	2.0E-02
				2-Methylnaphthalene	1.1E+01	ug/L	6.3E-08	mg/kg/day	NA	NA	NA	4.4E-06	mg/kg/day	NA	NA	NA
				Acenaphthene	1.2E+01	ug/L	7.0E-08	mg/kg/day	NA	NA	NA	4.9E-06	mg/kg/day	NA	NA	NA
				Fluorene	9.4E+00	ug/L	5.6E-08	mg/kg/day	NA	NA	NA	3.9E-06	mg/kg/day	NA	NA	NA
				Naphthalene	1.2E+02	ug/L	7.1E-07	mg/kg/day	NA	NA	NA	5.0E-05	mg/kg/day	9.0E-04	mg/kg/day	5.5E-02
				Phenanthrene	8.8E+00	ug/L	5.2E-08	mg/kg/day	NA	NA	NA					
			Total								2.2E-06					2.4E-01
		Exposure Point Total									2.2E-06					2.4E-01
	Exposure Medium Total										2.2E-06					2.4E-01
Medium Total											2.4E-05					1.2E+01
									Total of Receptor Risks Across All Media		2.4E-05	Total of Receptor Hazards Across All Media				1.2E+01

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to groundwater while bathing calculated on Table 7.5.CTE Supplement A.

Subchronic values used when available.

Table 7.5.CTE Supplement A
Calculation of DAevent (Construction Worker)
Shallow Aquifer
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Groundwater Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	B dimensionless	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+02	6.4E-03	3.4E-02	6.0E-01	1.4E+00	1.0E+00	4	5.6E-06	3
1,1-Dichloroethene	7.4E+02	1.2E-02	1.1E+00	3.7E-01	8.9E-01	1.0E+00	4	2.9E-05	3
1,4-Dichlorobenzene	8.0E-01	4.2E-02	9.9E-02	7.1E-01	1.7E+00	1.0E+00	4	1.7E-07	3
Chloroform	1.3E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	4	4.3E-06	3
Dibromochloromethane	4.4E+01	2.9E-03	1.6E-02	1.5E+00	3.7E+00	1.0E+00	4	9.0E-07	3
Methylene chloride	2.6E+01	3.5E-03	1.3E-01	3.2E-01	7.6E-01	1.0E+00	4	3.9E-07	3
Tetrachloroethene	3.9E+01	3.3E-02	7.2E-01	9.1E-01	2.2E+00	1.0E+00	4	6.7E-06	3
Trichloroethene	4.5E+04	1.2E-02	4.0E-01	5.8E-01	1.4E+00	1.0E+00	4	2.4E-03	3
Vinyl chloride	1.7E+03	5.6E-03	1.1E+00	2.4E-01	5.7E-01	1.0E+00	4	2.6E-05	3
Xylene, total	5.8E+00	5.3E-02	2.0E-01	4.2E-01	1.0E+00	1.0E+00	4	1.3E-06	3
cis-1,2-Dichloroethene	1.0E+04	7.7E-03	1.7E-01	3.7E-01	8.9E-01	1.0E+00	4	3.4E-04	3
cis-1,3-Dichloropropene	2.3E+00	4.3E-03	1.8E-02	4.5E-01	1.1E+00	1.0E+00	4	4.8E-08	3
trans-1,2-Dichloroethene	7.2E+02	7.7E-03	3.8E-01	3.7E-01	8.9E-01	1.0E+00	4	2.2E-05	3
2-Methylnaphthalene	1.1E+01	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	4	2.6E-06	3
Acenaphthene	1.2E+01	8.4E-02	4.0E-01	7.7E-01	1.8E+00	1.0E+00	4	4.8E-06	3
Carbazole	2.4E+01	5.2E-02	2.6E-01	9.1E-01	2.2E+00	1.0E+00	4	6.9E-06	3
Dibenzofuran	8.8E+00	9.5E-02	4.7E-01	9.2E-01	2.2E+00	1.0E+00	4	4.4E-06	3
Fluorene	9.4E+00	1.1E-01	5.3E-01	9.0E-01	2.2E+00	1.0E+00	4	5.3E-06	3
Naphthalene	1.2E+02	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	4	2.9E-05	3
Phenanthrene	8.8E+00	1.4E-01	7.4E-01	1.1E+00	4.1E+00	1.0E+00	4	7.1E-06	3
Heptachlor	3.5E-02	8.6E-03	1.2E-02	1.3E+01	3.2E+01	8.0E-01	4	4.9E-09	2
Heptachlor epoxide	1.2E-01	8.6E-03	8.6E-04	1.3E+01	3.2E+01	8.0E-01	4	1.6E-08	2
2,6-Dinitrotolune	2.8E+00	2.1E-03	1.9E-02	1.1E+00	2.7E+00	1.0E+00	4	3.7E-08	3
RDX	7.3E-01	3.5E-04	NA	NA	NA	NA	4	2.5E-10	1
Arsenic	5.9E+00	1.0E-03	NA	NA	NA	NA	4	5.9E-09	1
Iron	2.3E+04	1.0E-03	NA	NA	NA	NA	4	2.3E-05	1
Lead	2.4E+00	1.0E-03	NA	NA	NA	NA	4	2.4E-09	1
Manganese	8.4E+02	1.0E-03	NA	NA	NA	NA	4	8.4E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

Table 7.5.CTE Supplement B
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Senario
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Cw	MW	K_H	k_l	k_g	K_v	ER	ERa	Ca
	(μg/L)	(mol/gram)	(unitless)	(cm/hr)	(cm/hr)	(cm/hr)	(mg/hr)	(g/sec-m^2)	(mg/m^3)
1,1,2-Trichloroethane	1.7E+02	1.3E+02	3.4E-02	3.1E+00	1.9E+03	2.9E+00	5.0E+02	5.1E-08	1.5E-03
1,1-Dichloroethene	7.4E+02	9.7E+01	1.1E+00	3.3E+00	2.0E+03	3.3E+00	2.5E+03	2.5E-07	7.2E-03
1,4-Dichlorobenzene	8.0E-01	1.5E+02	9.9E-02	3.0E+00	1.8E+03	3.0E+00	2.4E+00	2.4E-10	6.9E-06
Chloroform	1.3E+02	1.2E+02	1.5E-01	3.2E+00	1.9E+03	3.1E+00	4.1E+02	4.2E-08	1.2E-03
Dibromochloromethane	4.4E+01	2.1E+02	1.6E-02	2.8E+00	1.7E+03	2.5E+00	1.1E+02	1.1E-08	3.2E-04
Methylene chloride	2.6E+01	8.5E+01	1.3E-01	3.4E+00	2.1E+03	3.4E+00	8.9E+01	9.1E-09	2.6E-04
Tetrachloroethene	3.9E+01	1.7E+02	7.2E-01	2.9E+00	1.8E+03	2.9E+00	1.1E+02	1.2E-08	3.3E-04
Trichloroethene	4.5E+04	1.3E+02	4.0E-01	3.1E+00	1.9E+03	3.1E+00	1.4E+05	1.4E-05	4.0E-01
Vinyl chloride	1.7E+03	6.3E+01	1.1E+00	3.7E+00	2.3E+03	3.7E+00	6.3E+03	6.5E-07	1.8E-02
Xylene, total	5.8E+00	1.1E+02	2.0E-01	3.3E+00	2.0E+03	3.2E+00	1.9E+01	1.9E-09	5.5E-05
cis-1,2-Dichloroethene	1.0E+04	9.7E+01	1.7E-01	3.3E+00	2.0E+03	3.3E+00	3.4E+04	3.5E-06	1.0E-01
cis-1,3-Dichloropropene	2.3E+00	1.1E+02	3.4E-02	3.2E+00	2.0E+03	3.1E+00	7.1E+00	7.3E-10	2.1E-05
trans-1,2-Dichloroethene	7.2E+02	9.7E+01	3.8E-01	3.3E+00	2.0E+03	3.3E+00	2.4E+03	2.5E-07	7.0E-03
2-Methylnaphthalene	1.1E+01	1.3E+02	1.8E-02	3.1E+00	1.9E+03	2.8E+00	3.1E+01	3.2E-09	8.9E-05
Acenaphthene	1.2E+01	1.5E+02	4.0E-01	3.0E+00	1.8E+03	3.0E+00	3.4E+01	3.5E-09	1.0E-04
Fluorene	9.4E+00	1.7E+02	5.3E-01	2.9E+00	1.8E+03	2.9E+00	2.7E+01	2.8E-09	8.0E-05
Naphthalene	1.2E+02	1.3E+02	1.8E-02	3.1E+00	1.9E+03	2.8E+00	3.5E+02	3.6E-08	1.0E-03
Phenanthrene	8.8E+00	1.8E+02	7.0E-01	2.9E+00	1.7E+03	2.9E+00	2.5E+01	2.6E-09	7.4E-05

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 ER = Kv * Cw * L/1000 cm^3 * mg/1000 μg

Equation 5 ERa = ER * g/1000 mg * hr/60 min * min/60 sec * 1/A

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch)	(m^2)	2,700
Era = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

Table 7.5.RME Supplement A
Calculation of DAevent
Child Resident, Shallow Groundwater, Tap Water
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Groundwater Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+02	6.4E-03	3.4E-02	6.0E-01	1.4E+00	1.0E+00	1	2.3E-06	2
1,1-Dichloroethene	1.5E+03	1.2E-02	1.1E+00	3.7E-01	8.9E-01	1.0E+00	1	3.2E-05	3
1,4-Dichlorobenzene	8.0E-01	4.2E-02	9.9E-02	7.1E-01	1.7E+00	1.0E+00	1	7.8E-08	2
Chloroform	1.3E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	1.7E-06	2
Dibromochloromethane	4.4E+01	2.9E-03	1.6E-02	1.5E+00	3.7E+00	1.0E+00	1	4.3E-07	2
Methylene chloride	2.6E+01	3.5E-03	1.3E-01	3.2E-01	7.6E-01	1.0E+00	1	1.5E-07	3
Tetrachloroethene	3.9E+01	3.3E-02	7.2E-01	9.1E-01	2.2E+00	1.0E+00	1	3.4E-06	2
Trichloroethene	7.4E+04	1.2E-02	4.0E-01	5.8E-01	1.4E+00	1.0E+00	1	1.9E-03	2
Vinyl chloride	1.0E+04	5.6E-03	1.1E+00	2.4E-01	5.7E-01	1.0E+00	1	7.5E-05	3
Xylene, total	4.3E+01	5.3E-02	2.0E-01	4.2E-01	1.0E+00	1.0E+00	1	4.1E-06	2
cis-1,2-Dichloroethene	4.6E+04	7.7E-03	1.7E-01	3.7E-01	8.9E-01	1.0E+00	1	6.1E-04	3
cis-1,3-Dichloropropene	2.3E+00	4.3E-03	1.8E-02	4.5E-01	1.1E+00	1.0E+00	1	1.8E-08	2
trans-1,2-Dichloroethene	7.2E+02	7.7E-03	3.8E-01	3.7E-01	8.9E-01	1.0E+00	1	9.6E-06	3
2-Methylnaphthalene	3.6E+01	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	1	3.5E-06	2
Acenaphthene	4.1E+01	8.4E-02	4.0E-01	7.7E-01	1.8E+00	1.0E+00	1	8.3E-06	2
Carbazole	2.2E+02	5.2E-02	2.6E-01	9.1E-01	2.2E+00	1.0E+00	1	3.0E-05	2
Dibenzofuran	2.7E+01	9.5E-02	4.7E-01	9.2E-01	2.2E+00	1.0E+00	1	6.7E-06	2
Fluorene	3.0E+01	1.1E-01	5.3E-01	9.0E-01	2.2E+00	1.0E+00	1	8.5E-06	2
Naphthalene	1.2E+03	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	1	1.2E-04	2
Phenanthrene	2.8E+01	1.4E-01	7.0E-01	1.1E+00	4.1E+00	1.0E+00	1	1.1E-05	2
Heptachlor	6.4E-02	8.6E-03	1.2E-02	1.3E+01	3.2E+01	8.0E-01	1	4.4E-09	2
Heptachlor epoxide	1.0E+00	8.6E-03	8.6E-04	1.3E+01	3.2E+01	8.0E-01	1	7.1E-08	2
2,6-Dinitrotolune	2.0E+01	2.1E-03	1.9E-02	1.1E+00	2.7E+00	1.0E+00	1	4.2E-08	1
RDX	1.9E+00	3.48E-04	NA	NA	NA	NA	1	6.7E-10	1
Arsenic	1.1E+01	1.0E-03	NA	NA	NA	NA	1	1.1E-08	1
Iron	6.9E+04	1.0E-03	NA	NA	NA	NA	1	6.9E-05	1
Lead	1.6E+01	1.0E-03	NA	NA	NA	NA	1	1.6E-08	1
Manganese	1.1E+03	1.0E-03	NA	NA	NA	NA	1	1.1E-06	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
tevent<t*: DAevent (mg/cm2-event) =
2 x FA x Kp x CW x (sqrt((6 x τ_{event} x tevent)/π)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
FA x Kp x CW x (tevent/(1+B) + 2 x τ_{event} x ((1 + 3xB + $3xB^2$)/$(1+B)^2$) x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 2001, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005.
NA - not applicable.

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	8.8E-01	mg/kg	1.4E-06	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.0E-06	NA	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	9.3E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	6.8E-06	NA	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	1.1E-06	mg/kg/day	7.3E-01	1/(mg/kg-day)	7.8E-07	NA	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	8.1E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	5.9E-06	NA	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	9.7E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	7.0E-07	NA	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	2.6E-06	mg/kg/day	2.4E-01	1/(mg/kg-day)	6.3E-07	NA	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	6.6E-06	mg/kg/day	3.4E-01	1/(mg/kg-day)	2.2E-06	NA	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	1.7E-05	mg/kg/day	3.4E-01	1/(mg/kg-day)	5.7E-06	NA	mg/kg/day	NA	NA	NA
				Aroclor-1260	9.6E-01	mg/kg	1.5E-06	mg/kg/day	2.0E+00	1/(mg/kg-day)	3.0E-06	NA	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	1.4E-02	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Antimony	3.5E+01	mg/kg	5.4E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Arsenic	9.2E+00	mg/kg	1.4E-05	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.2E-05	NA	mg/kg/day	NA	NA	NA
				Cadmium	4.2E+00	mg/kg	6.5E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Chromium	8.1E+01	mg/kg	1.3E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Copper	1.8E+03	mg/kg	2.8E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Iron	9.4E+04	mg/kg	1.5E-01	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Lead	1.9E+03	mg/kg	3.0E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	5.1E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Mercury	7.7E-01	mg/kg	1.2E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Nickel	9.6E+01	mg/kg	1.5E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Thallium	1.7E+00	mg/kg	2.7E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Vanadium	4.7E+02	mg/kg	7.3E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Zinc	3.1E+03	mg/kg	4.9E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								4.8E-05					0.0E+00

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	8.8E-01	mg/kg	9.4E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.9E-07	NA	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	6.4E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.6E-06	NA	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	7.3E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.3E-07	NA	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	5.5E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.0E-06	NA	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	6.6E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.8E-07	NA	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	4.2E-07	mg/kg/day	2.4E-01	1/(mg/kg-day)	1.0E-07	NA	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	1.0E-06	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.5E-07	NA	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	2.6E-06	mg/kg/day	3.4E-01	1/(mg/kg-day)	8.9E-07	NA	mg/kg/day	NA	NA	NA
				Aroclor-1260	9.6E-01	mg/kg	1.1E-06	mg/kg/day	2.0E+00	1/(mg/kg-day)	2.2E-06	NA	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	7.6E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Antimony	3.5E+01	mg/kg	2.9E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Arsenic	9.2E+00	mg/kg	2.3E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.4E-06	NA	mg/kg/day	NA	NA	NA
				Cadmium	4.2E+00	mg/kg	3.4E-08	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Chromium	8.1E+01	mg/kg	6.7E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Copper	1.8E+03	mg/kg	1.5E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Iron	9.4E+04	mg/kg	7.7E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Lead	1.9E+03	mg/kg	1.6E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	2.7E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Mercury	7.7E-01	mg/kg	6.4E-08	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Nickel	9.6E+01	mg/kg	7.9E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Thallium	1.7E+00	mg/kg	1.4E-07	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Vanadium	4.7E+02	mg/kg	3.8E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Zinc	3.1E+03	mg/kg	2.6E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.7E-05					0.0E+00
		Exposure Point Total									6.6E-05					0.0E+00
	Exposure Medium Total										6.6E-05					0.0E+00
	Air	Emissions from Soil at Site 2	Inhalation	Chromium	6.1E-08	mg/m3	1.1E-11	mg/kg/day	4.1E+01	1/(mg/kg-day)	4.4E-10	NA	mg/kg/day	NA	mg/kg/day	NA
			Exp. Route Total								4.4E-10					NA
		Exposure Point Total									4.4E-10					NA
	Exposure Medium Total										4.4E-10					NA
Medium Total											6.6E-05					0.0E+00

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Drainage Features and Ponded Area	Ingestion	Bromodichloromethane	4.3E+00	UG/L	1.5E-06	mg/kg/day	6.2E-02	1/(mg/kg-day)	9.3E-08	NA	mg/kg/day	NA	NA	NA
				Chloroform	8.6E+00	UG/L	3.0E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Trichloroethene	1.3E+02	UG/L	4.6E-05	mg/kg/day	1.3E-02	1/(mg/kg-day)	6.0E-07	NA	mg/kg/day	NA	NA	NA
				Vinyl chloride	1.2E+01	UG/L	4.1E-06	mg/kg/day	7.2E-01	1/(mg/kg-day)	3.0E-06	NA	mg/kg/day	NA	NA	NA
				cis-1,2-Dichloroethene	5.4E+01	UG/L	1.9E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				bis(2-Ethylhexyl)phthalate	8.1E+01	UG/L	2.8E-05	mg/kg/day	1.4E-02	1/(mg/kg-day)	3.9E-07	NA	mg/kg/day	NA	NA	NA
				Arsenic	3.2E+00	UG/L	1.1E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.7E-06	NA	mg/kg/day	NA	NA	NA
				Chromium	1.7E+02	UG/L	5.7E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Lead	7.4E+01	UG/L	2.6E-05	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	UG/L	3.7E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								5.7E-06					0.0E+00
			Dermal	Bromodichloromethane	4.3E+00	UG/L	2.8E-07	mg/kg/day	6.2E-02	1/(mg/kg-day)	1.7E-08	NA	mg/kg/day	NA	NA	NA
				Chloroform	8.6E+00	UG/L	6.3E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	NA	mg/kg/day	NA	NA	NA
				Trichloroethene	1.3E+02	UG/L	1.8E-05	mg/kg/day	1.3E-02	1/(mg/kg-day)	2.4E-07	NA	mg/kg/day	NA	NA	NA
				Vinyl chloride	1.2E+01	UG/L	5.4E-07	mg/kg/day	7.2E-01	1/(mg/kg-day)	3.9E-07	NA	mg/kg/day	NA	NA	NA
				cis-1,2-Dichloroethene	5.4E+01	UG/L	3.9E-06	mg/kg/day	NA	1/(mg/kg-day)	NA	NA	mg/kg/day	NA	NA	NA
				bis(2-Ethylhexyl)phthalate	8.1E+01	UG/L	1.0E-04	mg/kg/day	1.4E-02	1/(mg/kg-day)	1.4E-06	NA	mg/kg/day	NA	NA	NA
				Arsenic	3.2E+00	UG/L	1.8E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.6E-08	NA	mg/kg/day	NA	NA	NA
				Chromium	1.7E+02	UG/L	1.8E-06	mg/kg/day	NA	1/(mg/kg-day)	NA	NA	mg/kg/day	NA	NA	NA
				Lead	7.4E+01	UG/L	4.0E-07	mg/kg/day	NA	1/(mg/kg-day)	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	UG/L	5.9E-06	mg/kg/day	NA	1/(mg/kg-day)	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								2.1E-06					0.0E+00
		Exposure Point Total									7.8E-06					0.0E+00
	Exposure Medium Total										7.8E-06					0.0E+00
Medium Total											7.8E-06					0.0E+00

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

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Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
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Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Drainage Features and Ponded Area	Ingestion	Vinyl chloride	9.8E+00	mg/kg	1.1E-06	mg/kg/day	1.4E+00	1/mg/kg/day	1.6E-06	NA	mg/kg/day	NA	NA	NA
				Benzo(a)anthracene	2.1E+00	mg/kg	2.5E-07	mg/kg/day	7.3E-01	1/mg/kg/day	1.8E-07	NA	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	2.1E-07	mg/kg/day	7.3E+00	1/mg/kg/day	1.5E-06	NA	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	1.5E-07	mg/kg/day	7.3E-01	1/mg/kg/day	1.1E-07	NA	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	5.8E-08	mg/kg/day	7.3E+00	1/mg/kg/day	4.2E-07	NA	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	1.6E-06	mg/kg/day	1.5E+00	1/mg/kg/day	2.3E-06	NA	mg/kg/day	NA	NA	NA
				Chromium	1.5E+03	mg/kg	1.8E-04	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Lead	5.5E+02	mg/kg	6.3E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	9.8E-06	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								6.1E-06					0.0E+00
			Dermal	Vinyl chloride	9.8E+00	mg/kg	3.3E-05	mg/kg/day	1.4E+00	1/mg/kg/day	4.6E-05	NA	mg/kg/day	NA	NA	NA
				Benzo(a)anthracene	2.1E+00	mg/kg	9.4E-06	mg/kg/day	7.3E-01	1/mg/kg/day	6.8E-06	NA	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	1.8E+00	mg/kg	7.9E-06	mg/kg/day	7.3E+00	1/mg/kg/day	5.7E-05	NA	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.3E+00	mg/kg	5.7E-06	mg/kg/day	7.3E-01	1/mg/kg/day	4.2E-06	NA	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.0E-01	mg/kg	2.2E-06	mg/kg/day	7.3E+00	1/mg/kg/day	1.6E-05	NA	mg/kg/day	NA	NA	NA
				Arsenic	1.3E+01	mg/kg	1.4E-05	mg/kg/day	1.5E+00	1/mg/kg/day	2.1E-05	NA	mg/kg/day	NA	NA	NA
				Chromium	1.5E+03	mg/kg	5.3E-04	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Lead	5.5E+02	mg/kg	1.9E-04	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
				Vanadium	8.5E+01	mg/kg	2.9E-05	mg/kg/day	NA	1/mg/kg/day	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.5E-04					0.0E+00
		Exposure Point Total									1.6E-04					0.0E+00
	Exposure Medium Total										1.6E-04					0.0E+00
Medium Total											1.6E-04					0.0E+00

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	2.5E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				1,1-Dichloroethene	1.5E+03	ug/L	2.2E-02	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				1,4-Dichlorobenzene	8.0E-01	ug/L	1.2E-05	mg/kg/day	2.4E-02	1/mg/kg/day	2.9E-07	NA	mg/kg/day	NA	NA	NA
				Chloroform	1.3E+02	ug/L	1.9E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Dibromochloromethane	4.4E+01	ug/L	6.6E-04	mg/kg/day	8.4E-02	1/mg/kg/day	5.5E-05	NA	mg/kg/day	NA	NA	NA
				Methylene chloride	2.6E+01	ug/L	3.9E-04	mg/kg/day	7.5E-03	1/mg/kg/day	2.9E-06	NA	mg/kg/day	NA	NA	NA
				Tetrachloroethene	3.9E+01	ug/L	5.8E-04	mg/kg/day	5.4E-01	1/mg/kg/day	3.1E-04	NA	mg/kg/day	NA	NA	NA
				Trichloroethene	7.4E+04	ug/L	1.1E+00	mg/kg/day	1.3E-02	1/mg/kg/day	1.4E-02	NA	mg/kg/day	NA	NA	NA
				Vinyl chloride	1.0E+04	ug/L	1.5E-01	mg/kg/day	1.4E+00	1/mg/kg/day	1.9E-01	NA	mg/kg/day	NA	NA	NA
				Xylene, total	4.3E+01	ug/L	6.5E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,2-Dichloroethene	4.6E+04	ug/L	6.9E-01	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,3-Dichloropropene	2.3E+00	ug/L	3.4E-05	mg/kg/day	1.0E-01	1/mg/kg/day	3.4E-06	NA	mg/kg/day	NA	NA	NA
				trans-1,2-Dichloroethene	7.2E+02	ug/L	1.1E-02	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				2-Methylnaphthalene	3.6E+01	ug/L	5.4E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Acenaphthene	4.1E+01	ug/L	6.1E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Carbazole	2.2E+02	ug/L	3.3E-03	mg/kg/day	2.0E-02	1/mg/kg/day	6.6E-05	NA	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	4.0E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Fluorene	3.0E+01	ug/L	4.5E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Naphthalene	1.2E+03	ug/L	1.8E-02	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Phenanthrene	2.8E+01	ug/L	4.1E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	9.5E-07	mg/kg/day	4.5E+00	1/mg/kg/day	4.3E-06	NA	mg/kg/day	NA	NA	NA
				Heptachlor epoxide	1.0E+00	ug/L	1.5E-05	mg/kg/day	9.1E+00	1/mg/kg/day	1.4E-04	NA	mg/kg/day	NA	NA	NA
				2,6-Dinitrotolune	2.0E+01	ug/L	3.0E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				RDX	1.9E+00	ug/L	2.9E-05	mg/kg/day	1.1E-01	1/mg/kg/day	3.2E-06	NA	mg/kg/day	NA	NA	NA
				Arsenic	1.1E+01	ug/L	1.6E-04	mg/kg/day	1.5E+00	1/mg/kg/day	2.4E-04	NA	mg/kg/day	NA	NA	NA
				Iron	6.9E+04	ug/L	1.0E+00	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Lead	1.6E+01	ug/L	2.4E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	1.6E-02	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								2.0E-01					0.0E+00

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	2.3E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				1,1-Dichloroethene	1.5E+03	ug/L	3.1E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				1,4-Dichlorobenzene	8.0E-01	ug/L	7.9E-06	mg/kg/day	2.4E-02	1/mg/kg/day	1.9E-07	NA	mg/kg/day	NA	NA	NA
				Chloroform	1.3E+02	ug/L	1.7E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Dibromochloromethane	4.4E+01	ug/L	4.4E-05	mg/kg/day	8.4E-02	1/mg/kg/day	3.7E-06	NA	mg/kg/day	NA	NA	NA
				Methylene chloride	2.6E+01	ug/L	1.4E-05	mg/kg/day	7.5E-03	1/mg/kg/day	1.1E-07	NA	mg/kg/day	NA	NA	NA
				Tetrachloroethene	3.9E+01	ug/L	3.4E-04	mg/kg/day	5.4E-01	1/mg/kg/day	1.8E-04	NA	mg/kg/day	NA	NA	NA
				Trichloroethene	7.4E+04	ug/L	1.9E-01	mg/kg/day	1.3E-02	1/mg/kg/day	2.4E-03	NA	mg/kg/day	NA	NA	NA
				Vinyl chloride	1.0E+04	ug/L	7.6E-03	mg/kg/day	1.4E+00	1/mg/kg/day	1.1E-02	NA	mg/kg/day	NA	NA	NA
				Xylene, total	4.3E+01	ug/L	4.1E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,2-Dichloroethene	4.6E+04	ug/L	6.1E-02	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				cis-1,3-Dichloropropene	2.3E+00	ug/L	1.8E-06	mg/kg/day	1.0E-01	1/mg/kg/day	1.8E-07	NA	mg/kg/day	NA	NA	NA
				trans-1,2-Dichloroethene	7.2E+02	ug/L	9.5E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				2-Methylnaphthalene	3.6E+01	ug/L	3.5E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Acenaphthene	4.1E+01	ug/L	8.3E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Carbazole	2.2E+02	ug/L	3.0E-03	mg/kg/day	2.0E-02	1/mg/kg/day	6.1E-05	NA	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	6.8E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Fluorene	3.0E+01	ug/L	8.5E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Naphthalene	1.2E+03	ug/L	1.2E-02	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Phenanthrene	2.8E+01	ug/L	1.1E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	4.4E-07	mg/kg/day	4.5E+00	1/mg/kg/day	2.0E-06	NA	mg/kg/day	NA	NA	NA
				Heptachlor epoxide	1.0E+00	ug/L	7.1E-06	mg/kg/day	9.1E+00	1/mg/kg/day	6.5E-05	NA	mg/kg/day	NA	NA	NA
				2,6-Dinitrotolune	2.0E+01	ug/L	9.4E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				RDX	1.9E+00	ug/L	8.1E-08	mg/kg/day	1.1E-01	1/mg/kg/day	9.0E-09	NA	mg/kg/day	NA	NA	NA
				Arsenic	1.1E+01	ug/L	1.3E-06	mg/kg/day	1.5E+00	1/mg/kg/day	1.9E-06	NA	mg/kg/day	NA	NA	NA
				Iron	6.9E+04	ug/L	8.3E-03	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Lead	1.6E+01	ug/L	1.9E-06	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	1.3E-04	mg/kg/day	NA	NA	NA	NA	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.3E-02					0.0E+00
		Medium Total									1.3E-02					0.0E+00
Exposure Medium Total											1.3E-02					0.0E+00
Medium Total											2.2E-01					0.0E+00
Total of Receptor Risks Across All Media											2.2E-01	Total of Receptor Hazards Across All Media				0.0E+00

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to surface water calculated on Table 7.4.RME Supplement A.

DAevent for exposure to groundwater while bathing calculated on Table 7.4.RME Supplement B and Table 7.5.RME Supplement B..

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	4.7E-01	mg/kg	1.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.4E-08	2.0E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	1.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.3E-07	1.8E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	2.1E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.5E-08	2.2E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	1.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	9.3E-08	1.3E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	1.4E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.0E-08	1.5E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	1.0E-08	mg/kg/day	2.4E-01	1/(mg/kg-day)	2.4E-09	1.1E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	3.8E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.3E-08	4.0E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	8.3E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	2.8E-08	8.8E-07	mg/kg/day	5.0E-04	mg/kg/day	1.8E-03
				Aroclor-1260	1.3E-01	mg/kg	5.1E-09	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.0E-08	5.4E-08	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	3.0E-04	mg/kg/day	NA	NA	NA	3.2E-03	mg/kg/day	1.0E+00	mg/kg/day	3.2E-03
				Antimony	5.4E+00	mg/kg	2.2E-07	mg/kg/day	NA	NA	NA	2.3E-06	mg/kg/day	4.0E-04	mg/kg/day	5.7E-03
				Arsenic	7.0E+00	mg/kg	2.8E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.2E-07	3.0E-06	mg/kg/day	3.0E-04	mg/kg/day	1.0E-02
				Cadmium	1.6E+00	mg/kg	6.4E-08	mg/kg/day	NA	NA	NA	6.7E-07	mg/kg/day	1.0E-03	mg/kg/day	6.7E-04
				Chromium	4.5E+01	mg/kg	1.8E-06	mg/kg/day	NA	NA	NA	1.9E-05	mg/kg/day	3.0E-03	mg/kg/day	6.4E-03
				Copper	4.5E+02	mg/kg	1.8E-05	mg/kg/day	NA	NA	NA	1.9E-04	mg/kg/day	4.0E-02	mg/kg/day	4.9E-03
				Iron	2.4E+04	mg/kg	9.5E-04	mg/kg/day	NA	NA	NA	1.0E-02	mg/kg/day	7.0E-01	mg/kg/day	1.4E-02
				Lead	6.6E+02	mg/kg	2.7E-05	mg/kg/day	NA	NA	NA	2.8E-04	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	7.1E-06	mg/kg/day	NA	NA	NA	7.5E-05	mg/kg/day	2.0E-02	mg/kg/day	3.7E-03
				Mercury	5.2E-01	mg/kg	2.1E-08	mg/kg/day	NA	NA	NA	2.2E-07	mg/kg/day	3.0E-04	mg/kg/day	7.4E-04
				Nickel	3.9E+01	mg/kg	1.6E-06	mg/kg/day	NA	NA	NA	1.7E-05	mg/kg/day	2.0E-02	mg/kg/day	8.3E-04
				Thallium	7.5E-01	mg/kg	3.0E-08	mg/kg/day	NA	NA	NA	3.2E-07	mg/kg/day	7.0E-05	mg/kg/day	4.6E-03
				Vanadium	7.1E+01	mg/kg	2.9E-06	mg/kg/day	NA	NA	NA	3.1E-05	mg/kg/day	1.0E-03	mg/kg/day	3.1E-02
				Zinc	1.1E+03	mg/kg	4.5E-05	mg/kg/day	NA	NA	NA	4.8E-04	mg/kg/day	3.0E-01	mg/kg/day	1.6E-03
			Exp. Route Total								7.4E-07					8.9E-02

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	4.7E-01	mg/kg	3.3E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.4E-09	3.5E-08	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	4.2E-01	mg/kg	2.9E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.1E-08	3.1E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	5.2E-01	mg/kg	3.6E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.6E-09	3.8E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.1E-01	mg/kg	2.2E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.6E-08	2.3E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	2.4E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.8E-09	2.6E-08	mg/kg/day	NA	NA	NA
				4,4'-DDD	2.5E-01	mg/kg	4.0E-10	mg/kg/day	2.4E-01	1/(mg/kg-day)	9.6E-11	4.2E-09	mg/kg/day	NA	NA	NA
				4,4'-DDE	9.4E-01	mg/kg	1.5E-09	mg/kg/day	3.4E-01	1/(mg/kg-day)	5.1E-10	1.6E-08	mg/kg/day	NA	NA	NA
				4,4'-DDT	2.1E+00	mg/kg	3.3E-09	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.1E-09	3.5E-08	mg/kg/day	5.0E-04	mg/kg/day	7.0E-05
				Aroclor-1260	1.3E-01	mg/kg	9.4E-10	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.9E-09	1.0E-08	mg/kg/day	NA	NA	NA
				Aluminum	7.5E+03	mg/kg	4.0E-06	mg/kg/day	NA	NA	NA	4.3E-05	mg/kg/day	1.0E+00	mg/kg/day	4.3E-05
				Antimony	5.4E+00	mg/kg	2.9E-09	mg/kg/day	NA	NA	NA	3.0E-08	mg/kg/day	6.0E-05	mg/kg/day	5.1E-04
				Arsenic	7.0E+00	mg/kg	1.1E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.7E-08	1.2E-07	mg/kg/day	3.0E-04	mg/kg/day	4.0E-04
				Cadmium	1.6E+00	mg/kg	8.4E-11	mg/kg/day	NA	NA	NA	8.9E-10	mg/kg/day	2.5E-05	mg/kg/day	3.6E-05
				Chromium	4.5E+01	mg/kg	2.4E-08	mg/kg/day	NA	NA	NA	2.6E-07	mg/kg/day	7.5E-05	mg/kg/day	3.4E-03
				Copper	4.5E+02	mg/kg	2.4E-07	mg/kg/day	NA	NA	NA	2.6E-06	mg/kg/day	4.0E-02	mg/kg/day	6.4E-05
				Iron	2.4E+04	mg/kg	1.3E-05	mg/kg/day	NA	NA	NA	1.3E-04	mg/kg/day	7.0E-01	mg/kg/day	1.9E-04
				Lead	6.6E+02	mg/kg	3.5E-07	mg/kg/day	NA	NA	NA	3.7E-06	mg/kg/day	NA	NA	NA
				Manganese	1.7E+02	mg/kg	9.3E-08	mg/kg/day	NA	NA	NA	9.9E-07	mg/kg/day	8.0E-04	mg/kg/day	1.2E-03
				Mercury	5.2E-01	mg/kg	2.8E-10	mg/kg/day	NA	NA	NA	2.9E-09	mg/kg/day	2.10E-05	mg/kg/day	3.7E-06
				Nickel	3.9E+01	mg/kg	2.1E-08	mg/kg/day	NA	NA	NA	2.2E-07	mg/kg/day	8.0E-04	mg/kg/day	3.1E-03
				Thallium	7.5E-01	mg/kg	4.0E-10	mg/kg/day	NA	NA	NA	4.2E-09	mg/kg/day	7.0E-05	mg/kg/day	1.6E-04
				Vanadium	7.1E+01	mg/kg	3.8E-08	mg/kg/day	NA	NA	NA	4.0E-07	mg/kg/day	2.6E-05	mg/kg/day	1.3E-06
				Zinc	1.1E+03	mg/kg	5.9E-07	mg/kg/day	NA	NA	NA	6.3E-06	mg/kg/day	3.0E-01	mg/kg/day	2.1E-05
			Exp. Route Total								6.5E-08					9.3E-03
		Exposure Point Total									8.0E-07					9.8E-02
	Exposure Medium Total										8.0E-07					9.8E-02
Medium Total											8.0E-07					9.8E-02

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	1.9E-04	mg/kg/day	NA	NA	NA	1.5E-03	mg/kg/day	4.0E-03	mg/kg/day	3.6E-01
				1,1-Dichloroethene	7.4E+02	ug/L	8.1E-04	mg/kg/day	NA	NA	NA	6.3E-03	mg/kg/day	5.0E-02	mg/kg/day	1.3E-01
				1,4-Dichlorobenzene	8.0E-01	ug/L	8.8E-07	mg/kg/day	2.4E-02	1/(mg/kg-day)	2.1E-08	6.9E-06	mg/kg/day	3.0E-02	mg/kg/day	2.3E-04
				Chloroform	1.3E+02	ug/L	1.4E-04	mg/kg/day	NA	NA	NA	1.1E-03	mg/kg/day	1.0E-02	mg/kg/day	1.1E-01
				Dibromochloromethane	4.4E+01	ug/L	4.8E-05	mg/kg/day	8.4E-02	1/(mg/kg-day)	4.1E-06	3.8E-04	mg/kg/day	2.0E-02	mg/kg/day	1.9E-02
				Methylene chloride	2.6E+01	ug/L	2.9E-05	mg/kg/day	7.5E-03	1/(mg/kg-day)	2.1E-07	2.2E-04	mg/kg/day	6.0E-02	mg/kg/day	3.7E-03
				Tetrachloroethene	3.9E+01	ug/L	4.3E-05	mg/kg/day	5.4E-01	1/(mg/kg-day)	2.3E-05	3.3E-04	mg/kg/day	1.0E-02	mg/kg/day	3.3E-02
				Trichloroethene	4.5E+04	ug/L	4.9E-02	mg/kg/day	1.3E-02	1/(mg/kg-day)	6.4E-04	3.8E-01	mg/kg/day	6.0E-03	mg/kg/day	6.4E+01
				Vinyl chloride	1.7E+03	ug/L	1.9E-03	mg/kg/day	7.2E-01	1/(mg/kg-day)	1.3E-03	1.5E-02	mg/kg/day	3.0E-03	mg/kg/day	4.9E+00
				Xylene, total	5.8E+00	ug/L	6.4E-06	mg/kg/day	NA	NA	NA	5.0E-05	mg/kg/day	2.0E-01	mg/kg/day	2.5E-04
				cis-1,2-Dichloroethene	1.0E+04	ug/L	1.1E-02	mg/kg/day	NA	NA	NA	8.9E-02	mg/kg/day	1.0E-02	mg/kg/day	8.9E+00
				cis-1,3-Dichloropropene	2.3E+00	ug/L	2.5E-06	mg/kg/day	1.0E-01	1/(mg/kg-day)	2.5E-07	2.0E-05	mg/kg/day	3.0E-02	mg/kg/day	6.6E-04
				trans-1,2-Dichloroethene	7.2E+02	ug/L	7.9E-04	mg/kg/day	NA	NA	NA	6.2E-03	mg/kg/day	2.0E-02	mg/kg/day	3.1E-01
				2-Methylnaphthalene	1.1E+01	ug/L	1.2E-05	mg/kg/day	NA	NA	NA	9.2E-05	mg/kg/day	4.0E-03	mg/kg/day	2.3E-02
				Acenaphthene	1.2E+01	ug/L	1.3E-05	mg/kg/day	NA	NA	NA	9.9E-05	mg/kg/day	6.0E-02	mg/kg/day	1.6E-03
				Carbazole	2.4E+01	ug/L	2.7E-05	mg/kg/day	2.0E-02	1/(mg/kg-day)	5.4E-07	2.1E-04	mg/kg/day	NA	NA	NA
				Dibenzofuran	8.8E+00	ug/L	9.6E-06	mg/kg/day	NA	NA	NA	7.5E-05	mg/kg/day	1.0E-03	mg/kg/day	7.5E-02
				Fluorene	9.4E+00	ug/L	1.0E-05	mg/kg/day	NA	NA	NA	8.1E-05	mg/kg/day	4.0E-02	mg/kg/day	2.0E-03
				Naphthalene	1.2E+02	ug/L	1.3E-04	mg/kg/day	NA	NA	NA	1.0E-03	mg/kg/day	2.0E-02	mg/kg/day	5.2E-02
				Phenanthrene	8.8E+00	ug/L	9.7E-06	mg/kg/day	NA	NA	NA	7.6E-05	mg/kg/day	NA	NA	NA
				Heptachlor	3.5E-02	ug/L	3.9E-08	mg/kg/day	4.5E+00	1/(mg/kg-day)	1.7E-07	3.0E-07	mg/kg/day	5.0E-04	mg/kg/day	6.0E-04
				Heptachlor epoxide	1.2E-01	ug/L	1.3E-07	mg/kg/day	9.1E+00	1/(mg/kg-day)	1.2E-06	1.0E-06	mg/kg/day	1.3E-05	mg/kg/day	7.8E-02
				2,6-Dinitrotolune	2.8E+00	ug/L	3.1E-06	mg/kg/day	NA	NA	NA	2.4E-05	mg/kg/day	1.0E-03	mg/kg/day	2.4E-02
				RDX	7.3E-01	ug/L	8.0E-07	mg/kg/day	1.1E-01	1/(mg/kg-day)	8.8E-08	6.2E-06	mg/kg/day	3.0E-03	mg/kg/day	2.1E-03
				Arsenic	5.9E+00	ug/L	6.5E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	9.8E-06	5.1E-05	mg/kg/day	3.0E-04	mg/kg/day	1.7E-01
				Iron	2.3E+04	ug/L	2.5E-02	mg/kg/day	NA	NA	NA	1.9E-01	mg/kg/day	7.0E-01	mg/kg/day	2.8E-01
				Lead	2.4E+00	ug/L	2.6E-06	mg/kg/day	NA	NA	NA	2.0E-05	mg/kg/day	NA	NA	NA
				Manganese	8.4E+02	ug/L	9.2E-04	mg/kg/day	NA	NA	NA	7.2E-03	mg/kg/day	2.0E-02	mg/kg/day	3.6E-01
			Exp. Route Total								2.0E-03					8.0E+01
		Medium Total									2.0E-03					8.0E+01
Exposure Medium Total											2.0E-03					8.0E+01
Medium Total											2.0E-03					8.0E+01
Total of Receptor Risks Across All Media											2.0E-03	Total of Receptor Hazards Across All Media				8.0E+01

* Surface soil & subsurface soil combined.

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	8.8E-01	mg/kg	2.0E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.5E-08	1.4E-06	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	1.4E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.0E-07	9.6E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	1.6E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.1E-08	1.1E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	1.2E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	8.7E-08	8.3E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	1.4E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.0E-08	1.0E-06	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	3.9E-08	mg/kg/day	2.4E-01	1/(mg/kg-day)	9.3E-09	2.7E-06	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	9.7E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.3E-08	6.8E-06	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	2.5E-07	mg/kg/day	3.4E-01	1/(mg/kg-day)	8.3E-08	1.7E-05	mg/kg/day	5.0E-04	mg/kg/day	3.4E-02
				Aroclor-1260	9.6E-01	mg/kg	2.2E-08	mg/kg/day	2.0E+00	1/(mg/kg-day)	4.4E-08	1.5E-06	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	2.1E-04	mg/kg/day	NA	NA	NA	1.5E-02	mg/kg/day	1.0E+00	mg/kg/day	1.5E-02
				Antimony	3.5E+01	mg/kg	8.0E-07	mg/kg/day	NA	NA	NA	5.6E-05	mg/kg/day	2.0E-04	mg/kg/day	2.8E-01
				Arsenic	9.2E+00	mg/kg	2.1E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.2E-07	1.5E-05	mg/kg/day	3.0E-04	mg/kg/day	5.0E-02
				Cadmium	4.2E+00	mg/kg	9.6E-08	mg/kg/day	NA	NA	NA	6.7E-06	mg/kg/day	1.0E-03	mg/kg/day	6.7E-03
				Chromium	8.1E+01	mg/kg	1.9E-06	mg/kg/day	NA	NA	NA	1.3E-04	mg/kg/day	2.0E-02	mg/kg/day	6.5E-03
				Copper	1.8E+03	mg/kg	4.2E-05	mg/kg/day	NA	NA	NA	2.9E-03	mg/kg/day	4.0E-02	mg/kg/day	7.3E-02
				Iron	9.4E+04	mg/kg	2.2E-03	mg/kg/day	NA	NA	NA	1.5E-01	mg/kg/day	7.0E-01	mg/kg/day	2.2E-01
				Lead	1.9E+03	mg/kg	4.4E-05	mg/kg/day	NA	NA	NA	3.0E-03	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	7.5E-06	mg/kg/day	NA	NA	NA	5.3E-04	mg/kg/day	2.0E-02	mg/kg/day	2.6E-02
				Mercury	7.7E-01	mg/kg	1.8E-08	mg/kg/day	NA	NA	NA	1.2E-06	mg/kg/day	3.0E-04	mg/kg/day	4.2E-03
				Nickel	9.6E+01	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	1.6E-04	mg/kg/day	2.0E-02	mg/kg/day	7.8E-03
				Thallium	1.7E+00	mg/kg	3.9E-08	mg/kg/day	NA	NA	NA	2.8E-06	mg/kg/day	7.0E-05	mg/kg/day	3.9E-02
				Vanadium	4.7E+02	mg/kg	1.1E-05	mg/kg/day	NA	NA	NA	7.5E-04	mg/kg/day	7.0E-03	mg/kg/day	1.1E-01
				Zinc	3.1E+03	mg/kg	7.3E-05	mg/kg/day	NA	NA	NA	5.1E-03	mg/kg/day	3.0E-01	mg/kg/day	1.7E-02
			Exp. Route Total								7.1E-07					8.8E-01

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	8.8E-01	mg/kg	7.9E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.8E-09	5.5E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	5.3E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.9E-08	3.7E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	6.1E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.5E-09	4.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	4.6E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.4E-08	3.3E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	5.5E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.0E-09	3.9E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	3.5E-09	mg/kg/day	2.4E-01	1/(mg/kg-day)	8.4E-10	2.4E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	8.7E-09	mg/kg/day	3.4E-01	1/(mg/kg-day)	3.0E-09	6.1E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	2.2E-08	mg/kg/day	3.4E-01	1/(mg/kg-day)	7.5E-09	1.5E-06	mg/kg/day	5.0E-04	mg/kg/day	3.1E-03
				Aroclor-1260	9.6E-01	mg/kg	9.3E-09	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.9E-08	6.5E-07	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	6.3E-06	mg/kg/day	NA	NA	NA	4.4E-04	mg/kg/day	1.0E+00	mg/kg/day	4.4E-04
				Antimony	3.5E+01	mg/kg	2.4E-08	mg/kg/day	NA	NA	NA	1.7E-06	mg/kg/day	3.0E-05	mg/kg/day	5.6E-02
				Arsenic	9.2E+00	mg/kg	1.9E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.9E-08	1.3E-06	mg/kg/day	3.0E-04	mg/kg/day	4.5E-03
				Cadmium	4.2E+00	mg/kg	2.9E-10	mg/kg/day	NA	NA	NA	2.0E-08	mg/kg/day	2.5E-05	mg/kg/day	8.1E-04
				Chromium	8.1E+01	mg/kg	5.6E-08	mg/kg/day	NA	NA	NA	3.9E-06	mg/kg/day	5.0E-04	mg/kg/day	7.9E-03
				Copper	1.8E+03	mg/kg	1.3E-06	mg/kg/day	NA	NA	NA	8.8E-05	mg/kg/day	4.0E-02	mg/kg/day	2.2E-03
				Iron	9.4E+04	mg/kg	6.5E-05	mg/kg/day	NA	NA	NA	4.5E-03	mg/kg/day	7.0E-01	mg/kg/day	6.5E-03
				Lead	1.9E+03	mg/kg	1.3E-06	mg/kg/day	NA	NA	NA	9.1E-05	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	2.3E-07	mg/kg/day	NA	NA	NA	1.6E-05	mg/kg/day	8.0E-04	mg/kg/day	2.0E-02
				Mercury	7.7E-01	mg/kg	5.3E-10	mg/kg/day	NA	NA	NA	3.7E-08	mg/kg/day	2.10E-05	mg/kg/day	4.7E-05
				Nickel	9.6E+01	mg/kg	6.6E-08	mg/kg/day	NA	NA	NA	4.7E-06	mg/kg/day	8.0E-04	mg/kg/day	6.6E-02
				Thallium	1.7E+00	mg/kg	1.2E-09	mg/kg/day	NA	NA	NA	8.3E-08	mg/kg/day	7.0E-05	mg/kg/day	4.6E-04
				Vanadium	4.7E+02	mg/kg	3.2E-07	mg/kg/day	NA	NA	NA	2.3E-05	mg/kg/day	1.8E-04	mg/kg/day	7.5E-05
				Zinc	3.1E+03	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	1.5E-04	mg/kg/day	3.0E-01	mg/kg/day	5.1E-04
			Exp. Route Total								1.5E-07					1.7E-01
		Exposure Point Total									8.6E-07					1.1E+00
	Exposure Medium Total										8.6E-07					1.1E+00
	Air	Emissions from Soil at Site 2	Inhalation	Chromium	6.1E-08	mg/m3	8.6E-11	mg/kg/day	4.1E+01	1/(mg/kg-day)	3.5E-09	6.0E-09	mg/kg/day	3.0E-05	mg/kg/day	2.0E-04
			Exp. Route Total								3.5E-09					2.0E-04
		Exposure Point Total									3.5E-09					2.0E-04
	Exposure Medium Total										3.5E-09					2.0E-04
Medium Total											8.6E-07					1.1E+00

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Water in Excavation	Dermal	1,1,2-Trichloroethane	1.7E+02	ug/L	4.5E-06	mg/kg/day	NA	NA	NA	3.2E-04	mg/kg/day	4.0E-02	mg/kg/day	7.9E-03
				1,1-Dichloroethene	1.5E+03	ug/L	4.3E-05	mg/kg/day	NA	NA	NA	3.0E-03	mg/kg/day	5.0E-02	mg/kg/day	6.0E-02
				1,4-Dichlorobenzene	8.0E-01	ug/L	1.4E-07	mg/kg/day	2.4E-02	1/(mg/kg-day)	3.3E-09	9.6E-06	mg/kg/day	3.0E-02	mg/kg/day	3.2E-04
				Chloroform	1.3E+02	ug/L	3.6E-06	mg/kg/day	NA	NA	NA	2.5E-04	mg/kg/day	1.0E-02	mg/kg/day	2.5E-02
				Dibromochloromethane	4.4E+01	ug/L	6.4E-07	mg/kg/day	8.4E-02	1/(mg/kg-day)	5.4E-08	4.5E-05	mg/kg/day	2.0E-02	mg/kg/day	2.3E-03
				Methylene chloride	2.6E+01	ug/L	3.3E-07	mg/kg/day	7.5E-03	1/(mg/kg-day)	2.5E-09	2.3E-05	mg/kg/day	6.0E-02	mg/kg/day	3.8E-04
				Tetrachloroethene	3.9E+01	ug/L	4.5E-06	mg/kg/day	5.4E-01	1/(mg/kg-day)	2.4E-06	3.1E-04	mg/kg/day	1.0E-01	mg/kg/day	3.1E-03
				Trichloroethene	7.4E+04	ug/L	3.0E-03	mg/kg/day	1.3E-02	1/(mg/kg-day)	3.9E-05	2.1E-01	mg/kg/day	6.0E-03	mg/kg/day	3.5E+01
				Vinyl chloride	1.0E+04	ug/L	1.2E-04	mg/kg/day	7.2E-01	1/(mg/kg-day)	8.6E-05	8.4E-03	mg/kg/day	3.0E-03	mg/kg/day	2.8E+00
				Xylene, total	4.3E+01	ug/L	8.1E-06	mg/kg/day	NA	1/(mg/kg-day)	NA	5.7E-04	mg/kg/day	2.0E-01	mg/kg/day	2.8E-03
				cis-1,2-Dichloroethene	4.6E+04	ug/L	1.3E-03	mg/kg/day	NA	NA	NA	8.9E-02	mg/kg/day	1.0E-01	mg/kg/day	8.9E-01
				cis-1,3-Dichloropropene	2.3E+00	ug/L	4.0E-08	mg/kg/day	1.0E-01	1/(mg/kg-day)	4.0E-09	2.8E-06	mg/kg/day	3.0E-02	mg/kg/day	9.3E-05
				trans-1,2-Dichloroethene	7.2E+02	ug/L	1.7E-05	mg/kg/day	NA	NA	NA	1.2E-03	mg/kg/day	2.0E-01	mg/kg/day	6.1E-03
				2-Methylnaphthalene	3.6E+01	ug/L	7.1E-06	mg/kg/day	NA	NA	NA	5.0E-04	mg/kg/day	4.0E-03	mg/kg/day	1.2E-01
				Acenaphthene	4.1E+01	ug/L	1.2E-05	mg/kg/day	NA	NA	NA	8.6E-04	mg/kg/day	6.0E-01	mg/kg/day	1.4E-03
				Carbazole	2.2E+02	ug/L	4.6E-05	mg/kg/day	2.0E-02	1/(mg/kg-day)	9.1E-07	3.2E-03	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	9.4E-06	mg/kg/day	NA	NA	NA	6.6E-04	mg/kg/day	1.0E-03	mg/kg/day	6.6E-01
				Fluorene	3.0E+01	ug/L	1.2E-05	mg/kg/day	NA	NA	NA	8.2E-04	mg/kg/day	4.0E-01	mg/kg/day	2.1E-03
				Naphthalene	1.2E+03	ug/L	2.3E-04	mg/kg/day	NA	NA	NA	1.6E-02	mg/kg/day	2.0E-02	mg/kg/day	8.1E-01
				Phenanthrene	2.8E+01	ug/L	1.4E-05	mg/kg/day	NA	NA	NA	1.0E-03	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	5.7E-09	mg/kg/day	4.5E+00	1/(mg/kg-day)	2.6E-08	4.0E-07	mg/kg/day	5.0E-04	mg/kg/day	8.0E-04
				Heptachlor epoxide	1.0E+00	ug/L	9.2E-08	mg/kg/day	9.1E+00	1/(mg/kg-day)	8.4E-07	6.4E-06	mg/kg/day	1.3E-05	mg/kg/day	5.0E-01
				2,6-Dinitrotolune	2.0E+01	ug/L	2.0E-07	mg/kg/day	NA	NA	NA	1.4E-05	mg/kg/day	1.0E-03	mg/kg/day	1.4E-02
				RDX	1.9E+00	ug/L	3.1E-10	mg/kg/day	1.1E-01	1/(mg/kg-day)	3.4E-11	2.2E-08	mg/kg/day	2.4E-03	mg/kg/day	9.1E-06
				Arsenic	1.1E+01	ug/L	5.0E-09	mg/kg/day	1.5E+00	1/(mg/kg-day)	7.5E-09	3.5E-07	mg/kg/day	3.0E-04	mg/kg/day	1.2E-03
				Iron	6.9E+04	ug/L	3.2E-05	mg/kg/day	NA	NA	NA	2.2E-03	mg/kg/day	7.0E-01	mg/kg/day	3.2E-03
				Lead	1.6E+01	ug/L	7.4E-09	mg/kg/day	NA	NA	NA	5.2E-07	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	5.0E-07	mg/kg/day	NA	NA	NA	3.5E-05	mg/kg/day	8.0E-04	mg/kg/day	4.4E-02
			Exp. Route Total								1.3E-04					4.1E+01
		Medium Total									1.3E-04					4.1E+01
	Exposure Medium Total										1.3E-04					4.1E+01

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Water Vapors at Excavation Pit	Inhalation	1,1,2-Trichloroethane	1.7E+02	ug/L	4.1E-06	mg/kg/day	NA	NA	NA	2.9E-04	mg/kg/day	NA	NA	NA
				1,1-Dichloroethene	1.5E+03	ug/L	4.1E-05	mg/kg/day	NA	NA	NA	2.9E-03	mg/kg/day	6.0E-02	mg/kg/day	4.8E-02
				1,4-Dichlorobenzene	8.0E-01	ug/L	1.9E-08	mg/kg/day	4.0E-02	mg/kg/day	7.7E-10	1.4E-06	mg/kg/day	7.1E-01	mg/kg/day	1.9E-06
				Chloroform	1.3E+02	ug/L	3.3E-06	mg/kg/day	8.1E-02	mg/kg/day	2.7E-07	2.3E-04	mg/kg/day	1.4E-02	mg/kg/day	1.7E-02
				Dibromochloromethane	4.4E+01	ug/L	9.0E-07	mg/kg/day	NA	NA	NA	6.3E-05	mg/kg/day	NA	NA	NA
				Methylene chloride	2.6E+01	ug/L	7.2E-07	mg/kg/day	1.7E-03	mg/kg/day	1.2E-09	5.1E-05	mg/kg/day	8.6E-01	mg/kg/day	5.9E-05
				Tetrachloroethene	3.9E+01	ug/L	9.3E-07	mg/kg/day	2.0E-02	mg/kg/day	1.9E-08	6.5E-05	mg/kg/day	8.0E-02	mg/kg/day	8.1E-04
				Trichloroethene	7.4E+04	ug/L	1.9E-03	mg/kg/day	7.0E-03	mg/kg/day	1.3E-05	1.3E-01	mg/kg/day	1.7E-01	mg/kg/day	7.7E-01
				Vinyl chloride	1.0E+04	ug/L	3.0E-04	mg/kg/day	1.5E-02	mg/kg/day	4.6E-06	2.1E-02	mg/kg/day	2.8E-02	mg/kg/day	7.6E-01
				Xylene, total	4.3E+01	ug/L	1.1E-06	mg/kg/day	NA	NA	NA	8.0E-05	mg/kg/day	3.0E-02	mg/kg/day	2.7E-03
				cis-1,2-Dichloroethene	4.6E+04	ug/L	1.3E-03	mg/kg/day	NA	NA	NA	8.8E-02	mg/kg/day	NA	NA	NA
				cis-1,3-Dichloropropene	2.3E+00	ug/L	5.8E-08	mg/kg/day	1.0E-02	mg/kg/day	5.8E-10	4.0E-06	mg/kg/day	5.7E-03	mg/kg/day	7.1E-04
				trans-1,2-Dichloroethene	7.2E+02	ug/L	2.0E-05	mg/kg/day	NA	NA	NA	1.4E-03	mg/kg/day	1.7E-02	mg/kg/day	8.0E-02
				2-Methylnaphthalene	3.6E+01	ug/L	8.4E-07	mg/kg/day	NA	NA	NA	5.9E-05	mg/kg/day	NA	NA	NA
				Acenaphthene	4.1E+01	ug/L	9.8E-07	mg/kg/day	NA	NA	NA	6.9E-05	mg/kg/day	NA	NA	NA
				Fluorene	3.0E+01	ug/L	7.2E-07	mg/kg/day	NA	NA	NA	5.0E-05	mg/kg/day	NA	NA	NA
				Naphthalene	1.2E+03	ug/L	2.8E-05	mg/kg/day	NA	NA	NA	1.9E-03	mg/kg/day	9.0E-04	mg/kg/day	2.2E+00
				Phenanthrene	2.8E+01	ug/L	6.4E-07	mg/kg/day	NA	NA	NA	4.5E-05	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.8E-05					3.8E+00
		Exposure Point Total									1.8E-05					3.8E+00
	Exposure Medium Total										1.8E-05					3.8E+00
Medium Total											1.5E-04					4.5E+01
									Total of Receptor Risks Across All Media		1.5E-04			Total of Receptor Hazards Across All Media		4.6E+01

* Surface soil & subsurface soil combined.

Notes-

DAevent for exposure to groundwater while bathing calculated on Table 7.7.RME Supplement A.

Inhalation of volatiles from groundwater calculated on Table 7.7.RME Supplement B.

Subchronic values used when available.

Table 7.7.RME Supplement A
Calculation of DAevent (Construction Worker)
Shallow Aquifer
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical of Potential Concern	Groundwater Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+02	6.4E-03	3.4E-02	6.0E-01	1.4E+00	1.0E+00	8	9.8E-06	3
1,1-Dichloroethene	1.5E+03	1.2E-02	1.1E+00	3.7E-01	8.9E-01	1.0E+00	8	9.3E-05	3
1,4-Dichlorobenzene	8.0E-01	4.2E-02	9.9E-02	7.1E-01	1.7E+00	1.0E+00	8	3.0E-07	3
Chloroform	1.3E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	8	7.8E-06	3
Dibromochloromethane	4.4E+01	2.9E-03	1.6E-02	1.5E+00	3.7E+00	1.0E+00	8	1.4E-06	3
Methylene chloride	2.6E+01	3.5E-03	1.3E-01	3.2E-01	7.6E-01	1.0E+00	8	7.1E-07	3
Tetrachloroethene	3.9E+01	3.3E-02	7.2E-01	9.1E-01	2.2E+00	1.0E+00	8	9.7E-06	3
Trichloroethene	7.4E+04	1.2E-02	4.0E-01	5.8E-01	1.4E+00	1.0E+00	8	6.5E-03	3
Vinyl chloride	1.0E+04	5.6E-03	1.1E+00	2.4E-01	5.7E-01	1.0E+00	8	2.6E-04	3
Xylene, total	4.3E+01	5.3E-02	2.0E-01	4.2E-01	1.0E+00	1.0E+00	8	1.8E-05	3
cis-1,2-Dichloroethene	4.6E+04	7.7E-03	1.7E-01	3.7E-01	8.9E-01	1.0E+00	8	2.8E-03	3
cis-1,3-Dichloropropene	2.3E+00	4.3E-03	1.8E-02	4.5E-01	1.1E+00	1.0E+00	8	8.7E-08	3
trans-1,2-Dichloroethene	7.2E+02	7.7E-03	3.8E-01	3.7E-01	8.9E-01	1.0E+00	8	3.8E-05	3
2-Methylnaphthalene	3.6E+01	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	8	1.5E-05	3
Acenaphthene	4.1E+01	8.4E-02	4.0E-01	7.7E-01	1.8E+00	1.0E+00	8	2.7E-05	3
Carbazole	2.2E+02	5.2E-02	2.6E-01	9.1E-01	2.2E+00	1.0E+00	8	9.9E-05	3
Dibenzofuran	2.7E+01	9.5E-02	4.7E-01	9.2E-01	2.2E+00	1.0E+00	8	2.0E-05	3
Fluorene	3.0E+01	1.1E-01	5.3E-01	9.0E-01	2.2E+00	1.0E+00	8	2.5E-05	3
Naphthalene	1.2E+03	4.7E-02	1.8E-02	5.6E-01	1.3E+00	1.0E+00	8	5.0E-04	3
Phenanthrene	2.8E+01	1.4E-01	7.0E-01	1.1E+00	4.1E+00	1.0E+00	8	3.1E-05	3
Heptachlor	6.4E-02	8.6E-03	1.2E-02	1.3E+01	3.2E+01	8.0E-01	8	1.2E-08	2
Heptachlor epoxide	1.0E+00	8.6E-03	8.6E-04	1.3E+01	3.2E+01	8.0E-01	8	2.0E-07	2
2,6-Dinitrotolune	2.0E+01	2.1E-03	1.9E-02	1.1E+00	2.7E+00	1.0E+00	8	4.3E-07	3
RDX	1.9E+00	3.5E-04	NA	NA	NA	NA	8	6.7E-10	1
Arsenic	1.1E+01	1.0E-03	NA	NA	NA	NA	8	1.1E-08	1
Iron	6.9E+04	1.0E-03	NA	NA	NA	NA	8	6.9E-05	1
Lead	1.6E+01	1.0E-03	NA	NA	NA	NA	8	1.6E-08	1
Manganese	1.1E+03	1.0E-03	NA	NA	NA	NA	8	1.1E-06	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

Table 7.7.RME Supplement B
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Senario
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical	Cw	MW	K_H	k_l	k_g	K_v	ER	ERa	Ca
	(μg/L)	(mol/gram)	(unitless)	(cm/hr)	(cm/hr)	(cm/hr)	(mg/hr)	(g/sec-m^2)	(mg/m^3)
1,1,2-Trichloroethane	1.7E+02	1.3E+02	3.4E-02	3.1E+00	1.9E+03	2.9E+00	5.0E+02	5.1E-08	1.5E-03
1,1-Dichloroethene	1.5E+03	9.7E+01	1.1E+00	3.3E+00	2.0E+03	3.3E+00	5.0E+03	5.1E-07	1.5E-02
1,4-Dichlorobenzene	8.0E-01	1.5E+02	9.9E-02	3.0E+00	1.8E+03	3.0E+00	2.4E+00	2.4E-10	6.9E-06
Chloroform	1.3E+02	1.2E+02	1.5E-01	3.2E+00	1.9E+03	3.1E+00	4.1E+02	4.2E-08	1.2E-03
Dibromochloromethane	4.4E+01	2.1E+02	1.6E-02	2.8E+00	1.7E+03	2.5E+00	1.1E+02	1.1E-08	3.2E-04
Methylene chloride	2.6E+01	8.5E+01	1.3E-01	3.4E+00	2.1E+03	3.4E+00	8.9E+01	9.1E-09	2.6E-04
Tetrachloroethene	3.9E+01	1.7E+02	7.2E-01	2.9E+00	1.8E+03	2.9E+00	1.1E+02	1.2E-08	3.3E-04
Trichloroethene	7.4E+04	1.3E+02	4.0E-01	3.1E+00	1.9E+03	3.1E+00	2.3E+05	2.3E-05	6.7E-01
Vinyl chloride	1.0E+04	6.3E+01	1.1E+00	3.7E+00	2.3E+03	3.7E+00	3.7E+04	3.8E-06	1.1E-01
Xylene, total	4.3E+01	1.1E+02	2.0E-01	3.3E+00	2.0E+03	3.2E+00	1.4E+02	1.4E-08	4.1E-04
cis-1,2-Dichloroethene	4.6E+04	9.7E+01	1.7E-01	3.3E+00	2.0E+03	3.3E+00	1.5E+05	1.6E-05	4.5E-01
cis-1,3-Dichloropropene	2.3E+00	1.1E+02	3.4E-02	3.2E+00	2.0E+03	3.1E+00	7.1E+00	7.3E-10	2.1E-05
trans-1,2-Dichloroethene	7.2E+02	9.7E+01	3.8E-01	3.3E+00	2.0E+03	3.3E+00	2.4E+03	2.5E-07	7.0E-03
2-Methylnaphthalene	3.6E+01	1.3E+02	1.8E-02	3.1E+00	1.9E+03	2.8E+00	1.0E+02	1.1E-08	3.0E-04
Acenaphthene	4.1E+01	1.5E+02	4.0E-01	3.0E+00	1.8E+03	3.0E+00	1.2E+02	1.2E-08	3.5E-04
Fluorene	3.0E+01	1.7E+02	5.3E-01	2.9E+00	1.8E+03	2.9E+00	8.8E+01	9.1E-09	2.6E-04
Naphthalene	1.2E+03	1.3E+02	1.8E-02	3.1E+00	1.9E+03	2.8E+00	3.4E+03	3.5E-07	9.9E-03
Phenanthrene	2.8E+01	1.8E+02	7.0E-01	2.9E+00	1.7E+03	2.9E+00	7.9E+01	8.1E-09	2.3E-04

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 $ER = Kv * Cw * L/1000\ cm^3 * mg/1000\ \mu g$

Equation 5 $ERa = ER * g/1000\ mg * hr/60\ min * min/60\ sec * 1/A$

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch)	(m^2)	2,700
Era = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Ingestion	Benzo(a)anthracene	8.8E-01	mg/kg	3.1E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.2E-07	8.6E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	2.1E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.5E-06	5.8E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	2.4E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.7E-07	6.7E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	1.8E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.3E-06	5.1E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	2.2E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-07	6.0E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	5.9E-07	mg/kg/day	2.4E-01	1/(mg/kg-day)	1.4E-07	1.6E-06	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	1.5E-06	mg/kg/day	3.4E-01	1/(mg/kg-day)	5.0E-07	4.1E-06	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	3.7E-06	mg/kg/day	3.4E-01	1/(mg/kg-day)	1.3E-06	1.0E-05	mg/kg/day	5.0E-04	mg/kg/day	2.1E-02
				Aroclor-1260	9.6E-01	mg/kg	3.3E-07	mg/kg/day	2.0E+00	1/(mg/kg-day)	6.7E-07	9.4E-07	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	3.2E-03	mg/kg/day	NA	NA	NA	9.0E-03	mg/kg/day	1.0E+00	mg/kg/day	9.0E-03
				Antimony	3.5E+01	mg/kg	1.2E-05	mg/kg/day	NA	NA	NA	3.4E-05	mg/kg/day	4.0E-04	mg/kg/day	8.5E-02
				Arsenic	9.2E+00	mg/kg	3.2E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.8E-06	9.0E-06	mg/kg/day	3.0E-04	mg/kg/day	3.0E-02
				Cadmium	4.2E+00	mg/kg	1.5E-06	mg/kg/day	NA	NA	NA	4.1E-06	mg/kg/day	1.0E-03	mg/kg/day	4.1E-03
				Chromium	8.1E+01	mg/kg	2.8E-05	mg/kg/day	NA	NA	NA	7.9E-05	mg/kg/day	3.0E-03	mg/kg/day	2.6E-02
				Copper	1.8E+03	mg/kg	6.3E-04	mg/kg/day	NA	NA	NA	1.8E-03	mg/kg/day	4.0E-02	mg/kg/day	4.4E-02
				Iron	9.4E+04	mg/kg	3.3E-02	mg/kg/day	NA	NA	NA	9.2E-02	mg/kg/day	7.0E-01	mg/kg/day	1.3E-01
				Lead	1.9E+03	mg/kg	6.6E-04	mg/kg/day	NA	NA	NA	1.8E-03	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	1.1E-04	mg/kg/day	NA	NA	NA	3.2E-04	mg/kg/day	2.0E-02	mg/kg/day	1.6E-02
				Mercury	7.7E-01	mg/kg	2.7E-07	mg/kg/day	NA	NA	NA	7.6E-07	mg/kg/day	3.0E-04	mg/kg/day	2.5E-03
				Nickel	9.6E+01	mg/kg	3.4E-05	mg/kg/day	NA	NA	NA	9.4E-05	mg/kg/day	2.0E-02	mg/kg/day	4.7E-03
				Thallium	1.7E+00	mg/kg	6.0E-07	mg/kg/day	NA	NA	NA	1.7E-06	mg/kg/day	7.0E-05	mg/kg/day	2.4E-02
				Vanadium	4.7E+02	mg/kg	1.6E-04	mg/kg/day	NA	NA	NA	4.6E-04	mg/kg/day	1.0E-03	mg/kg/day	4.6E-01
				Zinc	3.1E+03	mg/kg	1.1E-03	mg/kg/day	NA	NA	NA	3.1E-03	mg/kg/day	3.0E-01	mg/kg/day	1.0E-02
			Exp. Route Total								1.1E-05					8.6E-01

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	At Site 2	Dermal Absorption	Benzo(a)anthracene	8.8E-01	mg/kg	2.6E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.9E-07	7.4E-07	mg/kg/day	NA	NA	NA
				Benzo(a)pyrene	5.9E-01	mg/kg	1.8E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.3E-06	5.0E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	6.8E-01	mg/kg	2.0E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.5E-07	5.7E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	5.2E-01	mg/kg	1.5E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.1E-06	4.3E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	6.2E-01	mg/kg	1.8E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.3E-07	5.2E-07	mg/kg/day	NA	NA	NA
				4,4'-DDD	1.7E+00	mg/kg	1.2E-07	mg/kg/day	2.4E-01	1/(mg/kg-day)	2.8E-08	3.3E-07	mg/kg/day	NA	NA	NA
				4,4'-DDE	4.2E+00	mg/kg	2.9E-07	mg/kg/day	3.4E-01	1/(mg/kg-day)	9.9E-08	8.1E-07	mg/kg/day	NA	NA	NA
				4,4'-DDT	1.1E+01	mg/kg	7.4E-07	mg/kg/day	3.4E-01	1/(mg/kg-day)	2.5E-07	2.1E-06	mg/kg/day	5.0E-04	mg/kg/day	4.1E-03
				Aroclor-1260	9.6E-01	mg/kg	3.1E-07	mg/kg/day	2.0E+00	1/(mg/kg-day)	6.2E-07	8.6E-07	mg/kg/day	NA	NA	NA
				Aluminum	9.2E+03	mg/kg	2.1E-04	mg/kg/day	NA	NA	NA	5.9E-04	mg/kg/day	1.0E+00	mg/kg/day	5.9E-04
				Antimony	3.5E+01	mg/kg	8.0E-07	mg/kg/day	NA	NA	NA	2.2E-06	mg/kg/day	6.0E-05	mg/kg/day	3.7E-02
				Arsenic	9.2E+00	mg/kg	6.4E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	9.6E-07	1.8E-06	mg/kg/day	3.0E-04	mg/kg/day	6.0E-03
				Cadmium	4.2E+00	mg/kg	9.6E-09	mg/kg/day	NA	NA	NA	2.7E-08	mg/kg/day	2.5E-05	mg/kg/day	1.1E-03
				Chromium	8.1E+01	mg/kg	1.9E-06	mg/kg/day	NA	NA	NA	5.2E-06	mg/kg/day	7.5E-05	mg/kg/day	7.0E-02
				Copper	1.8E+03	mg/kg	4.2E-05	mg/kg/day	NA	NA	NA	1.2E-04	mg/kg/day	4.0E-02	mg/kg/day	2.9E-03
				Iron	9.4E+04	mg/kg	2.2E-03	mg/kg/day	NA	NA	NA	6.0E-03	mg/kg/day	7.0E-01	mg/kg/day	8.6E-03
				Lead	1.9E+03	mg/kg	4.4E-05	mg/kg/day	NA	NA	NA	1.2E-04	mg/kg/day	NA	NA	NA
				Manganese	3.3E+02	mg/kg	7.5E-06	mg/kg/day	NA	NA	NA	2.1E-05	mg/kg/day	8.0E-04	mg/kg/day	2.6E-02
				Mercury	7.7E-01	mg/kg	1.8E-08	mg/kg/day	NA	NA	NA	5.0E-08	mg/kg/day	2.10E-05	mg/kg/day	6.2E-05
				Nickel	9.6E+01	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	6.2E-06	mg/kg/day	8.0E-04	mg/kg/day	8.9E-02
				Thallium	1.7E+00	mg/kg	3.9E-08	mg/kg/day	NA	NA	NA	1.1E-07	mg/kg/day	7.0E-05	mg/kg/day	4.2E-03
				Vanadium	4.7E+02	mg/kg	1.1E-05	mg/kg/day	NA	NA	NA	3.0E-05	mg/kg/day	2.6E-05	mg/kg/day	1.0E-04
				Zinc	3.1E+03	mg/kg	7.3E-05	mg/kg/day	NA	NA	NA	2.0E-04	mg/kg/day	3.0E-01	mg/kg/day	6.8E-04
			Exp. Route Total								4.9E-06					2.5E-01
		Exposure Point Total									1.6E-05					1.1E+00
	Exposure Medium Total										1.6E-05					1.1E+00
	Air	Emissions from Soil at Site 2	Inhalation	Chromium	6.1E-08	mg/m3	8.6E-11	mg/kg/day	4.1E+01	1/(mg/kg-day)	3.5E-09	6.0E-09	mg/kg/day	3.0E-05	mg/kg/day	2.0E-04
			Exp. Route Total								3.5E-09					2.0E-04
		Exposure Point Total									3.5E-09					2.0E-04
	Exposure Medium Total										3.5E-09					2.0E-04
Medium Total											1.6E-05					1.1E+00

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Shallow Groundwater	Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+02	ug/L	5.9E-04	mg/kg/day	NA	NA	NA	1.7E-03	mg/kg/day	4.0E-03	mg/kg/day	4.2E-01
				1,1-Dichloroethene	1.5E+03	ug/L	5.2E-03	mg/kg/day	NA	NA	NA	1.5E-02	mg/kg/day	5.0E-02	mg/kg/day	2.9E-01
				1,4-Dichlorobenzene	8.0E-01	ug/L	2.8E-06	mg/kg/day	2.4E-02	1/(mg/kg-day)	6.7E-08	7.8E-06	mg/kg/day	3.0E-02	mg/kg/day	2.6E-04
				Chloroform	1.3E+02	ug/L	4.5E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	1.0E-02	mg/kg/day	1.3E-01
				Dibromochloromethane	4.4E+01	ug/L	1.5E-04	mg/kg/day	8.4E-02	1/(mg/kg-day)	1.3E-05	4.3E-04	mg/kg/day	2.0E-02	mg/kg/day	2.2E-02
				Methylene chloride	2.6E+01	ug/L	9.1E-05	mg/kg/day	7.5E-03	1/(mg/kg-day)	6.8E-07	2.5E-04	mg/kg/day	6.0E-02	mg/kg/day	4.2E-03
				Tetrachloroethene	3.9E+01	ug/L	1.4E-04	mg/kg/day	5.4E-01	1/(mg/kg-day)	7.4E-05	3.8E-04	mg/kg/day	1.0E-02	mg/kg/day	3.8E-02
				Trichloroethene	7.4E+04	ug/L	2.6E-01	mg/kg/day	1.3E-02	1/(mg/kg-day)	3.4E-03	7.2E-01	mg/kg/day	6.0E-03	mg/kg/day	1.2E+02
				Vinyl chloride	1.0E+04	ug/L	3.5E-02	mg/kg/day	7.2E-01	1/(mg/kg-day)	2.5E-02	9.8E-02	mg/kg/day	3.0E-03	mg/kg/day	3.3E+01
				Xylene, total	4.3E+01	ug/L	1.5E-04	mg/kg/day	NA	NA	NA	4.2E-04	mg/kg/day	2.0E-01	mg/kg/day	2.1E-03
				cis-1,2-Dichloroethene	4.6E+04	ug/L	1.6E-01	mg/kg/day	NA	NA	NA	4.5E-01	mg/kg/day	1.0E-02	mg/kg/day	4.5E+01
				cis-1,3-Dichloropropene	2.3E+00	ug/L	8.0E-06	mg/kg/day	1.0E-01	1/(mg/kg-day)	8.0E-07	2.3E-05	mg/kg/day	3.0E-02	mg/kg/day	7.5E-04
				trans-1,2-Dichloroethene	7.2E+02	ug/L	2.5E-03	mg/kg/day	NA	NA	NA	7.0E-03	mg/kg/day	2.0E-02	mg/kg/day	3.5E-01
				2-Methylnaphthalene	3.6E+01	ug/L	1.3E-04	mg/kg/day	NA	NA	NA	3.6E-04	mg/kg/day	4.0E-03	mg/kg/day	8.9E-02
				Acenaphthene	4.1E+01	ug/L	1.4E-04	mg/kg/day	NA	NA	NA	4.0E-04	mg/kg/day	6.0E-02	mg/kg/day	6.6E-03
				Carbazole	2.2E+02	ug/L	7.7E-04	mg/kg/day	2.0E-02	1/(mg/kg-day)	1.5E-05	2.1E-03	mg/kg/day	NA	NA	NA
				Dibenzofuran	2.7E+01	ug/L	9.4E-05	mg/kg/day	NA	NA	NA	2.6E-04	mg/kg/day	1.0E-03	mg/kg/day	2.6E-01
				Fluorene	3.0E+01	ug/L	1.1E-04	mg/kg/day	NA	NA	NA	3.0E-04	mg/kg/day	4.0E-02	mg/kg/day	7.4E-03
				Naphthalene	1.2E+03	ug/L	4.2E-03	mg/kg/day	NA	NA	NA	1.2E-02	mg/kg/day	2.0E-02	mg/kg/day	5.8E-01
				Phenanthrene	2.8E+01	ug/L	9.6E-05	mg/kg/day	NA	NA	NA	2.7E-04	mg/kg/day	NA	NA	NA
				Heptachlor	6.4E-02	ug/L	2.2E-07	mg/kg/day	4.5E+00	1/(mg/kg-day)	1.0E-06	6.2E-07	mg/kg/day	5.0E-04	mg/kg/day	1.2E-03
				Heptachlor epoxide	1.0E+00	ug/L	3.6E-06	mg/kg/day	9.1E+00	1/(mg/kg-day)	3.2E-05	1.0E-05	mg/kg/day	1.3E-05	mg/kg/day	7.7E-01
				2,6-Dinitrotolune	2.0E+01	ug/L	7.0E-05	mg/kg/day	NA	NA	NA	2.0E-04	mg/kg/day	1.0E-03	mg/kg/day	2.0E-01
				RDX	1.9E+00	ug/L	6.8E-06	mg/kg/day	1.1E-01	1/(mg/kg-day)	7.4E-07	1.9E-05	mg/kg/day	3.0E-03	mg/kg/day	6.3E-03
				Arsenic	1.1E+01	ug/L	3.8E-05	mg/kg/day	1.5E+00	1/(mg/kg-day)	5.6E-05	1.1E-04	mg/kg/day	3.0E-04	mg/kg/day	3.5E-01
				Iron	6.9E+04	ug/L	2.4E-01	mg/kg/day	NA	NA	NA	6.7E-01	mg/kg/day	7.0E-01	mg/kg/day	9.6E-01
				Lead	1.6E+01	ug/L	5.6E-05	mg/kg/day	NA	NA	NA	1.6E-04	mg/kg/day	NA	NA	NA
				Manganese	1.1E+03	ug/L	3.8E-03	mg/kg/day	NA	NA	NA	1.1E-02	mg/kg/day	2.0E-02	mg/kg/day	5.3E-01
			Exp. Route Total								2.9E-02					2.0E+02
		Medium Total									2.9E-02					2.0E+02
	Exposure Medium Total										2.9E-02					2.0E+02
Medium Total											2.9E-02					2.0E+02
									Total of Receptor Risks Across All Media		2.9E-02	Total of Receptor Hazards Across All Media				2.0E+02

* Surface soil & subsurface soil combined.

Table 9 - Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/05

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1, GSDi = Hom	Using Equation 1, GSDi = Het	Using Equation 2, GSDi = Hom	Using Equation 2, GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	441.8	441.8	441.8	441.8
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**2.1**	**2.3**	**2.1**	**2.3**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**6.5**	**8.3**	**6.5**	**8.3**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**1.3%**	**3.1%**	**1.3%**	**3.1%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 2	Benzo(a)anthracene	4.1E-08	NA	2.1E-08	6.2E-08	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	3.8E-07	NA	1.9E-07	5.7E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	4.1E-08	NA	2.1E-08	6.3E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	2.2E-07	NA	1.2E-07	3.4E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	3.1E-08	NA	1.6E-08	4.7E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	1.0E-08	NA	1.2E-09	1.1E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	3.1E-08	NA	3.8E-09	3.5E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	1.2E-07	NA	1.4E-08	1.3E-07	Liver	2.0E-03	NA	2.4E-04	2.3E-03
			Aroclor-1260	1.8E-07	NA	1.0E-07	2.9E-07	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.4E-03	NA	5.5E-05	1.4E-03
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	2.9E-03	NA	7.7E-04	3.7E-03
			Arsenic	8.6E-07	NA	1.0E-07	9.6E-07	Skin, Vascular	5.6E-03	NA	6.7E-04	6.2E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	5.9E-04	NA	9.5E-05	6.9E-04
			Chromium	NA	NA	NA	0.0E+00	None reported	1.3E-02	NA	2.0E-02	3.3E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	4.7E-03	NA	1.9E-04	4.9E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.3E-02	NA	9.1E-04	2.4E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	2.7E-03	NA	2.7E-03	5.4E-03
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	8.3E-04	NA	8.2E-04	1.6E-03
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	6.8E-03	NA	2.7E-04	7.1E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.4E-01	NA	2.2E-01	3.6E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	9.3E-04	NA	3.7E-05	9.6E-04
			Chemical Total	1.9E-06	0.0E+00	5.9E-07	2.5E-06		2.1E-01	0.0E+00	2.4E-01	4.5E-01
		Exposure Point Total					2.5E-06					4.5E-01
	Exposure Medium Total						2.5E-06					4.5E-01
	Air	Emissions from Surface Soil at Site 2	Chromium	NA	6.8E-09	NA	6.8E-09	Nasal	NA	1.6E-05	NA	1.6E-05
			Chemical Total	0.0E+00	6.8E-09	0.0E+00	6.8E-09		0.0E+00	1.6E-05	0.0E+00	1.6E-05
		Exposure Point Total					6.8E-09					1.6E-05
	Exposure Medium Total						6.8E-09					1.6E-05
Medium Total							2.5E-06					4.5E-01

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Drainage Features and Ponded Area	Bromodichloromethane	1.5E-08	NA	1.3E-08	2.8E-08	Kidney	3.5E-05	NA	3.0E-05	6.5E-05
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.4E-04	NA	1.3E-04	2.7E-04
			Trichloroethene	9.6E-08	NA	1.7E-07	2.7E-07	Liver	3.6E-03	NA	6.4E-03	1.0E-02
			Vinyl chloride	4.8E-07	NA	2.8E-07	7.6E-07	Liver	6.4E-04	NA	3.8E-04	1.0E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	8.8E-04	NA	8.3E-04	1.7E-03
			bis(2-Ethylhexyl)phthalate	6.4E-08	NA	1.0E-06	1.1E-06	Liver	6.6E-04	NA	1.1E-02	1.1E-02
			Arsenic	2.7E-07	NA	1.9E-08	2.9E-07	Skin, Vascular	1.7E-03	NA	1.2E-04	1.9E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	9.0E-03	NA	5.1E-02	6.0E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	8.8E-03	NA	1.6E-02	2.4E-02
			Chemical Total	9.2E-07	0.0E+00	1.5E-06	2.4E-06		2.5E-02	0.0E+00	8.5E-02	1.1E-01
		Exposure Point Total					2.4E-06					1.1E-01
	Exposure Medium Total						2.4E-06					1.1E-01
Medium Total							2.4E-06					1.1E-01
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	0.0E+00	NA	0.0E+00	0.0E+00	Liver	3.3E-04	NA	1.1E-03	1.5E-03
			Benzo(a)anthracene	2.5E-07	NA	8.3E-07	1.1E-06	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	5.4E-08	NA	2.4E-07	2.9E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	4.5E-07	NA	2.0E-06	2.5E-06	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	3.3E-08	NA	1.4E-07	1.8E-07	NA	NA	NA	NA	0.0E+00
			Arsenic	1.3E-07	NA	5.6E-07	6.9E-07	Skin, Vascular	4.5E-03	NA	4.6E-03	9.2E-03
			Chromium	7.0E-07	NA	7.2E-07	1.4E-06	None reported	5.2E-02	NA	7.1E-01	7.7E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	8.6E-03	NA	1.1E-01	1.2E-01
			Chemical Total	1.6E-06	0.0E+00	4.5E-06	6.1E-06		6.6E-02	0.0E+00	8.3E-01	9.0E-01
		Exposure Point Total					6.1E-06					9.0E-01
	Exposure Medium Total						6.1E-06					9.0E-01
Medium Total							6.1E-06					9.0E-01
Receptor Total							1.1E-05				Receptor HI Total	1.5E+00

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
								Total Liver HI Across All Media =				3.3E-02
								Total Skin HI Across All Media =				2.4E-02
								Total Vascular HI Across All Media =				2.4E-02
								Total Gastrointestinal HI Across All Media =				2.9E-02
								Total Blood HI Across All Media =				1.3E-02
								Total CNS HI Across All Media =				3.1E-02
								Total Kidney HI Across All Media =				4.8E-01
								Total Longeviety HI Across All Media =				3.7E-03
								Total Cholesterol HI Across All Media =				3.7E-03
								Total Decreased Body and Organ weight HI Across All Media =				1.6E-03
								Total Hair HI Across All Media =				7.1E-03
								Total Nasal HI Across All Media =				1.6E-05

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 2	Benzo(a)anthracene	3.7E-09	NA	4.7E-10	4.2E-09	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	3.5E-08	NA	4.5E-09	4.0E-08	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	4.0E-09	NA	5.0E-10	4.5E-09	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	2.4E-08	NA	3.1E-09	2.7E-08	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	2.6E-09	NA	3.3E-10	2.9E-09	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	2.9E-10	NA	8.3E-12	2.9E-10	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	2.0E-09	NA	5.9E-11	2.1E-09	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	3.2E-09	NA	9.3E-11	3.3E-09	Liver	1.5E-04	NA	4.3E-06	1.5E-04
			Aroclor-1260	3.0E-09	NA	4.1E-10	3.4E-09	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	3.9E-04	NA	3.8E-06	3.9E-04
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	2.6E-04	NA	1.7E-05	2.7E-04
			Arsenic	8.1E-08	NA	2.3E-09	8.3E-08	Skin, Vascular	1.4E-03	NA	4.0E-05	1.4E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	8.1E-05	NA	3.2E-06	8.5E-05
			Chromium	NA	NA	NA	0.0E+00	None reported	1.1E-03	NA	4.1E-04	1.5E-03
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	5.2E-04	NA	5.1E-06	5.3E-04
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.8E-03	NA	1.8E-05	1.8E-03
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	5.5E-04	NA	1.3E-04	6.9E-04
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	1.1E-04	NA	2.7E-05	1.4E-04
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	9.0E-04	NA	8.8E-06	9.1E-04
			Vanadium	NA	NA	NA	0.0E+00	Kidney	6.6E-03	NA	2.5E-03	9.0E-03
			Zinc	NA	NA	NA	0.0E+00	Blood	1.8E-04	NA	1.8E-06	1.8E-04
			Chemical Total	1.6E-07	0.0E+00	1.2E-08	1.7E-07		1.4E-02	0.0E+00	3.1E-03	1.7E-02
		Exposure Point Total					1.7E-07					1.7E-02
	Exposure Medium Total						1.7E-07					1.7E-02
Medium Total							1.7E-07					1.7E-02
Receptor Total							1.7E-07				Receptor HI Total	1.7E-02

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
											Total Liver HI Across All Media =	1.1E-03
											Total Skin HI Across All Media =	2.3E-03
											Total Vascular HI Across All Media =	2.3E-03
											Total Gastrointestinal HI Across All Media =	2.4E-03
											Total Blood HI Across All Media =	1.4E-03
											Total CNS HI Across All Media =	1.1E-03
											Total Kidney HI Across All Media =	9.1E-03
											Total Longeviety HI Across All Media =	2.7E-04
											Total Cholesterol HI Across All Media =	2.7E-04
											Total Decreased Body and Organ weight HI Across All Media =	1.4E-04
											Total Hair HI Across All Media =	9.1E-04

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 2	Benzo(a)anthracene	2.1E-08	NA	4.3E-08	6.4E-08	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	1.9E-07	NA	4.0E-07	5.9E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	2.1E-08	NA	4.4E-08	6.5E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	1.2E-07	NA	2.4E-07	3.5E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.6E-08	NA	3.3E-08	4.9E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	5.2E-09	NA	2.5E-09	7.7E-09	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	1.6E-08	NA	7.7E-09	2.4E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	6.1E-08	NA	2.9E-08	9.0E-08	Liver	2.8E-03	NA	1.3E-03	4.1E-03
			Aroclor-1260	9.5E-08	NA	2.1E-07	3.1E-07	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.9E-03	NA	3.0E-04	2.2E-03
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	4.0E-03	NA	4.2E-03	8.2E-03
			Arsenic	4.4E-07	NA	2.1E-07	6.5E-07	Skin, Vascular	7.6E-03	NA	3.6E-03	1.1E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	8.1E-04	NA	5.2E-04	1.3E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	1.8E-02	NA	1.1E-01	1.3E-01
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	6.4E-03	NA	1.0E-03	7.5E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	3.1E-02	NA	5.0E-03	3.6E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	3.7E-03	NA	1.5E-02	1.9E-02
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	1.1E-03	NA	4.5E-03	5.6E-03
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	9.4E-03	NA	1.5E-03	1.1E-02
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.9E-01	NA	1.2E+00	1.4E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	1.3E-03	NA	2.0E-04	1.5E-03
			Chemical Total	9.9E-07	0.0E+00	1.2E-06	2.2E-06		2.8E-01	0.0E+00	1.3E+00	1.6E+00
		Exposure Point Total					2.2E-06					1.6E+00
	Exposure Medium Total						2.2E-06					1.6E+00
	Air	Emissions from Surface Soil at Site 2	Chromium	NA	3.5E-09	NA	3.5E-09	Nasal	NA	2.2E-05	NA	2.2E-05
			Chemical Total	0.0E+00	3.5E-09	0.0E+00	3.5E-09		0.0E+00	2.2E-05	0.0E+00	2.2E-05
		Exposure Point Total					3.5E-09					2.2E-05
	Exposure Medium Total						3.5E-09					2.2E-05
Medium Total							2.2E-06					1.6E+00

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Drainage Features and Ponded Area	Bromodichloromethane	7.7E-09	NA	4.6E-09	1.2E-08	Kidney	4.8E-05	NA	2.9E-05	7.7E-05
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.9E-04	NA	1.3E-04	3.2E-04
			Trichloroethene	4.9E-08	NA	6.3E-08	1.1E-07	Liver	4.9E-03	NA	6.3E-03	1.1E-02
			Vinyl chloride	2.5E-07	NA	1.0E-07	3.5E-07	Liver	8.8E-04	NA	3.7E-04	1.3E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	1.2E-03	NA	8.1E-04	2.0E-03
			bis(2-Ethylhexyl)phthalate	3.3E-08	NA	3.7E-07	4.1E-07	Liver	9.1E-04	NA	1.0E-02	1.1E-02
			Arsenic	1.4E-07	NA	7.0E-09	1.5E-07	Skin, Vascular	2.4E-03	NA	1.2E-04	2.5E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	1.2E-02	NA	5.0E-02	6.2E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.2E-02	NA	1.5E-02	2.7E-02
			Chemical Total	4.7E-07	0.0E+00	5.5E-07	1.0E-06		3.5E-02	0.0E+00	8.3E-02	1.2E-01
		Exposure Point Total					1.0E-06					1.2E-01
	Exposure Medium Total						1.0E-06					1.2E-01
Medium Total							1.0E-06					1.2E-01
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	1.3E-07	NA	3.1E-07	4.3E-07	Liver	4.5E-04	NA	1.1E-03	1.6E-03
			Benzo(a)anthracene	2.8E-08	NA	8.8E-08	1.2E-07	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	2.3E-07	NA	7.4E-07	9.7E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.7E-08	NA	5.3E-08	7.0E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	6.6E-08	NA	2.1E-07	2.7E-07	NA	NA	NA	NA	0.0E+00
			Arsenic	3.6E-07	NA	2.6E-07	6.2E-07	Skin, Vascular	6.2E-03	NA	4.5E-03	1.1E-02
			Chromium	NA	NA	NA	0.0E+00	None reported	7.2E-02	NA	7.0E-01	7.7E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.2E-02	NA	1.1E-01	1.2E-01
			Chemical Total	8.3E-07	0.0E+00	1.7E-06	2.5E-06		9.1E-02	0.0E+00	8.2E-01	9.1E-01
		Exposure Point Total					2.5E-06					9.1E-01
	Exposure Medium Total						2.5E-06					9.1E-01
Medium Total							2.5E-06					9.1E-01
Receptor Total							5.7E-06				Receptor HI Total	2.6E+00

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
											Total Liver HI Across All Media =	4.1E-02
											Total Skin HI Across All Media =	3.5E-02
											Total Vascular HI Across All Media =	3.5E-02
											Total Gastrointestinal HI Across All Media =	4.4E-02
											Total Blood HI Across All Media =	2.3E-02
											Total CNS HI Across All Media =	4.8E-02
											Total Kidney HI Across All Media =	1.5E+00
											Total Longeviety HI Across All Media =	8.2E-03
											Total Cholesterol HI Across All Media =	8.2E-03
											Total Decreased Body and Organ weight HI Across All Media =	5.6E-03
											Total Hair HI Across All Media =	1.1E-02
											Total Nasal HI Across All Media =	2.2E-05

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	NA	NA	NA	0.0E+00	Liver	1.9E-03	NA	6.4E-05	1.9E-03
			Aroclor-1260	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	3.5E-03	NA	3.9E-05	3.5E-03
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	6.1E-03	NA	4.7E-04	6.6E-03
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	1.1E-02	NA	3.7E-04	1.1E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	7.2E-04	NA	3.3E-05	7.5E-04
			Chromium	NA	NA	NA	0.0E+00	None reported	6.9E-03	NA	3.1E-03	1.0E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	5.2E-03	NA	5.9E-05	5.3E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.5E-02	NA	1.8E-04	1.6E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	4.0E-03	NA	1.1E-03	5.1E-03
			Mercury	NA	NA	NA		Immune System	7.9E-04	NA	3.4E-06	8.0E-04
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	8.9E-04	NA	2.9E-03	3.8E-03
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	4.9E-03	NA	1.5E-04	5.1E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.3E-02	NA	1.2E-06	3.3E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	1.7E-03	NA	1.9E-05	1.7E-03
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		9.5E-02	0.0E+00	8.5E-03	1.0E-01
		Exposure Point Total					0.0E+00					1.0E-01
	Exposure Medium Total						0.0E+00					1.0E-01
Medium Total							0.0E+00					1.0E-01

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	NA	NA	NA	0.0E+00	Liver	1.5E-05	NA	5.2E-05	6.7E-05
			Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	1.8E-03	NA	1.8E-03	3.6E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	1.3E-02	NA	1.8E-01	1.9E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.2E-03	NA	4.3E-02	4.6E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.8E-02	0.0E+00	2.2E-01	2.4E-01
		Exposure Point Total					0.0E+00					2.4E-01
	Exposure Medium Total						0.0E+00					2.4E-01
Medium Total							0.0E+00					2.4E-01

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	5.4E-01	NA	4.8E-02	5.9E-01
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	1.9E-01	NA	2.4E-02	2.1E-01
			1,4-Dichlorobenzene	NA	NA	NA	0.0E+00	Liver, Developmental	3.4E-04	NA	2.2E-04	5.6E-04
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.7E-01	NA	1.4E-02	1.8E-01
			Dibromochloromethane	NA	NA	NA	0.0E+00	Liver	2.8E-02	NA	1.8E-03	3.0E-02
			Methylene chloride	NA	NA	NA	0.0E+00	Liver	5.6E-03	NA	2.0E-04	5.8E-03
			Tetrachloroethene	NA	NA	NA	0.0E+00	Liver, whole body	5.0E-02	NA	2.8E-02	7.8E-02
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	9.5E+01	NA	1.5E+01	1.1E+02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	7.3E+00	NA	3.5E-01	7.6E+00
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	3.7E-04	NA	2.3E-04	6.0E-04
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	1.3E+01	NA	1.1E+00	1.4E+01
			cis-1,3-Dichloropropene	NA	NA	NA	0.0E+00	Chronic irritation	9.8E-04	NA	5.0E-05	1.0E-03
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	4.6E-01	NA	3.8E-02	5.0E-01
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	3.4E-02	NA	2.2E-02	5.6E-02
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	2.5E-03	NA	3.2E-03	5.7E-03
			Carbazole	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	1.1E-01	NA	1.8E-01	2.9E-01
			Fluorene	NA	NA	NA	0.0E+00	Blood	3.0E-03	NA	5.4E-03	8.4E-03
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	7.8E-02	NA	4.9E-02	1.3E-01
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	NA	NA	NA	0.0E+00	Liver	9.0E-04	NA	4.0E-04	1.3E-03
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	1.2E-01	NA	5.2E-02	1.7E-01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	3.7E-02	NA	1.4E-03	3.8E-02
			RDX	NA	NA	NA	0.0E+00	Prostrate	3.1E-03	NA	1.7E-05	3.1E-03
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.5E-01	NA	3.3E-03	2.6E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	4.1E-01	NA	5.3E-03	4.2E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	5.4E-01	NA	1.7E-01	7.1E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.2E+02	0.0E+00	1.8E+01	1.4E+02
		Exposure Point Total					0.0E+00					1.4E+02
	Exposure Medium Total						0.0E+00					1.4E+02
Medium Total							0.0E+00					1.4E+02
Receptor Total							0.0E+00				Receptor HI Total	1.4E+02

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.2E+02
Total Skin HI Across All Media =	2.8E-01
Total Vascular HI Across All Media =	2.8E-01
Total Gastrointestinal HI Across All Media =	4.4E-01
Total Blood HI Across All Media =	1.6E+01
Total CNS HI Across All Media =	7.2E-01
Total Kidney HI Across All Media =	3.7E-01
Total Longeviety HI Across All Media =	6.6E-03
Total Cholesterol HI Across All Media =	6.6E-03
Total Decreased Body and Organ weight HI Across All Media =	1.3E-01
Total Hair HI Across All Media =	5.1E-03
Total Immune System HI Across All Media =	8.0E-04
Total Developmental HI Across All Media =	5.6E-04
Total Whole Body HI Across All Media =	7.8E-02
Total Prostrate HI Across All Media =	3.1E-03
Total Mortality HI Across All Media =	6.0E-04
Total Chronic Irritation HI Across All Media =	1.0E-03

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Landscaper
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 2	Benzo(a)anthracene	2.1E-08	NA	1.8E-08	3.9E-08	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	2.0E-07	NA	1.7E-07	3.6E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	2.2E-08	NA	1.9E-08	4.0E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	1.2E-07	NA	1.0E-07	2.2E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.6E-08	NA	1.4E-08	3.0E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	5.2E-09	NA	1.0E-09	6.3E-09	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	1.6E-08	NA	3.2E-09	2.0E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	6.1E-08	NA	1.2E-08	7.3E-08	Liver	1.1E-03	NA	2.1E-04	1.3E-03
			Aroclor-1260	9.6E-08	NA	8.8E-08	1.8E-07	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	7.2E-04	NA	4.7E-05	7.6E-04
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	1.5E-03	NA	6.7E-04	2.2E-03
			Arsenic	4.5E-07	NA	8.9E-08	5.4E-07	Skin, Vascular	2.9E-03	NA	5.7E-04	3.5E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	3.1E-04	NA	8.2E-05	3.9E-04
			Chromium	NA	NA	NA	0.0E+00	None reported	6.7E-03	NA	1.8E-02	2.4E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	2.4E-03	NA	1.6E-04	2.6E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.2E-02	NA	7.9E-04	1.3E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.4E-03	NA	2.3E-03	3.8E-03
			Nickel	NA	NA	NA	0.0E+00	Weights	4.3E-04	NA	7.1E-04	1.1E-03
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	3.6E-03	NA	2.3E-04	3.8E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	7.3E-02	NA	1.9E-01	2.6E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	4.8E-04	NA	3.2E-05	5.1E-04
			Chemical Total	1.0E-06	0.0E+00	5.1E-07	1.5E-06		1.1E-01	0.0E+00	2.1E-01	3.2E-01
		Exposure Point Total					1.5E-06					3.2E-01
	Exposure Medium Total						1.5E-06					3.2E-01
	Air	Emissions from Surface Soil at Site 2	Chromium	NA	3.5E-09	NA	3.5E-09	Nasal	NA	8.4E-06	NA	8.4E-06
			Chemical Total	0.0E+00	3.5E-09	0.0E+00	3.5E-09		0.0E+00	8.4E-06	0.0E+00	8.4E-06
		Exposure Point Total					3.5E-09					8.4E-06
	Exposure Medium Total						3.5E-09					8.4E-06
Medium Total							1.5E-06					3.2E-01
Receptor Total							1.5E-06				Receptor HI Total	3.2E-01

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Landscaper
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

Total Liver HI Across All Media =	5.0E-03
Total Skin HI Across All Media =	7.3E-03
Total Vascular HI Across All Media =	7.3E-03
Total Gastrointestinal HI Across All Media =	1.5E-02
Total Blood HI Across All Media =	6.5E-03
Total CNS HI Across All Media =	4.5E-03
Total Kidney HI Across All Media =	2.6E-01
Total Longeviety HI Across All Media =	2.2E-03
Total Cholesterol HI Across All Media =	2.2E-03
Total Decreased Body and Organ weight HI Across All Media =	1.1E-03
Total Hair HI Across All Media =	3.8E-03
Total Nasal HI Across All Media =	8.4E-06

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	NA	NA	NA	0.0E+00	Liver	1.8E-02	NA	5.9E-04	1.8E-02
			Aroclor-1260	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	3.2E-02	NA	3.6E-04	3.3E-02
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	5.7E-02	NA	4.3E-03	6.2E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	1.0E-01	NA	3.4E-03	1.0E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	6.7E-03	NA	3.0E-04	7.0E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	6.4E-02	NA	2.9E-02	9.3E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	4.8E-02	NA	5.4E-04	4.9E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.4E-01	NA	1.6E-03	1.5E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	3.7E-02	NA	1.0E-02	4.8E-02
			Mercury	NA	NA	NA		Immune System	7.4E-03	NA	3.1E-05	7.4E-03
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	8.3E-03	NA	2.7E-02	3.5E-02
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	4.6E-02	NA	1.4E-03	4.7E-02
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.0E-01	NA	1.1E-05	3.0E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	1.6E-02	NA	1.8E-04	1.6E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		8.9E-01	0.0E+00	7.8E-02	9.7E-01
		Exposure Point Total					0.0E+00					9.7E-01
	Exposure Medium Total						0.0E+00					9.7E-01
Medium Total							0.0E+00					9.7E-01

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	NA	NA	NA	0.0E+00	Liver	1.4E-04	NA	8.7E-04	1.0E-03
			Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	1.7E-02	NA	3.1E-02	4.7E-02
			Chromium	NA	NA	NA	0.0E+00	None reported	1.2E-01	NA	3.0E+00	3.1E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.0E-02	NA	7.1E-01	7.4E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.7E-01	0.0E+00	3.7E+00	3.9E+00
		Exposure Point Total					0.0E+00					3.9E+00
	Exposure Medium Total						0.0E+00					3.9E+00
Medium Total							0.0E+00					3.9E+00

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	1.8E+00	NA	9.4E-02	1.9E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	6.3E-01	NA	7.4E-02	7.0E-01
			1,4-Dichlorobenzene	NA	NA	NA	0.0E+00	Liver, Developmental	1.1E-03	NA	4.2E-04	1.6E-03
			Chloroform	NA	NA	NA	0.0E+00	Liver	5.6E-01	NA	2.8E-02	5.8E-01
			Dibromochloromethane	NA	NA	NA	0.0E+00	Liver	9.4E-02	NA	3.5E-03	9.8E-02
			Methylene chloride	NA	NA	NA	0.0E+00	Liver	1.9E-02	NA	3.8E-04	1.9E-02
			Tetrachloroethene	NA	NA	NA	0.0E+00	Liver, whole body	1.7E-01	NA	5.5E-02	2.2E-01
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	3.2E+02	NA	3.0E+01	3.5E+02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	2.4E+01	NA	7.0E-01	2.5E+01
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	1.2E-03	NA	4.5E-04	1.7E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	4.5E+01	NA	2.2E+00	4.7E+01
			cis-1,3-Dichloropropene	NA	NA	NA	0.0E+00	Chronic irritation	3.3E-03	NA	9.9E-05	3.4E-03
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	1.5E+00	NA	7.6E-02	1.6E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	1.1E-01	NA	4.2E-02	1.6E-01
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	8.2E-03	NA	6.3E-03	1.5E-02
			Carbazole	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	3.7E-01	NA	3.6E-01	7.3E-01
			Fluorene	NA	NA	NA	0.0E+00	Blood	1.0E-02	NA	1.1E-02	2.1E-02
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	2.6E-01	NA	9.6E-02	3.6E-01
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	NA	NA	NA	0.0E+00	Liver	3.0E-03	NA	7.9E-04	3.8E-03
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	3.9E-01	NA	1.0E-01	4.9E-01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	1.2E-01	NA	2.8E-03	1.2E-01
			RDX	NA	NA	NA	0.0E+00	Prostrate	1.0E-02	NA	3.0E-05	1.0E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	8.4E-01	NA	5.6E-03	8.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.4E+00	NA	9.1E-03	1.4E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.8E+00	NA	2.9E-01	2.1E+00
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		4.0E+02	0.0E+00	3.5E+01	4.3E+02
		Exposure Point Total					0.0E+00					4.3E+02
	Exposure Medium Total						0.0E+00					4.3E+02
Medium Total							0.0E+00					4.3E+02
Receptor Total							0.0E+00				Receptor HI Total	4.4E+02

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	3.8E+02
Total Skin HI Across All Media =	1.0E+00
Total Vascular HI Across All Media =	1.0E+00
Total Gastrointestinal HI Across All Media =	1.6E+00
Total Blood HI Across All Media =	5.0E+01
Total CNS HI Across All Media =	2.2E+00
Total Kidney HI Across All Media =	1.8E+00
Total Longeviety HI Across All Media =	6.2E-02
Total Cholesterol HI Across All Media =	6.2E-02
Total Decreased Body and Organ weight HI Across All Media =	3.9E-01
Total Hair HI Across All Media =	4.7E-02
Total Immune System HI Across All Media =	7.4E-03
Total Developmental HI Across All Media =	1.6E-03
Total Whole Body HI Across All Media =	2.2E-01
Total Prostrate HI Across All Media =	1.0E-02
Total Mortality HI Across All Media =	1.7E-03
Total Chronic Irritation HI Across All Media =	3.4E-03

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	NA	NA	NA	0.0E+00	Liver	2.9E-02	NA	3.5E-03	3.3E-02
			Aroclor-1260	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.3E-02	NA	5.0E-04	1.3E-02
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	1.2E-01	NA	3.2E-02	1.5E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	4.2E-02	NA	5.0E-03	4.7E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	5.7E-03	NA	9.1E-04	6.6E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	3.7E-02	NA	5.9E-02	9.6E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	6.2E-02	NA	2.5E-03	6.4E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.8E-01	NA	7.3E-03	1.9E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	2.2E-02	NA	2.2E-02	4.5E-02
			Mercury	NA	NA	NA		Immune System	3.5E-03		5.3E-05	3.6E-03
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	6.6E-03	NA	7.5E-02	8.2E-02
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	3.3E-02	NA	3.6E-03	3.7E-02
			Vanadium	NA	NA	NA	0.0E+00	Kidney	6.4E-01	NA	8.5E-05	6.4E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	1.4E-02	NA	5.7E-04	1.5E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.2E+00	0.0E+00	2.1E-01	1.4E+00
		Exposure Point Total					0.0E+00					1.4E+00
	Exposure Medium Total						0.0E+00					1.4E+00
	Air	Emissions from Soil* at Site 2	Chromium	NA	NA	NA	0.0E+00	Nasal	NA	5.6E-04	NA	5.6E-04
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	5.6E-04	0.0E+00	5.6E-04
		Exposure Point Total					0.0E+00					5.6E-04
	Exposure Medium Total						0.0E+00					5.6E-04
Medium Total							0.0E+00					1.4E+00

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Drainage Features and Ponded Area	Bromodichloromethane	NA	NA	NA	0.0E+00	Kidney	3.5E-05	NA	3.0E-05	6.5E-05
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.4E-04	NA	1.3E-04	2.7E-04
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	3.6E-03	NA	6.4E-03	1.0E-02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	6.4E-04	NA	3.8E-04	1.0E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	8.8E-04	NA	8.3E-04	1.7E-03
			bis(2-Ethylhexyl)phthalate	NA	NA	NA	0.0E+00	Liver	6.6E-04	NA	1.1E-02	1.1E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	1.7E-03	NA	1.2E-04	1.9E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	9.0E-03	NA	5.1E-02	6.0E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	8.8E-03	NA	1.6E-02	2.4E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.5E-02	0.0E+00	8.5E-02	1.1E-01
		Exposure Point Total					0.0E+00					1.1E-01
	Exposure Medium Total						0.0E+00					1.1E-01
Medium Total							0.0E+00					1.1E-01
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	NA	NA	NA	0.0E+00	Liver	3.3E-04	NA	2.3E-03	2.6E-03
			Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	4.5E-03	NA	9.3E-03	1.4E-02
			Chromium	NA	NA	NA	0.0E+00	None reported	5.2E-02	NA	1.4E+00	1.5E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	8.6E-03	NA	2.3E-01	2.3E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.6E-02	0.0E+00	1.7E+00	1.7E+00
		Exposure Point Total					0.0E+00					1.7E+00
	Exposure Medium Total						0.0E+00					1.7E+00
Medium Total							0.0E+00					1.7E+00

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	1.2E+00	NA	1.1E-01	1.3E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	8.2E-01	NA	1.1E-01	9.4E-01
			1,4-Dichlorobenzene	NA	NA	NA	0.0E+00	Liver, Developmental	7.3E-04	NA	4.9E-04	1.2E-03
			Chloroform	NA	NA	NA	0.0E+00	Liver	3.6E-01	NA	3.2E-02	3.9E-01
			Dibromochloromethane	NA	NA	NA	0.0E+00	Liver	6.0E-02	NA	4.1E-03	6.4E-02
			Methylene chloride	NA	NA	NA	0.0E+00	Liver	1.2E-02	NA	4.5E-04	1.2E-02
			Tetrachloroethene	NA	NA	NA	0.0E+00	Liver, whole body	1.1E-01	NA	6.4E-02	1.7E-01
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	3.4E+02	NA	5.9E+01	4.0E+02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	9.1E+01	NA	4.8E+00	9.6E+01
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	5.9E-03	NA	3.9E-03	9.8E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	1.3E+02	NA	1.1E+01	1.4E+02
			cis-1,3-Dichloropropene	NA	NA	NA	0.0E+00	Chronic irritation	2.1E-03	NA	1.1E-04	2.2E-03
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	9.9E-01	NA	8.8E-02	1.1E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	2.5E-01	NA	1.7E-01	4.1E-01
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	1.9E-02	NA	2.6E-02	4.4E-02
			Carbazole	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	7.3E-01	NA	1.3E+00	2.0E+00
			Fluorene	NA	NA	NA	0.0E+00	Blood	2.1E-02	NA	4.0E-02	6.1E-02
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	1.6E+00	NA	1.1E+00	2.7E+00
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	NA	NA	NA	0.0E+00	Liver	3.5E-03	NA	1.7E-03	5.1E-03
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	2.1E+00	NA	1.0E+00	3.2E+00
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	5.5E-01	NA	2.3E-02	5.7E-01
			RDX	NA	NA	NA	0.0E+00	Prostrate	1.8E-02	NA	6.9E-05	1.8E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	9.8E-01	NA	8.9E-03	9.9E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.7E+00	NA	2.4E-02	2.7E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.5E+00	NA	3.4E-01	1.8E+00
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		5.7E+02	0.0E+00	7.9E+01	6.5E+02
		Exposure Point Total					0.0E+00					6.5E+02
	Exposure Medium Total						0.0E+00					6.5E+02

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Water Vapors at Showerhead	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	NA	1.3E-03	NA	1.3E-03
			1,4-Dichlorobenzene	NA	4.5E-10	NA	4.5E-10	Liver	NA	5.0E-07	NA	5.0E-07
			Chloroform	NA	1.6E-07	NA	1.6E-07	Liver, Kidney	NA	4.2E-04	NA	4.2E-04
			Dibromochloromethane	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Methylene chloride	NA	7.9E-10	NA	7.9E-10	Liver	NA	4.6E-06	NA	4.6E-06
			Tetrachloroethene	NA	1.0E-08	NA	1.0E-08	Kidney, Liver	NA	1.9E-05	NA	1.9E-05
			Trichloroethene	NA	7.6E-06	NA	7.6E-06	Nervous System, Eyes	NA	1.9E-02	NA	1.9E-02
			Vinyl chloride	NA	3.2E-06	NA	3.2E-06	Liver	NA	2.2E-02	NA	2.2E-02
			Xylene, total	NA	NA	NA	0.0E+00	CNS	NA	6.9E-05	NA	6.9E-05
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			cis-1,3-Dichloropropene	NA	3.7E-10	NA	3.7E-10	Nasal	NA	1.9E-05	NA	1.9E-05
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Liver, Lung	NA	2.1E-03	NA	2.1E-03
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Acenaphthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Fluorene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Naphthalene	NA	NA	NA	0.0E+00	Respiratory System	NA	5.7E-02	NA	5.7E-02
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Chemical Total	0.0E+00	1.1E-05	0.0E+00	1.1E-05		0.0E+00	1.0E-01	0.0E+00	1.0E-01
		Exposure Point Total					1.1E-05					1.0E-01
	Exposure Medium Total						1.1E-05					1.0E-01
Medium Total							0.0E+00					6.5E+02
Receptor Total							0.0E+00				Receptor HI Total	6.5E+02

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	5.0E+02
Total Skin HI Across All Media =	1.1E+00
Total Vascular HI Across All Media =	1.1E+00
Total Gastrointestinal HI Across All Media =	3.0E+00
Total Blood HI Across All Media =	1.4E+02
Total CNS HI Across All Media =	1.9E+00
Total Kidney HI Across All Media =	2.9E+00
Total Longeviety HI Across All Media =	1.5E-01
Total Cholesterol HI Across All Media =	1.5E-01
Total Decreased Body and Organ weight HI Across All Media =	2.8E+00
Total Hair HI Across All Media =	3.7E-02
Total Nasal HI Across All Media =	5.8E-04
Total Immune System HI Across All Media =	3.6E-03
Total Developmental HI Across All Media =	1.2E-03
Total Whole Body HI Across All Media =	1.7E-01
Total Prostrate HI Across All Media =	1.8E-02
Total Nervous System HI Across All Media =	1.9E-02
Total Lung HI Across All Media =	2.1E-03
Total Respiratory System HI Across All Media =	5.7E-02
Total Mortality HI Across All Media =	9.8E-03
Total Chronic Irritation HI Across All Media =	2.2E-03
Total Eyes HI Across All Media =	1.9E-02

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	5.9E-08	NA	3.4E-07	4.0E-07	Liver	NA	NA	NA	0.0E+00
			Benzo(a)anthracene	2.8E-08	NA	2.1E-07	2.4E-07	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	3.2E-07	NA	2.4E-06	2.7E-06	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	2.6E-08	NA	2.0E-07	2.2E-07	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	2.5E-07	NA	1.9E-06	2.2E-06	NA	NA	NA	NA	0.0E+00
			Arsenic	7.4E-07	NA	1.3E-06	2.0E-06	Skin, Vascular	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	None reported	NA	NA	NA	0.0E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chemical Total	1.4E-06	0.0E+00	6.4E-06	7.8E-06		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					7.8E-06					0.0E+00
	Exposure Medium Total						7.8E-06					0.0E+00
Medium Total							7.8E-06					0.0E+00

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	NA	NA	NA	0.0E+00
			1,4-Dichlorobenzene	1.0E-07	NA	4.6E-08	1.5E-07	Liver, Developmental	NA	NA	NA	0.0E+00
			Chloroform	NA	NA	NA	0.0E+00	Liver	NA	NA	NA	0.0E+00
			Dibromochloromethane	2.0E-05	NA	8.9E-07	2.1E-05	Liver	NA	NA	NA	0.0E+00
			Methylene chloride	1.0E-06	NA	2.6E-08	1.1E-06	Liver	NA	NA	NA	0.0E+00
			Tetrachloroethene	1.1E-04	NA	4.5E-05	1.6E-04	Liver, whole body	NA	NA	NA	0.0E+00
			Trichloroethene	3.1E-03	NA	3.6E-04	3.4E-03	Liver	NA	NA	NA	0.0E+00
			Vinyl chloride	1.3E-02	NA	4.4E-04	1.3E-02	Liver	NA	NA	NA	0.0E+00
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	NA	NA	NA	0.0E+00
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			cis-1,3-Dichloropropene	1.2E-06	NA	4.5E-08	1.3E-06	Chronic irritation	NA	NA	NA	0.0E+00
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	NA	NA	NA	0.0E+00
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	NA	NA	NA	0.0E+00
			Carbazole	2.6E-06	NA	1.6E-06	4.2E-06	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Fluorene	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	NA	NA	NA	0.0E+00
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	8.4E-07	NA	2.7E-07	1.1E-06	Liver	NA	NA	NA	0.0E+00
			Heptachlor epoxide	5.8E-06	NA	1.8E-06	7.6E-06	Liver	NA	NA	NA	0.0E+00
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			RDX	4.2E-07	NA	1.3E-09	4.2E-07	Prostrate	NA	NA	NA	0.0E+00
			Arsenic	4.7E-05	NA	4.0E-07	4.8E-05	Skin, Vascular	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Chemical Total	1.6E-02	0.0E+00	8.5E-04	1.7E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					1.7E-02					0.0E+00
	Exposure Medium Total						1.7E-02					0.0E+00
Medium Total							1.7E-02					0.0E+00
Receptor Total							1.7E-02				Receptor HI Total	0.0E+00

* Surface soil & subsurface soil combined.

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	NA	NA	NA	0.0E+00	Liver	2.7E-01	NA	2.3E-02	2.9E-01
			Aroclor-1260	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.2E-01	NA	3.3E-03	1.2E-01
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	1.1E+00	NA	2.1E-01	1.3E+00
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	3.9E-01	NA	3.3E-02	4.3E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	5.3E-02	NA	6.0E-03	5.9E-02
			Chromium	NA	NA	NA	0.0E+00	None reported	3.5E-01	NA	3.9E-01	7.3E-01
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	5.8E-01	NA	1.6E-02	5.9E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.7E+00	NA	4.8E-02	1.8E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	2.1E-01	NA	1.5E-01	3.5E-01
			Mercury	NA	NA	NA		Immune System	3.3E-02		3.5E-04	3.3E-02
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	6.1E-02	NA	4.9E-01	5.5E-01
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	3.1E-01	NA	2.4E-02	3.4E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	6.0E+00	NA	5.6E-04	6.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	1.3E-01	NA	3.8E-03	1.4E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.1E+01	0.0E+00	1.4E+00	1.3E+01
		Exposure Point Total					0.0E+00					1.3E+01
	Exposure Medium Total						0.0E+00					1.3E+01
	Air	Emissions from Soil* at Site 2	Chromium	NA	NA	NA	0.0E+00	Nasal	NA	4.9E-04	NA	4.9E-04
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	4.9E-04	0.0E+00	4.9E-04
		Exposure Point Total					0.0E+00					4.9E-04
	Exposure Medium Total						0.0E+00					4.9E-04
Medium Total							0.0E+00					1.3E+01

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Drainage Features and Ponded Area	Bromodichloromethane	NA	NA	NA	0.0E+00	Kidney	1.6E-04	NA	4.5E-05	2.1E-04
			Chloroform	NA	NA	NA	0.0E+00	Liver	6.5E-04	NA	2.0E-04	8.6E-04
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	1.7E-02	NA	9.8E-03	2.7E-02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	3.0E-03	NA	5.7E-04	3.6E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	4.1E-03	NA	1.3E-03	5.4E-03
			bis(2-Ethylhexyl)phthalate	NA	NA	NA	0.0E+00	Liver	3.1E-03	NA	1.6E-02	1.9E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	8.1E-03	NA	1.9E-04	8.3E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	4.2E-02	NA	7.8E-02	1.2E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	4.1E-02	NA	2.4E-02	6.4E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.2E-01	0.0E+00	1.3E-01	2.5E-01
		Exposure Point Total					0.0E+00					2.5E-01
	Exposure Medium Total						0.0E+00					2.5E-01
Medium Total							0.0E+00					2.5E-01
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	NA	NA	NA	0.0E+00	Liver	3.1E-03	NA	1.2E-01	1.2E-01
			Benzo(a)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	4.2E-02	NA	4.9E-01	5.4E-01
			Chromium	NA	NA	NA	0.0E+00	None reported	4.9E-01	NA	7.6E+01	7.7E+01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	8.0E-02	NA	1.2E+01	1.2E+01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.2E-01	0.0E+00	8.9E+01	8.9E+01
		Exposure Point Total					0.0E+00					8.9E+01
	Exposure Medium Total						0.0E+00					8.9E+01
Medium Total							0.0E+00					8.9E+01

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	2.7E+00	NA	6.7E-01	3.4E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	1.9E+00	NA	7.5E-01	2.7E+00
			1,4-Dichlorobenzene	NA	NA	NA	0.0E+00	Liver, Developmental	1.7E-03	NA	3.0E-03	4.7E-03
			Chloroform	NA	NA	NA	0.0E+00	Liver	8.3E-01	NA	2.0E-01	1.0E+00
			Dibromochloromethane	NA	NA	NA	0.0E+00	Liver	1.4E-01	NA	2.5E-02	1.7E-01
			Methylene chloride	NA	NA	NA	0.0E+00	Liver	2.8E-02	NA	2.8E-03	3.1E-02
			Tetrachloroethene	NA	NA	NA	0.0E+00	Liver, whole body	2.5E-01	NA	3.9E-01	6.4E-01
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	7.9E+02	NA	3.6E+02	1.1E+03
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	2.1E+02	NA	2.9E+01	2.4E+02
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	1.4E-02	NA	2.4E-02	3.8E-02
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	3.0E+02	NA	7.1E+01	3.7E+02
			cis-1,3-Dichloropropene	NA	NA	NA	0.0E+00	Chronic irritation	4.9E-03	NA	7.0E-04	5.6E-03
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	2.3E+00	NA	5.5E-01	2.9E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	5.8E-01	NA	1.0E+00	1.6E+00
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	4.3E-02	NA	1.6E-01	2.0E-01
			Carbazole	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	1.7E+00	NA	7.7E+00	9.5E+00
			Fluorene	NA	NA	NA	0.0E+00	Blood	4.8E-02	NA	2.4E-01	2.9E-01
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	3.8E+00	NA	6.7E+00	1.0E+01
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	NA	NA	NA	0.0E+00	Liver	8.1E-03	NA	1.0E-02	1.8E-02
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	5.0E+00	NA	6.2E+00	1.1E+01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	1.3E+00	NA	4.8E-02	1.3E+00
			RDX	NA	NA	NA	0.0E+00	Prostrate	4.1E-02	NA	3.2E-04	4.2E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.3E+00	NA	4.1E-02	2.3E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	6.3E+00	NA	1.1E-01	6.4E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	3.5E+00	NA	1.6E+00	5.0E+00
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.3E+03	0.0E+00	4.8E+02	1.8E+03
		Exposure Point Total					0.0E+00					1.8E+03
	Exposure Medium Total						0.0E+00					1.8E+03
	Exposure Medium Total						0.0E+00					1.8E+03
Medium Total							0.0E+00					1.8E+03
Receptor Total							0.0E+00				Receptor HI Total	1.9E+03

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.4E+03
Total Skin HI Across All Media =	3.6E+00
Total Vascular HI Across All Media =	3.6E+00
Total Gastrointestinal HI Across All Media =	8.8E+00
Total Blood HI Across All Media =	3.8E+02
Total CNS HI Across All Media =	5.6E+00
Total Kidney HI Across All Media =	2.8E+01
Total Longeviety HI Across All Media =	1.3E+00
Total Cholesterol HI Across All Media =	1.3E+00
Total Decreased Body and Organ weight HI Across All Media =	1.1E+01
Total Hair HI Across All Media =	3.4E-01
Total Nasal HI Across All Media =	4.9E-04
Total Immune System HI Across All Media =	3.3E-02
Total Developmental HI Across All Media =	4.7E-03
Total Whole Body HI Across All Media =	6.4E-01
Total Prostrate HI Across All Media =	4.2E-02
Total Mortality HI Across All Media =	3.8E-02
Total Chronic Irritation HI Across All Media =	5.6E-03

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	4.8E-09	NA	6.6E-10	5.5E-09	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	4.3E-08	NA	5.9E-09	4.9E-08	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	5.3E-09	NA	7.3E-10	6.1E-09	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	3.2E-08	NA	4.4E-09	3.6E-08	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	3.6E-09	NA	4.9E-10	4.1E-09	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	8.4E-10	NA	2.6E-11	8.6E-10	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	4.5E-09	NA	1.4E-10	4.6E-09	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	9.8E-09	NA	3.1E-10	1.0E-08	Liver	4.0E-03	NA	1.3E-04	4.2E-03
			Aroclor-1260	3.5E-09	NA	5.2E-10	4.0E-09	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	7.4E-03	NA	7.7E-05	7.5E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	2.6E-02	NA	1.8E-03	2.8E-02
			Arsenic	1.5E-07	NA	4.6E-09	1.5E-07	Skin, Vascular	2.3E-02	NA	7.2E-04	2.4E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.5E-03	NA	6.5E-05	1.6E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	2.2E-03	NA	9.3E-04	3.1E-03
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	1.1E-02	NA	1.2E-04	1.1E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	3.3E-02	NA	3.5E-04	3.3E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	8.5E-03	NA	2.2E-03	1.1E-02
			Mercury	NA	NA	NA		Immune System	1.7E-03	NA	6.7E-06	1.7E-03
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	1.9E-03	NA	5.7E-03	7.6E-03
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	1.0E-02	NA	4.3E-05	1.1E-02
			Vanadium	NA	NA	NA	0.0E+00	Lifetime	1.0E-02	NA	2.4E-06	1.0E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	3.6E-03	NA	3.8E-05	3.7E-03
			Chemical Total	2.5E-07	0.0E+00	1.8E-08	2.7E-07		1.4E-01	0.0E+00	1.2E-02	1.6E-01
		Exposure Point Total					2.7E-07					1.6E-01
	Exposure Medium Total						2.7E-07					1.6E-01
Medium Total							2.7E-07					1.6E-01

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Water in Excavation	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	NA	NA	3.9E-03	3.9E-03
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	NA	NA	1.6E-02	1.6E-02
			1,4-Dichlorobenzene	NA	NA	1.7E-09	1.7E-09	Liver, Developmental	NA	NA	1.6E-04	1.6E-04
			Chloroform	NA	NA	NA	0.0E+00	Liver	NA	NA	1.2E-02	1.2E-02
			Dibromochloromethane	NA	NA	3.0E-08	3.0E-08	Liver	NA	NA	1.3E-03	1.3E-03
			Methylene chloride	NA	NA	1.2E-09	1.2E-09	Liver	NA	NA	1.8E-04	1.8E-04
			Tetrachloroethene	NA	NA	1.5E-06	1.5E-06	Liver, whole body	NA	NA	1.9E-03	1.9E-03
			Trichloroethene	NA	NA	1.2E-05	1.2E-05	Liver	NA	NA	1.1E+01	1.1E+01
			Vinyl chloride	NA	NA	7.6E-06	7.6E-06	Liver	NA	NA	2.5E-01	2.5E-01
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	NA	NA	1.9E-04	1.9E-04
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	9.7E-02	9.7E-02
			cis-1,3-Dichloropropene	NA	NA	1.9E-09	1.9E-09	Chronic irritation	NA	NA	4.5E-05	4.5E-05
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	3.1E-03	3.1E-03
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	NA	NA	1.8E-02	1.8E-02
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	NA	NA	2.3E-04	2.3E-04
			Carbazole	NA	NA	5.6E-08	5.6E-08	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	NA	NA	1.3E-01	1.3E-01
			Fluorene	NA	NA	NA	0.0E+00	Blood	NA	NA	3.7E-04	3.7E-04
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	NA	NA	4.1E-02	4.1E-02
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	NA	NA	8.8E-09	8.8E-09	Liver	NA	NA	2.8E-04	2.8E-04
			Heptachlor epoxide	NA	NA	6.1E-08	6.1E-08	Liver	NA	NA	3.6E-02	3.6E-02
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	NA	NA	1.1E-03	1.1E-03
			RDX	NA	NA	1.1E-11	1.1E-11	Prostrate	NA	NA	3.0E-06	3.0E-06
			Arsenic	NA	NA	3.6E-09	3.6E-09	Skin, Vascular	NA	NA	5.6E-04	5.6E-04
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	9.1E-04	9.1E-04
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	3.0E-02	3.0E-02
			Chemical Total	0.0E+00	0.0E+00	2.2E-05	2.2E-05		0.0E+00	0.0E+00	1.2E+01	1.2E+01
		Exposure Point Total					2.2E-05					1.2E+01
	Exposure Medium Total						2.2E-05					1.2E+01

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Water Vapors at Excavation Pit	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	NA	5.8E-03	NA	5.8E-03
			1,4-Dichlorobenzene	NA	1.9E-10	NA	1.9E-10	Liver	NA	4.7E-07	NA	4.7E-07
			Chloroform	NA	6.7E-08	NA	6.7E-08	Liver, Kidney	NA	4.2E-03	NA	4.2E-03
			Dibromochloromethane	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Methylene chloride	NA	3.0E-10	NA	3.0E-10	Liver	NA	1.5E-05	NA	1.5E-05
			Tetrachloroethene	NA	4.6E-09	NA	4.6E-09	Kidney, Liver	NA	2.0E-04	NA	2.0E-04
			Trichloroethene	NA	2.0E-06	NA	2.0E-06	Nervous System, Eyes	NA	1.2E-01	NA	1.2E-01
			Vinyl chloride	NA	1.9E-07	NA	1.9E-07	Liver	NA	3.2E-02	NA	3.2E-02
			Xylene, total	NA	NA	NA	0.0E+00	CNS	NA	8.9E-05	NA	8.9E-05
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			cis-1,3-Dichloropropene	NA	1.4E-10	NA	1.4E-10	Nasal	NA	1.8E-04	NA	1.8E-04
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Liver, Lung	NA	2.0E-02	NA	2.0E-02
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Acenaphthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Fluorene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Naphthalene	NA	NA	NA	0.0E+00	Respiratory System	NA	5.5E-02	NA	5.5E-02
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	0.0E+00	NA	0.0E+00
			Chemical Total	0.0E+00	2.2E-06	0.0E+00	2.2E-06		0.0E+00	2.3E-01	0.0E+00	2.3E-01
		Exposure Point Total					2.2E-06					2.3E-01
	Exposure Medium Total						2.2E-06					2.3E-01
Medium Total							2.4E-05					1.2E+01
Receptor Total							2.4E-05				Receptor HI Total	1.2E+01

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.2E+01
Total Skin HI Across All Media =	3.5E-02
Total Vascular HI Across All Media =	3.5E-02
Total Gastrointestinal HI Across All Media =	4.5E-02
Total Blood HI Across All Media =	1.5E-01
Total CNS HI Across All Media =	1.6E-01
Total Kidney HI Across All Media =	1.4E-01
Total Decreased Body and Organ weight HI Across All Media =	4.9E-02
Total Hair HI Across All Media =	1.1E-02
Total Immune System HI Across All Media =	1.7E-03
Total Developmental HI Across All Media =	1.6E-04
Total Whole Body HI Across All Media =	1.9E-03
Total Prostrate HI Across All Media =	3.0E-06
Total Nervous System HI Across All Media =	1.2E-01
Total Lung HI Across All Media =	2.0E-02
Total Respiratory System HI Across All Media =	5.5E-02
Total Lifetime HI Across All Media =	1.0E-02
Total Mortality HI Across All Media =	1.9E-04
Total Chronic Irritation HI Across All Media =	4.5E-05
Total Chronic Nasal HI Across All Media =	1.8E-04
Total Eyes HI Across All Media =	1.2E-01

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	1.0E-06	NA	6.9E-07	1.7E-06	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	6.8E-06	NA	4.6E-06	1.1E-05	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	7.8E-07	NA	5.3E-07	1.3E-06	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	5.9E-06	NA	4.0E-06	9.9E-06	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	7.0E-07	NA	4.8E-07	1.2E-06	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	6.3E-07	NA	1.0E-07	7.3E-07	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	2.2E-06	NA	3.5E-07	2.6E-06	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	5.7E-06	NA	8.9E-07	6.6E-06	Liver	NA	NA	NA	0.0E+00
			Aroclor-1260	3.0E-06	NA	2.2E-06	5.2E-06	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	NA	NA	NA	0.0E+00
			Arsenic	2.2E-05	NA	3.4E-06	2.5E-05	Skin, Vascular	NA	NA	NA	0.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	None reported	NA	NA	NA	0.0E+00
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Mercury	NA	NA	NA		Immune System	NA	NA	NA	0.0E+00
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	NA	NA	NA	0.0E+00
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Chemical Total	4.8E-05	0.0E+00	1.7E-05	6.6E-05		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					6.6E-05					0.0E+00
	Exposure Medium Total						6.6E-05					0.0E+00
	Air	Emissions from Soil* at Site 2	Chromium	NA	4.4E-10	NA	4.4E-10	Nasal	NA	NA	NA	0.0E+00
			Chemical Total	0.0E+00	4.4E-10	0.0E+00	4.4E-10		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					4.4E-10					0.0E+00
	Exposure Medium Total						4.4E-10					0.0E+00
Medium Total							6.6E-05					0.0E+00

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Drainage Features and Ponded Area	Bromodichloromethane	9.3E-08	NA	1.7E-08	1.1E-07	Kidney	NA	NA	NA	0.0E+00
			Chloroform	NA	NA	NA	0.0E+00	Liver	NA	NA	NA	0.0E+00
			Trichloroethene	6.0E-07	NA	2.4E-07	8.3E-07	Liver	NA	NA	NA	0.0E+00
			Vinyl chloride	3.0E-06	NA	3.9E-07	3.3E-06	Liver	NA	NA	NA	0.0E+00
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			bis(2-Ethylhexyl)phthalate	3.9E-07	NA	1.4E-06	1.8E-06	Liver	NA	NA	NA	0.0E+00
			Arsenic	1.7E-06	NA	2.6E-08	1.7E-06	Skin, Vascular	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	None reported	NA	NA	NA	0.0E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Chemical Total	5.7E-06	0.0E+00	2.1E-06	7.8E-06		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					7.8E-06					0.0E+00
	Exposure Medium Total						7.8E-06					0.0E+00
Medium Total							7.8E-06					0.0E+00
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	1.6E-06	NA	4.6E-05	4.8E-05	Liver	NA	NA	NA	0.0E+00
			Benzo(a)anthracene	1.8E-07	NA	6.8E-06	7.0E-06	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	1.5E-06	NA	5.7E-05	5.9E-05	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.1E-07	NA	4.2E-06	4.3E-06	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	4.2E-07	NA	1.6E-05	1.7E-05	NA	NA	NA	NA	0.0E+00
			Arsenic	2.3E-06	NA	2.1E-05	2.3E-05	Skin, Vascular	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	None reported	NA	NA	NA	0.0E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chemical Total	6.1E-06	0.0E+00	1.5E-04	1.6E-04		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					1.6E-04					0.0E+00
	Exposure Medium Total						1.6E-04					0.0E+00
Medium Total							1.6E-04					0.0E+00

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	NA	NA	NA	0.0E+00
			1,4-Dichlorobenzene	2.9E-07	NA	1.9E-07	4.8E-07	Liver, Developmental	NA	NA	NA	0.0E+00
			Chloroform	NA	NA	NA	0.0E+00	Liver	NA	NA	NA	0.0E+00
			Dibromochloromethane	5.5E-05	NA	3.7E-06	5.9E-05	Liver	NA	NA	NA	0.0E+00
			Methylene chloride	2.9E-06	NA	1.1E-07	3.0E-06	Liver	NA	NA	NA	0.0E+00
			Tetrachloroethene	3.1E-04	NA	1.8E-04	5.0E-04	Liver, whole body	NA	NA	NA	0.0E+00
			Trichloroethene	1.4E-02	NA	2.4E-03	1.7E-02	Liver	NA	NA	NA	0.0E+00
			Vinyl chloride	1.9E-01	NA	1.1E-02	2.0E-01	Liver	NA	NA	NA	0.0E+00
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	NA	NA	NA	0.0E+00
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			cis-1,3-Dichloropropene	3.4E-06	NA	1.8E-07	3.6E-06	Chronic irritation	NA	NA	NA	0.0E+00
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	NA	NA	NA	0.0E+00
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	NA	NA	NA	0.0E+00
			Carbazole	6.6E-05	NA	6.1E-05	1.3E-04	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Fluorene	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	NA	NA	NA	0.0E+00
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	4.3E-06	NA	2.0E-06	6.3E-06	Liver	NA	NA	NA	0.0E+00
			Heptachlor epoxide	1.4E-04	NA	6.5E-05	2.0E-04	Liver	NA	NA	NA	0.0E+00
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			RDX	3.2E-06	NA	9.0E-09	3.2E-06	Prostrate	NA	NA	NA	0.0E+00
			Arsenic	2.4E-04	NA	1.9E-06	2.4E-04	Skin, Vascular	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Chemical Total	2.0E-01	0.0E+00	1.3E-02	2.2E-01		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.2E-01					0.0E+00
	Exposure Medium Total						2.2E-01					0.0E+00
Medium Total							2.2E-01					0.0E+00
Receptor Total							2.2E-01				Receptor HI Total	0.0E+00

* Surface soil & subsurface soil combined.

TABLE 9.6.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	1.4E-08	NA	2.4E-09	1.6E-08	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	1.3E-07	NA	2.1E-08	1.5E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.5E-08	NA	2.6E-09	1.8E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	9.3E-08	NA	1.6E-08	1.1E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.0E-08	NA	1.8E-09	1.2E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	2.4E-09	NA	9.6E-11	2.5E-09	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	1.3E-08	NA	5.1E-10	1.3E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	2.8E-08	NA	1.1E-09	2.9E-08	Liver	1.8E-03	NA	7.0E-05	1.8E-03
			Aroclor-1260	1.0E-08	NA	1.9E-09	1.2E-08	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	3.2E-03	NA	4.3E-05	3.3E-03
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	5.7E-03	NA	5.1E-04	6.3E-03
			Arsenic	4.2E-07	NA	1.7E-08	4.4E-07	Skin, Vascular	1.0E-02	NA	4.0E-04	1.0E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	6.7E-04	NA	3.6E-05	7.1E-04
			Chromium	NA	NA	NA	0.0E+00	None reported	6.4E-03	NA	3.4E-03	9.8E-03
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	4.9E-03	NA	6.4E-05	4.9E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.4E-02	NA	1.9E-04	1.5E-02
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	3.7E-03	NA	1.2E-03	5.0E-03
			Mercury	NA	NA	NA		Immune System	7.4E-04	NA	3.7E-06	7.5E-04
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	8.3E-04	NA	3.1E-03	4.0E-03
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	4.6E-03	NA	1.6E-04	4.7E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.1E-02	NA	1.3E-06	3.1E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	1.6E-03	NA	2.1E-05	1.6E-03
			Chemical Total	7.4E-07	0.0E+00	6.5E-08	8.0E-07		8.9E-02	0.0E+00	9.3E-03	9.8E-02
		Exposure Point Total					8.0E-07					9.8E-02
	Exposure Medium Total						8.0E-07					9.8E-02
Medium Total							8.0E-07					9.8E-02

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	3.6E-01	NA	NA	3.6E-01
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	1.3E-01	NA	NA	1.3E-01
			1,4-Dichlorobenzene	2.1E-08	NA	NA	2.1E-08	Liver, Developmental	2.3E-04	NA	NA	2.3E-04
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.1E-01	NA	NA	1.1E-01
			Dibromochloromethane	4.1E-06	NA	NA	4.1E-06	Liver	1.9E-02	NA	NA	1.9E-02
			Methylene chloride	2.1E-07	NA	NA	2.1E-07	Liver	3.7E-03	NA	NA	3.7E-03
			Tetrachloroethene	2.3E-05	NA	NA	2.3E-05	Liver, whole body	3.3E-02	NA	NA	3.3E-02
			Trichloroethene	6.4E-04	NA	NA	6.4E-04	Liver	6.4E+01	NA	NA	6.4E+01
			Vinyl chloride	1.3E-03	NA	NA	1.3E-03	Liver	4.9E+00	NA	NA	4.9E+00
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	2.5E-04	NA	NA	2.5E-04
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	8.9E+00	NA	NA	8.9E+00
			cis-1,3-Dichloropropene	2.5E-07	NA	NA	2.5E-07	Chronic irritation	6.6E-04	NA	NA	6.6E-04
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	3.1E-01	NA	NA	3.1E-01
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	2.3E-02	NA	NA	2.3E-02
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	1.6E-03	NA	NA	1.6E-03
			Carbazole	5.4E-07	NA	NA	5.4E-07	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	7.5E-02	NA	NA	7.5E-02
			Fluorene	NA	NA	NA	0.0E+00	Blood	2.0E-03	NA	NA	2.0E-03
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	5.2E-02	NA	NA	5.2E-02
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	1.7E-07	NA	NA	1.7E-07	Liver	6.0E-04	NA	NA	6.0E-04
			Heptachlor epoxide	1.2E-06	NA	NA	1.2E-06	Liver	7.8E-02	NA	NA	7.8E-02
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	2.4E-02	NA	NA	2.4E-02
			RDX	8.8E-08	NA	NA	8.8E-08	Prostrate	2.1E-03	NA	NA	2.1E-03
			Arsenic	9.8E-06	NA	NA	9.8E-06	Skin, Vascular	1.7E-01	NA	NA	1.7E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.8E-01	NA	NA	2.8E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	3.6E-01	NA	NA	3.6E-01
			Chemical Total	2.0E-03	0.0E+00	0.0E+00	2.0E-03		8.0E+01	0.0E+00	0.0E+00	8.0E+01
		Exposure Point Total					2.0E-03					8.0E+01
	Exposure Medium Total						2.0E-03					8.0E+01
Medium Total							2.0E-03					8.0E+01
Receptor Total							2.0E-03				Receptor HI Total	8.0E+01

TABLE 9.6.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	6.9E+01
Total Skin HI Across All Media =	1.8E-01
Total Vascular HI Across All Media =	1.8E-01
Total Gastrointestinal HI Across All Media =	3.0E-01
Total Blood HI Across All Media =	9.6E+00
Total CNS HI Across All Media =	3.7E-01
Total Kidney HI Across All Media =	1.1E-01
Total Longeviety HI Across All Media =	6.3E-03
Total Cholesterol HI Across All Media =	6.3E-03
Total Decreased Body and Organ weight HI Across All Media =	5.7E-02
Total Hair HI Across All Media =	4.7E-03
Total Immune System HI Across All Media =	7.5E-04
Total Developmental HI Across All Media =	2.3E-04
Total Whole Body HI Across All Media =	3.3E-02
Total Prostrate HI Across All Media =	2.1E-03
Total Mortality HI Across All Media =	2.5E-04
Total Chronic Irritation HI Across All Media =	6.6E-04

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	1.5E-08	NA	5.8E-09	2.1E-08	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	1.0E-07	NA	3.9E-08	1.4E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.1E-08	NA	4.5E-09	1.6E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	8.7E-08	NA	3.4E-08	1.2E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.0E-08	NA	4.0E-09	1.4E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	9.3E-09	NA	8.4E-10	1.0E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	3.3E-08	NA	3.0E-09	3.6E-08	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	8.3E-08	NA	7.5E-09	9.1E-08	Liver	3.4E-02	NA	3.1E-03	3.7E-02
			Aroclor-1260	4.4E-08	NA	1.9E-08	6.3E-08	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.5E-02	NA	4.4E-04	1.5E-02
			Antimony	NA	NA	NA	0.0E+00	Blood	2.8E-01	NA	5.6E-02	3.4E-01
			Arsenic	3.2E-07	NA	2.9E-08	3.5E-07	Skin, Vascular	5.0E-02	NA	4.5E-03	5.4E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	6.7E-03	NA	8.1E-04	7.5E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	6.5E-03	NA	7.9E-03	1.4E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	7.3E-02	NA	2.2E-03	7.5E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.2E-01	NA	6.5E-03	2.2E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	2.6E-02	NA	2.0E-02	4.6E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	4.2E-03		4.7E-05	4.2E-03
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	7.8E-03	NA	6.6E-02	7.4E-02
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	3.9E-02	NA	4.6E-04	4.0E-02
			Vanadium	NA	NA	NA	0.0E+00	Lifetime	1.1E-01	NA	7.5E-05	1.1E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	1.7E-02	NA	5.1E-04	1.7E-02
			Chemical Total	7.1E-07	0.0E+00	1.5E-07	8.6E-07		8.8E-01	0.0E+00	1.7E-01	1.1E+00
		Exposure Point Total					8.6E-07					1.1E+00
	Exposure Medium Total						8.6E-07					1.1E+00
	Air	Emissions from Soil* at Site 2	Chromium	NA	3.5E-09	NA	3.5E-09	Nasal	NA	2.0E-04	NA	2.0E-04
			Chemical Total	0.0E+00	3.5E-09	0.0E+00	3.5E-09		0.0E+00	2.0E-04	0.0E+00	2.0E-04
		Exposure Point Total					3.5E-09					2.0E-04
	Exposure Medium Total						3.5E-09					2.0E-04
Medium Total							8.6E-07					1.1E+00

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Water in Excavation	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	NA	NA	7.9E-03	7.9E-03
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	NA	NA	6.0E-02	6.0E-02
			1,4-Dichlorobenzene	NA	NA	3.3E-09	3.3E-09	Liver, Developmental	NA	NA	3.2E-04	3.2E-04
			Chloroform	NA	NA	NA	0.0E+00	Liver	NA	NA	2.5E-02	2.5E-02
			Dibromochloromethane	NA	NA	5.4E-08	5.4E-08	Liver	NA	NA	2.3E-03	2.3E-03
			Methylene chloride	NA	NA	2.5E-09	2.5E-09	Liver	NA	NA	3.8E-04	3.8E-04
			Tetrachloroethene	NA	NA	2.4E-06	2.4E-06	Liver, whole body	NA	NA	3.1E-03	3.1E-03
			Trichloroethene	NA	NA	3.9E-05	3.9E-05	Liver	NA	NA	3.5E+01	3.5E+01
			Vinyl chloride	NA	NA	8.6E-05	8.6E-05	Liver	NA	NA	2.8E+00	2.8E+00
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	NA	NA	2.8E-03	2.8E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	8.9E-01	8.9E-01
			cis-1,3-Dichloropropene	NA	NA	4.0E-09	4.0E-09	Chronic irritation	NA	NA	9.3E-05	9.3E-05
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	6.1E-03	6.1E-03
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	NA	NA	1.2E-01	1.2E-01
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	NA	NA	1.4E-03	1.4E-03
			Carbazole	NA	NA	9.1E-07	9.1E-07	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	NA	NA	6.6E-01	6.6E-01
			Fluorene	NA	NA	NA	0.0E+00	Blood	NA	NA	2.1E-03	2.1E-03
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	NA	NA	8.1E-01	8.1E-01
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	NA	NA	2.6E-08	2.6E-08	Liver	NA	NA	8.0E-04	8.0E-04
			Heptachlor epoxide	NA	NA	8.4E-07	8.4E-07	Liver	NA	NA	5.0E-01	5.0E-01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	NA	NA	1.4E-02	1.4E-02
			RDX	NA	NA	3.4E-11	3.4E-11	Prostrate	NA	NA	9.1E-06	9.1E-06
			Arsenic	NA	NA	7.5E-09	7.5E-09	Skin, Vascular	NA	NA	1.2E-03	1.2E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	3.2E-03	3.2E-03
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	4.4E-02	4.4E-02
			Chemical Total	0.0E+00	0.0E+00	1.3E-04	1.3E-04		0.0E+00	0.0E+00	4.1E+01	4.1E+01
		Exposure Point Total					1.3E-04					4.1E+01
	Exposure Medium Total						1.3E-04					4.1E+01

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Water Vapors at Excavation Pit	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	NA	4.8E-02	NA	4.8E-02
			1,4-Dichlorobenzene	NA	7.7E-10	NA	7.7E-10	Liver	NA	1.9E-06	NA	1.9E-06
			Chloroform	NA	2.7E-07	NA	2.7E-07	Liver, Kidney	NA	1.7E-02	NA	1.7E-02
			Dibromochloromethane	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Methylene chloride	NA	1.2E-09	NA	1.2E-09	Liver	NA	5.9E-05	NA	5.9E-05
			Tetrachloroethene	NA	1.9E-08	NA	1.9E-08	Kidney, Liver	NA	8.1E-04	NA	8.1E-04
			Trichloroethene	NA	1.3E-05	NA	1.3E-05	Nervous System, Eyes	NA	7.7E-01	NA	7.7E-01
			Vinyl chloride	NA	4.6E-06	NA	4.6E-06	Liver	NA	7.6E-01	NA	7.6E-01
			Xylene, total	NA	NA	NA	0.0E+00	CNS	NA	2.7E-03	NA	2.7E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			cis-1,3-Dichloropropene	NA	5.8E-10	NA	5.8E-10	Nasal	NA	7.1E-04	NA	7.1E-04
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Liver, Lung	NA	8.0E-02	NA	8.0E-02
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Acenaphthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Fluorene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Naphthalene	NA	NA	NA	0.0E+00	Respiratory System	NA	2.2E+00	NA	2.2E+00
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Chemical Total	0.0E+00	1.8E-05	0.0E+00	1.8E-05		0.0E+00	3.8E+00	0.0E+00	3.8E+00
		Exposure Point Total					1.8E-05					3.8E+00
	Exposure Medium Total						1.8E-05					3.8E+00
Medium Total							1.5E-04					4.5E+01
Receptor Total							1.5E-04				Receptor HI Total	4.6E+01

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	3.9E+01
Total Skin HI Across All Media =	9.5E-02
Total Vascular HI Across All Media =	9.5E-02
Total Gastrointestinal HI Across All Media =	3.0E-01
Total Blood HI Across All Media =	1.3E+00
Total CNS HI Across All Media =	8.7E-01
Total Kidney HI Across All Media =	7.9E-01
Total Decreased Body and Organ weight HI Across All Media =	8.9E-01
Total Hair HI Across All Media =	4.0E-02
Total Nasal HI Across All Media =	9.1E-04
Total Immune System HI Across All Media =	4.2E-03
Total Developmental HI Across All Media =	3.2E-04
Total Whole Body HI Across All Media =	3.1E-03
Total Prostrate HI Across All Media =	9.1E-06
Total Lung HI Across All Media =	8.0E-02
Total Respiratory System HI Across All Media =	2.2E+00
Total Lifetime HI Across All Media =	1.1E-01
Total Mortality HI Across All Media =	2.8E-03
Total Chronic Irritation HI Across All Media =	9.3E-05
Total Eyes HI Across All Media =	7.7E-01

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Benzo(a)anthracene	2.2E-07	NA	1.9E-07	4.2E-07	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	1.5E-06	NA	1.3E-06	2.8E-06	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.7E-07	NA	1.5E-07	3.2E-07	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	1.3E-06	NA	1.1E-06	2.4E-06	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.6E-07	NA	1.3E-07	2.9E-07	NA	NA	NA	NA	0.0E+00
			4,4'-DDD	1.4E-07	NA	2.8E-08	1.7E-07	NA	NA	NA	NA	0.0E+00
			4,4'-DDE	5.0E-07	NA	9.9E-08	6.0E-07	NA	NA	NA	NA	0.0E+00
			4,4'-DDT	1.3E-06	NA	2.5E-07	1.5E-06	Liver	2.1E-02	NA	4.1E-03	2.5E-02
			Aroclor-1260	6.7E-07	NA	6.2E-07	1.3E-06	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	9.0E-03	NA	5.9E-04	9.6E-03
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	8.5E-02	NA	3.7E-02	1.2E-01
			Arsenic	4.8E-06	NA	9.6E-07	5.8E-06	Skin, Vascular	3.0E-02	NA	6.0E-03	3.6E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	4.1E-03	NA	1.1E-03	5.2E-03
			Chromium	NA	NA	NA	0.0E+00	None reported	2.6E-02	NA	7.0E-02	9.6E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	4.4E-02	NA	2.9E-03	4.7E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.3E-01	NA	8.6E-03	1.4E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.6E-02	NA	2.6E-02	4.2E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	2.5E-03		6.2E-05	2.6E-03
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	4.7E-03	NA	8.9E-02	9.3E-02
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	2.4E-02	NA	4.2E-03	2.8E-02
			Vanadium	NA	NA	NA	0.0E+00	Kidney	4.6E-01	NA	1.0E-04	4.6E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	1.0E-02	NA	6.8E-04	1.1E-02
			Chemical Total	1.1E-05	0.0E+00	4.9E-06	1.6E-05		8.6E-01	0.0E+00	2.5E-01	1.1E+00
		Exposure Point Total					1.6E-05					1.1E+00
	Exposure Medium Total						1.6E-05					1.1E+00
	Air	Emissions from Soil* at Site 2	Chromium	NA	3.5E-09	NA	3.5E-09	Nasal	NA	2.0E-04	NA	2.0E-04
			Chemical Total	0.0E+00	3.5E-09	0.0E+00	3.5E-09		0.0E+00	2.0E-04	0.0E+00	2.0E-04
		Exposure Point Total					3.5E-09					2.0E-04
	Exposure Medium Total						3.5E-09					2.0E-04
Medium Total							1.6E-05					1.1E+00

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	4.2E-01	NA	NA	4.2E-01
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	2.9E-01	NA	NA	2.9E-01
			1,4-Dichlorobenzene	6.7E-08	NA	NA	6.7E-08	Liver, Developmental	2.6E-04	NA	NA	2.6E-04
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.3E-01	NA	NA	1.3E-01
			Dibromochloromethane	1.3E-05	NA	NA	1.3E-05	Liver	2.2E-02	NA	NA	2.2E-02
			Methylene chloride	6.8E-07	NA	NA	6.8E-07	Liver	4.2E-03	NA	NA	4.2E-03
			Tetrachloroethene	7.4E-05	NA	NA	7.4E-05	Liver, whole body	3.8E-02	NA	NA	3.8E-02
			Trichloroethene	3.4E-03	NA	NA	3.4E-03	Liver	1.2E+02	NA	NA	1.2E+02
			Vinyl chloride	2.5E-02	NA	NA	2.5E-02	Liver	3.3E+01	NA	NA	3.3E+01
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	2.1E-03	NA	NA	2.1E-03
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	4.5E+01	NA	NA	4.5E+01
			cis-1,3-Dichloropropene	8.0E-07	NA	NA	8.0E-07	Chronic irritation	7.5E-04	NA	NA	7.5E-04
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	3.5E-01	NA	NA	3.5E-01
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	8.9E-02	NA	NA	8.9E-02
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	6.6E-03	NA	NA	6.6E-03
			Carbazole	1.5E-05	NA	NA	1.5E-05	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	2.6E-01	NA	NA	2.6E-01
			Fluorene	NA	NA	NA	0.0E+00	Blood	7.4E-03	NA	NA	7.4E-03
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	5.8E-01	NA	NA	5.8E-01
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor	1.0E-06	NA	NA	1.0E-06	Liver	1.2E-03	NA	NA	1.2E-03
			Heptachlor epoxide	3.2E-05	NA	NA	3.2E-05	Liver	7.7E-01	NA	NA	7.7E-01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	2.0E-01	NA	NA	2.0E-01
			RDX	7.4E-07	NA	NA	7.4E-07	Prostrate	6.3E-03	NA	NA	6.3E-03
			Arsenic	5.6E-05	NA	NA	5.6E-05	Skin, Vascular	3.5E-01	NA	NA	3.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	9.6E-01	NA	NA	9.6E-01
			Lead	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	5.3E-01	NA	NA	5.3E-01
			Chemical Total	2.9E-02	0.0E+00	0.0E+00	2.9E-02		2.0E+02	0.0E+00	0.0E+00	2.0E+02
		Exposure Point Total					2.9E-02					2.0E+02
	Exposure Medium Total						2.9E-02					2.0E+02
Medium Total							2.9E-02					2.0E+02
Receptor Total							2.9E-02				Receptor HI Total	2.0E+02

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.5E+02
Total Skin HI Across All Media =	4.2E-01
Total Vascular HI Across All Media =	4.2E-01
Total Gastrointestinal HI Across All Media =	1.2E+00
Total Blood HI Across All Media =	4.6E+01
Total CNS HI Across All Media =	5.8E-01
Total Kidney HI Across All Media =	7.2E-01
Total Longeviety HI Across All Media =	1.2E-01
Total Cholesterol HI Across All Media =	1.2E-01
Total Decreased Body and Organ weight HI Across All Media =	6.8E-01
Total Hair HI Across All Media =	2.8E-02
Total Nasal HI Across All Media =	2.0E-04
Total Immune System HI Across All Media =	2.6E-03
Total Developmental HI Across All Media =	2.6E-04
Total Whole Body HI Across All Media =	3.8E-02
Total Prostrate HI Across All Media =	6.3E-03
Total Mortality HI Across All Media =	2.1E-03
Total Chronic Irritation HI Across All Media =	7.5E-04

TABLE 10.1.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 2	Chromium	NA	NA	NA	0.0E+00	None reported	1.8E-02	NA	1.1E-01	1.3E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.9E-01	NA	1.2E+00	1.4E+00
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.1E-01	0.0E+00	1.3E+00	1.5E+00
		Exposure Point Total					0.0E+00					1.5E+00
	Exposure Medium Total						0.0E+00					1.5E+00
Medium Total							0.0E+00					1.5E+00
Receptor Total							0.0E+00				Receptor HI Total	1.5E+00

Total Kidney HI Across All Media = 1.4E+00

TABLE 10.1.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	5.4E-01	NA	4.8E-02	5.9E-01
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	1.9E-01	NA	2.4E-02	2.1E-01
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.7E-01	NA	1.4E-02	1.8E-01
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	9.5E+01	NA	1.5E+01	1.1E+02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	7.3E+00	NA	3.5E-01	7.6E+00
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	1.3E+01	NA	1.1E+00	1.4E+01
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	4.6E-01	NA	3.8E-02	5.0E-01
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	1.1E-01	NA	1.8E-01	2.9E-01
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	7.8E-02	NA	4.9E-02	1.3E-01
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	1.2E-01	NA	5.2E-02	1.7E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.5E-01	NA	3.3E-03	2.6E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	4.1E-01	NA	5.3E-03	4.2E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	5.4E-01	NA	1.7E-01	7.1E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.2E+02	0.0E+00	1.8E+01	1.4E+02
		Exposure Point Total					0.0E+00					1.4E+02
	Exposure Medium Total						0.0E+00					1.4E+02
Medium Total							0.0E+00					1.4E+02
Receptor Total							0.0E+00				Receptor HI Total	1.4E+02

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.2E+02
Total Skin HI Across All Media =	2.6E-01
Total Vascular HI Across All Media =	2.6E-01
Total Gastrointestinal HI Across All Media =	4.2E-01
Total Blood HI Across All Media =	1.6E+01
Total CNS HI Across All Media =	7.1E-01
Total Kidney HI Across All Media =	2.9E-01
Total Decreased Body and Organ weight HI Across All Media =	1.3E-01

TABLE 10.2.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	1.2E-01	NA	3.2E-02	1.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.8E-01	NA	7.3E-03	1.9E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	6.4E-01	NA	8.5E-05	6.4E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		9.4E-01	0.0E+00	3.9E-02	9.8E-01
		Exposure Point Total					0.0E+00					9.8E-01
	Exposure Medium Total						0.0E+00					9.8E-01
Medium Total							0.0E+00					9.8E-01
Sediment	Sediment	Drainage Features and Ponded Area	Chromium	NA	NA	NA	0.0E+00	None reported	5.2E-02	NA	1.4E+00	1.5E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	8.6E-03	NA	2.3E-01	2.3E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.1E-02	0.0E+00	1.7E+00	1.7E+00
		Exposure Point Total					0.0E+00					1.7E+00
	Exposure Medium Total						0.0E+00					1.7E+00
Medium Total							0.0E+00					1.7E+00
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	1.2E+00	NA	1.1E-01	1.3E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	8.2E-01	NA	1.1E-01	9.4E-01
			Chloroform	NA	NA	NA	0.0E+00	Liver	3.6E-01	NA	3.2E-02	3.9E-01
			Tetrachloroethene	NA	NA	NA	0.0E+00	Liver, whole body	1.1E-01	NA	6.4E-02	1.7E-01
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	3.4E+02	NA	5.9E+01	4.0E+02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	9.1E+01	NA	4.8E+00	9.6E+01
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	1.3E+02	NA	1.1E+01	1.4E+02
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	9.9E-01	NA	8.8E-02	1.1E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	2.5E-01	NA	1.7E-01	4.1E-01
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	7.3E-01	NA	1.3E+00	2.0E+00
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	1.6E+00	NA	1.1E+00	2.7E+00
			Phenanthrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	2.1E+00	NA	1.0E+00	3.2E+00
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	5.5E-01	NA	2.3E-02	5.7E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	9.8E-01	NA	8.9E-03	9.9E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.7E+00	NA	2.4E-02	2.7E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.5E+00	NA	3.4E-01	1.8E+00
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		5.7E+02	0.0E+00	7.9E+01	6.5E+02
		Exposure Point Total					0.0E+00					6.5E+02
	Exposure Medium Total						0.0E+00					6.5E+02
Medium Total							0.0E+00					6.5E+02
Receptor Total							0.0E+00				Receptor HI Total	6.5E+02

TABLE 10.2.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	5.0E+02
Total Skin HI Across All Media =	9.9E-01
Total Vascular HI Across All Media =	9.9E-01
Total Gastrointestinal HI Across All Media =	2.9E+00
Total Blood HI Across All Media =	1.4E+02
Total CNS HI Across All Media =	1.8E+00
Total Kidney HI Across All Media =	2.9E+00
Total Longeviety HI Across All Media =	1.5E-01
Total Cholesterol HI Across All Media =	1.5E-01
Total Decreased Body and Organ weight HI Across All Media =	2.7E+00
Total Whole Body HI Across All Media =	1.7E-01

TABLE 10.2.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	and Ponded Area	Chromium	NA	NA	NA	0.0E+00	None reported	1.2E-01	NA	3.0E+00	3.1E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.0E-02	NA	7.1E-01	7.4E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.5E-01	0.0E+00	3.7E+00	3.8E+00
		Exposure Point Total					0.0E+00					3.8E+00
	Exposure Medium Total						0.0E+00					3.8E+00
Medium Total							0.0E+00					3.8E+00
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	1.8E+00	NA	9.4E-02	1.9E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	6.3E-01	NA	7.4E-02	7.0E-01
			Chloroform	NA	NA	NA	0.0E+00	Liver	5.6E-01	NA	2.8E-02	5.8E-01
			Tetrachloroethene	NA	NA	NA	0.0E+00	Liver, whole body	1.7E-01	NA	5.5E-02	2.2E-01
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	3.2E+02	NA	3.0E+01	3.5E+02
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	2.4E+01	NA	7.0E-01	2.5E+01
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	4.5E+01	NA	2.2E+00	4.7E+01
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	1.5E+00	NA	7.6E-02	1.6E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	1.1E-01	NA	4.2E-02	1.6E-01
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	3.7E-01	NA	3.6E-01	7.3E-01
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	2.6E-01	NA	9.6E-02	3.6E-01
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	3.9E-01	NA	1.0E-01	4.9E-01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	1.2E-01	NA	2.8E-03	1.2E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	8.4E-01	NA	5.6E-03	8.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.4E+00	NA	9.1E-03	1.4E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.8E+00	NA	2.9E-01	2.1E+00
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		4.0E+02	0.0E+00	3.5E+01	4.3E+02
		Exposure Point Total					0.0E+00					4.3E+02
	Exposure Medium Total						0.0E+00					4.3E+02
Medium Total							0.0E+00					4.3E+02
Receptor Total							0.0E+00				Receptor HI Total	4.3E+02

TABLE 10.2.CTE

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	3.7E+02
Total Skin HI Across All Media =	8.5E-01
Total Vascular HI Across All Media =	8.5E-01
Total Gastrointestinal HI Across All Media =	1.4E+00
Total Blood HI Across All Media =	5.0E+01
Total CNS HI Across All Media =	2.1E+00
Total Kidney HI Across All Media =	1.5E+00
Total Decreased Body and Organ weight HI Across All Media =	3.6E-01
Total Whole Body HI Across All Media =	2.2E-01

TABLE 10.3.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	4,4'-DDT	NA	NA	NA	0.0E+00	Liver	2.7E-01	NA	2.3E-02	2.9E-01
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.2E-01	NA	3.3E-03	1.2E-01
			Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	1.1E+00	NA	2.1E-01	1.3E+00
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	3.9E-01	NA	3.3E-02	4.3E-01
			Chromium	NA	NA	NA	0.0E+00	None reported	3.5E-01	NA	3.9E-01	7.3E-01
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	5.8E-01	NA	1.6E-02	5.9E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.7E+00	NA	4.8E-02	1.8E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	2.1E-01	NA	1.5E-01	3.5E-01
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	6.1E-02	NA	4.9E-01	5.5E-01
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	3.1E-01	NA	2.4E-02	3.4E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	6.0E+00	NA	5.6E-04	6.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	1.3E-01	NA	3.8E-03	1.4E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.1E+01	0.0E+00	1.4E+00	1.3E+01
		Exposure Point Total					0.0E+00					1.3E+01
	Exposure Medium Total						0.0E+00					1.3E+01
Medium Total							0.0E+00					1.3E+01
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	NA	NA	NA	0.0E+00	Liver	3.1E-03	NA	1.2E-01	1.2E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	4.2E-02	NA	4.9E-01	5.4E-01
			Chromium	NA	NA	NA	0.0E+00	None reported	4.9E-01	NA	7.6E+01	7.7E+01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	8.0E-02	NA	1.2E+01	1.2E+01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.2E-01	0.0E+00	8.9E+01	8.9E+01
		Exposure Point Total					0.0E+00					8.9E+01
	Exposure Medium Total						0.0E+00					8.9E+01
Medium Total							0.0E+00					8.9E+01

TABLE 10.3.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	2.7E+00	NA	6.7E-01	3.4E+00
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	1.9E+00	NA	7.5E-01	2.7E+00
			Chloroform	NA	NA	NA	0.0E+00	Liver	8.3E-01	NA	2.0E-01	1.0E+00
			Dibromochloromethane	NA	NA	NA	0.0E+00	Liver	1.4E-01	NA	2.5E-02	1.7E-01
			Tetrachloroethene	NA	NA	NA	0.0E+00	Liver, whole body	2.5E-01	NA	3.9E-01	6.4E-01
			Trichloroethene	NA	NA	NA	0.0E+00	Liver	7.9E+02	NA	3.6E+02	1.1E+03
			Vinyl chloride	NA	NA	NA	0.0E+00	Liver	2.1E+02	NA	2.9E+01	2.4E+02
			Xylene, total	NA	NA	NA	0.0E+00	Body Weight, Mortality	1.4E-02	NA	2.4E-02	3.8E-02
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	3.0E+02	NA	7.1E+01	3.7E+02
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	2.3E+00	NA	5.5E-01	2.9E+00
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	5.8E-01	NA	1.0E+00	1.6E+00
			Acenaphthene	NA	NA	NA	0.0E+00	Liver	4.3E-02	NA	1.6E-01	2.0E-01
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	1.7E+00	NA	7.7E+00	9.5E+00
			Fluorene	NA	NA	NA	0.0E+00	Blood	4.8E-02	NA	2.4E-01	2.9E-01
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	3.8E+00	NA	6.7E+00	1.0E+01
			Heptachlor epoxide	NA	NA	NA	0.0E+00	Liver	5.0E+00	NA	6.2E+00	1.1E+01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	1.3E+00	NA	4.8E-02	1.3E+00
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.3E+00	NA	4.1E-02	2.3E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	6.3E+00	NA	1.1E-01	6.4E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	3.5E+00	NA	1.6E+00	5.0E+00
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.3E+03	0.0E+00	4.8E+02	1.8E+03
		Exposure Point Total					0.0E+00					1.8E+03
	Exposure Medium Total						0.0E+00					1.8E+03
	Exposure Medium Total						0.0E+00					1.8E+03
Medium Total							0.0E+00					1.8E+03
Receptor Total							0.0E+00				Receptor HI Total	1.9E+03

TABLE 10.3.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.4E+03
Total Skin HI Across All Media =	3.6E+00
Total Vascular HI Across All Media =	3.6E+00
Total Gastrointestinal HI Across All Media =	8.8E+00
Total Blood HI Across All Media =	3.8E+02
Total CNS HI Across All Media =	5.5E+00
Total Kidney HI Across All Media =	2.8E+01
Total Longeviety HI Across All Media =	1.3E+00
Total Cholesterol HI Across All Media =	1.3E+00
Total Decreased Body and Organ weight HI Across All Media =	1.1E+01
Total Hair HI Across All Media =	3.4E-01
Total Whole Body HI Across All Media =	6.4E-01
Total Mortality HI Across All Media =	3.8E-02

TABLE 10.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	Dibromochloromethane	2.0E-05	NA	8.9E-07	2.1E-05	Liver	NA	NA	NA	0.0E+00
			Methylene chloride	1.0E-06	NA	2.6E-08	1.1E-06	Liver	NA	NA	NA	0.0E+00
			Tetrachloroethene	1.1E-04	NA	4.5E-05	1.6E-04	Liver, whole body	NA	NA	NA	0.0E+00
			Trichloroethene	3.1E-03	NA	3.6E-04	3.4E-03	Liver	NA	NA	NA	0.0E+00
			Vinyl chloride	1.3E-02	NA	4.4E-04	1.3E-02	Liver	NA	NA	NA	0.0E+00
			cis-1,3-Dichloropropene	1.2E-06	NA	4.5E-08	1.3E-06	Chronic irritation	NA	NA	NA	0.0E+00
			Carbazole	2.6E-06	NA	1.6E-06	4.2E-06	NA	NA	NA	NA	0.0E+00
			Heptachlor	8.4E-07	NA	2.7E-07	1.1E-06	Liver	NA	NA	NA	0.0E+00
			Heptachlor epoxide	5.8E-06	NA	1.8E-06	7.6E-06	Liver	NA	NA	NA	0.0E+00
			Arsenic	4.7E-05	NA	4.0E-07	4.8E-05	Skin, Vascular	NA	NA	NA	0.0E+00
			Chemical Total	1.6E-02	0.0E+00	8.5E-04	1.7E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					1.7E-02					0.0E+00
	Exposure Medium Total						1.7E-02					0.0E+00
Medium Total							1.7E-02					0.0E+00
Receptor Total							1.7E-02				Receptor HI Total	0.0E+00

* Surface soil & subsurface soil combined.

TABLE 10.4.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Drainage Features and Ponded Area	Vinyl chloride	1.6E-06	NA	4.6E-05	4.8E-05	Liver	NA	NA	NA	0.0E+00
			Benzo(a)anthracene	1.8E-07	NA	6.8E-06	7.0E-06	NA	NA	NA	NA	0.0E+00
			Benzo(a)pyrene	1.5E-06	NA	5.7E-05	5.9E-05	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.1E-07	NA	4.2E-06	4.3E-06	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	4.2E-07	NA	1.6E-05	1.7E-05	NA	NA	NA	NA	0.0E+00
			Arsenic	2.3E-06	NA	2.1E-05	2.3E-05	Skin, Vascular	NA	NA	NA	0.0E+00
			Chemical Total	6.1E-06	0.0E+00	1.5E-04	1.6E-04		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					1.6E-04					0.0E+00
	Exposure Medium Total						1.6E-04					0.0E+00
Medium Total							1.6E-04					0.0E+00
Groundwater	Shallow Groundwater	Tap Water	Dibromochloromethane	5.5E-05	NA	3.7E-06	5.9E-05	Liver	NA	NA	NA	0.0E+00
			Methylene chloride	2.9E-06	NA	1.1E-07	3.0E-06	Liver	NA	NA	NA	0.0E+00
			Tetrachloroethene	3.1E-04	NA	1.8E-04	5.0E-04	Liver, whole body	NA	NA	NA	0.0E+00
			Trichloroethene	1.4E-02	NA	2.4E-03	1.7E-02	Liver	NA	NA	NA	0.0E+00
			Vinyl chloride	1.9E-01	NA	1.1E-02	2.0E-01	Liver	NA	NA	NA	0.0E+00
			cis-1,3-Dichloropropene	3.4E-06	NA	1.8E-07	3.6E-06	Chronic irritation	NA	NA	NA	0.0E+00
			Carbazole	6.6E-05	NA	6.1E-05	1.3E-04	NA	NA	NA	NA	0.0E+00
			Heptachlor	4.3E-06	NA	2.0E-06	6.3E-06	Liver	NA	NA	NA	0.0E+00
			Heptachlor epoxide	1.4E-04	NA	6.5E-05	2.0E-04	Liver	NA	NA	NA	0.0E+00
			RDX	3.2E-06	NA	9.0E-09	3.2E-06	Prostrate	NA	NA	NA	0.0E+00
			Arsenic	2.4E-04	NA	1.9E-06	2.4E-04	Skin, Vascular	NA	NA	NA	0.0E+00
			Chemical Total	2.0E-01	0.0E+00	1.3E-02	2.2E-01		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.2E-01					0.0E+00
	Exposure Medium Total						2.2E-01					0.0E+00
Medium Total							2.2E-01					0.0E+00
Receptor Total							2.2E-01				Receptor HI Total	0.0E+00

* Surface soil & subsurface soil combined.

TABLE 10.4.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Water in Excavation	Trichloroethene	NA	NA	1.2E-05	1.2E-05	Liver	NA	NA	1.1E+01	1.1E+01
			Vinyl chloride	NA	NA	7.6E-06	7.6E-06	Liver	NA	NA	2.5E-01	2.5E-01
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	NA	NA	1.3E-01	1.3E-01
			Chemical Total	0.0E+00	0.0E+00	2.0E-05	2.0E-05		0.0E+00	0.0E+00	1.2E+01	1.2E+01
		Exposure Point Total					2.0E-05					1.2E+01
	Exposure Medium Total						2.0E-05					1.2E+01
Groundwater	Air	Excavation Pit	Trichloroethene	NA	2.0E-06	NA	2.0E-06	Nervous System, Eyes	NA	1.2E-01	NA	1.2E-01
			Chemical Total	0.0E+00	2.0E-06	0.0E+00	2.0E-06		0.0E+00	1.2E-01	0.0E+00	1.2E-01
		Exposure Point Total					2.0E-06					1.2E-01
	Exposure Medium Total						2.0E-06					1.2E-01
Medium Total							2.2E-05					1.2E+01
Receptor Total							2.7E+01				Receptor HI Total	1.2E+01

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.1E+01
Total CNS HI Across All Media =	1.2E-01
Total Kidney HI Across All Media =	1.3E-01
Total Nervous System HI Across All Media =	1.2E-01
Total Eyes HI Across All Media =	1.2E-01

TABLE 10.5.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Antimony	NA	NA	NA	0.0E+00	Blood	2.8E-01	NA	5.6E-02	3.4E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.2E-01	NA	6.5E-03	2.2E-01
			Vanadium	NA	NA	NA	0.0E+00	Lifetime	1.1E-01	NA	7.5E-05	1.1E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.0E-01	0.0E+00	6.3E-02	6.7E-01
		Exposure Point Total					0.0E+00					6.7E-01
	Exposure Medium Total						0.0E+00					6.7E-01
Medium Total							0.0E+00					6.7E-01
Groundwater	Shallow Groundwater	Water in Excavation	Tetrachloroethene	NA	NA	2.4E-06	2.4E-06	Liver, whole body	NA	NA	3.1E-03	3.1E-03
			Trichloroethene	NA	NA	3.9E-05	3.9E-05	Liver	NA	NA	3.5E+01	3.5E+01
			Vinyl chloride	NA	NA	8.6E-05	8.6E-05	Liver	NA	NA	2.8E+00	2.8E+00
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	NA	NA	8.9E-01	8.9E-01
			2-Methylnaphthalene	NA	NA	NA	0.0E+00	Lung	NA	NA	1.2E-01	1.2E-01
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	NA	NA	6.6E-01	6.6E-01
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	NA	NA	8.1E-01	8.1E-01
			Heptachlor epoxide	NA	NA	8.4E-07	8.4E-07	Liver	NA	NA	5.0E-01	5.0E-01
			Chemical Total	0.0E+00	0.0E+00	1.3E-04	1.3E-04		0.0E+00	0.0E+00	4.1E+01	4.1E+01
		Exposure Point Total					1.3E-04					4.1E+01
	Exposure Medium Total						1.3E-04					4.1E+01
Groundwater	Air	Water Vapors at Excavation Pit	Trichloroethene	NA	1.3E-05	NA	1.3E-05	Nervous System, Eyes	NA	7.7E-01	NA	7.7E-01
			Vinyl chloride	NA	4.6E-06	NA	4.6E-06	Liver	NA	7.6E-01	NA	7.6E-01
			Naphthalene	NA	NA	NA	0.0E+00	Respiratory System	NA	2.2E+00	NA	2.2E+00
			Chemical Total	0.0E+00	1.8E-05	0.0E+00	1.8E-05		0.0E+00	3.7E+00	0.0E+00	3.7E+00
		Exposure Point Total					1.8E-05					3.7E+00
	Exposure Medium Total						1.8E-05					3.7E+00
Medium Total							1.5E-04					4.4E+01
Receptor Total							1.5E-04				Receptor HI Total	4.5E+01

TABLE 10.5.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	3.9E+01
Total Gastrointestinal HI Across All Media =	2.2E-01
Total Blood HI Across All Media =	1.2E+00
Total CNS HI Across All Media =	7.7E-01
Total Kidney HI Across All Media =	7.7E-01
Total Decreased Body and Organ weight HI Across All Media =	8.1E-01
Total Whole Body HI Across All Media =	3.1E-03
Total Respiratory System HI Across All Media =	2.2E+00
Total Lifetime HI Across All Media =	1.1E-01
Total Eyes HI Across All Media =	7.7E-01

TABLE 10.5.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	3.6E-01	NA	NA	3.6E-01
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	1.3E-01	NA	NA	1.3E-01
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.1E-01	NA	NA	1.1E-01
			Dibromochloromethane	4.1E-06	NA	NA	4.1E-06	Liver	1.9E-02	NA	NA	1.9E-02
			Tetrachloroethene	2.3E-05	NA	NA	2.3E-05	Liver, whole body	3.3E-02	NA	NA	3.3E-02
			Trichloroethene	6.4E-04	NA	NA	6.4E-04	Liver	6.4E+01	NA	NA	6.4E+01
			Vinyl chloride	1.3E-03	NA	NA	1.3E-03	Liver	4.9E+00	NA	NA	4.9E+00
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	8.9E+00	NA	NA	8.9E+00
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	3.1E-01	NA	NA	3.1E-01
			Heptachlor epoxide	1.2E-06	NA	NA	1.2E-06	Liver	7.8E-02	NA	NA	7.8E-02
			Arsenic	9.8E-06	NA	NA	9.8E-06	Skin, Vascular	1.7E-01	NA	NA	1.7E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.8E-01	NA	NA	2.8E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	3.6E-01	NA	NA	3.6E-01
			Chemical Total	2.0E-03	0.0E+00	0.0E+00	2.0E-03		7.9E+01	0.0E+00	0.0E+00	7.9E+01
		Exposure Point Total					2.0E-03					7.9E+01
	Exposure Medium Total						2.0E-03					7.9E+01
Medium Total							2.0E-03					7.9E+01
Receptor Total							2.0E-03				Receptor HI Total	7.9E+01

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	6.9E+01
Total Skin HI Across All Media =	1.7E-01
Total Vascular HI Across All Media =	1.7E-01
Total Gastrointestinal HI Across All Media =	2.8E-01
Total Blood HI Across All Media =	9.6E+00
Total CNS HI Across All Media =	3.6E-01
Total Whole Body HI Across All Media =	3.3E-02

TABLE 10.6.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 2 Expanded Remedial Investigation Report
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	At Site 2	Antimony	NA	NA	NA	0.0E+00	Longevity, Blood Glucose, and Cholesterol	8.5E-02	NA	3.7E-02	1.2E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.3E-01	NA	8.6E-03	1.4E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	4.6E-01	NA	1.0E-04	4.6E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.7E-01	0.0E+00	4.6E-02	7.2E-01
		Exposure Point Total					0.0E+00					7.2E-01
	Exposure Medium Total						0.0E+00					7.2E-01
Medium Total							0.0E+00					7.2E-01
Groundwater	Shallow Groundwater	Tap Water	1,1,2-Trichloroethane	NA	NA	NA	0.0E+00	Blood	4.2E-01	NA	NA	4.2E-01
			1,1-Dichloroethene	NA	NA	NA	0.0E+00	Liver	2.9E-01	NA	NA	2.9E-01
			Chloroform	NA	NA	NA	0.0E+00	Liver	1.3E-01	NA	NA	1.3E-01
			Dibromochloromethane	1.3E-05	NA	NA	1.3E-05	Liver	2.2E-02	NA	NA	2.2E-02
			Tetrachloroethene	7.4E-05	NA	NA	7.4E-05	Liver, whole body	3.8E-02	NA	NA	3.8E-02
			Trichloroethene	3.4E-03	NA	NA	3.4E-03	Liver	1.2E+02	NA	NA	1.2E+02
			Vinyl chloride	2.5E-02	NA	NA	2.5E-02	Liver	3.3E+01	NA	NA	3.3E+01
			cis-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	4.5E+01	NA	NA	4.5E+01
			trans-1,2-Dichloroethene	NA	NA	NA	0.0E+00	Blood	3.5E-01	NA	NA	3.5E-01
			Carbazole	1.5E-05	NA	NA	1.5E-05	NA	NA	NA	NA	0.0E+00
			Dibenzofuran	NA	NA	NA	0.0E+00	Kidney	2.6E-01	NA	NA	2.6E-01
			Naphthalene	NA	NA	NA	0.0E+00	Decreased Body Weight	5.8E-01	NA	NA	5.8E-01
			Heptachlor	1.0E-06	NA	NA	1.0E-06	Liver	1.2E-03	NA	NA	1.2E-03
			Heptachlor epoxide	3.2E-05	NA	NA	3.2E-05	Liver	7.7E-01	NA	NA	7.7E-01
			2,6-Dinitrotolune	NA	NA	NA	0.0E+00	NA	2.0E-01	NA	NA	2.0E-01
			Arsenic	5.6E-05	NA	NA	5.6E-05	Skin, Vascular	3.5E-01	NA	NA	3.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	9.6E-01	NA	NA	9.6E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	5.3E-01	NA	NA	5.3E-01
			Chemical Total	2.9E-02	0.0E+00	0.0E+00	2.9E-02		2.0E+02	0.0E+00	0.0E+00	2.0E+02
		Exposure Point Total					2.9E-02					2.0E+02
	Exposure Medium Total						2.9E-02					2.0E+02
Medium Total							2.9E-02					2.0E+02
Receptor Total							2.9E-02				Receptor HI Total	2.0E+02

TABLE 10.6.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 2 Expanded Remedial Investigation Report

St. Juliens Creek Annex

Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

* Surface soil & subsurface soil combined.

Total Liver HI Across All Media =	1.5E+02
Total Skin HI Across All Media =	3.5E-01
Total Vascular HI Across All Media =	3.5E-01
Total Gastrointestinal HI Across All Media =	1.1E+00
Total Blood HI Across All Media =	4.6E+01
Total CNS HI Across All Media =	5.3E-01
Total Kidney HI Across All Media =	7.2E-01
Total Longeviety HI Across All Media =	1.2E-01
Total Cholesterol HI Across All Media =	1.2E-01
Total Decreased Body and Organ weight HI Across All Media =	5.8E-01
Total Whole Body HI Across All Media =	3.8E-02

Table 11.1 - Calculations of Blood Lead Concentrations (PbBs), Surface Soil, Trespasser

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/05

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1, GSDi = Hom	Using Equation 1, GSDi = Het	Using Equation 2, GSDi = Hom	Using Equation 2, GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	441.8	441.8	441.8	441.8
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	52	52	52	52
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**1.7**	**1.9**	**1.7**	**1.9**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**5.0**	**6.6**	**5.0**	**6.6**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**0.5%**	**1.6%**	**0.5%**	**1.6%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Table 11.2 - Calculations of Blood Lead Concentrations (PbBs), Surface Soil, Landscape

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/05

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1, GSDi = Hom	Using Equation 1, GSDi = Het	Using Equation 2, GSDi = Hom	Using Equation 2, GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	441.8	441.8	441.8	441.8
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	26	26	26	26
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**1.6**	**1.8**	**1.6**	**1.8**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**4.8**	**6.3**	**4.8**	**6.3**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**0.4%**	**1.4%**	**0.4%**	**1.4%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Table 11.3 - Calculations of Blood Lead Concentrations (PbBs), Soil, Future Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/05

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1, GSDi = Hom	Using Equation 1, GSDi = Het	Using Equation 2, GSDi = Hom	Using Equation 2, GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	661	661	661	661
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**2.5**	**2.7**	**2.5**	**2.7**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**7.5**	**9.4**	**7.5**	**9.4**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**2.1%**	**4.3%**	**2.1%**	**4.3%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil