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NO FURTHER RESPONSE ACTION PLANNED DECISION DOCUMENT

SITE 9 - TRANSFORMER STORAGE AREA

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE

CONTRACT TASK ORDER 0104

December 17, 1999

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

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DECLARATION

SITE NAME AND LOCATION

Site 9 – Transformer Storage Area

STATEMENT OF BASIS

This No Further Response Action Plan (NFRAP) decision is based on the results of the Initial Assessment Study (1984) and the Confirmation Study Step 1A (Verification), Round One (June 1986).

DESCRIPTION OF THE SELECTED REMEDY

Based on the results of previous field investigations and the toxicological evaluation, it has been determined that no significant risk or threat to public health exists. No further action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, is required.

DECLARATION

This decision document represents the selected action for this site developed in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Contingency Plan (NCP). It has been determined that the selected remedy of no further action is protective of human health, attains federal and state requirements that are applicable or relevant and appropriate, and is cost effective. Based on contaminant levels detected at the site and the low probability for contaminant migration, ecological risks are not anticipated. The statutory preference for further treatment is not satisfied because further treatment was not found to be necessary. The primary contaminant of concern (polychlorinated biphenyls [PCBs]) were detected at levels below regulatory standards, and contaminant levels at the site have been determined to present no significant threat to human health; thus, no treatment is necessary.

_____ Date:_____

S.W. Johnson, CAPT, CEC, USN
Regional Engineer
By direction of the Commander,
Navy Region Mid-Atlantic

1.0 INTRODUCTION

This document presents the No Further Response Action Planned (NFRAP) Decision Document for Site 9 at the Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Annex Site (CAX). This NFRAP was prepared by Baker Environmental, Inc. (Baker), under contract to the Atlantic Division, Naval Facilities Engineering Command (LANTDIV) under the Comprehensive Long-Term Environmental Action – Navy (CLEAN II) Contract N62470-95-D-6007, Contract Task Order (CTO) 0104.

1.1 Site Location and Description

Cheatham Annex, located in Williamsburg, York County, Virginia, was established in June 1943 as a satellite unit of the Naval Supply Depot to provide bulk storage facilities. Since 1943, Cheatham Annex has been used for receiving, storing, packaging, and shipping materials to federal facilities on the east coast and to major distribution centers in Europe. In July 1987, CAX was designated the Hampton Roads Navy Recreational Complex. Today the mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel. CAX currently operates under the Naval Weapons Station (WPNSTA) Yorktown. Prior to October 1998, CAX operated under the Fleet and Industrial Supply Center (FISC).

Site 9-Transformer Storage Area is located in the northern portion of CAX, approximately 2,000 feet north of Sanda Avenue along B Street. The site is approximately 7,000 square feet in size and located adjacent to the northwest corner of Building CAD 16 as shown on Figure 1. Figure 2 depicts the Site Plan for Site 9 and also shows soil sampling locations, which are discussed in the following subsections. The site is bound by a chain-link fence on two sides, by Building CAD 16 on one side, and by a paved storage area on one side. A photograph of Site 9 (from September 1997) is provided on Figure 3.

1.2 Site History and Enforcement Activities

Between 1973 and 1980, electrical transformers, some of which contained polychlorinated biphenyls (PCBs), were reported to have been stored at Site 9. These transformers were awaiting repair or disposal. Between six and 30 transformers were stored at the site at a time. The storage area surface was exposed soil enclosed by an earthen containment wall. Information regarding the number of leaking transformers, the volume of PCB oil stored or spilled is not known. If the transformers had small leaks, the total volume of transformer oil leaked was likely to be less than one gallon. The total volume could be much greater if oil was spilled (as opposed to leaked). Transformers were no longer stored at the site after 1980 and the area was graded and covered with gravel (NEESA, 1984).

Site 9, Transformer Storage Area, was included in an Initial Assessment Study (IAS) of Naval Supply Center, Cheatham Annex and Yorktown Fuels Division (NEESA, 1984). A total of 12 sites were considered in the study. Site 9 was identified as a potentially contaminated site based on information from historical records, aerial photographs, field inspections, and personnel interviews. Sites were evaluated for the type of contamination, migration pathways, and pollutant receptors. Based on the results of the IAS, Site 9 was recommended for confirmation study.

The Confirmation Studies were conducted by Dames & Moore in two rounds. A Confirmation Study Step 1A (Verification), Round One was conducted at Site 9, NSC Cheatham Annex, in 1986. The Round Two Confirmation Study did not include Site 9. Soil samples were collected from thirteen different locations at Site 9 (Figure 2), and analyzed for polychlorinated biphenyls (PCBs) and 2,3,7,8-

tetrachlorodibenzo-p-dioxin (TCDD). Nine samples were within the fenced perimeter near building 16, whereas two sets of two samples were taken outside the fenced perimeter along drainage pathways from the site. The results of these analyses are presented in Table 1. The depths of the soil samples are not known.

Aroclor-1260 was the only PCB detected in the soil samples. It was detected in eight of thirteen samples at a maximum detected concentration of 321 micrograms per kilogram (μg/kg). (One μg/kg is equivalent to 1 part per billion [ppb].) Aroclor-1260 was detected in four of the nine samples within the fenced perimeter at concentrations of 41 μg/kg, 35 μg/kg, 22 μg/kg, and 195 μg/kg. The four samples collected from outside the fenced perimeter contained 21 μg/kg, 29 μg/kg, 321 μg/kg, and 82 μg/kg of Aroclor-1260. TCDD was not detected in any samples.

Based on the results of Round One of the Confirmation Study, it was concluded that spill contents had migrated off site via local drainage routes. However, no additional sampling or actions were recommended due to the low levels of the detections. All detections fall below the Toxic Substances Control Act [TSCA] action level of 1.0 part per million (ppm) or 1,000 ppb. (One ppm is equivalent to 1 milligram per kilogram [mg/kg].) This action level is defined in 40 CFR Part 761.61 as the lowest action level for the clean up of PCBs in soils (specified for soils in high occupancy areas).

1.3 Community Participation

Community involvement for Site 9 has occurred through the addition of NSC Cheatham Annex to the Naval Weapons Station Yorktown Restoration Advisory Board (RAB) in 1999. RAB meetings are advertised to the public and held on a quarterly basis. The RAB is made up of government officials and local residents. Also, the Administrative Record File for NSC Cheatham Annex is available to the public at the Gus Grissom Library in Newport News, Virginia. Documents related to Site 9 in the Administrative Record for Cheatham Annex include the IAS, the Confirmation Study reports, and the Site Management Plan for Cheatham Annex. Upon finalization, the NFRAP will be included in the Administrative Record File.

2.0 SUMMARY OF SITE CHARACTERISTICS

2.1 Geology, Physiography, and Climatology

CAX is located in Williamsburg, Virginia, on the York-James Peninsula, which is an embayed portion of the Atlantic Coastal Plain physiographic province (Teifke, 1973). This elongated peninsula trends northwest-southeast and occupies an area of approximately 1,752 square miles. The peninsula is roughly bordered to the southwest by the James River, to the northeast by the York River, and to the southeast by the confluence of the James River and the Chesapeake Bay. At CAX, the peninsula is approximately 6 miles wide.

The topography at CAX is characterized by gently rolling terrain dissected by ravines and stream valleys trending predominantly northeastward toward the York River. Ground elevations at CAX vary from sea level along the eastern boundary, which borders the York River, to a maximum elevation of approximately 50 ft above mean sea level (msl) on a few scattered hills in the western portion of the Activity. Valleys as deep as 40 feet, with steep slopes (slopes exceeding 1:1) occur along the major creeks draining CAX.

The climate of the Virginia Peninsula is influenced by the moderating effects of the Atlantic Ocean. This results in mild winters and long, warm summers. High humidity frequently occurs along the coast and less frequently inland. Ground fog is frequent in the late summer, especially during the early morning hours. Freezing temperatures occur intermittently from October through March. Average monthly temperatures in the area range from approximately 38.8°F in January to 77.4°F in July.

Because of its location near the coastline, York County is subject to easterly storms throughout late summer and early fall, causing high tides and flooding. Intense hurricanes occasionally sweep the coast. Winter is characterized by storms that move along the eastern seaboard. The storms from the north are associated with high winds and precipitation occasionally in the form of snow, ice pellets, or rain; however, the snow is seldom prolonged or heavy. The average annual precipitation is 44.15 inches, with the summer months being the wettest and the winter months being the driest.

Spring is a period of contrasting weather, particularly during March. Spring and autumn are periods of frost. Summer is warm and humid with occasional showers and afternoon thunderstorms. Autumn is a season of comfortable temperatures (average temperature 60° to 81°F) and generally pleasant weather.

Winds are highly variable in the area of CAX. Prevailing winds are usually from the south-southwest, but north-northeasterly winds are common in some months. Onshore winds predominate during the spring and summer.

The Atlantic Coastal Plain physiographic province is underlain by unconsolidated sediments of Quaternary, Tertiary, and Cretaceous ages that dip gently to the southeast and have a combined thickness of approximately 1,900 ft in the vicinity of CAX (Teifke, 1973).

Most of the surficial unconsolidated sediment at CAX has been mapped as the Shirley Formation of the Pleistocene series (Mixon et. al., 1989). This formation is composed of gravel, sand, silt, clay, and peat deposited in river and estuarine environments. Its thickness is estimated to vary from 0- to 80-ft. The Chuckatuck Formation of Pleistocene age underlies the Shirley Formation and is described as sand, silt, and clay with minor amounts of peat deposited in bay environments. The Chuckatuck Formation rests on the top of the Windsor Formation, also of Pleistocene age. This formation is composed of a series of sand and silt deposited in marine and estuarine environments. Its thickness is estimated to vary from 0- to 40-ft.

The Bacons Castle Formation of Pliocene age underlies the Windsor Formation and is described as a clayey silt and silty fine-grained sand. The Bacons Castle Formation rests unconformably on the weathered top of the Upper Yorktown Formation, also of Pliocene age. The presence of calcite-cemented shells and shell fragments is characteristic of the upper portion of the Yorktown Formation.

2.2 Soils

According to the Soil Survey for CAX, soils in the vicinity of Site 9 have been mapped as Urban Land. This group comprises approximately 14 percent of the total land at CAX and is designated for areas in which 85 percent or more of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. Slopes in these areas range from approximately 0 to 15 percent, with the surface in the vicinity of Site 9 being very flat. Due to the variability of this unit, the survey does not provide descriptions of the significant soil characteristics.

2.3 Groundwater

The Atlantic Coastal Plain sediments are the most important source of potable water in the region. Recharge to the groundwater system is derived from precipitation. Approximately 50 percent of the precipitation is lost to evapotranspiration. The remaining 50 percent either results in surface runoff, or infiltrates and is introduced into the groundwater regime. Recharge of aquifers may occur at the surface near outcrop zones, or from downward migration from overlying strata.

The shallow aquifer system in York County is comprised of the following six units: (1) the Columbia aquifer, (2) the Cornwallis Cave confining unit, (3) the Cornwallis Cave aquifer, (4) the Yorktown confining unit, (5) the Yorktown-Eastover aquifer, and (6) the Eastover-Calvert confining unit (Brockman et. al., 1997). Hydrogeologic units are recognized only where they are saturated (for aquifers) or confining (for confining units). For example, although the strata that typically comprise a given aquifer (when saturated) are present, the hydrogeologic unit does not exist in areas where the unit is not saturated. Vertical migration of groundwater is typically impeded in areas where the confining units are continuous, relatively thick, and comprised primarily of low-permeability strata such as clay or silt.

It is anticipated that the Cornwallis Cave aquifer is the shallow aquifer underlying Site 9. Depth to groundwater is estimated to be approximately 20 feet below ground surface based on interpretation of topographic information. This unit is comprised of sand with varying amounts of clay and silt. Marine shell fragments are also common. Dissolution cavities are present in portions of York County.

2.4 Surface Water

Cheatham Annex is bound on the west by Cheatham Pond, on the north by the mouth of Queen Creek, on the east by the York River, and on the south by King Creek. In 1943, dams were constructed to create the 108-acre Cheatham Pond from the tidal Queen Creek, as well as the 43-acre Penniman Lake a tidally influenced area near King Creek. Jones Pond, a 69 acre freshwater nontidal pond, was formed by damming a portion of the Cub Creek watershed. It is located in the northwestern section of Cheatham Annex and is enclosed by several wooded ravines. Numerous small creeks flow through wooded ravines throughout Cheatham Annex, and drain into tidal creeks that join the York River. In most areas, forests extend to the marsh and lake margins. The tributaries of Cheatham Annex all drain into the York River. The Walt Feurer Youth Pond (two acres) and the Cat Fish Pond (one acre) are shallow, warm water, man-made ponds. (Department of the Navy [DON], 1998).

2.5 Receptors

This facility remains active, and there are Site personnel working on the property. Current human receptors are limited to on-site workers. The occurrence of trespassing on Site 9 is highly unlikely since the majority of the site is bound by a chain link fence on two sides, by Building CAD 16 on one side, and by a paved storage area on one side. In addition, the site is located within CAX's Warehouse Area, which is the most secure portion of the Activity. The Warehouse Area is off limits to unauthorized personnel and is enclosed by a perimeter fence as shown in Figure 1. Future adult and child residents and future construction workers are also considered as potential receptors. Although Site 9 is located in an industrial area and will likely remain so in the future, the potential future receptors are considered as a conservative measure.

According to the "Inventory of Rare, Threatened and Endangered Species of the NSC Cheatham Annex", there were no endangered or threatened flora or fauna, or any Special Interest areas identified on or adjacent to Site 9.

3.0 RISK ASSESSMENT

Based on information available for the physical features, site setting, historical site activities, current and expected land uses, and areas surrounding Site 9, a human health risk assessment was performed for the following potential human receptor scenarios:

- Current on-site workers
- Future adult and young child (ages 1 through 6) on-site residents
- Future construction workers.

Based on the analytical results from the soil samples collected during Round One of the Confirmation Study, chemicals of potential concern (COPCs) were selected based on comparison to USEPA Region III Risk-Based Concentrations (RBCs) for residential soil (USEPA, 1999). One COPC, Aroclor-1260, was retained for soil.

3.1 Soils

Potential human health risks due to contamination at Site 9 were evaluated for direct contact exposure to soils. For the three potential receptor groups, the exposure pathways examined in this evaluation were accidental ingestion of soil, dermal contact with soil, and inhalation of fugitive dusts. This assessment was performed in accordance with the USEPA document "Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual: Part A" (USEPA, 1989) and the most recent updates. Risk assessment tables completed in the RAGS Part D reporting format (USEPA,1998) can be found in Attachment A.

Incremental Lifetime Cancer Risk (ILCR) values were calculated for direct contact soil exposures by the three potential human receptor groups. The carcinogenic COPC evaluated in this scenario was Aroclor-1260. The exposure point concentration for Aroclor-1260 used in the calculation of intake and dermally absorbed dose was the 95 percent Upper Confidence Limit (UCL) of the lognormal distribution of the soil data. This value is the conservative estimate of the average concentration that best represents reasonable maximum exposure (USEPA, 1992).

The total site ILCR value (summed over all pathways) for on-site workers was 2.4×10^{-07}, which is below USEPA's acceptable target risk range of 1×10^{-06} to 1×10^{-04}. The total site ILCR values calculated for future adult (6.1×10^{-07}) and child (3.9×10^{-07}) residents and the future construction worker (1.7×10^{-08}) were also below USEPA's acceptable target risk range.

Noncarcinogenic hazard index (HI) values were not calculated since there are no noncarcinogenic toxicity criteria for Aroclor-1260.

The ILCR values calculated for the current on-site workers, future residents, and future construction workers are summarized in Table 2. More detailed information (e.g., COPC selection, exposure point concentration, risk calculations) can be found in Attachment A.

3.2 Summary

Based on the results of the human health risk assessment, all ILCRs estimated for potential exposures to the soil COPC, Aroclor-1260, were below USEPA's acceptable target risk range of 1×10^{-06} to 1×10^{-04}. There were no noncarcinogenic health hazards calculated for exposure to Site 9 soil since noncarcinogenic toxicity criteria do not exist for Aroclor-1260.

Based on contaminant levels detected at the site and the low probability for contaminant migration, ecological risks are not anticipated. In addition, there is no evidence of endangered or threatened flora or fauna, or special interest areas on or adjacent to Site 9. As the PCB concentrations are below the TSCA residential limit of 1.0 ppm, unrestricted residential occupation of the area should be allowed.

4.0 DESCRIPTION OF THE NFRAP ALTERNATIVE

Based on the results of the IAS, the Confirmation Study, and the toxicological evaluation, it has been determined that no evidence exists to suggest that the soil at Site 9 has been significantly contaminated from the previous transformer storage activities. Therefore, current site conditions and the results of the environmental sampling indicate that no further action is warranted at Site 9.

5.0 REFERENCES

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TABLES

TABLE 1

SUMMARY OF CONFIRMATIONS STUDY ANALYTICAL RESULTS
NFRAP DECISION DOCUMENT - SITE 9
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE

Sample ID	9S01 ug/kg	9S02 ug/kg	9S03 ug/kg	9S04 ug/kg	9S05 ug/kg	9S06 ug/kg	9S07 ug/kg	9S08 ug/kg	9S09 ug/kg	9S10 ug/kg	9S11 ug/kg	9S12 ug/kg	9S13 ug/kg
PCBs													
Aroclor 1016	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aroclor 1221	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aroclor 1232	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aroclor 1242	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aroclor 1248	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aroclor 1254	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aroclor 1260	10 U	10 U	10 U	41	35	22	10 U	10 U	195	21	29	321	82
DIOXINS													
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U

Notes:

1) ug/kg = micrograms per kilogram
2) U = Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
3) Samples collected during the Confirmation Study Step 1A (verification), Round One (Dames and Moore, 1986)

TABLE 2

TOTAL SITE INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND
HAZARD INDICIES (HIs) FOR CURRENT AND FUTURE POTENTIAL HUMAN RECEPTORS
NFRAP DECISION DOCUMENT - SITE 9
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE

Receptors [1]	Adult		Young Child		Total Lifetime ILCR
	Total ILCR	Total HI	Total ILCR	Total HI	Total ILCR
Current On-Site Workers	2.4E-07	0.00	NA	NA	NA
Future Adult Construction / Utility Workers	1.7E-08	0.00	NA	NA	NA
Future Adult and Young Child On-site Residents - RME	6.1E-07	0.00	3.9E-07	0.00	1.0E-06

Notes:

ILCR = Incremental Lifetime Cancer Risk
HI = Hazard Index
NA = Not Applicable
RME = Reasonable Maximum Exposure
(1) All receptors were evaluated for exposures to surface soil

FIGURES

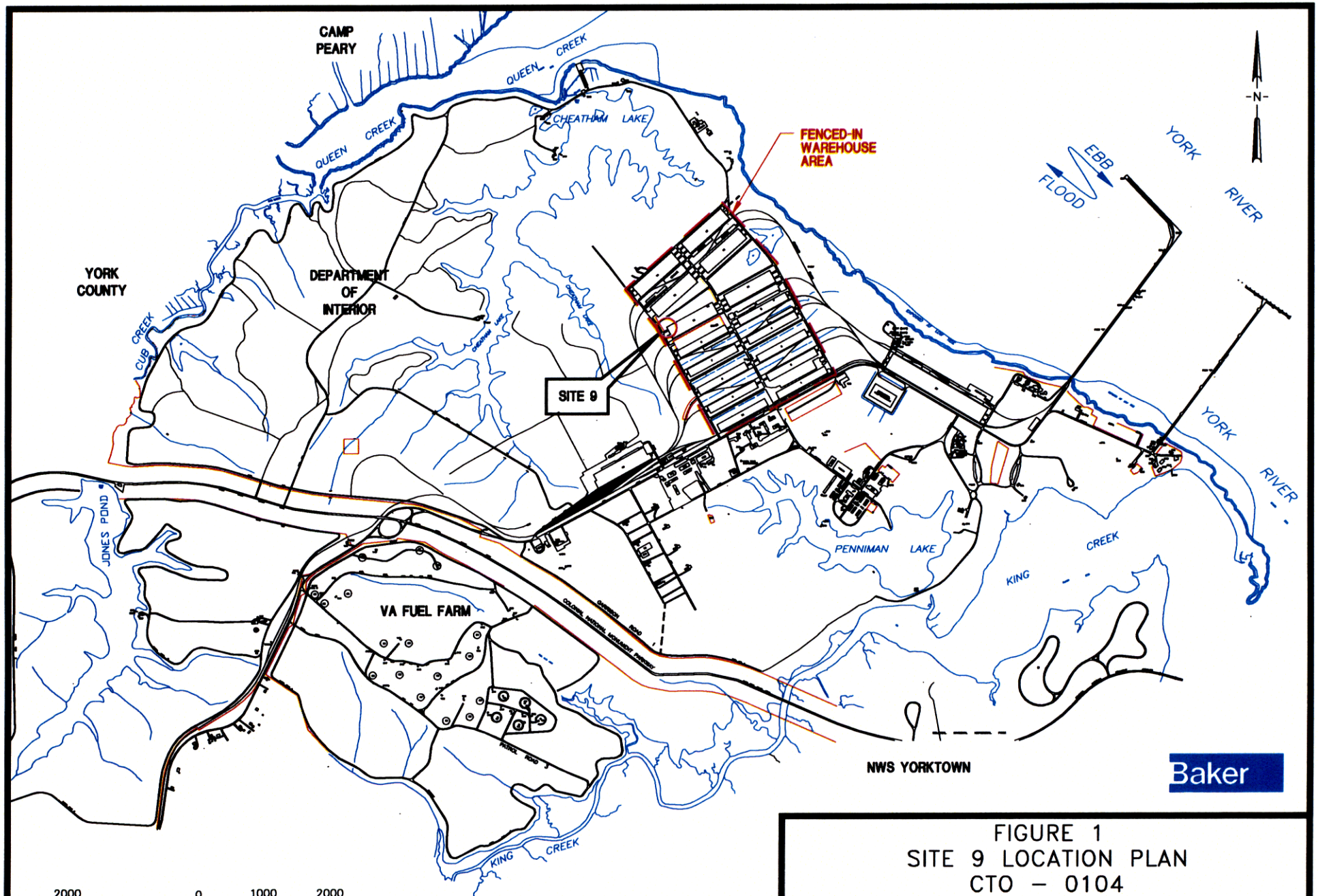

FIGURE 1
SITE 9 LOCATION PLAN
CTO – 0104

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE

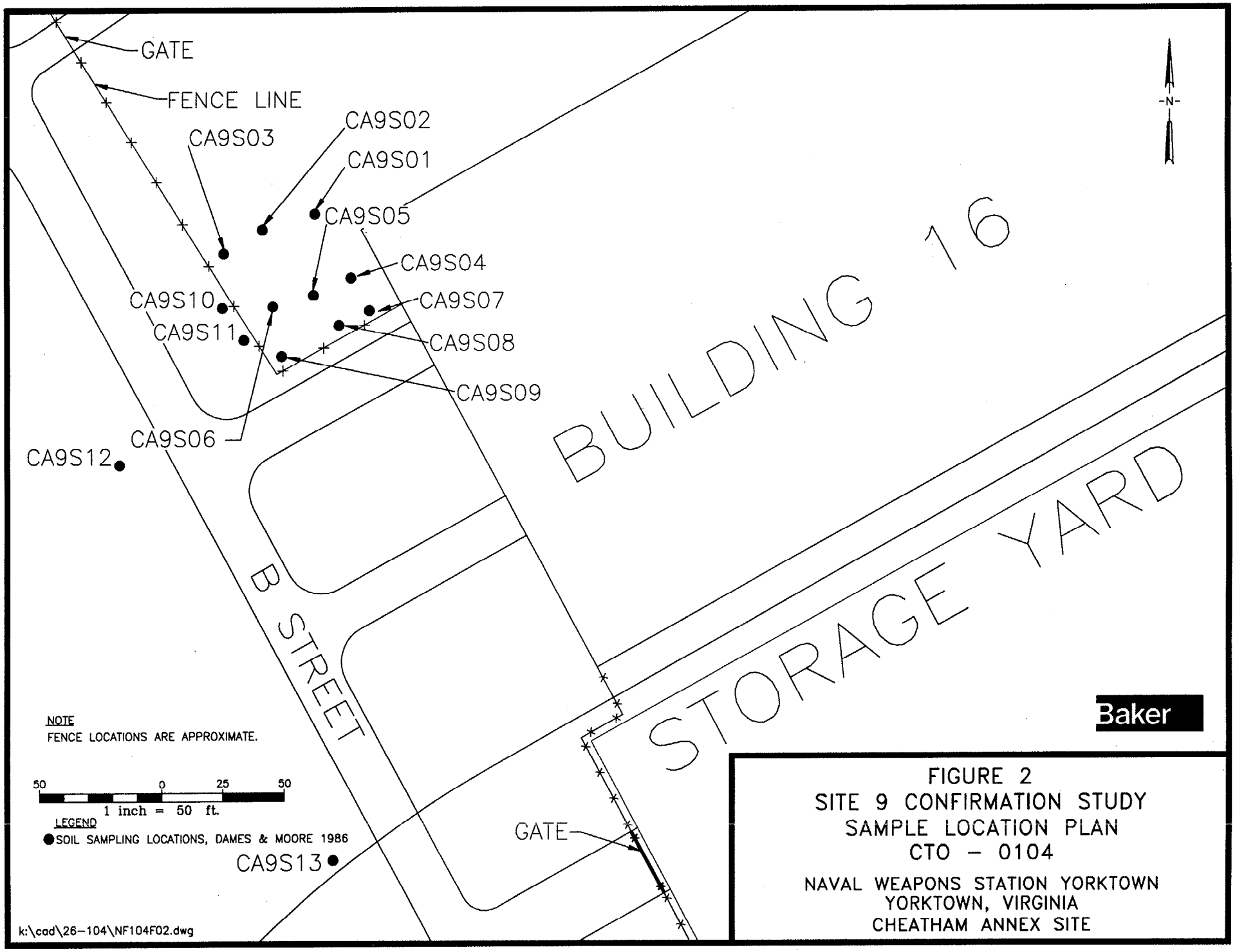

FIGURE 2
SITE 9 CONFIRMATION STUDY
SAMPLE LOCATION PLAN
CTO - 0104

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE

FIGURE 3
SITE PHOTOGRAPH

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE

Baker

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ATTACHMENT A

RAGS PART D TABLES

Please Note:

The following tables have been intentionally omitted:

- Table 5 – No noncancer toxicity available for Aroclor-1260.
- Table 7 – No noncancer toxicity available for Aroclor-1260.
- Table 8 – Identical information found on Table 9.
- Table 10 – No target organ information available for Aroclor-1260

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

SITE 9, TRANSFORMER STORAGE AREA

CHEATHAM ANNEX

WILLIAMSBURG, 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	Surface Soil	Surface Soil	Site 9 Surface Soil	On-Site Worker	Adult	Dermal	On-site	Quantitative	Personnel may access site for work/training related activities
						Ingestion	On-site	Quantitative	Personnel may access site for work/training related activities
		Air	Fugitive Dusts	On-Site Worker	Adult	Inhalation	On-site	Quantitative	Personnel may access site for work/training related activities
Future	Surface Soil	Surface Soil	Site 9 Surface Soil	Resident	Adult	Dermal	On-site	Quantitative	Potential future residential development.
						Ingestion	On-site	Quantitative	Potential future residential development.
					Child	Dermal	On-site	Quantitative	Potential future residential development.
						Ingestion	On-site	Quantitative	Potential future residential development.
				Construction Worker	Adult	Dermal	On-site	Quantitative	Excavation, construction activities for potential future development.
						Ingestion	On-site	Quantitative	Excavation, construction activities for potential future development.
		Air	Fugitive Dusts	Resident	Adult	Inhalation	On-site	Quantitative	Potential future residential development.
					Child	Inhalation	On-site	Quantitative	Potential future residential development.
				Construction Worker	Adult	Inhalation	On-site	Quantitative	Excavation, construction activities for potential future development.

TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Current, Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

CAS Number	Chemical	Minimu (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background (2) Value	Screening (3) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
	PCBs																
12674-11-2	Aroclor-1016	ND		ND		µg/kg	0/13	ND	10U-10U	ND		547.5	N	N/A	N/A	NO	BSL
11104-28-2	Aroclor-1221	ND		ND		µg/kg	0/13	ND	10U-10U	ND		319.4	C	N/A	N/A	NO	BSL
11141-16-5	Aroclor-1232	ND		ND		µg/kg	0/13	ND	10U-10U	ND		319.4	C	N/A	N/A	NO	BSL
53469-21-9	Aroclor-1242	ND		ND		µg/kg	0/13	ND	10U-10U	ND		319.4	C	N/A	N/A	NO	BSL
12672-29-6	Aroclor-1248	ND		ND		µg/kg	0/13	ND	10U-10U	ND		319.4	C	N/A	N/A	NO	BSL
11097-69-1	Aroclor-1254	ND		ND		µg/kg	0/13	ND	10U-10U	ND		319.4	C	N/A	N/A	NO	BSL
11096-82-5	Aroclor-1260	21		321		µg/kg	8/13	93.25	10U-10U	321		319.4	C	N/A	N/A	YES	ASL
	DIOXINS																
1746-01-6	Tetrachlorodibenzo-p-dioxin, 2,3,7,8-(TCDD)	ND		ND		µg/kg	0/13	ND	50U-50U	ND		0.0	C	N/A	N/A	NO	BSL

(1) Minimum/maximum detected concentration.
(2) WPNSTA Background Study (Baker, 1995)
Background values = Normal 95% UCL.
(3) USEPA Region III COC Screening Value (derived from USEPA Region III RBC Table, April 1999)

(4) Rationale Codes

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Same chemical class (CHEM)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) No detection limits given; analyte detected in every sample.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

C = Carcinogenic
N = Non-Carcinogenic

µg/kg = micrograms per kilogram

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aroclor-1260	mg/kg	0.059308	0.1059548	0.321		mg/kg	0.105955	95% UCL	(1)	0.105955	95% UCL	(1)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); Mean of Normal Data (Mean-N).

(1) Conservative estimate of the arithmetic average concentration.
(2) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Data set contains fewer than five samples. Therefore, maximum concentration used for EPC.

TABLE 4.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: On-Site Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA, 1991	NA	NA	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	
	Fi	Fraction Ingested from Source	NA	0.5	Professional Judgemen	NA	NA	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	NA	NA	
	ED	Exposure Duration	years	25	USEPA, 1991	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	NA	NA	
Dermal	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2	4,100	USEPA, 1997	NA	NA	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	1	USEPA, 1992	NA	NA	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	NA	NA	
	EF	Exposure Frequency	days/year	250	Professional Judgemen	NA	NA	
	ED	Exposure Duration	years	25	USEPA, 1991	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	NA	NA	
Inhalation	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	IR-S	Inhalation Rate	m3/hour	1.25	USEPA, 1991	NA	NA	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	8	USEPA, 1991	NA	NA	1/BW x1/AT
	EF	Exposure Frequency	days/year	250	USEPA, 1991	NA	NA	
	ED	Exposure Duration	years	25	USEPA, 1991	NA	NA	
	1/PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd et al., 1995	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	NA	NA	

(1) USEPA Region III default values of 0.05% for VOCs, 10% for SVOCs, nitramines, and pesticides, 6% for PCBs, 1% for arsenic, and 1% for inorganics were used for ABS values.

Sources:

Cowherd, et al.: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002

USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1. Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002

USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1. Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.

USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1. Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.

USEPA, 1995: Assessing Dermal Exposure from Soil.

USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa

TABLE 4.2
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	USEPA, 1991	NA	NA	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	
	FI	Fraction Ingested from Source	NA	1	USEPA, 1989	NA	NA	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	NA	NA	
	ED	Exposure Duration	years	1	USEPA, 1991	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	NA	NA	
Dermal	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2	5,300	USEPA, 1992	NA	NA	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.24	USEPA, 1992	NA	NA	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	NA	NA	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	NA	NA	
	ED	Exposure Duration	year	1	USEPA, 1992	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	NA	NA	
Inhalation	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	2.80	USEPA, 1997	NA	NA	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	8	Professional Judgement	NA	NA	1/BW x1/AT
	EF	Exposure Frequency	days/year	250	USEPA, 1991	NA	NA	
	ED	Exposure Duration	year	1	USEPA, 1991	NA	NA	
	1/PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd et al., 1995	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	NA	NA	

(1) USEPA Region III default values of 0.05% for VOCs, 10% for SVOCs, nitramines, and pesticides, 6% for PCBs, 1% for arsenic, and 1% for inorganics were used for ABS values.

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.

USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.

USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment

USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.

USEPA, 1995: Assessing Dermal Exposure from Soil.

USEPA, 1997: Exposure Factors Handbook Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa

TABLE 4.3
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA, 1989	NA	NA	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	
	Fi	Fraction Ingested from Source	NA	1	Professional Judgement	NA	NA	
	EF	Exposure Frequency	days/year	350	USEPA, 1989	NA	NA	
	ED	Exposure Duration	years	30	USEPA, 1989	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	USEPA, 1989	NA	NA	
Dermal	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2	5,800	USEPA, 1997	NA	NA	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	1	USEPA, 1995	NA	NA	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	NA	NA	
	EF	Exposure Frequency	days/year	350	Professional Judgement	NA	NA	
	ED	Exposure Duration	years	30	USEPA, 1989	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	USEPA, 1989	NA	NA	
Inhalation	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	IR-S	Inhalation Rate	m3/hour	0.83	USEPA, 1991	NA	NA	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	12	USEPA, 1991	NA	NA	1/BW x1/AT
	EF	Exposure Frequency	days/year	350	USEPA, 1991	NA	NA	
	ED	Exposure Duration	years	4	USEPA, 1991	NA	NA	
	1/PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd et al., 1995	NA	NA	
	BW	Body Weight	kg	70	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	1,460	USEPA, 1989	NA	NA	

(1) USEPA Region III default values of 0.05% for VOCs, 10% for SVOCs, nitramines, and pesticides. 6% for PCBs. 1% for arsenic, and 1% for inorganics were used for ABS values.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1. Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1994
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1997. Exposure Factors Handbook. Vol 1: General Factors. ORD. EPA/600/P-95/002Fa

TABLE 4.4
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Younger Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	USEPA, 1989	NA	NA	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	
	Fi	Fraction Ingested from Source	NA	1	Professional Judgement	NA	NA	
	EF	Exposure Frequency	days/year	350	USEPA, 1989	NA	NA	
	ED	Exposure Duration	years	6	USEPA, 1989	NA	NA	
	BW	Body Weight	kg	15	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	NA	NA	
Dermal	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	--	NA	NA	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2	2,006	USEPA, 1992	NA	NA	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	1	USEPA, 1995	NA	NA	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	NA	NA	
	EF	Exposure Frequency	days/year	350	USEPA, 1989	NA	NA	
	ED	Exposure Duration	years	6	USEPA, 1989	NA	NA	
	BW	Body Weight	kg	15	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	NA	NA	
Inhalation	C	Contaminant Concentration in Soil	mg/kg	see Table 3.1	see Table 3.1	NA	NA	CDI (mg/kg-day) =
	IR-S	Inhalation Rate	m3/hour	0.50	USEPA, 1991	NA	NA	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	12	USEPA, 1991	NA	NA	1/BW x1/AT
	EF	Exposure Frequency	days/year	350	USEPA, 1991	NA	NA	
	ED	Exposure Duration	years	4	USEPA, 1991	NA	NA	
	1/PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd et al., 1995	NA	NA	
	BW	Body Weight	kg	15	USEPA, 1989	NA	NA	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	NA	NA	
	AT-N	Averaging Time (Non-Cancer)	days	1,460	USEPA, 1989	NA	NA	

(1) USEPA Region III default values of 0.05% for VOCs, 10% for SVOCs, nitramines, and pesticides, 6% for PCBs, 1% for arsenic, and 1% for inorganics were used for ABS values.
NA - Not Applicable
Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1 Human Health Evaluation Manual, Part A OERR EPA/540/1-89/002.
USEPA, 1993: "Superfund's standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposures from Soil

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)
Aroclor-1260	2.00E+00	89%	2.25E+00	$(mg/kg/day)^{-1}$	B2	IRIS	02/26/1998

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

(1) Provide equation for derivation in text.

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide article date provided by NCEA.

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

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
SITE 9
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)
Aroclor-1260				2.00E+00	mg/kg/day	B2	IRIS	02/26/1998

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.

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 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
CHEATHAM ANNEX - SITE 9
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Current
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Aroclor-1260	3.7E-08	5.6E-12	2.0E-07	2.4E-07	Aroclor-1260	--	--	--	--	--
			(Total)	3.7E-08	5.6E-12	2.0E-07	2.4E-07	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00

Total Risk Across Surface Soil	2.4E-07
Total Risk Across All Media and All Exposure Routes	2.4E-07

Total Hazard Index Across Surface Soil	0.00
Total Hazard Index Across All Media and All Exposure Routes	0.00

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
CHEATHAM ANNEX - SITE 9
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Aroclor-1260	1.4E-08	5.0E-13	2.5E-09	1.7E-08	Aroclor-1260	--	--	--	--	--
			(Total)	1.4E-08	5.0E-13	2.5E-09	1.7E-08	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00

Total Risk Across Surface Soil	1.7E-08
Total Risk Across All Media and All Exposure Routes	1.7E-08

Total Hazard Index Across Surface Soil	0.00
Total Hazard Index Across All Media and All Exposure Routes	0.00

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
CHEATHAM ANNEX - SITE 9
WILLIAMSBURG, VIRGINIA

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Aroclor-1260	1.2E-07	1.3E-12	4.9E-07	6.1E-07	Aroclor-1260	--	--	--	--	--
			(Total)	1.2E-07	1.3E-12	4.9E-07	6.1E-07	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00

Total Risk Across Surface Soil	6.1E-07
Total Risk Across All Media and All Exposure Routes	6.1E-07

Total Hazard Index Across Surface Soil	0.00
Total Hazard Index Across All Media and All Exposure Routes	0.00

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
CHEATHAM ANNEX - SITE 9
WILLIAMSBURG, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident - RME
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Aroclor-1260	2.3E-07	3.5E-12	1.6E-07	3.9E-07	Aroclor-1260	--	--	--	--	--
			(Total)	2.3E-07	3.5E-12	1.6E-07	3.9E-07	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00

Total Risk Across Surface Soil	3.9E-07
Total Risk Across All Media and All Exposure Routes	3.9E-07

Total Hazard Index Across Surface Soil	0.00
Total Hazard Index Across All Media and All Exposure Routes	0.00

RISK ASSESSMENT STATISTICS AND CALCULATIONS

SOIL STATISTICAL SUMMARY
SITE 9, TRANSFORMER STORAGE AREA
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Sample ID	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level
PCBs							
Aroclor 1260	21	321	9S12	8/13	59.3077	94.3666	105.9548

ON-SITE WORKERS - CURRENT SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

CDI (mg/kg/d)= (Cs*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Description	On-site Worker	
CDI	Chronic daily intake (mg/kg/d)	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	
CSFo	Oral cancer slope factor (1/(mg/kg/d))	CS	
HQ	Hazard quotient	CS	
RfDo	Oral reference dose (mg/kg/d)	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	
IR	Ingestion Rate (mg/d)	100	
CF	Conversion factor (kg/mg)	0.000001	
FI	Fraction of soil ingested from site	0.5	
EF	Exposure Frequency (d/yr)	250	
ED	Exposure Duration (yrs)	25	
BW	Body weight (kg)	70	
ATc	Averaging time, carcinogens (d)	25550	
ATn	Averaging time, noncarcinogens (d)	9125	

Parameter	Cs (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	Carcinogens			Noncarcinogens		
				CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Aroclor-1260	0.1059548	2	NA	1.9E-08	3.7E-08	100.0%	5.2E-08	--	--
				Total ILCR:	3.7E-08	100.0%	HI:	0.0E+00	0.0%

NOTES:
NA - Toxicity criterion not available.
-- Not applicable.
TEC - 2,3,7,8-TCDD Toxic Equivalent Concentration

ON-SITE WORKERS - CURRENT SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

DAD (mg/kg/d)= (Cs*CF*AF*ABS*A*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Description	On-site Worker	
DAD	Dermally absorbed dose (mg/kg/d)	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	
CSFo	Oral cancer slope factor (1/(mg/kg/d))	CS	
HQ	Hazard quotient	CS	
RfDo	Oral reference dose (mg/kg/d)	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	
CF	Conversion factor (kg/mg)	0.000001	
AF	Soil to skin adherence factor (mg/cm2-event)	1	
ABS	Absorption fraction	CS	
A	Skin surface area available for contact (cm2)	4100	
EF	Exposure Frequency (d/yr)	250	
ED	Exposure Duration (yrs)	25	
BW	Body weight (kg)	70	
ATc	Averaging time, carcinogens (d)	25550	
ATn	Averaging time, noncarcinogens (d)	9125	

Parameter	Cs (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	Carcinogens			Noncarcinogens		
					DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Aroclor-1260	0.1059548	0.06	2.247191011	NA	9.1E-08	2.0E-07	100.0%	2.6E-07	--	--
					Total ILCR:	2.0E-07	100.0%	HI:	0.0E+00	0.0%

NOTES:
NA - Toxicity criterion not available.
-- Not applicable.
TEC - 2,3,7,8-TCDD Toxic Equivalent Concentration

ON-SITE WORKERS - CURRENT SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

CDI (mg/kg/d)= (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = Cs * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Description	On-site Worker	
CDI	Chronic daily intake (mg/kg/d)	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	
CSFi	Inhalation cancer slope factor (1/(mg/kg/d))	CS	
HQ	Hazard quotient	CS	
RfDi	Inhalation reference dose (mg/kg/d)	CS	
Ca	Concentration of chemical in air as fugitive dusts (mg/m3)	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	
PEF	Particulate emission factor (m3/kg)	1.32E+09	
RR	Respiration rate (m3/hr)	1.25	
ET	Exposure time (hrs/d)	8	
EF	Exposure Frequency (d/yr)	250	
ED	Exposure Duration (yrs)	25	
BW	Body weight (kg)	70	
ATc	Averaging time, carcinogens (d)	25550	
ATn	Averaging time, noncarcinogens (d)	9125	

Parameter	Cs (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	Carcinogens			Noncarcinogens		
					CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Aroclor-1260	0.105955	8.03E-11	2	NA	2.8E-12	5.6E-12	100.0%	7.9E-12	--	--
					Total ILCR:	5.6E-12	100.0%	HI:	0.0E+00	0.0%

NOTES:
NA - Toxicity criterion not available.
-- Not applicable.
TEC - 2,3,7,8-TCDD Toxic Equivalent Concentration

CONSTRUCTION WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

CDI (mg/kg/d)= (Cs*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Description	Adult	
CDI	Chronic daily intake (mg/kg/d)	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	
CSFo	Oral cancer slope factor (1/(mg/kg/d))	CS	
HQ	Hazard quotient	CS	
RfDo	Oral reference dose (mg/kg/d)	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	
IR	Ingestion Rate (mg/d)	480	
CF	Conversion factor (kg/mg)	1.00E-06	
FI	Fraction of soil ingested from site	1	
EF	Exposure Frequency (d/yr)	250	
ED	Exposure Duration (yrs)	1	
BW	Body weight (kg)	70	
ATc	Averaging time, carcinogens (d)	25550	
ATn	Averaging time, noncarcinogens (d)	365	

				Carcinogens			Noncarcinogens		
Parameter	Cs (mg/kg)	CSFo /(mg/kg/d	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILC	CDI (mg/kg/d)	HQ	% Contrib. HI
Aroclor-1260	0.105955	2	NA	7.1E-09	1.4E-08	100.0%	5.0E-07	--	--
				Total ILCR:	1.4E-08	100.0%	Total HI:	0.0E+00	0.0%

NOTES:
NA - Toxicity criterion not available.
-- Not applicable.

CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

DAD (mg/kg/d)= (Cs*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Description	Adult	
DAD	Dermally absorbed dose (mg/kg/d)	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	
CSFo	Oral cancer slope factor (1/(mg/kg/d))	CS	
HQ	Hazard quotient	CS	
RfDo	Oral reference dose (mg/kg/d)	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	
CF	Conversion factor (kg/mg)	1.00E-06	
AF	Soil to skin adherence factor (mg/cm2-event)	0.24	
ABS	Absorption fraction	CS	
SA	Skin surface area available for contact (cm2)	5,300	
EF	Exposure Frequency (d/yr)	250	
ED	Exposure Duration (yrs)	1	
BW	Body weight (kg)	70	
ATc	Averaging time, carcinogens (d)	25550	
ATn	Averaging time, noncarcinogens (d)	365	

					Carcinogens			Noncarcinogens		
Parameter	Cs (mg/kg)	ABS	CSFd /(mg/kg/d	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib Total ILC	DAD (mg/kg/d)	HQ	% Contrib. HI
Aroclor-1260	0.105955	0.06	2.247191	NA	1.1E-09	2.5E-09	100.0%	7.9E-08	--	--
					Total ILCR:	2.5E-09	100.0%	HI:	0.0E+00	0.0%

NOTES:
NA - Toxicity criterion not available.
-- Not applicable.

CONSTRUCTION WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

CDI (mg/kg/d)= (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = Cs * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Description	Adult	
CDI	Chronic daily intake (mg/kg/d)	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	
CSFi	Inhalation cancer slope factor (1/(mg/kg/d))	CS	
HQ	Hazard quotient	CS	
RfDi	Inhalation reference dose (mg/kg/d)	CS	
Ca	Concentration of chemical in air as fugitive dusts (mg/m3)	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	
PEF	Particulate emission factor (m3/kg)	1.32E+09	
RR	Respiration rate (m3/hr)	2.80	
ET	Exposure time (hrs/d)	8	
EF	Exposure Frequency (d/yr)	250	
ED	Exposure Duration (yrs)	1	
BW	Body weight (kg)	70	
ATc	Averaging time, carcinogens (d)	25,550	
ATn	Averaging time, noncarcinogens (d)	365	

					Carcinogens			Noncarcinogens		
Parameter	Cs (mg/kg)	Ca (mg/m3)	CSFi /(mg/kg/d	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib Total ILC	CDI (mg/kg/d)	HQ	% Contrib. HI
Aroclor-1260	0.105955	8.03E-11	2	NA	2.5E-13	5.0E-13	100.0%	1.8E-11	--	--
					Total ILCR:	5.0E-13	100.0%	HI:	0.0E+00	0.0%

NOTES:
NA - Toxicity criterion not available.
-- Not applicable.

ADULT AND YOUNG CHILD RESIDENTS (AGES 1 TO 6 YEARS) - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

CDI (mg/kg/d)= (Cs*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Description	Adult	Young Child	
CDI	Chronic daily intake (mg/kg/d)	CS	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	CS	
CSFo	Oral cancer slope factor (1/(mg/kg/d))	CS	CS	
HQ	Hazard quotient	CS	CS	
RfDo	Oral reference dose (mg/kg/d)	CS	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	CS	
IR	Ingestion Rate (mg/d)	100	200	
CF	Conversion factor (kg/mg)	0.000001	0.000001	
FI	Fraction of soil ingested from site	1	1	
EF	Exposure Frequency (d/yr)	350	350	
ED	Exposure Duration (yrs)	30	6	
BW	Body weight (kg)	70	15	
ATc	Averaging time, carcinogens (d)	25550	25550	
ATn	Averaging time, noncarcinogens (d)	10950	2190	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	Cs (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
PCBs															
Aroclor-1260	0.1059548	2	NA	6.2E-08	1.2E-07	100.0%	1.5E-07	--	--	1.2E-07	2.3E-07	100.0%	1.4E-06	--	--
				Total ILCR:	1.2E-07	100.0%	HI:	0.0E+00	0.0%	Total ILCR:	2.3E-07	100.0%	HI:	0.0E+00	0.0%

ADULT AND YOUNG CHILD RESIDENTS (AGES 1 TO 6 YEARS) - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

DAD (mg/kg/d)= (Cs*CF*AF*ABS*A*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Description	Adult	Young Child	
DAD	Dermally absorbed dose (mg/kg/d)	CS	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	CS	
CSFo	Oral cancer slope factor (1/(mg/kg/d))	CS	CS	
HQ	Hazard quotient	CS	CS	
RfDo	Oral reference dose (mg/kg/d)	CS	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	CS	
CF	Conversion factor (kg/mg)	1.00E-06	1.00E-06	
AF	Soil to skin adherence factor (mg/cm2-event)	1	1	
ABS	Absorption fraction	CS	CS	
A	Skin surface area available for contact (cm2)	5,800	2,006	
EF	Exposure Frequency (d/yr)	350	350	
ED	Exposure Duration (yrs)	30	6	
BW	Body weight (kg)	70	15	
ATc	Averaging time, carcinogens (d)	25550	25,550	
ATn	Averaging time, noncarcinogens (d)	10950	2,190	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	Cs (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
PCBs																
Aroclor-1260	0.1059548	0.06	2.247191	NA	2.2E-07	4.9E-07	100.0%	5.1E-07	--	--	7.0E-08	1.6E-07	100.0%	8.2E-07	--	--
					Total ILCR:	4.9E-07	100.0%	HI:	0.0E+00	0.0%	Total ILCR:	1.6E-07	100.0%	HI:	0.0E+00	0.0%

ADULT AND YOUNG CHILD RESIDENTS (AGES 1 TO 6 YEARS) - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 9
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX - WILLIAMSBURG, VIRGINIA

CDI (mg/kg/d)= (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = Cs * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Description	Adult	Young Child	
CDI	Chronic daily intake (mg/kg/d)	CS	CS	(Chemical Specific)
ILCR	Incremental lifetime cancer risk	CS	CS	
CSFi	Inhalation cancer slope factor (1/(mg/kg/d))	CS	CS	
HQ	Hazard quotient	CS	CS	
RfDi	Inhalation reference dose (mg/kg/d)	CS	CS	
Ca	Concentration of chemical in air as fugitive dusts (mg/m3)	CS	CS	
Cs	Concentration of chemical in soil (mg/kg)	CS	CS	
PEF	Particulate emission factor (m3/kg)	1.32E+09	1.32E+09	
RR	Respiration rate (m3/hr)	0.83	0.50	
ET	Exposure time (hrs/d)	12	12	
EF	Exposure Frequency (d/yr)	350	350	
ED	Exposure Duration (yrs)	4	4	
BW	Body weight (kg)	70	15	
ATc	Averaging time, carcinogens (d)	25,550	25,550	
ATn	Averaging time, noncarcinogens (d)	1,460	1,460	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	Cs (mg/kg)	Ca (mg/m3)	CSFi /(mg/kg/d	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILC	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILC	CDI (mg/kg/d)	HQ	% Contrib. HI
PCBs																
Aroclor-1260	0.105955	8.03E-11	2	NA	6.3E-13	1.3E-12	100.0%	1.1E-11	--	--	1.8E-12	3.5E-12	100.0%	3.1E-11	--	--
					Total ILCR:	1.3E-12	100.0%	HI:	0.0E+00	0.0%	Total ILCR:	3.5E-12	100.0%	HI:	0.0E+00	0.0%

NOTES:
NA - Toxicity criterion not available.
-- Not applicable.