N61165.AR.004919
CNC CHARLESTON
5090.3a

RCRA FACILITY INVESTIGATION REPORT FOR AREA OF CONCERN 721 CNC CHARLESTON SC

5/1/2013

TETRA TECH

RCRA Facility Investigation Report

for

Area of Concern (AOC) 721

Charleston Naval Complex
North Charleston, South Carolina

Naval Facilities Engineering Command Southeast

Contract Number N62467-08-D-1001
Contract Task Order JM62

May 2013

091005/P

RCRA FACILITY INVESTIGATION REPORT
FOR
AREA OF CONCERN (AOC) 721

CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command
4130 Faber Place Drive, Suite 202
North Charleston, South Carolina 29405

Submitted by:
Tetra Tech
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406

CONTRACT NUMBER N62467-08-D-1001
CONTRACT TASK ORDER JM62

MAY 2013

PREPARED UNDER THE DIRECTION OF:

LAWSON ANDERSON, CHMM
PROJECT MANAGER
TETRA TECH
MEMPHIS,TENNESSEE

APPROVED FOR SUBMISSION BY:

JOHN J. TREPANOWSKI, P.E.
PROGRAM MANAGER
TETRA TECH
KING OF PRUSSIA, PENNSYLVANIA

TABLE OF CONTENTS

SECTION **PAGE NO.**

ACRONYMS AND ABBREVIATIONS vii

1.0 INTRODUCTION 1-1
1.1 SITE DESCRIPTION 1-1
1.1.1 Previous Site Investigations 1-2
1.1.2 Site Investigation 1-3
1.2 REPORT ORGANIZATION 1-3

2.0 PHYSICAL SETTING 2-1
2.1 GEOLOGY 2-1
2.2 GROUNDWATER 2-2
2.2.1 Regional 2-2
2.2.2 AOC 721 2-2
2.3 CLIMATE 2-4

3.0 FIELD INVESTIGATION 3-1
3.1 INVESTIGATION OBJECTIVES 3-1
3.2 SAMPLING PROCEDURES, PROTOCOLS, AND ANALYSES 3-2
3.2.1 Sample Identification 3-2
3.2.2 Soil Sampling 3-2
3.2.3 Monitoring Well Installation and Development 3-3
3.2.4 Groundwater Sampling 3-3
3.2.5 Sediment Sampling 3-4
3.2.6 Surface Water Sampling 3-4
3.2.7 Vertical and Horizontal Surveying 3-5
3.2.8 Decontamination Procedures 3-6

4.0 NATURE AND EXTENT 4-1
4.1 INORGANIC BACKGROUND EVALUATION 4-1
4.2 NATURE AND EXTENT OF CONTAMINATION IN SOIL 4-2
4.3 NATURE AND EXTENT OF CONTAMINATION IN GROUNDWATER 4-2
4.4 NATURE AND EXTENT OF CONTAMINATION IN SEDIMENT 4-3
4.5 NATURE AND EXTENT OF CONTAMINATION IN SURFACE WATER 4-4
4.6 NOISETTE CREEK SAMPLING RESULTS – ZONE J RFI 4-5

5.0 CONTAMINANT FATE AND TRANSPORT 5-1
5.1 PAHs 5-1
5.2 METALS 5-4
5.3 PESTICIDES 5-6
5.4 PHTHALATE ESTERS 5-6

6.0 INTERIM MEASURES 6-1
6.1 INTERIM MEASURE PREPARATION 6-1
6.2 EXCAVATION 6-1
6.3 CONFIRMATORY SAMPLING 6-2
6.4 EFFECTS OF SOIL REMOVAL ON OTHER MEDIA 6-2
6.5 CONCLUSIONS 6-4

TABLE OF CONTENTS (Continued)

SECTION **PAGE NO.**

7.0 HUMAN HEALTH RISK ASSESSMENT 7-1
7.1 INTRODUCTION 7-1
7.2 DATA EVALUATION 7-2
7.2.1 Data Usability 7-3
7.2.2 Selection of Chemicals of Potential Concern 7-3
7.2.3 COPCs Selected for HHRA 7-6
7.3 EXPOSURE ASSESSMENT 7-8
7.3.1 Sources of Environmental Contamination 7-9
7.3.2 Potential Contaminant Migration Routes 7-9
7.3.3 Potential Current and Future Receptors of Concern and Exposure Pathways 7-10
7.3.4 Calculation of Exposure Point Concentrations 7-11
7.3.5 Chemical and Intake Estimation 7-12
7.4 TOXICITY ASSESSMENT 7-22
7.4.1 Sources Of Toxicity Criteria 7-23
7.4.2 Toxicity Criteria for Dermal Exposure 7-23
7.4.3 Toxicity Criteria for the Carcinogenic Effects of PAHs 7-24
7.4.4 Toxicity Criteria for Chromium 7-25
7.5 RISK CHARACTERIZATION 7-25
7.5.1 Quantitative Analysis of Chemicals 7-25
7.5.2 Interpretation of Risk Assessment Results 7-26
7.5.3 Results of the Risk Characterization 7-27
7.6 UNCERTAINTY ANALYSIS 7-28
7.6.1 Uncertainty in Data Evaluation 7-30
7.6.2 Uncertainty in the Exposure Assessment 7-30
7.6.3 Uncertainty in the Toxicity Assessment 7-32
7.6.4 Uncertainty in the Risk Characterization 7-35
7.7 SUMMARY 7-36

8.0 ECOLOGICAL RISK ASSESSMENT 8-1
8.1 SCREENING-LEVEL PROBLEM FORMULATION 8-1
8.1.1 Environmental Setting 8-1
8.1.2 Contaminant Fate and Transport 8-2
8.1.3 Ecotoxicity 8-4
8.1.4 Complete Exposure Pathways and Potential Receptors 8-4
8.1.5 Preliminary Assessment and Measures of Effects 8-5
8.2 SCREENING-LEVEL ECOLOGICAL EFFECTS EVALUATION 8-6
8.3 SCREENING-LEVEL EXPOSURE ESTIMATE 8-6
8.4 SCREENING-LEVEL RISK CALCULATION 8-7
8.5 REFINEMENT OF PRELIMINARY CHEMICALS OF POTENTIAL CONCERN 8-8
8.5.1 General Approach 8-8
8.5.2 Assessment Endpoints and Measures of Effects 8-9
8.5.3 Conceptual Exposure Model 8-12
8.5.4 Step 3a Risk Characterization and Discussion 8-12
8.6 ECOLOGICAL RISK UNCERTAINTY ANALYSIS 8-22
8.6.1 Measures of Effects and Assessment Endpoints 8-22
8.6.2 Exposure Characterization 8-24
8.6.3 Ecological Effects Data 8-24
8.6.4 Risk Characterization 8-25
8.7 SUMMARY AND CONCLUSIONS 8-25

TABLE OF CONTENTS (Continued)

SECTION **PAGE NO.**

9.0 CONCLUSIONS AND RECOMMENDATIONS 9-1
9.1 SUMMARY OF HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS 9-1
9.1.1 Baseline Human Health Risk Assessment 9-1
9.1.2 Ecological Risk Assessment 9-2
9.2 RECOMMENDATIONS 9-2

10.0 REFERENCES 10-1

APPENDICES

A ANALYTICAL DATA
B DATA VALIDATION
C HHRA SUPPORTING INFORMATION
D ERA SUPPORTING INFORMATION
E RESPONSE TO COMMENTS

TABLES

NUMBER

2-1 Horizontal Hydraulic Gradients
2-2 Horizontal Flow Velocities
4-1 Selected Background for Surface Soil
4-2 Selected Background for Groundwater
4-3 Background Sediment Data
4-4 Summary of Detections – Surface Soil, AOC 721
4-5 Occurrence, Distribution and Selection of Chemicals of Potential Concern – Surface Soil – Direct Contact, AOC 721
4-6 Summary of Detections – Groundwater, AOC 721
4-7 Occurrence, Distribution and Selection of Chemicals of Potential Concern – Groundwater, AOC 721
4-8 Summary of Detections – Sediment
4-9 Occurrence, Distribution and Selection of Chemicals of Potential Concern – Sediment, AOC 721
4-10 Summary of Detections – Surface Water, AOC 721
4-11 Occurrence, Distribution and Selection of Chemicals of Potential Concern – Surface Water, AOC 721
6-1 Post Excavation Confirmatory Soil Sampling Locations
6-2 Comparison of Pre- and Post-Excavation Metals Concentrations in Groundwater
7-1 Screening Criteria for Soil and Sediment, AOC 721
7-2 Screening Criteria for Groundwater and Surface Water, AOC 721
7-3 Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Surface Soil - Direct Contact, AOC 721
7-4 Occurrence, Distribution, and Selection of Chemicals of Potential Concern- Surface Soil- Migration to Groundwater, AOC 721

TABLES (Continued)

NUMBER

7-5 Occurrence, Distribution, and Selection of Chemicals of Potential Concern- Groundwater, AOC 721
7-6 Occurrence, Distribution, and Selection of Chemicals of Potential Concern- Sediment, AOC 721
7-7 Occurrence, Distribution, and Selection of Chemicals of Potential Concern- Surface Water, AOC 721
7-8 Chemicals Retained as COPCs, AOC 721
7-9 Selection of Exposure Pathways, AOC 721
7-10 Exposure Routes for Quantitative Evaluation, AOC 721
7-11 Exposure Point Concentrations, AOC 721
7-12 AOC 721 - Summary of Exposure Input Parameters (RME)
7-13 Non-Cancer Toxicity Data – Oral/Dermal
7-14 Non-Cancer Toxicity Data – Inhalation
7-15 Cancer Toxicity Data – Oral/Dermal
7-16 Cancer Toxicity Data – Inhalation
7-17 Summary of Cancer Risks and Hazard Indices – Reasonable Maximum Exposures, AOC 721
7-18 Chemicals Retained as COCs, AOC 721
8-1 Surface Soil COPC Selection, AOC 721
8-2 Sediment COPC Selection, AOC 721
8-3 Surface Water COPC Selection, AOC 721
8-4 Background Sediment Data, AOC 721
8-5 Exposure Parameters for the Terrestrial Wildlife Model, AOC 721
8-6 Terrestrial Food Chain Model – Conservative Scenario, Insectivorous Receptors, AOC-721
8-7 Terrestrial Food Chain Model – Conservative Scenario, Wetland Invertivore Receptors, AOC 721
8-8 Terrestrial Food Chain Model – Conservative Scenario, Piscivorous Receptors, AOC 721
8-9 Terrestrial Food Chain Model – Average Scenario, Insectivorous Receptors, AOC 721
8-10 Terrestrial Food Chain Model – Average Scenario, Wetland Invertivore Receptors, AOC 721
8-11 Terrestrial Food Chain Model – Average Scenario, Piscivorous Receptors, AOC 721

FIGURES

NUMBER

1-1 Site Vicinity Map
1-2 Site Location Map
1-3 Site Features Map
1-4 Coal Pile Distribution Map
2-1 Shallow Groundwater Contours, June 1996
2-2 Shallow Groundwater Contours, March 2002
3-1 SWMU 44 Monitoring Wells and Topographic Divide
4-1 Background and Screening Criteria Exceedances in Surface Soil
4-2 Screening Criteria Exceedances in Groundwater - Organics
4-3 Background and Screening Criteria Exceedances in Groundwater - Inorganics
4-4 Background and Screening Criteria Exceedances in Sediment - Organics
4-5 Background and Screening Criteria Exceedance in Sediment - Inorganics
8-1 Conceptual Exposure Model

ACRONYMS

AA	Atomic absorption
AET	Apparent effects threshold
ANZECC	Australian and New Zealand Environment and Conservation Council
atm-m^3/mole	Atmosphere-cubic meter per mole
AVS	Acid volatile sulfides
AOC	Area of concern
ATSDR	Agency for Toxic Substances and Disease
BAF	Bioaccumulation factor
BCT	BRAC Cleanup Team
BEQ	Benzo(a)pyrene equivalent
bgs	Below ground surface
BRAC	Base Realignment and Closure Act
BSAF	Biota sediment accumulation factor
Cal EPA	California Environmental Protection Agency
CDD	Chlorinated dibenzo-p-dioxins
CDF	Chlorinated-dibenzofurans
CDI	Chronic daily intake
CFR	Code of Federal Regulations
CH2M-Jones	CH2MHill, Inc. and J.A. Jones Construction
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
CMS	Corrective Measures Study
cm^2	Square centimeters
CNC	Charleston Naval Complex
COC	Chemical of concern
COPC	Chemical of potential concern
CSAP	Comprehensive Sampling and Analysis Plan
CSF	Cancer slope factor
CSM	Conceptual site model
ΔH	Change in Head
ΔL	Change in Length
DDT	Dichlorodiphenyltrichloroethane
DNA	Deoxyribonucleic acid
DQO	Data Quality Objectives
Eco SSL	Ecological Soil Screening Level

EEQ	Ecological effects quotient
EPC	Exposure point concentration
ERA	Ecological risk assessment
ER-M	Effects Range Median
ESDSOPQAM	Environmental Services Division, *Standard Operating Procedures and Quality Assurance Manual*
ESV	Ecological screening value
EU	Exposure unit
FI	Fraction ingested
FS	Feasibility Study
ft	Foot/feet
ft/day	Feet per day
ft/ft	Feet per foot
GPS	Global positioning system
HEAST	Health Effects Assessment Summary Table
HHRA	Human Health Risk Assessment
HI	Hazard indices
HQ	Hazard quotient
HSWA	Hazardous and Solid Waste Amendment
ICAP	Inductively coupled argon plasma
ILCR	Incremental lifetime cancer risk
IM	Interim Measure
IRIS	Integrated Risk Information System
ISM	Interim Stabilization Measure
IUR	Inhalation unit risk
Kh	Hydraulic conductivity
K_{oc}	Organic carbon partition coefficient
K_{ow}	Octonol-water partition coefficient
LCS	Laboratory Control Samples
LOAEL	Lowest observed adverse effect level
L/hr	Liters per hour
MCL	Maximum contaminant level
MDL	Method detections limit
µg/dL	Micrograms per deciliter
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
mg/kg	milligrams per kilogram

MHW	Mean high water
MRL	Minimal risk level
msl	Mean sea level
Navy	U.S. Navy
NCEA	National Center for Environmental Assessment
NFA	No Further Action
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No observed adverse effect level
OCRM	Office of Ocean Coastal Resource Management
OERR	Office of Emergency and Remedial Response
ORNL	Oak Ridge National Laboratories
ORP	Oxidation reduction potential
OSWER	Office of Solid Waste and Emergency Response
ppt	parts per thousand
PCB	Polychlorinated biphenyl
PAH	Polynuclear aromatic hydrocarbon
PE	Performance evaluation
PEL	Probable effects level
PPRTV	Provisional peer-reviewed toxicity value
QA/QC	Quality assurance/quality control
QC	Quality control
Qc	Quaternary age inorganic clay
Qm	Quaternary age marsh clay
Qs	Quaternary age sand
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfC	Reference concentration
RfD	Reference dose
RFI	RCRA Facility Investigation
RI	Remedial investigation
RME	Reasonable maximum exposure
RSL	Regional screening level
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SDWA	Safe Drinking Water Act
SEM	Simultaneously extracted metals

SMDP	Scientific/management decision point
SOP	Standard operating procedures
Spectra Tech	Spectra Tech, Inc.
SQuiRT	Screening Quick Reference Table
SSL	Soil screening level
SSV	Sediment screening value
SSW	Saltwater surface water
SQG	Soil quality guidelines
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit
Ta	Tertiary age
TAL	Total analyte list
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total dissolved solids
Tetra Tech	Tetra Tech, Inc.
TEF	Toxicity equivalence factor
TEQ	Toxicity equivalence quotient
TEL	Threshold effects level
TOC	Total organic carbon
TRV	Toxicity reference value
TSS	Total suspended solids
URF	Unit risk factor
UCL	Upper confidence limit
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WHO	World Health Organization
WM	Waste Management

EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report describes investigations conducted at Area of Concern (AOC) 721, Zone C, at the Charleston Naval Complex (CNC) in North Charleston, South Carolina. The RFI report assesses human health and ecological risks at AOC 721, and provides recommendations regarding the need for further evaluation.

Historical Information and Setting

AOC 721 is approximately 1.6 acres in size, and is located in the northern portion of CNC, immediately south of Noisette Creek, and adjacent to Solid Waste Management Unit (SWMU) 44. The area encompassing AOC 721 was formerly a marsh that was filled with dredge material in the early 1920s. Much of the site is still a wetland, but instead of a marsh, the site is densely vegetated with scrub-shrub species such as laurel oak (*Quercus laurifolia*), wax myrtle (*Myrica cerifera*), marsh elder (*Iva frutescens*), sea myrtle (*Baccharis halimifolia*) and sea ox-eye (*Borrichia frutescens*). Herbaceous vegetation and vines such as salt marsh bulrush (*Scirpus robustus*), black grass (*Juncus gerardii*), salt grass (*Distichlis spicata*), Southern dewberry (*Rubus trivialis*), poison ivy (*Toxicodendron*), and Virginia creeper (*Parthenocissus quinquefolia*) are common in some portions of the site. A 650-foot-long drainage ditch forms the western edge of the site, and discharges into Noisette Creek. A small pond east of the ditch drains into the ditch.

A coal storage facility was located within SWMU 44 from 1941 until 1996. Coal was stored in piles, and the amount of coal stored at the facility varied over time. An aerial photograph from 1957 indicates that the coal storage area extended into the southeastern portion of AOC 721. Based on available historical information, sources of contamination at AOC 721 include filling of the marsh with dredge material and the storage of coal.

AOC 721 was designated as an AOC as a result of investigations of SWMU 44, and thus, investigations associated with SWMU 44 are pertinent to the history of AOC 721. Initial sampling events conducted between 1981 and 1985 at SWMU 44 identified metals in surface water and storm water runoff samples. A RCRA Facility Assessment (RFA) to evaluate the coal storage facility was conducted in 1995. Conclusions based on 1981 to 1985 sampling events and the RFA led to RFI activities, which began in 1995 and continued until 1997. The *Zone C RFI Report* (EnSafe, 1997) identified aluminum, arsenic, beryllium, and benzo(a)pyrene equivalents (BEQs) as SWMU 44 chemicals of concern (COCs) in soil; and aluminum, antimony, arsenic, beryllium, and manganese as SWMU 44 groundwater COCs. The bulk coal historically stored at the site was identified as the likely source of soil and stormwater runoff contamination; and as a result, an interim measure (IM) was conducted in 1996 by the Navy

Environmental Detachment Charleston to remove the existing coal pile and surface soil that visually appeared to be contaminated. A Corrective Measures Study (CMS) following the RFI began in 1999 and was completed in 2002 (CH2M-Jones, 2002). A second IM at SWMU 44 to remove arsenic-impacted soils was conducted in 2001 to meet remediation goals that would allow unrestricted land use. The *CMS Work Plan/Interim Measure Completion Report (*CH2M-Jones, 2002) concluded that SWMU 44 should be considered for No Further Action (NFA) status. SWMU 44 received NFA status documented in a letter from South Carolina Department of Health and Environmental Control (SCDHEC) dated 13 May, 2002.

During the CMS investigation mentioned above, elevated concentrations of arsenic were detected in soil samples collected north of SWMU 44. In addition, historical photos were found indicating that the coal storage area extended northward beyond what had been considered the northern extent of SWMU 44. In 2001, the Navy requested that SCDHEC designate the area of elevated arsenic concentrations as a new site, separate from SWMU 44. The area in question was subsequently designated as AOC 721.

RFI field activities for AOC 721 began in April 2003 and were performed in accordance with the *AOC 721 RFI Work Plan* (EnSafe, 2003). Based on the preliminary RFI results, IM soil removal activities were performed in November 2005 (Spectra Tech, 2006), and consisted of the removal of arsenic-contaminated soil from an 893 square foot area in which arsenic concentrations exceeded the target cleanup level of 70 mg/kg. The cleanup target level was the National Oceanic and Atmospheric Administration (NOAA) Effects Range Median (ER-M), which is an ecological risk assessment-based value for sediment that indicates when impacts to benthic macro invertebrates are expected. Following the IM soil removal activities, additional groundwater samples were collected by Tetra Tech in 2008 to assess post-IM groundwater concentrations.

Human Health Risk Assessment

The baseline human health risk assessment for AOC 721 was performed to characterize potential risks to likely human receptors under current and potential future land use. Potential receptors retained for quantitative evaluation included current/future construction workers, industrial workers, adolescent trespassers, adult and child recreational users, and hypothetical child and adult residents. Surface soil, groundwater, surface water, and sediment were evaluated.

Cumulative Hazard Indices (HIs) for the typical industrial worker, adolescent trespassers, and adult recreational users under the reasonable maximum exposure (RME) scenario were less than or equal to unity (1). The cumulative HI for the construction worker exceeded unity, but HIs calculated on a target organ/target effect specific basis did not exceed unity. Cumulative HIs for the child recreational user exposed to surface soil (HI = 3), for the hypothetical child resident exposed to surface soil (HI = 9), for the hypothetical child resident exposed to groundwater (HI = 108), and for hypothetical adult resident

exposed to groundwater (HI = 46) exceeded unity even when calculated on a target organ/target effect specific basis. The primary risk drivers (i.e., chemicals contributing most to the elevated risk estimates) are arsenic and thallium in surface soil and antimony, arsenic, manganese, and thallium in groundwater. However, note that the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. For thallium, a provisional toxicity value was provided by USEPA's National Center for Environmental Assessment for the purposes of developing screening levels for soil and groundwater. However, USEPA concluded that available human studies do not support derivation of an oral RfD. Therefore, while the provisional value was used for screening and evaluating the likelihood for noncarcinogenic effects, the results will not be used to determine whether thallium should be a contaminant of concern.

Cumulative incremental lifetime cancer risks (ILCRs) for construction workers, typical workers, adolescent trespassers, child recreational users, adult recreational users, and lifelong recreational users exposed to surface soil, groundwater, and sediments of AOC 721 were less than or within the USEPA's target risk range of 10^{-4} to 10^{-6}. Cumulative ILCRs for the following receptors hypothetically exposed to AOC 721 surface soil and groundwater exceeded USEPA's target risk range:

Receptor	**Medium**	**ILCR**
Child Resident	Soil	2E-04
Child Resident	Groundwater	2E-03
Adult Resident	Groundwater	3E-03
Lifelong Resident	Surface Soil	2E-04
Lifelong Resident	Groundwater	5E-03

Arsenic was the main contributor to the ILCRs for exposure to soil. However, note that the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. Arsenic, chromium (evaluated using hexavalent chromium toxicity criteria), bis(2-ethylhexyl) phthalate, and heptachlor were the main contributors to the ILCRs for groundwater.

Ecological Risk Assessment

The ecological risk assessment for AOC 721 consisted of Steps 1, 2, and 3a of the eight-step ecological risk assessment (ERA) process. Surface soil, surface water, and sediment were evaluated.

Ecological chemicals of potential concern (COPCs) pose negligible potential risks to aquatic organisms, terrestrial plants, and soil invertebrates at the site.

Concentrations of arsenic, cobalt, mercury, selenium, and zinc in some sediment samples exceeded values indicative of expected impacts to benthic invertebrates.

Food chain modeling was conducted to evaluate potential risks to terrestrial wildlife from bioaccumulative COPCs in surface soil and sediment. Insectivorous and piscivorous species of birds and mammals representative of those that would likely inhabit AOC 721 were selected as surrogate species; these consisted of the short-tailed shrew, American robin, star-nosed mole, Carolina wren, mink, and green heron. The food chain modeling indicated that bioaccumulative COPCs pose negligible risks to insectivorous mammals. Mercury was the only bioaccumulative COPC that could pose risks to insectivorous and piscivorous birds.

Conclusions and Recommendations

Cumulative HIs for the child recreational user (HI = 3) and child resident (HI = 9) exposed to surface soil exceeded unity even when calculated on a target organ/target effect specific basis, due primarily to arsenic and thallium. Cumulative HIs for the child resident (HI = 108) and adult resident (HI = 46) exposed to groundwater exceeded unity, due primarily to antimony, arsenic, manganese, and thallium. Cumulative ILCRs for various resident scenarios exceeded the USEPA's target risk range due primarily to arsenic in soil, and to arsenic, chromium (evaluated using toxicity criteria for hexavalent chromium), bis(2-ethylhexyl) phthalate, and heptachlor in groundwater. As noted previously for thallium, a provisional toxicity value was provided by USEPA's National Center for Environmental Assessment for the purposes of developing screening levels for soil and groundwater. However, USEPA concluded that available human studies do not support derivation of an oral RfD. Therefore, while the provisional value was used for screening and evaluating the likelihood for noncarcinogenic effects, the results will not be used to determine whether thallium should be a contaminant of concern. The ERA recommended that arsenic, cobalt, mercury, selenium, and zinc be retained as COPCs because concentrations of these five chemicals in some samples indicated expected impacts to sediment invertebrates. The ERA also recommended that mercury in sediment be retained as a COPC for insectivorous and piscivorous birds based on food chain modeling. It is therefore recommended that a corrective measures study be conducted to address the above chemicals with the exception of thallium in soil/sediment and groundwater.

1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report has been prepared for Area of Concern (AOC) 721, Zone C, at the Charleston Naval Complex (CNC) as part of the U.S. Navy (Navy) Comprehensive Long-Term Environmental Action Navy (CLEAN) program. The environmental investigation and remediation at CNC are required by the Hazardous and Solid Waste Amendment (HSWA) portion of the RCRA Part B permit issued by the South Carolina Department of Health and Environmental Control (SCDHEC). RCRA Corrective Action Program objectives are designed to evaluate the nature and extent of any hazardous waste or constituent releases, and to identify, develop, and implement appropriate corrective measures to protect human health and the environment.

CNC is on the western bank of the Cooper River in North Charleston, South Carolina (Figure 1-1). AOC 721 is located along the southern bank of Noisette Creek in Zone C, west of Avenue D North (Figure 1-2). The site is an extension of the boundary area of Solid Waste Management Unit (SWMU) 44, a former coal storage area.

AOC 721 was previously investigated as part of the Zone C RFI. Preliminary investigations of this area were detailed in the *Final RCRA Facility Assessment* (RFA) (EnSafe/Allen & Hoshall, 1995a) and the *Final Zone C RFI Report* (EnSafe, 1997). These reports provide details of the base closure process for environmental cleanup, division of the base into investigative zones, and the investigative approach for the RFI. This RFI Report, prepared by Tetra Tech, Inc. (Tetra Tech), focuses on the AOC 721 property and is submitted to satisfy the HSWA portion of the Part B permit, dated September 8, 2011.

1.1 SITE DESCRIPTION

AOC 721 is approximately 1.6 acres and is located in the northernmost portion of Zone C, west of Avenue D North, and just south of Noisette Creek (Figure 1-3). The site includes a 650-foot-long drainage ditch on the western side of the site that begins at the northernmost area of the SWMU 44 investigation area and runs northeast along the former perimeter road before discharging into Noisette Creek. A small pond east of the ditch drains into the 650-foot-long ditch. A surface topography survey was conducted to accurately determine site boundaries and surface flow runoff during the RFI field work.

Because AOC 721 is an extension of SWMU 44, site history descriptions reflect activities associated with SWMU 44. During the Corrective Measures Study (CMS) investigation (2002) by CH2MHill, Inc., and J.A. Jones Construction (CH2M-Jones) for SWMU 44, elevated concentrations of arsenic were detected in soil samples collected north of the SWMU 44 1996 coal pile footprint area. In 2001, the Navy requested that SCDHEC designate the area of elevated arsenic concentrations as a new site, separate from SWMU 44. The

request to classify the area of elevated arsenic detections north of the SWMU 44 footprint as another site was discussed during a partnering meeting (April 2002 Base Realignment and Closure Act [BRAC] Cleanup Team [BCT]) and presented in the May 2002 *CMS Work Plan/Interim Measure (IM) Completion Report, SWMU 44, Zone C* (CH2M-Jones, 2002).

The area encompassing AOC 721 is slightly north of SWMU 44. Much of what is now AOC 721 and SWMU 44 was formerly a marsh, and was filled with dredge materials in the early 1920s. A coal storage facility was located within the footprint of SWMU 44 from 1941 until 1996 [Spectra Tech, Inc., (Spectra Tech) 2006a]. Aerial photographs taken in the 1950s show the coal storage facility as a non-vegetated area, indicating that the area north of the railroad was used for coal storage. As Figure 1-4 indicates, a portion of the coal storage area, as delineated from a 1957 aerial photograph of the area, was within the present boundaries of AOC 721. The amount of coal stored at the facility varied over time, and at one point, coal piles extended north along the railroad tracks.

The site area currently consists of grasses, small trees, and a drainage ditch along the northern edge. A shallow pond resulting from coal pile removal activities in 1996 is located within the SWMU 44 boundary west of the railroad and is approximately 100 to 200 feet in diameter (Figure 1-3).

No activities other than the filling of marsh area with dredge materials and coal storage have been documented for the area between Noisette Creek and the railroad spur built for the storage and transfer of coal used at the power house (Building 32). These are the same activities associated with SWMU 44, which is nearly adjacent to AOC 721. Portions of what is now classified as AOC 721 were included in the 1996 Interim Stabilization Measures (ISM) coal removal. Therefore, the list of analyses for investigating AOC 721 was the same as proposed for SWMU 44 in the *Zone C RFI Work Plan* (EnSafe/Allen & Hoshall, 1995b), and refined based on subsequent SWMU 44 soil, groundwater, and sediment sampling data.

1.1.1 Previous Site Investigations

Initial sampling events conducted between 1981 and 1985 identified metals and suspended solids in surface water and storm water runoff samples. An RFA to evaluate the coal storage facility was conducted in 1995. Conclusions of the 1981-1985 sampling events and the RFA led to RFI activities, which began in 1995 and continued until 1997. The *Zone C RFI Report* (EnSafe, 1997) identified aluminum, arsenic, beryllium, and benzo(a)pyrene equivalents (BEQs) as SWMU 44 chemicals of concern (COCs) in soil; and aluminum, antimony, arsenic, beryllium, and manganese as SWMU 44 groundwater COCs. The bulk coal historically stored at the site was identified as a potential source of soil and stormwater runoff contamination; and as a result, an IM was conducted in 1996 by the Navy Environmental Detachment Charleston to remove the existing coal pile and associated, visually-suspect surface soil. A CMS following the RFI began in 1999 and was completed in 2002. A second IM at SWMU 44 to remove arsenic-impacted soils near the railroad was

conducted in 2001 by CH2M-Jones to meet remediation goals that would allow unrestricted land use. The *CMS Work Plan/Interim Measure Completion Report* concluded that SWMU 44 should be considered for No Further Action (NFA) status. SWMU 44 received NFA status documented in a letter from SCDHEC dated 13 May, 2002.

Soil and sediment samples collected during the CMS and IM activities indicated arsenic exceedances in the area designated as AOC 721 extending approximately 150 feet north of the 1996 north coal pile footprint and in the drainage ditch running along the northern edge of the site toward Noisette Creek. The soil, groundwater, and sediment data collected as part of the previous SWMU 44 investigations created an initial database for the AOC 721 area. This data was used to develop the investigation strategy and work plan for AOC 721.

1.1.2 Site Investigation

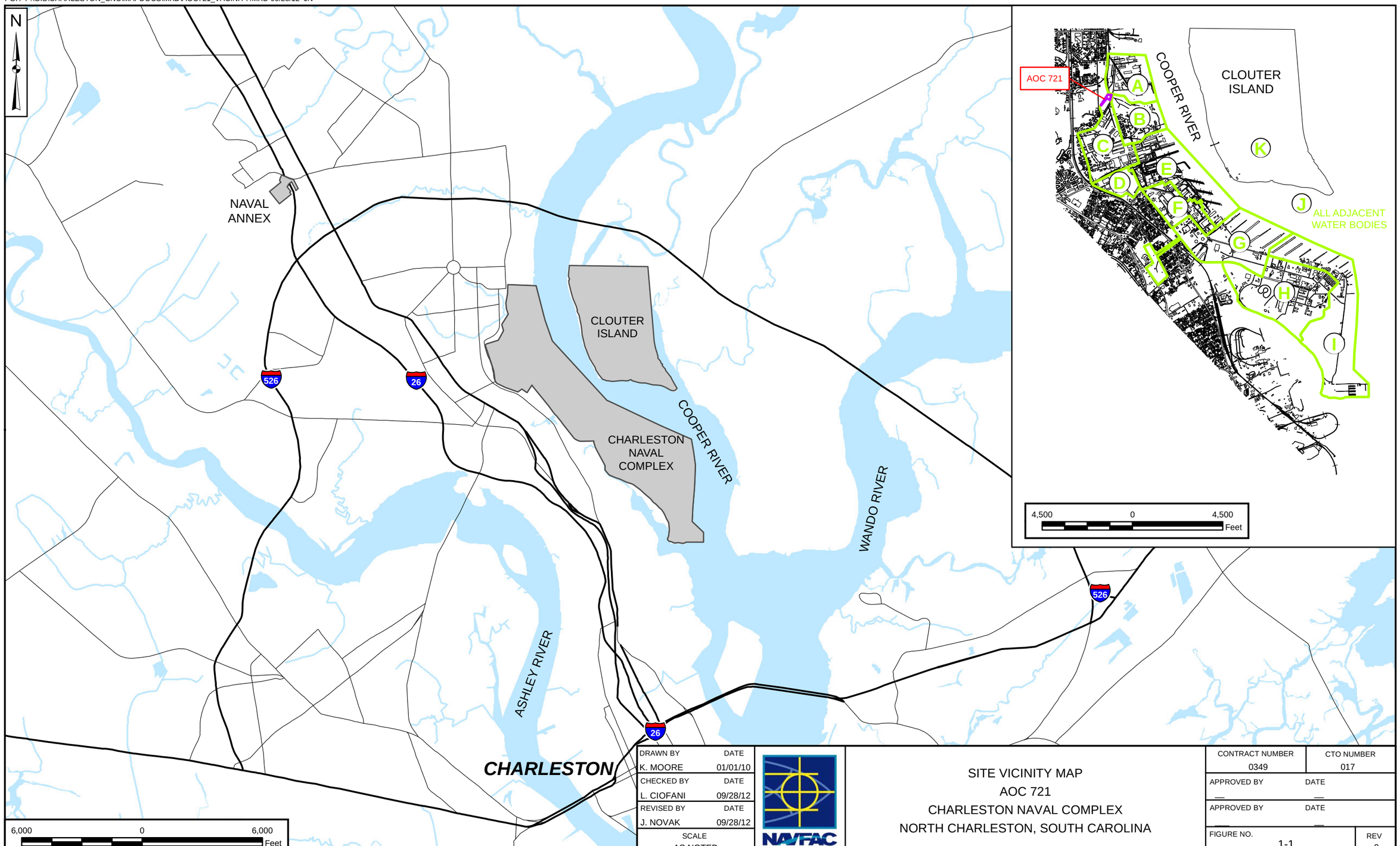
RFI field activities for AOC 721 began in April 2003. Investigations were performed in accordance with the *AOC 721 RFI Work Plan* (EnSafe, 2003). The *AOC 721 RFI Work Plan* addressed sampling and analysis requirements resulting from data gaps noted during the evaluation of data from SWMU 44 within the AOC 721 boundary, and on expected migration pathways to Noisette Creek based on surface topography.

Based on the preliminary RFI results, IM soil removal activities were performed in 2005 (Spectra Tech, 2006a) and is summarized in Section 6.0 of this report. Following the IM soil removal activities, additional groundwater samples were collected by Tetra Tech in 2008 to assess post-IM groundwater concentrations.

1.2 REPORT ORGANIZATION

This report is divided into 10 sections. Section 1.0 serves as an introduction. Section 2.0 provides information on the physical setting. Section 3.0 summarizes the RFI field investigations. Section 4.0 provides information on the nature and extent of AOC 721 contamination. Section 5.0 details the fate and transport of contaminants. Section 6.0 provides a description of the IM activities performed to date. Sections 7.0 and 8.0 provide the human health risk assessment and the ecological risk assessment, respectively. Section 9.0 presents conclusions and recommendations. Section 10.0 provides references

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_VACINITY.MXD 09/28/12 JN



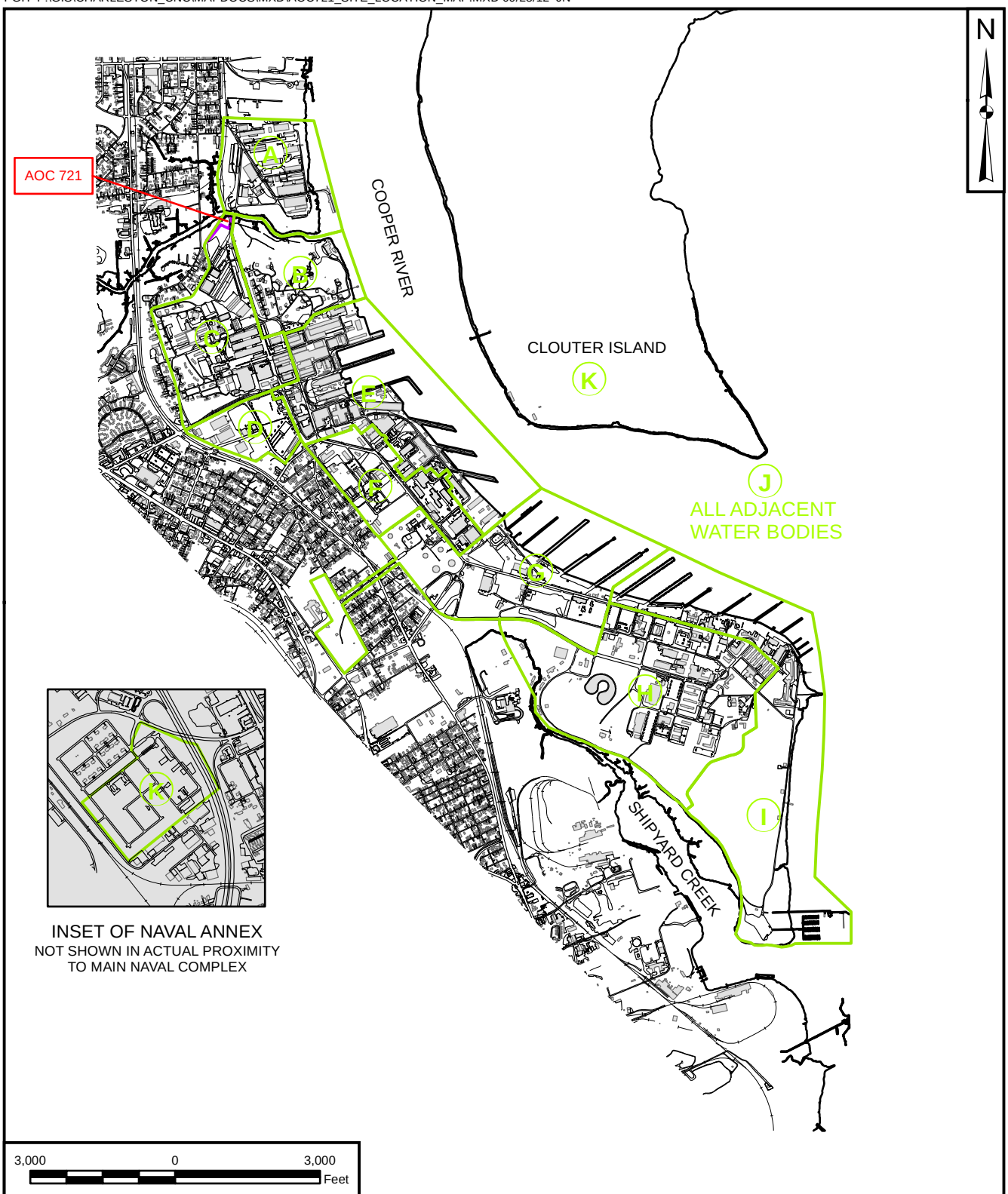
DRAWN BY	DATE
K. MOORE	01/01/10
CHECKED BY	DATE
L. CIOFANI	09/28/12
REVISED BY	DATE
J. NOVAK	09/28/12
SCALE	
AS NOTED	

NAVFAC

SITE VICINITY MAP
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

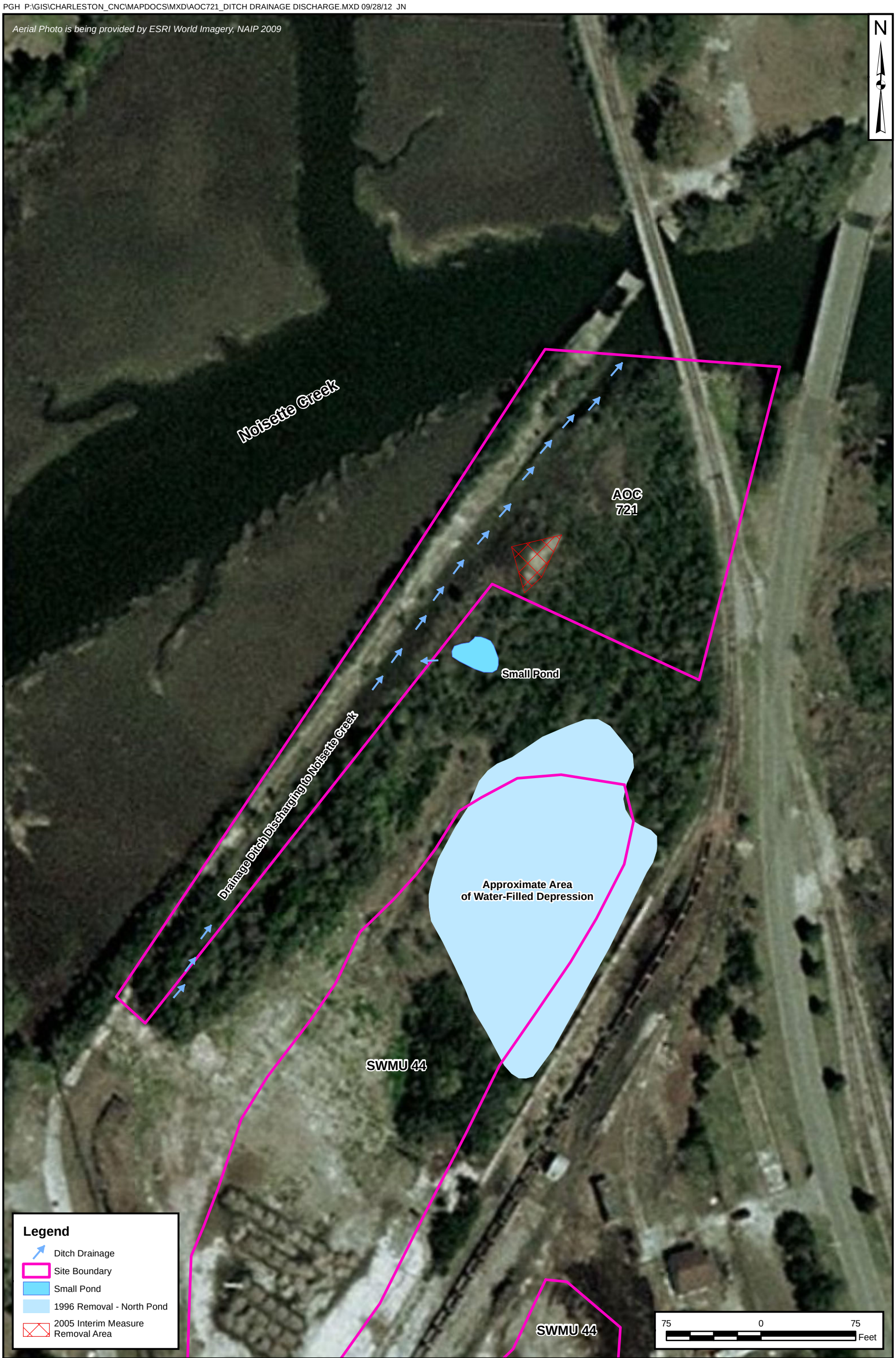
CONTRACT NUMBER	CTO NUMBER
0349	017
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
1-1	0

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_SITE_LOCATION_MAP.MXD 09/28/12 JN



DRAWN BY	DATE			CONTRACT NUMBER	CTO NUMBER
J. NOVAK	09/25/12			0349	017
CHECKED BY	DATE			APPROVED BY	DATE
L. CIOFANI	09/28/12			___	___
REVISED BY	DATE			APPROVED BY	DATE
				___	___
SCALE AS NOTED		NAVFAC	SITE LOCATION MAP AOC 721 CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	FIGURE NO. 1-2	REV 0

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_DITCH DRAINAGE DISCHARGE.MXD 09/28/12 JN



DRAWN BY	DATE
J. NOVAK	08/29/12
CHECKED BY	DATE
L. CIOFANI	09/28/12
REVISED BY	DATE
J. NOVAK	09/28/12
SCALE	
AS NOTED	

NAVFAC

SITE FEATURES MAP
RCRA FACILITY INVESTIGATION REPORT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NUMBER	CTO NUMBER
0349	017
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO. FIGURE 1-3	REV 0

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_COAL PILE DELINEATION.MXD 09/28/12 JN

DRAWN BY J. NOVAK	DATE 08/29/12	COAL PILE DISTRIBUTION MAP RCRA FACILITY INVESTIGATION REPORT AOC 721 CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NUMBER 0349	CTO NUMBER 017
CHECKED BY L. CIOFANI	DATE 09/28/12		APPROVED BY —	DATE —
REVISED BY J. NOVAK	DATE 09/28/12		APPROVED BY —	DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 1-4	REV 0

2.0 PHYSICAL SETTING

CNC is located in the Lower South Carolina Coastal Plain Physiographic Province, on the Cooper River side of the Charleston Peninsula, which is formed by the confluence of the Cooper and Ashley Rivers.

AOC 721 is located in Zone C in the former naval shipyard area, proximal to the southern bank of Noisette Creek, west of Avenue D North, and consists of three topographically distinct areas. The first topographic area consists of a northeast trending ditch that is approximately 650 feet in length. The flow channel is typically 2 to 3 feet in depth and ranges in elevation from 4 feet mean sea level (msl) at the upland end to -2 feet msl at the confluence with Noisette Creek. A narrow upland area parallels the ditch and ranges in elevation from 3.5 feet msl to 6 feet msl. The second area is just south of the drainage ditch/Noisette Creek confluence and ranges in elevation from 3.5 feet msl to 5.5 feet msl, with minor topographic depressions. The third area is between the railroad spur and Avenue D North in the northeast portion of AOC 721 and rises steeply from Noisette Creek to approximately 8 feet msl.

2.1 GEOLOGY

AOC 721 is situated on poorly consolidated Quaternary age sediments that overlie the Tertiary age (Ta) Ashley Formation. Quaternary age sediments (Qs, Qm, and Qc) at the site are sometimes covered by a thin veneer, less than a few feet in thickness, of anthropogenic fill placed during various phases of construction and site operations.

Lithologic information was obtained from two continuously sampled rotasonic soil borings (044027 and 044028, located near the center and southeastern corners of AOC 721, respectively) previously advanced to 45 feet below ground surface (bgs) in the AOC 721 area. A stratigraphic column for AOC 721 lithologies based on borings 044027 and 044028, exclusive of anthropogenic fill materials, is presented below.

Tertiary Age (Ta)

The Ta Ashley Formation is olive-brown, calcareous, clayey silt, and is present throughout the Charleston area. Ta was encountered at approximately -30 feet msl in borings 044027 and 044028 that were advanced to the top of this unit during SWMU 44 activities.

Quaternary Age Sediments (Qs, Qm, and Qc)

Qs_1 is a light to medium grey, fine- to coarse-grained, well-sorted sand, with basal shell hash and phosphate. This unit was encountered at depth in both borings and is the basal sand for this section.

Qs_2 is typically grey to grey-green, very fine to fine, silty sand. Sands of this unit were the prevalent sand sediments in boring 044028, located near the southeastern corner of AOC 721.

Qs_3 is a tan-grey, fine to coarse-grained, well-sorted sand. Sands of this unit were encountered throughout the section at location 044027 near the center portion of AOC 721.

Qm is a dark grey to black, sometimes dark brown or greenish grey, soft, organic-rich clayey silt, locally known as “marsh clay”. Thickly interbedded with Qs_3 at boring 044027 but thinly interbedded with Qs_2 at boring 044028.

Qc is a grey-green with occasional red or blue, firm to stiff inorganic clay. There are only two occurrences of Qc, both occurring at boring 044028. One is thinly bedded in mid-section, and the other is as a well developed basal unit of the section directly overlying Ta.

2.2 GROUNDWATER

2.2.1 Regional

The Ta is a regional confining unit isolating surficial sediments from deeper sediments in the Charleston area. Sediments overlying the Ashley Formation are grouped into a single surficial aquifer. The surficial aquifer is considered to be an unconfined unit. However, localized confined and semi-confined conditions occur within the aquifer due to its heterogeneous nature. Groundwater flow in the surficial aquifer tends to follow topography and flows to the Cooper and Ashley River drainages, which bound the Charleston peninsula.

2.2.2 AOC 721

The site is situated on unconsolidated sediments that have been grouped into a single surficial aquifer. The surficial aquifer at AOC 721 consists primarily of either Qs_2 or Qs_3 interbedded with Qm. Sand Qs_2 is more dominant than Qm in boring 044028 located near the southeast corner of the AOC. However, the distribution of sand Qs_3 and Qm are approximately equal throughout boring 044027 near the center of AOC 721 and the alternating beds increase almost equally in thickness with depth. The occurrences of inorganic clay (Qc) and marsh clay (Qm) are typically effective aquitard material in the vertical direction. Consequently, the interbedded nature of the aquifer matrix may lead to localized semi-confined areas in what is considered to be an unconfined surficial aquifer system. Recharge to the surficial aquifer at AOC 721 is by direct recharge from precipitation and by lateral flow from upgradient areas of Zone C.

Groundwater Flow

Figure 2-1 depicts groundwater elevation contours for the SWMU 44 and AOC 721 area based on synoptic 1996 pre-coal removal and IM water-level data collected from all wells in the study area. Groundwater elevation contours for the SWMU 44 and AOC 721 study area prior to the 1996 coal removal demonstrate that shallow groundwater flow directions were north and north-northwest toward Noisette Creek. Groundwater elevation contours based on synoptic data collected in March 2002 are presented on Figure 2-2. Shallow groundwater flow directions in 2002 were also north and north-northwest toward Noisette Creek, demonstrating that groundwater flow directions between the 1996 pre-IM removal and 2002 post-IM removal events were not significantly changed.

Hydraulic Gradient

Flow paths at locations A and B were selected for estimating horizontal hydraulic gradients under existing conditions and are depicted on Figure 2-2. Table 2-1 presents values and gradients calculated using the March 2002 groundwater elevation contours.

TABLE 2-1
HORIZONTAL HYDRAULIC GRADIENTS

Location	ΔH (ft)	ΔL (ft)	Gradient
A	3	186	0.016
B	3	167	0.018

Notes:
ΔH = Change in Head
ΔL = Change in Length
ft = feet

Horizontal Flow Velocity

Flow velocities are estimated using hydraulic conductivity (Kh) and porosity values obtained from hydraulic testing and geotechnical laboratory analysis. Geotechnical and hydraulic testing performed during the SWMU 44 RFI were used to estimate flow velocities at AOC 721.

An undisturbed sample of orange-brown/tan fine-grained sand (Qs_3), was recovered using a thin-walled sampler (Shelby tube) from a depth of 14.5 to 16.5 ft bgs in well boring 044004, and submitted for laboratory analysis. Laboratory permeability of the undisturbed sample was determined to be 3.50×10^{-4} centimeters/second [0.992 feet per day (ft/day)]. Slug testing performed at well 044006 yielded a comparable permeability of 1.35 ft/day. The Geometric Mean of laboratory and field permeability data is 1.16 ft/day. Porosity of the undisturbed sand sample was determined to be 0.293.

AOC 721 horizontal flow velocities were estimated using hydraulic gradients along flow paths A and B, developed from March 19, 2002, groundwater elevation data, and are presented in Table 2-2. Laboratory porosity and hydraulic conductivity geometric mean were used to calculate horizontal groundwater flow velocities for AOC 721.

TABLE 2-2
HORIZONTAL FLOW VELOCITIES

Flow Path	Hydraulic Gradient (ft/ft)	Porosity	Kh (ft/day)	Velocity (ft/day)
A	0.016	0.293	1.16	0.063
B	0.018	0.293	1.16	0.071

Notes:
ft/ft = feet per foot
ft/day = feet per day
Kh = Horizontal hydraulic conductivity (geometric mean of field and laboratory data)

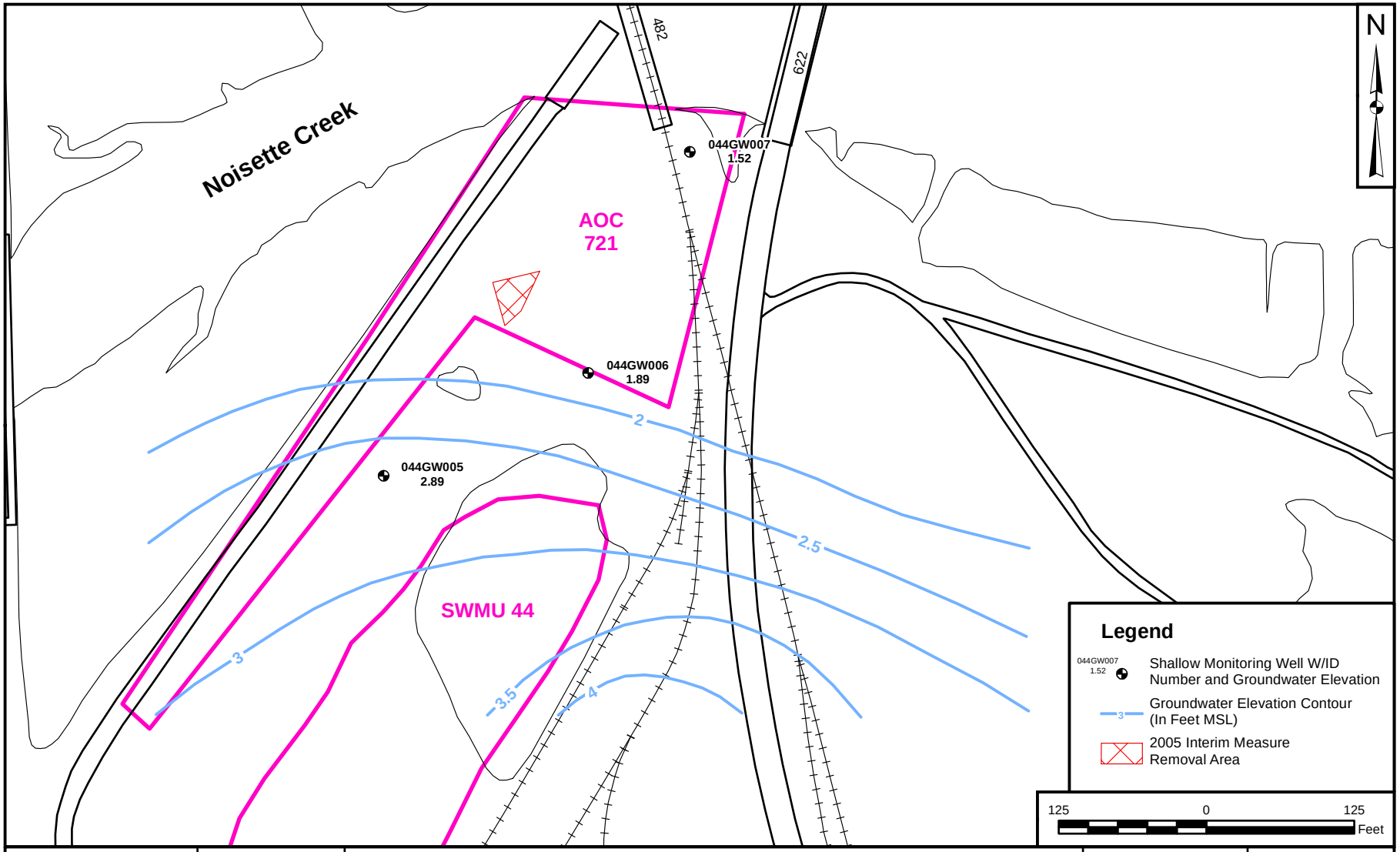
Vertical Groundwater Flow

No deep wells were installed at the site. Therefore, an evaluation of vertical flow direction and gradient within the surficial aquifer at AOC 721 is not possible. However, deeper aquifers are isolated from the surficial aquifer by the Ashley Formation, which is an effective regional confining unit.

2.3 CLIMATE

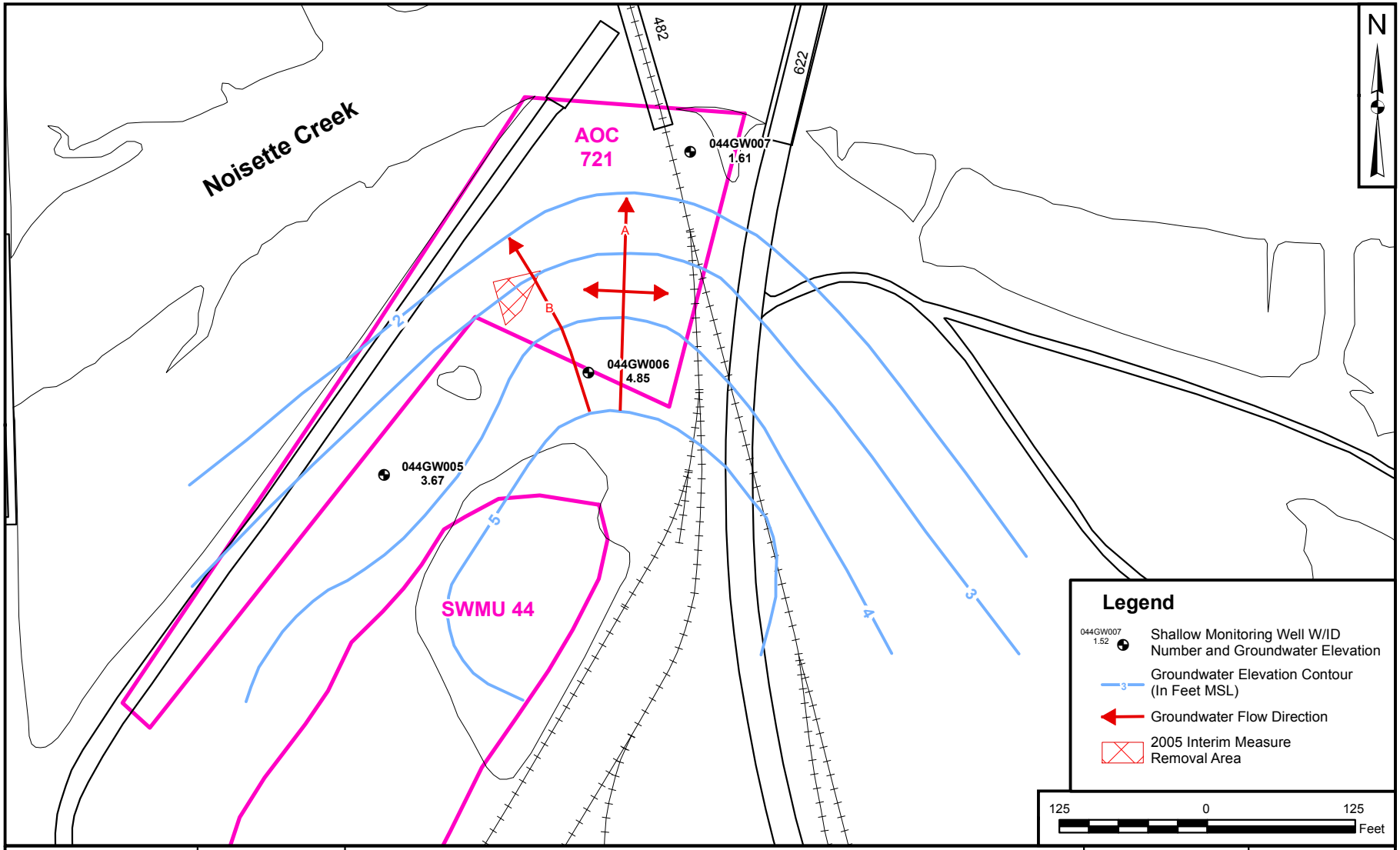
Summary discussions of climatological conditions at CNC are presented in Section 2.3 of the *Zone C RCRA Facility Investigation Report* (EnSafe, 1997).

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_SHALLOW GW JUNE1996.MXD 09/28/12 JN



DRAWN BY J. NOVAK	DATE 08/30/12	SHALLOW GROUNDWATER CONTOURS JUNE 1996 AOC 721 CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NUMBER ___ / CTO NUMBER ___
CHECKED BY L. CIOFANI	DATE 09/28/12		APPROVED BY ___ / DATE ___
REVISED BY J. NOVAK	DATE 09/28/12		APPROVED BY ___ / DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 2-1 / REV 0

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_SHALLOW GW ALT2.MXD 04/03/13 DC



DRAWN BY	DATE
J. NOVAK	08/30/12
CHECKED BY	DATE
L. CIOFANI	04/03/13
REVISED BY	DATE
D. COUCH	04/03/13
SCALE	
AS NOTED	

NAVFAC

SHALLOW GROUNDWATER CONTOURS
MARCH 2002
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NUMBER	CTO NUMBER
—	—
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 2-2	0

3.0 FIELD INVESTIGATION

This section lists the field investigation objectives and describes the technical sampling methods, procedures, and protocols implemented for AOC 721 data collection. Fieldwork was conducted in accordance with the *Comprehensive Sampling and Analysis Plan* (CSAP) (EnSafe/Allen&Hoshall, 1996), the United States Environmental Protection Agency (USEPA) Region 4, Environmental Services Division, *Standard Operating Procedures and Quality Assurance Manual* (1996) (ESDSOPQAM), the *AOC 721 RFI Work Plan* (EnSafe, 2003), and the *Quality Assurance Project Plan for Supplemental RCRA Facility Investigation of AOC 721* (Tetra Tech, 2008).

3.1 INVESTIGATION OBJECTIVES

The sampling strategy for AOC 721 was detailed in the *AOC 721 RFI Work Plan* (EnSafe, 2003) and was designed to:

- Determine the extent of semivolatile organic compound (SVOC) contamination detected in previous soil sample location 044SS005 and evaluate the potential for contaminant migration into the drainage ditch.

- Delineate screening criteria soil exceedances at sample locations 044M0017, 044SS006, 044SB025 and 044SB027.

- Determine the oxidation/reduction potential (ORP) and dissolved constituent concentrations in groundwater [total organic carbon (TOC), total dissolved solids (TDS), Fe^{2+} and Fe^{3+}].

- Evaluate groundwater geochemistry: temporal variations in detected arsenic concentrations, variations in groundwater geochemistry, and determine reasons for arsenic detections in well 044007.

- Confirm constituent concentrations from previous sediment data and evaluate possible runoff from upland sources, and delineate screening criteria exceedances in the drainage ditch, as well as determine if sediment from AOC 721 is impacting Noisette Creek.

- Determine variations in surface water quality resulting from tidal inundation.

As described in Section 1.1.3, sampling was also conducted in 2008 by Tetra Tech to determine post-IM groundwater concentrations.

3.2 SAMPLING PROCEDURES, PROTOCOLS, AND ANALYSES

3.2.1 Sample Identification

All samples collected during this investigation were identified using the 10-character scheme from Section 11.4 of the CSAP. This scheme identifies the samples by site, matrix, location, and depth. The first three characters identify the site where the sample was collected. The fourth character identifies the sample matrix or quality control (QC) code. The fifth through eighth characters identify the location. The ninth and tenth characters identify the soil sample interval or groundwater sampling event. For example, sample ID 721SB00601 is a first-interval soil sample (S) from soil boring (B) 006 at AOC 721. Similarly, sample ID 044GW00509 would be the ninth groundwater (G) sample collected from monitoring well (W) 005 at SWMU 044, and 044GW00510 would indicate the tenth groundwater sample collected from the same well.

3.2.2 Soil Sampling

Section 4 of the CSAP describes RFI soil sampling procedures and activities.

3.2.2.1 Soil Sampling Locations

Soil samples were collected in April 2003 from locations proposed in the *AOC 721 RFI Work Plan* (EnSafe, 2003) and based on the investigation strategy outlined in Section 6 of that plan. After the analytical data from the initial round of soil samples were evaluated, a second sampling event was deemed necessary to characterize the extent of elevated concentrations of SVOCs and metals. The second soil sampling event was conducted in June 2003.

3.2.2.2 Soil Sample Collection

Composite soil samples were collected for laboratory analysis from 0- to 1-ft bgs. The 0- to 1-ft bgs interval is referred to in this report as the “first”, “upper interval” or “surface”. No other intervals were collected during the AOC 721 RFI soil sampling.

Stainless-steel spoons and bowls were used to collect soil samples. At grassy locations, the vegetative root zone (generally less than 2 inches thick) overlying the soil was removed before advancing the spoon to 1 ft bgs. Soil from the 0- to 1-ft bgs interval was homogenized in accordance with the CSAP.

3.2.2.3 Soil Sample Preparation, Packaging, and Shipment

Section 3.2.2.3 of the *Zone A RFI Report* (EnSafe, 1998) discusses soil sample preparation, packaging, and shipment for CNC.

3.2.2.4 Soil Sample Analysis

Section 3.2.2.4 of the *Zone A RFI Report* (EnSafe, 1998) discusses soil sample analysis for CNC.

3.2.3 Monitoring Well Installation and Development

No new monitoring wells were installed during the AOC 721 RFI investigation.

3.2.3.1 Monitoring Well Development

SWMU 44 wells sampled during the AOC 721 RFI investigation were developed until field parameters (e.g., temperature, dissolved oxygen, pH, turbidity, etc.) in the groundwater stabilized during well purge prior to sampling.

3.2.4 Groundwater Sampling

Groundwater was sampled in accordance with Section 6 of the CSAP. The following subsections briefly summarize the site-specific methods applied for AOC 721 groundwater collection.

3.2.4.1 Groundwater Sampling Locations

Groundwater samples were collected from the approved well locations identified in the *AOC 721 RFI Work Plan* (EnSafe, 2003), which consisted of SWMU 44 wells 044005, 044006, and 044007 (Figure 3-1).

3.2.4.2 Groundwater Sample Collection

Section 3.2.4.2 of the *Zone A RFI Report* (EnSafe, 1998) discusses groundwater sample collection at CNC.

3.2.4.3 Groundwater Sample Preparation, Packaging, and Shipment

Section 3.2.4.3 of the *Zone A RFI Report* (EnSafe, 1998) discusses groundwater sample preparation, packaging, and shipment for CNC.

3.2.4.4 Groundwater Sample Analysis

Section 3.2.4.4 of the *Zone A RFI Report* (EnSafe, 1998) discusses groundwater sample analysis for CNC. Groundwater samples collected from select SWMU 44 wells during the AOC 721 RFI were analyzed for SVOCs, metals, TOC, total suspended solids (TSS), and TDS. Groundwater redox conditions were evaluated by analyzing samples for TOC, ORP, Fe^{2+}, and Fe^{3+}. ORP values were measured in the field during well purge using a Horiba U-22 with a flow through cell. Analysis for Fe^{2+} was performed using HACH test Method 8146 and a spectrophotometer. Analysis for Fe^{3+} was performed using HACH test Method 8147 and a spectrophotometer.

3.2.5 Sediment Sampling

Section 4 of the CSAP describes RFI sediment sampling procedures and activities.

3.2.5.1 Sediment Sample Locations

Sediment samples were collected in April 2003 from locations proposed in the *AOC 721 RFI Work Plan* (EnSafe 2003) and based on the investigation strategy outlined in Section 6 of the work plan.

3.2.5.2 Sediment Sample Collection

Composite sediment samples were collected for laboratory analysis from 0- to 1-ft bgs. The 0- to 1-ft bgs interval is referred to in this report as the “first”, “upper interval” or “surface”. No other intervals were collected during the AOC 721 RFI sediment sampling.

Stainless-steel spoons and bowls were used to collect sediment samples. Sediment was collected and homogenized in accordance with the CSAP.

3.2.5.3 Sediment Sample Preparation, Packaging, and Shipment

Section 3.2.5.3 of the *Zone A RFI Report* (EnSafe, 1998) discusses sediment sample preparation, packaging, and shipment for CNC.

3.2.5.4 Sediment Sample Analysis

Section 3.2.5.4 of the *Zone A RFI Report* (EnSafe, 1998) discusses sediment sample analysis for CNC.

3.2.6 Surface Water Sampling

Section 4 of the CSAP describes RFI surface water sampling procedures and activities.

3.2.6.1 Surface Water Sample Locations

Surface water samples were collected in April 2003 from locations proposed in the *AOC 721 RFI Work Plan* (EnSafe, 2003) and based on the investigation strategy outlined in Section 6 of the work plan.

3.2.6.2 Surface Water Sample Collection

Surface water samples were collected by submerging the appropriate sample containers with the open end pointed upstream. Care was taken not to disturb bottom sediments during the sampling procedure. Surface water samples were collected in accordance with the CSAP.

3.2.6.3 Surface Water Sample Preparation, Packaging, and Shipment

Section 3.2.5.3 of the *Zone C RFI Report* (EnSafe, 1997) discusses surface water sample preparation, packaging, and shipment for CNC.

3.2.6.4 Surface Water Sample Analysis

Section 3.2.5.4 of the *Zone C RFI Report* (EnSafe, 1997) discusses surface water sample analysis for CNC.

3.2.7 Vertical and Horizontal Surveying

Section 3.2.8 of the *Zone A RFI Report* (EnSafe, 1998) discusses vertical and horizontal surveying for CNC.

Prior to the submittal of the *AOC 721 Work Plan*, a topographic contour map was made of the land surface associated with AOC 721 and SWMU 44 north of the coal unloading trestle, to identify potential migration pathways and subsequent sample locations. Ground elevation data and corresponding locational data were collected and contoured by a registered land surveyor. Data were collected on 25 foot centers, and at the top and toe of major elevation changes such as the drainage ditch along the northern edge of AOC 721. Data were electronically contoured using 0.5-ft contour intervals. Figure 4-1 in the *AOC 721 Work Plan* depicts AOC 721 site topography.

A topographic divide extends northeast from monitoring well 044003 through monitoring well 044006 across the site area, as shown on Figure 3-1. This divide breaks the site area into two major surface water runoff directions. The first direction is towards the northwest, which is toward AOC 721 and the

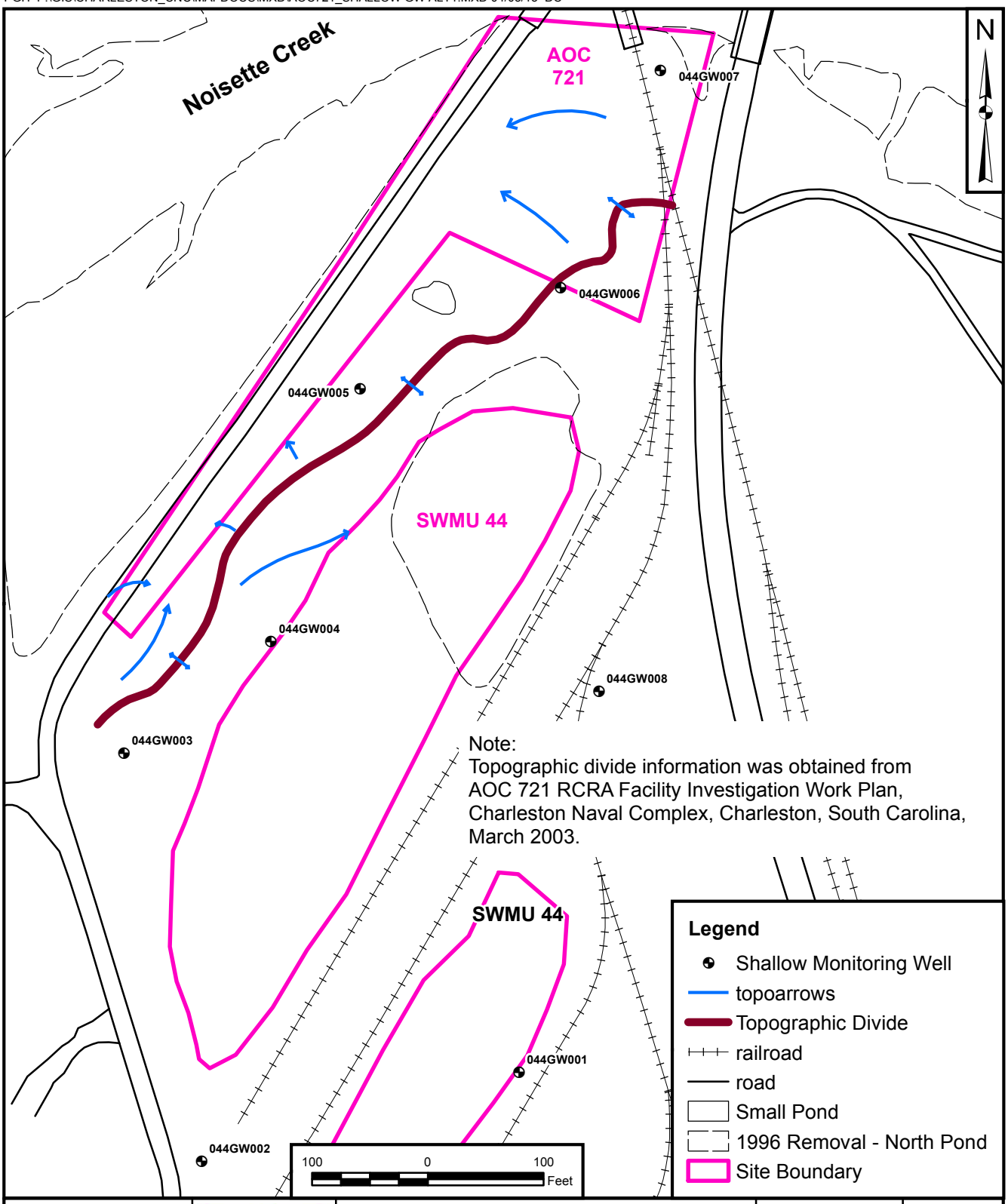
drainage ditch. The second runoff direction is towards the southeast and the water-filled depression created by the 1996 coal removal ISM.

Mean high water (MHW) for the base is 3.5 ft msl. The MHW line is depicted on Figure 4-1 of the *AOC 721 Work Plan*; however, extremely high tides occasionally exceed the MHW elevation.

3.2.8 Decontamination Procedures

Section 3.2.10 of the *Zone A RFI Report* (EnSafe, 1998) discusses prevention of cross-contamination and decontamination procedures for sampling and non-sampling equipment at CNC.

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_SHALLOW GW ALT1.MXD 04/05/13 DC



Note:
Topographic divide information was obtained from AOC 721 RCRA Facility Investigation Work Plan, Charleston Naval Complex, Charleston, South Carolina, March 2003.

DRAWN BY D. COUCH	DATE 04/02/13	SWMU 44 MONITORING WELLS AND TOPOGRAPHIC DIVIDE AOC 721 CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NUMBER ___	CTO NUMBER ___
CHECKED BY	DATE		APPROVED BY ___	DATE ___
REVISED BY	DATE		APPROVED BY ___	DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 3 - 1	REV 0

4.0 NATURE AND EXTENT

This section presents the results of the sampling and analysis of environmental samples collected at AOC 721 based on sampling activities during the RFI investigation and previously collected SWMU 44 samples within the footprint of AOC 721. Sampling was conducted at AOC 721 to identify human health concerns and potential releases from the site into Noisette Creek. Soil, groundwater, sediment, and surface water data are discussed separately below. Because the drainage ditch sampled at AOC 721 discharges to Noisette Creek, a discussion of the Noisette Creek sampling results from the Zone J RFI is also included.

4.1 INORGANIC BACKGROUND EVALUATION

Analytical data for inorganics are often difficult to evaluate, because inorganics are ubiquitous and naturally occurring in environmental media. Compounding this difficulty is the fact that much of the soil at AOC 721 is dredge-fill material that has been artificially placed onsite. The following describes the step-by-step procedures used to determine background values for inorganics in soil, sediment, and groundwater at AOC 721, and the approach for comparing background data to site data.

Many chemicals, particularly carcinogenic inorganics such as arsenic, are typically detected at concentrations that are much higher than the corresponding risk-based screening levels. It is usually necessary to supplement site-specific sampling efforts with an attempt to determine the non-site-related concentrations of these chemicals. The problem is how to determine these reference (or background) concentrations, and how much higher than background a specific chemical concentration must be before it is of concern.

Background data sets for soil (Table 4-1) and groundwater (Table 4-2) were established by evaluating soil and shallow groundwater sample locations from the Railroad Lines and Zone C background data sets. The maximum of the Railroad Lines and Zone C background values were selected for the AOC 721 background data sets. The sediment background data set (Table 4-3) was comprised of sediment samples collected in December 2005 from 10 locations in Charleston Harbor that had been pre-approved by the BCT, and was the same background data set used in the evaluation of Zone J sediment (Tetra Tech, 2011). Maximum concentrations of analytes detected in the background data sets were used in the screening of AOC 721 data in the remainder of this section.

4.2 NATURE AND EXTENT OF CONTAMINATION IN SOIL

This section describes the results of screening analyte detections in soil against the USEPA Regional Screening Levels (RSLs) and AOC 721 background concentrations. A target hazard quotient of 0.1 was used for the screening of non-carcinogenic constituents. Soil sampling was performed to complete delineation of inorganic and SVOC exceedances recorded during the Zone C RFI. Analytical results for any parameter detected at least once in the surface soil samples are presented in Table 4-4. Descriptive statistics [e.g., frequency of detection, concentration range detected, and location(s) of maximum positive detection] are summarized in Table 4-5. The locations of positive detections exceeding both screening criteria and background are depicted in Figure 4-1.

Soil samples collected for the AOC 721 RFI were analyzed for metals only. Arsenic, cobalt, iron, and thallium were detected at concentrations above both the AOC 721 background concentrations and screening criteria. Arsenic concentrations were greater than the background concentration in only one of the nine soil samples. The maximum concentration of arsenic only slightly exceeds the background value. Only one sample was available for cobalt and iron, and thallium was detected in only one of seven samples. The two sample locations with concentrations of one or more analytes exceeding both screening criteria and background are located within or near the location of the 1957 coal pile delineation (Figure 1-4).

4.3 NATURE AND EXTENT OF CONTAMINATION IN GROUNDWATER

This section describes the results of screening analyte detections in groundwater against USEPA RSLs and AOC 721 background concentrations. Groundwater samples were collected to characterize potential groundwater contamination from the storage and burning of coal. Samples for laboratory analysis were collected from existing monitoring wells 044005, 044006, and 044007. Analytical results for any parameter detected at least once in the groundwater samples are presented in Table 4-6. Descriptive statistics (e.g., frequency of detection, concentration range detected, and location[s] of maximum positive detection) are summarized in Table 4-7.

Groundwater samples collected for the AOC 721 RFI were analyzed for polynuclear aromatic hydrocarbons (PAHs), but not for other SVOCs, based on groundwater data from sampling events at SWMU 44 from 1995 to 1999. There were no PAH detections in groundwater during the AOC 721 RFI investigation. The SVOC bis(2-ethylhexyl) phthalate was detected in two samples collected from monitoring well 044006 between 1995 and 1997. Both of the detections exceeded screening criteria. Pesticide compounds were analyzed in groundwater samples collected as a part of the 1995 to 1999 investigation of SWMU 44 groundwater. Heptachlor was detected in only one groundwater sample from monitoring well 044007 during this period. Figure 4-2 presents organics in groundwater detected at

concentrations exceeding screening criteria. No background values were available for the organics detected in groundwater.

Several metals were detected in AOC 721 RFI groundwater samples and in previous SWMU 44 groundwater samples. Figure 4-3 presents inorganics in groundwater detected at concentrations exceeding both background and screening criteria. Analysis of Total Analyte List (TAL) metals was conducted in previous sampling events at SWMU 44 except during the sixth sampling event (January 1999) in monitoring well 044007, where the sample was analyzed for antimony, arsenic, beryllium, chromium, lead, thallium and mercury. Aluminum, antimony, arsenic, chromium, cobalt, iron, manganese, thallium, and vanadium were detected at concentrations above background levels and screening criteria. For the 2003 to 2008 sampling period, aluminum, antimony, chromium, cobalt, and thallium were not detected in any wells. Arsenic was detected above background concentrations and screening levels in all wells sampled during the 2003 to 2008 sampling events. Iron was detected above screening levels in all wells sampled during the 2003 to 2008 sampling events, but iron concentrations exceeded background in only 4 of the 9 samples collected during these events. Manganese was detected above screening levels but below background concentrations in all wells sampled during the 2003 to 2008 sampling events. Detected vanadium concentrations for the 2003 to 2008 sampling events were less than background concentrations and screening levels.

4.4 NATURE AND EXTENT OF CONTAMINATION IN SEDIMENT

This section describes the results of screening analyte detections in sediment against USEPA RSLs and AOC 721 sediment background concentrations. Sediment samples were collected to characterize and delineate contamination in the drainage ditch along the western boundary of the site and in portions of wetlands on the site that met the criteria of critical habitat as defined by the National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Coastal Resource Management (OCRM). Soil samples previously collected within the identified critical habitat area were included in the sediment evaluation. Although most of these samples (with the exception of the samples collected within the drainage ditch) have properties that would allow them to be evaluated as either soil or sediment, a determination was made to evaluate all samples northwest of the critical habitat delineation line as sediment. Analytical results for any parameter detected at least once in the sediment samples are presented in Table 4-8. Descriptive statistics [e.g., frequency of detection, concentration range detected, and location(s)] of maximum positive detections are summarized in Table 4-9. The locations of positive organic and inorganic detections that exceed both background and screening criteria are depicted in Figure 4-4 and Figure 4-5, respectively.

Sediment samples were analyzed for volatile organic compounds (VOCs), PAHs, and inorganics. Previous sediment samples associated with the SWMU 44 investigation were analyzed for TOC.

Benzo(a)anthracene (a PAH compound), aluminum, arsenic, cobalt, iron, manganese, thallium, and vanadium were detected at concentrations above background and RSLs. Benzo(a)anthracene concentrations in sediment samples exceeded the background concentration in 7 of 16 samples. One sample from C044SB025 had an aluminum concentration in sediment that exceeded the background concentration. Arsenic concentrations in sediment samples exceeded the background concentration in 19 of 34 samples. Cobalt concentrations in sediment samples exceeded the background concentration in 5 of 25 samples. Iron in sediment samples exceeded the background concentration in one sample taken in 1995 from a drainage ditch. Manganese concentrations in sediment samples exceeded the background concentration in 2 of 10 samples. Thallium, which was detected in 3 of 32 sediment samples, was not detected in background samples. Thallium exceeded the RSL in all 3 sediment samples with detected thallium concentrations. Vanadium concentrations in sediment samples exceeded the background concentration in 2 of 10 samples.

Although sediment concentrations were conservatively screened against criteria based on RSLs for residential soil, sediment exposures are expected to be less frequent and less intense for potential human receptors than residential exposures to soil. Therefore, it is likely that sediment exposures incurred by receptors would be approximately one order of magnitude less intensive/frequent than exposures incurred under a residential land use scenario. As shown in Table 4-9, only concentrations of arsenic, cobalt, iron, and thallium exceed both background and screening criteria based on RSLs for residential soil that have been increased by an order of magnitude (i.e., multiplied by 10).

4.5 NATURE AND EXTENT OF CONTAMINATION IN SURFACE WATER

This section describes the results of screening analyte detections in surface water against USEPA Region 4 saltwater surface water chronic ecological screening values. Sample 721WP00101 was collected at mid-tide from the small pond that adjoins the AOC 721 drainage ditch on April 21, 2003. Two samples [one at high tide on 04/21/03 at 1:45 p.m. (721WD00102) and a second at low tide on April 22, 2003 at 8:05 a.m. (721WD00101)] were also collected from the ditch at location 721WD001. Analytical results for any parameter detected at least once in the surface water samples are presented in Table 4-10. Descriptive statistics (e.g., frequency of detection, concentration range detected, and arithmetic mean of positive detections are summarized in Table 4-11.

Surface water samples were analyzed for organic and inorganic compounds. There were no organic compounds detected in surface water. Eight inorganics were detected in surface water. Arsenic concentrations were less than their respective Saltwater Surface Water (SSW) screening values, and SSW screening values were not available for the other seven inorganics detected in surface water (Table 4-11).

4.6 NOISETTE CREEK SAMPLING RESULTS – ZONE J RFI

Because the drainage ditch in AOC 721 discharges into Noisette Creek, this section discusses results of the Noisette Creek sampling presented in the Zone J RFI Report (Tetra Tech, 2011) which is currently under review by SCDHEC. Three sediment samples were collected in April 2008 from Noisette Creek as part of the Zone J RFI. Section 4 of the Zone J RFI report discusses chemicals detected in sediment collected during April 2008 and also compares the 2008 data to historical sediment data collected from one of the same locations. A summary of the 2008 sediment data from the Zone J RFI is presented below.

SVOCs detected in sediment at concentrations greater than USEPA Region 4 Ecological Screening Values and background concentrations consisted of PAHs and bis(2-ethylhexyl) phthalate. Sediment concentrations of SVOCs were generally less in 2008 than in 1997 and 2005. Copper concentrations exceeded background concentrations and USEPA Region 4 Ecological Screening Values in sediment samples collected from Noisette Creek. Mercury and zinc concentrations exceeded their Region 4 Ecological Screening Values in the duplicate sample obtained from one Noisette Creek sample but not in the original sample. The pesticide 4,4'-DDD was detected in two Noisette Creek samples, while 4,4'-DDE was detected in one sample. Detected concentrations of these pesticides slightly exceeded USEPA Region 4 Ecological Screening Values. No other pesticides or PCBs were detected in samples collected from Noisette Creek.

TABLE 4-1

SELECTED BACKGROUND FOR SURFACE SOIL
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Parameter	Railroad Lines Maximum Concentration	Zone C Maximum Concentration	Maximum	Unit
ALUMINUM	NA	9850	9850	mg/kg
ANTIMONY	NA	1.4	1.4	mg/kg
ARSENIC	92	39	92	mg/kg
BARIUM	NA	193	193	mg/kg
BERYLLIUM	NA	0.26	0.26	mg/kg
CADMIUM	NA	0.65	0.65	mg/kg
CALCIUM	NA	85600	85600	mg/kg
CHROMIUM, TOTAL	NA	32	32	mg/kg
COBALT	NA	2.9	2.9	mg/kg
COPPER	109	40	109	mg/kg
IRON	NA	12000	12000	mg/kg
LEAD	NA	588	588	mg/kg
MAGNESIUM	NA	2390	2390	mg/kg
MANGANESE	NA	101	101	mg/kg
MERCURY	NA	0.75	0.75	mg/kg
NICKEL	NA	28	28	mg/kg
POTASSIUM	NA	836	836	mg/kg
SELENIUM	NA	1.3	1.3	mg/kg
SILVER	NA	0.06	0.06	mg/kg
SODIUM	NA	729	729	mg/kg
THALLIUM	NA	ND	ND	mg/kg
TIN	NA	8.1	8.1	mg/kg
VANADIUM	NA	25	25	mg/kg
ZINC	NA	779	779	mg/kg

Source: Surface soil background samples from the Technical Memorandum: Summary of Inorganic Chemical Concentrations in Background Soil and Groundwater, Charleston Naval Complex

mg/kg - Milligrams per kilogram

NA - Not available

ND - Not detected

TABLE 4-2

SELECTED BACKGROUND FOR GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Parameter	Zone C Maximum Concentration	Unit
ALUMINUM	620	µg/l
ANTIMONY	ND	µg/l
ARSENIC	6	µg/l
BARIUM	16	µg/l
BERYLLIUM	0.36	µg/l
CADMIUM	ND	µg/l
CALCIUM	152000	µg/l
CHROMIUM, TOTAL	2	µg/l
COBALT	2	µg/l
COPPER	ND	µg/l
CYANIDE	NA	µg/l
IRON	4660	µg/l
LEAD	4	µg/l
MAGNESIUM	9250	µg/l
MANGANESE	789	µg/l
MERCURY	ND	µg/l
NICKEL	5	µg/l
POTASSIUM	6400	µg/l
SELENIUM	ND	µg/l
SILVER	ND	µg/l
SODIUM	NA	µg/l
THALLIUM	ND	µg/l
TIN	ND	µg/l
VANADIUM	2	µg/l
ZINC	15	µg/l

Source: Shallow groundwater background samples for Zone C from the Technical Memorandum: Summary of Inorganic Chemical Concentrations in Background Soil and Groundwater, Charleston Naval Complex

µg/l - Micrograms per liter
ND - Not detected
NA - Not available

TABLE 4-3

BACKGROUND SEDIMENT DATA[1]
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical[2]	Range of Detected Values	Average Value[3]	2 x Average Value	Range of Nondetects[4]	BSLM000101		BSLM000201		BSLM000301		BSLM000401		BSLM000501		BSLM000601		BSLM000701		BSLM000801		BSLM000901		BSLM001001	
Inorganics (mg/kg)																								
Aluminum	1600-27000	10720.0	21440	-	27000		19000		7700		1600		7900		4300		8300		14000		12000		5400	
Antimony	-	0.4	0.9	0.62 - 1.6	1.2	U	1.6	U	0.74	U	0.62	U	0.72	U	0.71	U	0.69	U	0.93	U	0.92	U	0.64	U
Arsenic	0.98-15	6.0	12.0	-	15		11		3.8		0.98	J	5.9		2.4		3.6		9		5.2		3.2	
Barium	8.8-30	17.3	34.6	-	30		27		9.7		9.4		11		18		18		25		16		8.8	
Beryllium	0.12 - 1.5	0.55	1.1	-	1.5		1	J	0.35	J	0.12	J	0.42	J	0.23	J	0.36	J	0.67	J	0.51	J	0.33	J
Cadmium	-	0.2	0.4	0.3 - 0.8	0.56	U	0.8	U	0.36	U	0.3	U	0.35	U	0.35	U	0.34	U	0.46	U	0.45	U	0.31	U
Calcium	3000-140000	26630.0	53260	-	3100		16000		19000		3000		40000		6400		4800		140000		19000		15000	
Chromium	4.5-56	21.8	43.5	-	56		42		16		4.5		17		10		15		21		23		13	
Cobalt	0.49-8.4	3.2	6.4	-	7.4		8.4		1.8		0.49	J	2		1.2	J	1.9		3.4		3.9		1.3	J
Copper	1.1-16	7.5	14.9	-	7.7		16		5.9		1.1	J	4.3		3.2		5.9		15		13		2.4	J
Iron	1800-33000	11800.0	23600	-	33000		22000		7900		1800		8900		5000		8600		14000		11000		5800	
Lead	2.7-21	9.0	18.1	-	14		15		6.7		2.7		4.9		4.3		8.6		21		9.8		3.4	
Magnesium	530-7100	3213.0	6426	-	7100		6300		2200		530		2800		1600		2100		3900		3700		1900	
Manganese	33-240	108.0	216	-	240		180		74		33		97		41		57		160		140		58	
Mercury	0.0053-0.11	0.036	0.072	-	0.035	J	0.059	J	0.031	J	0.0053	J	0.016	J	0.018	J	0.034		0.11		0.045		0.0078	J
Nickel	1.1-15	6.2	12.42	-	15		12	J	5.2	J	1.1	J	4.8	J	2.4	J	4.6	J	6.9	J	6.9	J	3.2	J
Potassium	240-4200	1523	3046	-	4200		2800		970		240		1200		690		1000		1800		1500		830	
Selenium	-	0.9	1.8	1.2 - 3.3	2.3	U	3.3	U	1.5	U	1.2	U	1.4	U	1.4	U	1.4	U	1.9	U	1.8	U	1.3	U
Sodium	2000-14000	6940	13880	-	10000		14000		5100		2000		6400		4600		5300		9900		7900		4200	
Thallium	-	1.3	2.5	1.8 - 4.7	3.3	U	4.7	U	2.1	U	1.8	U	2.1	U	2.1	U	2.0	U	2.7	U	2.7	U	1.9	U
Vanadium	4.2-61	24.4	48.8	-	61		43		17		4.2		18		11		21		32		25		12	
Zinc	9.7-64	35.8	71.5	-	53		64		25		9.7		21		18		40		60		43		24	
Pesticides and PCBs (µg/kg)																								
4,4'-DDD	-	3.1	6.2	4.3 - 11	8.5	U	11	U	5.6	U	4.3	U	5.1	U	4.8	U	5.0	U	6.3	U	6.9	U	4.4	U
4,4'-DDE	-	3.1	6.2	4.3 - 11	8.5	U	11	U	5.6	U	4.3	U	5.1	U	4.8	U	5.0	U	6.3	U	6.9	U	4.4	U
Dieldrin	-	3.6	7.2	5 - 13	9.9	U	13	U	6.5	U	5.0	U	5.9	U	5.6	U	5.9	U	7.4	U	8.0	U	5.2	U
PCB-1260	-	66.4	132.7	92 - 240	180	U	240	U	120	U	92	U	110	U	100	U	110	U	130	U	150	U	95	U
Semivolatile Organic Compounds (µg/kg)																								
2-Methylnaphthalene	-	25.0	49.9	35 - 90	68	U	90	U	44	U	35	U	41	U	39	U	40	U	51	U	55	U	36	U
Acenaphthene	-	19.7	39.4	27 - 71	54	U	71	U	35	U	27	U	32	U	31	U	32	U	40	U	44	U	28	U
Acenaphthylene	69	22.6	45.1	24 - 64	48	U	64	U	31	U	24	U	29	U	27	U	29	U	36	U	69	J	25	U
Anthracene	88	30.0	60.0	33 - 86	65	U	86	U	43	U	33	U	39	U	37	U	39	U	48	U	88	J	34	U
BAP Equivalents	28-495.16	84.0	168.1	27 -54	54	U	71	U	35	U	27	U	32	U	31	U	32	U	190.22		495.16		28	U
Benzo[a]anthracene	230	51.8	103.5	45 - 120	87	U	120	U	57	U	45	U	53	U	50	U	52	U	65	U	230	J	46	U
Benzo[a]pyrene	140-380	67.5	135.0	27 - 71	54	U	71	U	35	U	27	U	32	U	31	U	32	U	140	J	380	J	28	U
Benzo[b]fluoranthene	170-420	80.2	160.4	37 - 98	73	U	98	U	48	U	37	U	44	U	42	U	44	U	170	J	420	J	38	U
Benzo[g,h,i]perylene	69-200	45.7	91.4	33 - 86	65	U	86	U	43	U	33	U	39	U	37	U	39	U	69	J	200	J	34	U
Benzo[k]fluoranthene	140-330	76.6	153.1	52 - 140	100	U	140	U	67	U	52	U	61	U	58	U	60	U	140	J	330	J	53	U
Bis(2-ethylhexyl)phthalate	58-180	83.2	166.4	61 - 80	140	J	170	J	70	U	58	J	65	U	61	U	65	J	80	U	180	J	81	J
Chrysene	94-120	73.1	146.2	36 - 71	71	U	94	J	46	U	36	U	42	U	40	U	42	U	120	J	360	J	37	U
Dibenz(a,h)anthracene	-	25.5	50.9	35 - 90	78	U	90	U	44	U	35	U	41	U	39	U	40	U	51	U	55	U	36	U
Fluoranthene	52-380	71.1	142.1	37 - 73	73	U	110	J	48	U	37	U	52	J	42	U	44	U	55	U	380	J	38	U
Fluorene	-	22.9	45.7	32 - 83	62	U	83	U	41	U	32	U	37	U	36	U	37	U	46	U	50	U	33	U
Indeno[1,2,3-cd]pyrene	61-190	46.3	92.6	37 - 98	73	U	98	U	48	U	37	U	44	U	42	U	44	U	61	J	190	J	38	U
Naphthalene	-	19.7	39.4	27 - 71	54	U	71	U	35	U	27	U	32	U	31	U	32	U	40	U	44	U	28	U
Phenanthrene	-	30.2	60.3	42 - 110	82	U	110	U	54	U	42	U	49	U	47	U	49	U	61	U	66	U	43	U
Pyrene	50-510	89.1	178.2	29 - 56	56	U	170	J	37	U	29	U	50	J	32	U	34	U	52	J	510	J	30	U
Total PAHs (detects only)[5]	-	438.5	877	27 - 140	-		374		-		-		102		-		-		752		3157		-	
Total PAHs (ND=½ MDL)[6]	-	796.6	1593	27 - 140	581.5		1013		378		294		409.5		330.5		344.5		998.5		3314		302.5	

Notes
U: Non Detect; U values shown here are method detection limits (MDLs); see footnote #1.
J: Estimated value; the analyte was positively identified but its concentration was less than the reporting limit (RL) but greater than MDL.
(1) Data are from Table 3-1 of Spectra Tech (2006) except U values shown here are MDLs from Appendix A of the Spectra Tech report; U values in Table 3-1 of Spectra Tech (2006) are RLs.
(2) Chemicals in this table are those detected in Zone J samples collected in April 2008. See Table 3-1 and Appendix A of Spectra Tech (2006) for full background analytical dataset.
(3) Average of all samples calculated using ½ the sample specific MDL for nondetected samples.
(4) Sample-specific MDLs in nondetect samples.
(5) Total PAHs = the sum of detected concentrations of individual PAH compounds (non-detected compounds ignored).
(6) Total PAHs = the sum of concentrations of individual PAH compounds using ½ the sample specific MDL to represent nondetected compounds.

TABLE 4-4

SUMMARY OF DETECTIONS - SURFACE SOIL
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample	**044M001701**	**721SB00201**	**721SB00301**	**721SB00401**	**721SB00501**	**721SB02A01**	**721SB03A01**	**721SB04A01**	**721SB05A01**
Location	**C044M0017**	**C721SB002**	**C721SB003**	**C721SB004**	**C721SB005**	**C721SB02A**	**C721SB03A**	**C721SB04A**	**C721SB05A**
sample_dat	19950419	20030424	20030424	20030424	20030424	20030603	20030603	20030603	20030603
sample_typ	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
qc_type	NM	NM	NM	NM	NM	NM	NM	NM	NM
sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
matrix	SD	SO	SO	SO	SO	SO	SO	SO	SO
top_depth	-9999	0	0	0	0	0	0	0	0
bottom_dep	-9999	1	1	1	1	1	1	1	1
depth_unit	NA	FT	FT	FT	FT	FT	FT	FT	FT
submatrix	NA	SS	SS	SS	SS	SS	SS	SS	SS
depth_stat	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
sample_met	G	G	G	G	G	G	G	G	G
composite	N	N	N	N	N	N	N	N	N
Inorganics (mg/kg)									
ALUMINUM	4870								
ANTIMONY	0.97 J								
ARSENIC	69.2	92.7	28.6	75.6	33.8	79.2	44.8	21.2	90.7
BARIUM	64 J								
CADMIUM	0.31								
CALCIUM	12600 J								
CHROMIUM	22.8								
COBALT	8.8 J								
COPPER	51.3								
IRON	37600								
LEAD	63.6								
MAGNESIUM	1160 J								
MANGANESE	85.9								
MERCURY	1.6 J	0.17	0.24	0.13	0.13				
NICKEL	26.7 J								
POTASSIUM	1080 J								
SELENIUM	7.3 J	2.4 U	2.3 U	1.9 U	2.2 U				
SODIUM	1130 J								
THALLIUM	2.7 J	0.32 U	0.67 U	0.61 U	0.30 U		1.2 U	0.47 U	
VANADIUM	26.7								
ZINC	125 J								
Miscellaneous Parameters (mg/kg)									
TOTAL ORGANIC C	22500								

TABLE 4-5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN- SURFACE SOIL- DIRECT CONTACT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

CAS Number	Chemical	Frequency of Detection [1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	AOC 721 Background Surface Soil Maximum[4]	USEPA RSL (Residential)[5]	COPC Flag	Rationale For Contaminant Deletion [6]
Inorganics (mg/kg)												
7429-90-5	ALUMINUM	1/1	4870	4870	C044M0017	044M001701		4870	9850	7700 N	No	BSL
7440-36-0	ANTIMONY	1/1	0.97 J	0.97 J	C044M0017	044M001701		0.97	1.4	3.1 N	No	BSL
7440-38-2	**ARSENIC**	9/9	21.2	**92.7**	C721SB002	721SB00201		92.7	**92**	**0.39 C**	**Yes**	ASL
7440-39-3	BARIUM	1/1	64 J	64 J	C044M0017	044M001701		64	193	1500 N	No	BSL
7440-43-9	CADMIUM	1/1	0.31	0.31	C044M0017	044M001701		0.31	0.65	7 N	No	BSL
7440-70-2	CALCIUM	1/1	12600 J	12600 J	C044M0017	044M001701		12600	85600	NA	No	EN
7440-47-3	CHROMIUM	1/1	22.8	**22.8**	C044M0017	044M001701		22.8	32	**0.29 C[7]**	No	BKG
7440-48-4	**COBALT**	1/1	8.8 J	**8.8 J**	C044M0017	044M001701		8.8	**2.9**	**2.3 N**	**Yes**	ASL
7440-50-8	COPPER	1/1	51.3	51.3	C044M0017	044M001701		51.3	109	310 N	No	BSL
7439-89-6	**IRON**	1/1	37600	**37600**	C044M0017	044M001701		37600	**12000**	**5500 N**	**Yes**	ASL
7439-92-1	LEAD	1/1	63.6	63.6	C044M0017	044M001701		63.6	588	400	No	BSL
7439-95-4	MAGNESIUM	1/1	1160 J	1160 J	C044M0017	044M001701		1160	2390	NA	No	EN
7439-96-5	MANGANESE	1/1	85.9	85.9	C044M0017	044M001701		85.9	101	180 N	No	BSL
7439-97-6	MERCURY	5/5	0.13	**1.6 J**	C044M0017	044M001701		1.6	**0.75**	2.3 N[8]	No	BSL
7440-02-0	NICKEL	1/1	26.7 J	26.7 J	C044M0017	044M001701		26.7	28	150 N	No	BSL
7440-09-7	POTASSIUM	1/1	1080 J	**1080 J**	C044M0017	044M001701		1080	**836**	NA	No	EN
7782-49-2	SELENIUM	1/5	7.3 J	**7.3 J**	C044M0017	044M001701	1.9 - 2.4	7.3	**1.3**	39 N	No	BSL
7440-23-5	SODIUM	1/1	1130 J	**1130 J**	C044M0017	044M001701		1130	**729**	NA	No	EN
7440-28-0	**THALLIUM**	1/7	2.7 J	**2.7 J**	C044M0017	044M001701	0.3 - 1.2	2.7	**ND**	**0.078 N**	**Yes**	ASL
7440-62-2	VANADIUM	1/1	26.7	**26.7**	C044M0017	044M001701		26.7	**25**	39 N	No	BSL
7440-66-6	ZINC	1/1	125 J	125 J	C044M0017	044M001701		125	779	2300 N	No	BSL
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	1/1	22500	22500	C044M0017	044M001701		22500	NA	NA	No	NTX

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.

2 - Values presented are sample-specific quantitation limits.

3 - The maximum detected concentration is used for screening purposes.

4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.

5 - USEPA Regional Screening Level. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).

6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.

7 - Value for hexavalent chromium.

8 - Value for mercuric chloride and other mercury salts.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:

COPC= Chemical of Potential Concern

C = Carcinogenic

N = Noncarcinogenic

Rationale Codes:

For selection as a COPC:

ASL = Above Screening Level and site background

For elimination as a COPC:

BKG= Below site background concentration

BSL = Below COPC screening Level

NTX = No toxicity criteria

EN = Essential Nutrient

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW005		C044GW005		C044GW005		C044GW005		C044GW005		C044GW005	
Sample_dat	19950613		19960117		19960509		19960610		19970801		19990721	
Sample_tim	00:00:00		00:00:00		00:00:00		00:00:00		00:00:00		00:00:00	
Sent_to_la	99990101		99990101		99990101		99990101		99990101		99990101	
Field_poc	UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN	
Sample_typ	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
QC_type	NM		NM		NM		NM		NM		NM	
Sacode	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
Matrix	GW		GW		GW		GW		GW		GW	
Duplicate												
Semivolatile Organics (ug/L)												
ACETOPHENONE												
BENZOIC ACID			50	U	7	J	50	U	50	U		
BIS(2-ETHYLHEXYL)PHTHALATE			10	U	10	U	25	U	10	U		
DI-N-BUTYL PHTHALATE			10	U	1	J	10	U	10	U		
DIETHYL PHTHALATE			10	U	1	J	10	U	10	U		
Pesticides/PCBs (ug/L)												
HEPTACHLOR			0.04	U	0.04	U	0.04	U				
Inorganics (ug/L)												
ALUMINUM	481	J	18	U	38.2	U	110	U	8	U		
ANTIMONY	1.9	U	2.1	U	3.7	U	2.1	U	1.6	U	5	U
ARSENIC	3.2	U	3.8	J	2.5	UJ	7.1	J	3.3	J	3.3	U
BARIUM	45.6	J	32.1	J	22.4	U	24.2	U	39.6		31.3	
BERYLLIUM	0.41	U	0.66	J	0.54	U	0.75	J	0.91	J	0.49	U
CALCIUM	359000	J	280000	J	202000		211000	J	322000		277000	
CHROMIUM	2.6	J	3.1	J	1.8	U	2.9	U	2.3	J	1.7	J
COBALT	0.60	U	0.95	J	5.2	U	5.2	U	0.96	U	1.7	U
COPPER	3.2	J	0.60	UJ	0.60	UJ	2.2	U	1.4	U	1	U
IRON	2660		2380		1380		1380		2800		1390	
LEAD	2.2	J	1.7	UJ	1.7	U	1.7	U	0.90	U	2.1	U
MAGNESIUM	653000		523000		489000		658000	J	636000		477000	J
MANGANESE	1040		986		454		221	J	692		522	J
MERCURY	0.20	U	0.14	J	0.10	U	0.10	U	0.10	UJ	0.10	UJ
NICKEL	3.2	J	1.1	J	0.80	U	1.9	UJ	0.96	J	13	U
POTASSIUM	282000	J	226000	J	143000		225000		172000		194000	J
SELENIUM	4.4	U	2.8	UJ	2.8	U	2.8	U	3.4	U	2.9	U
SILVER	0.50	U	1.2	U	1.2	U	1.2	UJ	1	U	2	U
SODIUM	4640000		5430000		4580000		6590000		5180000		5030000	
THALLIUM	4.5	U	2.7	UJ	2.7	UJ	3.8	J	5	U	2.3	U
TIN	5.9	U	2.6	U	2.6	U	6.4	UJ	14	U	29.5	U
VANADIUM	2.1	U	2.7	J	2.3	U	2.4	UJ	3.3	J	1.8	J
ZINC	18.1	J	5.3	UJ	6.9	U	5.3	U	5.8	U	2.9	U
Miscellaneous Parameters (ug/L)												
CHLORIDE			8190000		10700000		11500000					
SULFATE			381000		232000		14400	U				
TOTAL DISSOLVED SOLIDS			17900000		19700000		20500000					
TOTAL ORGANIC CARBON												

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005
Sample_dat	19990721	19990721	20030422	20030505	20030521	20030605
Sample_tim	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Sent_to_la	99990101	99990101	99990101	99990101	99990101	99990101
Field_poc	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN
Sample_typ	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
QC_type	NM	NM	NM	NM	NM	NM
Sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Matrix	GW	GW	GW	GW	GW	GW
Duplicate						
Semivolatile Organics (ug/L)						
ACETOPHENONE						
BENZOIC ACID						
BIS(2-ETHYLHEXYL)PHTHALATE						
DI-N-BUTYL PHTHALATE						
DIETHYL PHTHALATE						
Pesticides/PCBs (ug/L)						
HEPTACHLOR						
Inorganics (ug/L)						
ALUMINUM						
ANTIMONY	5 U	5 U	3.4 U	5 U	14.4 U	
ARSENIC	3.3 U	3.3 U	2.5 U	2.5 U	2.1 J	2.8 J
BARIUM	30.3	31				
BERYLLIUM	0.47 U	0.46 U	0.54 J			
CALCIUM	270000	275000				
CHROMIUM	1.3 UJ	1.7 J				
COBALT	1.7 U	1.7 U	1.1 U			
COPPER	1 U	1 U				
IRON	28 J	24.2 U	725	128 J	55.6 U	55.6 U
LEAD	2.1 U	2.1 U				
MAGNESIUM	464000 J	473000 J				
MANGANESE	476 J	487 J				
MERCURY	0.10 UJ	0.10 UJ	0.10 U			
NICKEL	13 U	13 U				
POTASSIUM	188000 J	194000 J				
SELENIUM	2.9 U	2.9 U	2.3 U			
SILVER	2 U	2 U				
SODIUM	4830000	4920000				
THALLIUM	2.3 U	2.3 U	3.2 U			
TIN	29.5 U	29.5 U				
VANADIUM	1.7 J	1.6 J	0.97 U	1.1 J	1 U	
ZINC	2.9 U	2.9 U	5 U			
Miscellaneous Parameters (ug/L)						
CHLORIDE						
SULFATE						
TOTAL DISSOLVED SOLIDS			12600000	14000000	13800000	15100000
TOTAL ORGANIC CARBON			28300	31100	31700	41000

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW005		C044GW006		C044GW006	C044GW006		C044GW006		C044GW006	
Sample_dat	20080429		19950425		19950425	19950501		19960117		19960508	
Sample_tim	11:01:00		00:00:00		00:00:00	00:00:00		00:00:00		00:00:00	
Sent_to_la	20080429		99990101		99990101	99990101		99990101		99990101	
Field_poc	WHITTEN,M		UNKNOWN		UNKNOWN	UNKNOWN		UNKNOWN		UNKNOWN	
Sample_typ	NORMAL		NORMAL		NORMAL	NORMAL		NORMAL		NORMAL	
QC_type	NM		NM		NM	NM		NM		NM	
Sacode	NORMAL		NORMAL		NORMAL	NORMAL		NORMAL		NORMAL	
Matrix	GW		GW		GW	GW		GW		GW	
Duplicate											
Semivolatile Organics (ug/L)											
ACETOPHENONE			1	J							
BENZOIC ACID			95	U				2	J	50	U
BIS(2-ETHYLHEXYL)PHTHALATE			8	J				1	J	10	U
DI-N-BUTYL PHTHALATE			15	U				10	U	10	U
DIETHYL PHTHALATE			15	U				10	U	10	U
Pesticides/PCBs (ug/L)											
HEPTACHLOR			0.03	U				0.04	U	0.04	U
Inorganics (ug/L)											
ALUMINUM	258	U	119	J				18	U	23	U
ANTIMONY	7.5	U	1.9	U				2.1	U	4	U
ARSENIC	8.5	U	3.2	U				6.3	J	2.5	UJ
BARIUM	52.5		56	J				23.2		19.1	U
BERYLLIUM	0.12	U	0.20	U				0.45	J	0.30	U
CALCIUM	542000		327000					446000	J	401000	
CHROMIUM	9.7	U	3.4	J				1.6	J	0.80	U
COBALT	2.3	U	0.96	J				5.1		5.2	U
COPPER	4	U	4	U				0.60	UJ	1.2	UJ
IRON	400		851					5240		1110	
LEAD	7	U	2.4	J				1.7	U	1.7	U
MAGNESIUM	498000		245000					128000		76700	
MANGANESE	1010		1990					2580		546	
MERCURY	0.02	U	0.20	U				0.10	U	0.10	U
NICKEL	5.7	U	2.6	J				10.5	J	5.7	U
POTASSIUM	149000		148000					35500		29500	
SELENIUM	11	U	4.4	U				2.8	UJ	2.8	U
SILVER	2.7	U	0.50	U				1.2	U	2.7	U
SODIUM	4140000		1690000					643000		354000	
THALLIUM	10	U	4.5	UJ				2.7	U	2.7	UJ
TIN			5.9	UJ				2.6	U	3.1	J
VANADIUM	3.4	U	9.9	J				0.50	U	3.9	U
ZINC	10.9	U	19.9	J				5.3	U	6.9	U
Miscellaneous Parameters (ug/L)											
CHLORIDE						3530000		663000		362000	
SULFATE						1010000		1640000		1370000	
TOTAL DISSOLVED SOLIDS						8860000		4340000		3050000	
TOTAL ORGANIC CARBON											

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW006		C044GW006		C044GW006		C044GW006		C044GW006		C044GW006	
Sample_dat	19960611		19970730		19990722		19990722		19990722		20030422	
Sample_tim	00:00:00		00:00:00		00:00:00		00:00:00		00:00:00		00:00:00	
Sent_to_la	99990101		99990101		99990101		99990101		99990101		99990101	
Field_poc	UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN	
Sample_typ	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
QC_type	NM		NM		NM		NM		NM		NM	
Sacode	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
Matrix	GW		GW		GW		GW		GW		GW	
Duplicate												
Semivolatile Organics (ug/L)												
ACETOPHENONE												
BENZOIC ACID	50	U	50	U								
BIS(2-ETHYLHEXYL)PHTHALATE	10	U	10	U								
DI-N-BUTYL PHTHALATE	10	U	10	U								
DIETHYL PHTHALATE	10	U	10	U								
Pesticides/PCBs (ug/L)												
HEPTACHLOR	0.04	U										
Inorganics (ug/L)												
ALUMINUM	156	U	8	UJ								
ANTIMONY	3.3	U	2.6	J	5	U	5	U	5	U	3.4	U
ARSENIC	6.9	J	4.2	J	3.3	U	3.3	U	3.3	U	2.5	U
BARIUM	35.4	UJ	40.4		38.4		36		33.5			
BERYLLIUM	0.44	J	1.3	UJ	0.30	U	0.30	U	0.30	U	0.30	U
CALCIUM	267000	J	448000		391000		400000		404000			
CHROMIUM	0.86	U	1.7	U	0.50	UJ	0.50	UJ	0.50	UJ		
COBALT	5.2	U	3.8	UJ	1.7	U	1.7	U	1.7	U	2.5	J
COPPER	5.4	U	1.4	U	2	U	1.5	U	1	U		
IRON	518	U	4630		2890		1690		1160		4620	
LEAD	1.7	UJ	0.90	UJ	2.1	U	2.1	U	2.1	U		
MAGNESIUM	347000	J	152000		129000	J	128000	J	123000	J		
MANGANESE	1120	J	1770		1060	J	1110	J	1150	J		
MERCURY	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	U
NICKEL	5.3	UJ	7.7	J	13	U	13	U	13	U		
POTASSIUM	114000		60700		48800	J	47500	J	41800	J		
SELENIUM	2.8	U	3.4	U	2.9	U	2.9	U	2.9	U	2.3	U
SILVER	1.2	UJ	1	J	2	U	2	U	2	U		
SODIUM	3110000		939000		1100000		1070000		998000			
THALLIUM	2.7	UJ	6	J	2.3	U	2.8	U	2.3	U	3.2	U
TIN	2.6	UJ	14	U	29.5	U	29.5	U	29.5	U		
VANADIUM	26	J	1.9	J	1.2	J	1.1	J	1	J	0.94	U
ZINC	5.3	UJ	5.8	U	5	U	2.9	U	3.7	U	5	U
Miscellaneous Parameters (ug/L)												
CHLORIDE	5280000											
SULFATE	380000											
TOTAL DISSOLVED SOLIDS	10500000										7830000	
TOTAL ORGANIC CARBON											11800	

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006
Sample_dat	20030505	20030521	20030605	20030904	20031205	20080429
Sample_tim	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	13:47:00
Sent_to_la	99990101	99990101	99990101	20030904	20031205	20080429
Field_poc	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	WHITTEN,M
Sample_typ	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
QC_type	NM	NM	NM	NM	NM	NM
Sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Matrix	GW	GW	GW	GW	GW	GW
Duplicate						
Semivolatile Organics (ug/L)						
ACETOPHENONE						
BENZOIC ACID						
BIS(2-ETHYLHEXYL)PHTHALATE						
DI-N-BUTYL PHTHALATE						
DIETHYL PHTHALATE						
Pesticides/PCBs (ug/L)						
HEPTACHLOR						
Inorganics (ug/L)						
ALUMINUM						58.8 U
ANTIMONY	4.2 U	12.4 U				2.7 U
ARSENIC	2.5 U	2.1 J	2.2 J	2.5 U	3.7 J	4
BARIUM						78.8
BERYLLIUM						0.12 U
CALCIUM						628000
CHROMIUM						2.8 U
COBALT						5.3
COPPER						8.9
IRON	3520	2900	1430	1090	5400	5880
LEAD						4.4 U
MAGNESIUM						270000
MANGANESE						4110
MERCURY						0.02 U
NICKEL						16.5 U
POTASSIUM						71100
SELENIUM						2.2 U
SILVER						0.54 U
SODIUM						2280000
THALLIUM						2 U
TIN						
VANADIUM	1.3 J	1 U				0.52 U
ZINC						9.6 U
Miscellaneous Parameters (ug/L)						
CHLORIDE						
SULFATE						
TOTAL DISSOLVED SOLIDS	7330000	7690000	7560000	8170000	15000000	
TOTAL ORGANIC CARBON	14600	17500	11000	17500	14000	

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW007		C044GW007		C044GW007		C044GW007		C044GW007		C044GW007
Sample_dat	19950614		19960118		19960510		19960611		19970801		19990107
Sample_tim	00:00:00		00:00:00		00:00:00		00:00:00		00:00:00		00:00:00
Sent_to_la	99990101		99990101		99990101		99990101		99990101		99990101
Field_poc	UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN
Sample_typ	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL
QC_type	NM		NM		NM		NM		NM		NM
Sacode	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL
Matrix	GW		GW		GW		GW		GW		GW
Duplicate											
Semivolatile Organics (ug/L)											
ACETOPHENONE											
BENZOIC ACID			53	U	50	U	50	U	50	U	
BIS(2-ETHYLHEXYL)PHTHALATE			11	U	10	U	10	U	11	U	
DI-N-BUTYL PHTHALATE			11	U	10	U	10	U	10	U	
DIETHYL PHTHALATE			11	U	10	U	10	U	10	U	
Pesticides/PCBs (ug/L)											
HEPTACHLOR			0.079		0.04	U	0.04	U			
Inorganics (ug/L)											
ALUMINUM	2110	J	350		31.5	U	25.1	U	28.3	J	
ANTIMONY	1.9	U	54.1		10.3	J	8.2	U	35.3	J	
ARSENIC	12.3		109		30.1		62.8		23.2		
BARIUM	22.6	J	22.2		8.5	U	9.4	U	45.9		
BERYLLIUM	0.24	U	0.30	U	0.30	U	0.30	U	0.25	J	
CALCIUM	85000	J	85500	J	81400		84800	J	154000		
CHROMIUM	4.5	J	1.1	J	2.2	U	0.87	U	1	U	
COBALT	0.60	U	0.90	U	0.90	U	5.2	U	0.80	U	
COPPER	8.8	J	4.9	J	3	U	0.60	U	2.6	J	
IRON	8710		2350		1550		4440		567		
LEAD	4.9	J	1.7	U	1.7	U	1.7	U	0.90	U	
MAGNESIUM	86500		67200		74500		87700	J	18700		
MANGANESE	418		354		293		362	J	173		
MERCURY	0.20	U	0.10	U	0.10	U	0.10	U	0.10	UJ	
NICKEL	4.9	J	1.4	J	3.6	U	0.80	UJ	0.97	J	
POTASSIUM	87400	J	48800		38800		56200		11800		
SELENIUM	4.4	U	2.8	UJ	2.8	UJ	2.8	U	4.3	J	
SILVER	0.50	U	1.2	U	2.3		1.2	UJ	1	U	
SODIUM	784000		614000		686000		749000		108000		
THALLIUM	4.5	U	4.2	U	3.1	J	2.7	UJ	5	U	
TIN	5.9	U	2.6	U	2.6	J	2.6	UJ	14	U	
VANADIUM	6.9	J	14.6		9.6	U	7.4	UJ	2.1	J	
ZINC	24.7	J	5.3	U	13		5.3	U	5.8	U	
Miscellaneous Parameters (ug/L)											
CHLORIDE			759000		689000		1010000				
SULFATE			20200		25100		15800	U			
TOTAL DISSOLVED SOLIDS			2030000		2260000		2660000				
TOTAL ORGANIC CARBON											

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW007		C044GW007		C044GW007		C044GW007		C044GW007		C044GW007	
Sample_dat	19990107		19990107		19990722		19990722		19990722		20030422	
Sample_tim	00:00:00		00:00:00		00:00:00		00:00:00		00:00:00		00:00:00	
Sent_to_la	99990101		99990101		99990101		99990101		99990101		99990101	
Field_poc	UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN		UNKNOWN	
Sample_typ	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
QC_type	NM		NM		NM		NM		NM		NM	
Sacode	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
Matrix	GW		GW		GW		GW		GW		GW	
Duplicate												
Semivolatile Organics (ug/L)												
ACETOPHENONE												
BENZOIC ACID												
BIS(2-ETHYLHEXYL)PHTHALATE												
DI-N-BUTYL PHTHALATE												
DIETHYL PHTHALATE												
Pesticides/PCBs (ug/L)												
HEPTACHLOR												
Inorganics (ug/L)												
ALUMINUM												
ANTIMONY	2.7	U	3.4	J	5	U	5	U	5	U	9.3	U
ARSENIC	43.8		45.9		173		127		118		66.9	
BARIUM					98.1		91.1		84.3			
BERYLLIUM	0.11	J	0.10	U	0.30	U	0.30	U	0.30	U	0.30	U
CALCIUM					139000		138000		138000			
CHROMIUM	0.70	U	0.70	U	0.50	UJ	0.50	UJ	0.50	UJ		
COBALT					1.7	U	1.7	U	1.7	U	1.1	U
COPPER					1.5	U	1	U	1.6	U		
IRON					3330		2860		2440		1190	
LEAD	1.5	U	1.5	U	2.1	U	2.1	U	2.1	U		
MAGNESIUM					24100	J	23100	J	22100	J		
MANGANESE					278	J	231	J	216	J		
MERCURY	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ	0.10	U
NICKEL					13	U	13	U	13	U		
POTASSIUM					13100	J	13200	J	13100	J		
SELENIUM					2.9	U	2.9	U	2.9	U	5.7	J
SILVER					2	U	2	U	2	U		
SODIUM					168000		166000		171000			
THALLIUM	3.1	U	3.1	U	2.3	U	2.3	U	2.7	U	3.2	U
TIN					29.5	U	29.5	U	29.5	U		
VANADIUM					1	J	0.90	U	0.94	J	3.9	J
ZINC					6.5	U	6	U	17.7	U	5	U
Miscellaneous Parameters (ug/L)												
CHLORIDE												
SULFATE												
TOTAL DISSOLVED SOLIDS											699000	
TOTAL ORGANIC CARBON											6200	

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**
Sample_dat	**20030505**	**20030521**	**20030605**	**20030904**	**20031205**
Sample_tim	**00:00:00**	**00:00:00**	**00:00:00**	**00:00:00**	**00:00:00**
Sent_to_la	**99990101**	**99990101**	**99990101**	**20030904**	**20031205**
Field_poc	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**
Sample_typ	**NORMAL**	**NORMAL**	**NORMAL**	**NORMAL**	**NORMAL**
QC_type	**NM**	**NM**	**NM**	**NM**	**NM**
Sacode	**NORMAL**	**NORMAL**	**NORMAL**	**NORMAL**	**NORMAL**
Matrix	**GW**	**GW**	**GW**	**GW**	**GW**
Duplicate					
Semivolatile Organics (ug/L)					
ACETOPHENONE					
BENZOIC ACID					
BIS(2-ETHYLHEXYL)PHTHALATE					
DI-N-BUTYL PHTHALATE					
DIETHYL PHTHALATE					
Pesticides/PCBs (ug/L)					
HEPTACHLOR					
Inorganics (ug/L)					
ALUMINUM					
ANTIMONY	9.5 U	12.4 U			
ARSENIC	136	53.2	206	78	49
BARIUM					
BERYLLIUM					
CALCIUM					
CHROMIUM					
COBALT					
COPPER					
IRON	4420	1280	6330	2570	1900
LEAD					
MAGNESIUM					
MANGANESE					
MERCURY					
NICKEL					
POTASSIUM					
SELENIUM					
SILVER					
SODIUM					
THALLIUM					
TIN					
VANADIUM	1.8 J	4.1 J			
ZINC					
Miscellaneous Parameters (ug/L)					
CHLORIDE					
SULFATE					
TOTAL DISSOLVED SOLIDS	1150000	940000	1130000	1270000	2600000
TOTAL ORGANIC CARBON	8600	6600	14200	10100	7500

TABLE 4-6

SUMMARY OF DETECTIONS - GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Location	C044GW007		C044GW007		C044GW007	
Sample_dat	20080429		20080429		20080429	
Sample_tim	17:05:00		17:05:00		17:05:00	
Sent_to_la	20080429		20080429		20080429	
Field_poc	WHITTEN,M		WHITTEN,M		WHITTEN,M	
Sample_typ	NORMAL		NORMAL		NORMAL	
QC_type	NM		NM		FD	
Sacode	ORIG		AVG		DUP	
Matrix	GW		GW		GW	
Duplicate					044G00714	
Semivolatile Organics (ug/L)						
ACETOPHENONE						
BENZOIC ACID						
BIS(2-ETHYLHEXYL)PHTHALATE						
DI-N-BUTYL PHTHALATE						
DIETHYL PHTHALATE						
Pesticides/PCBs (ug/L)						
HEPTACHLOR						
Inorganics (ug/L)						
ALUMINUM	60.1	U	56.6	U	53.1	U
ANTIMONY	1.5	U	1.85	U	2.2	U
ARSENIC	126		122		118	
BARIUM	86.5		86.05		85.6	
BERYLLIUM	0.12	U	0.12	U	0.12	U
CALCIUM	173000		172000		171000	
CHROMIUM	1.4	U	1.2	U	1	U
COBALT	0.28	U	0.28	U	0.28	U
COPPER	2.5		2.7		2.9	
IRON	14100		13700		13300	
LEAD	4	U	4	U	4	U
MAGNESIUM	43100		43100		43100	
MANGANESE	1040		1030		1020	
MERCURY	0.02	U	0.02	U	0.02	U
NICKEL	2.5	U	1.705	U	0.91	U
POTASSIUM	20600		20500		20400	
SELENIUM	2.2	U	2.2	U	2.2	U
SILVER	0.54	U	0.54	U	0.54	U
SODIUM	270000		273000		276000	
THALLIUM	2	U	2	U	2	U
TIN						
VANADIUM	2.9	U	2.55	U	2.2	U
ZINC	7.8	U	8.2	U	8.6	U
Miscellaneous Parameters (ug/L)						
CHLORIDE						
SULFATE						
TOTAL DISSOLVED SOLIDS						
TOTAL ORGANIC CARBON						

TABLE 4-7

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN-GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection[1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects [2]	Concentration Used for Screening [3]	AOC 721 Background Maximum[4]	Screening Toxicity Value[5]	USEPA MCL[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
	Semivolatile Organics (ug/L)												
98-86-2	ACETOPHENONE	1/1	1 J	1 J	C044GW006	044GW00601a		1	NA	150 N	NA	No	BSL
65-85-0	BENZOIC ACID	2/13	2 J	7 J	C044GW005	044GW00503	50 - 95	7	NA	5800 N	NA	No	BSL
117-81-7	**BIS(2-ETHYLHEXYL)PHTHALATE**	2/13	1 J	**8 J**	C044GW006	044GW00601a	10 - 25	8	NA	**0.071 C**	**6**	**Yes**	ASL
84-74-2	DI-N-BUTYL PHTHALATE	1/13	1 J	1 J	C044GW005	044GW00503	10 - 15	1	NA	67 N	NA	No	BSL
84-66-2	DIETHYL PHTHALATE	1/13	1 J	1 J	C044GW005	044GW00503	10 - 15	1	NA	1100 N	NA	No	BSL
	Pesticides/PCBs (ug/L)												
76-44-8	**HEPTACHLOR**	1/10	0.079	**0.079**	C044GW007	044GW00702	0.03 - 0.04	0.079	NA	**0.0018 C**	0.4	**Yes**	ASL
	Inorganics (ug/L)												
7429-90-5	**ALUMINUM**	5/18	28.3 J	**2110 J**	C044GW007	044GW00701	8 - 258	2110	**620**	**1600 N**	**50 to 200 [8]**	**Yes**	ASL
7440-36-0	**ANTIMONY**	5/38	2.6 J	**54.1**	C044GW007	044GW00702	1.5 - 14.4	54.1	**ND**	**0.6 N**	**6**	**Yes**	ASL
7440-38-2	**ARSENIC**	29/45	2.1 J	**206**	C044GW007	044GW00711	2.5 - 8.5	206	**6**	**0.045 C**	**10**	**Yes**	ASL
7440-39-3	BARIUM	21/27	22.2	**98.1**	C044GW007	044GW00707	8.5 - 35.4	98.1	**16**	290 N	2000	No	BSL
7440-41-7	BERYLLIUM	8/32	0.11 J	**0.91 J**	C044GW005	044GW00505	0.1 - 1.3	0.91	**0.36**	1.6 N	4	No	BSL
7440-70-2	CALCIUM	27/27	81400	**628000**	C044GW006	044G00614		628000	**152000**	NA	NA	No	EN
7440-47-3	**CHROMIUM**	9/29	1.1 J	**4.5 J**	C044GW007	044GW00701	0.5 - 9.7	4.5	**2**	**0.031 C[9]**	100	**Yes**	ASL
7440-48-4	**COBALT**	5/30	0.95 J	**5.3**	C044GW006	044G00614	0.28 - 5.2	5.3	**2**	**0.47 N**	NA	**Yes**	ASL
7440-50-8	COPPER	6/27	2.5	**8.9**	C044GW006	044G00614	0.6 - 5.4	8.9	**ND**	62 N	1300	No	BSL
7439-89-6	**IRON**	39/43	28 J	**14100**	C044GW007	044G00714	24.2 - 518	14100	**4660**	**1100 N**	**300 [8]**	**Yes**	ASL
7439-92-1	LEAD	3/29	2.2 J	**4.9 J**	C044GW007	044GW00701	0.9 - 7	4.9	**4**	NA	15	No	BSL
7439-95-4	MAGNESIUM	27/27	18700	**658000 J**	C044GW005	044GW00504		658000	**9250**	NA	NA	No	EN
7439-96-5	**MANGANESE**	27/27	173	**4110**	C044GW006	044G00614		4110	**789**	**32 N**	**50 [8]**	**Yes**	ASL
7439-97-6	MERCURY	1/32	0.14 J	**0.14 J**	C044GW005	044GW00502	0.02 - 0.2	0.14	**ND**	0.43 N[10]	2	No	BSL
7440-02-0	NICKEL	9/27	0.96 J	**10.5 J**	C044GW006	044GW00602	0.8 - 16.5	10.5	**5**	30 N	NA	No	BSL
7440-09-7	POTASSIUM	27/27	11800	**282000 J**	C044GW005	044GW00501		282000	**6400**	NA	NA	No	EN
7782-49-2	SELENIUM	2/30	4.3 J	**5.7 J**	C044GW007	044GW00708	2.2 - 11	5.7	**ND**	7.8 N	50	No	BSL
7440-22-4	SILVER	2/27	1 J	**2.3**	C044GW007	044GW00703	0.5 - 2.7	2.3	**ND**	7.1 N	100 [8]	No	BSL
7440-23-5	SODIUM	27/27	108000	6590000	C044GW005	044GW00504		6590000	NA	NA	NA	No	EN
7440-28-0	**THALLIUM**	3/32	3.1 J	**6 J**	C044GW006	044GW00605	2 - 10	6	**ND**	**0.016 N**	**2**	**Yes**	ASL
7440-31-5	TIN	2/24	2.6 J	**3.1 J**	C044GW006	044GW00603	2.6 - 29.5	3.1	**ND**	930 N	NA	No	BSL
7440-62-2	**VANADIUM**	21/36	0.94 J	**26 J**	C044GW006	044GW00604	0.5 - 9.6	26	**2**	**7.8 N**	NA	**Yes**	ASL
7440-66-6	ZINC	4/30	13	**24.7 J**	C044GW007	044GW00701	2.9 - 17.7	24.7	**15**	470 N	5000 [8]	No	BSL
	Miscellaneous Parameters (ug/L)												
16887-00-6	CHLORIDE	10/10	362000	1.2E+07	C044GW005	044GW00504		11500000	NA	NA	NA	No	NTX
14808-79-8	SULFATE	8/10	20200	1640000	C044GW006	044GW00602	14400 - 15800	1640000	NA	NA	NA	No	NTX
--	TOTAL DISSOLVED SOLIDS	26/26	699000	2.1E+07	C044GW005	044GW00504		20500000	NA	NA	NA	No	NTX
--	TOTAL ORGANIC CARBON	16/16	6200	41000	C044GW005	044GW00510		41000	NA	NA	NA	No	NTX

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.

2 - Values presented are sample-specific quantitation limits.

3 - The maximum detected concentration is used for screening purposes.

4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.

5 - USEPA Regional Screening Level. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).

6 - 2012 Edition of the Drinking Water Standards and Health Advisories (USEPA, April 2012).

7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.

8 - Secondary MCL.

9 - The value is for hexavalent chromium.

10 - The value is for mercuric chloride (and other mercury salts).

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:

COPC= Chemical of Potential Concern

C = Carcinogenic

MCL = Maximum Contaminant Level

N = Noncarcinogenic

Rationale Codes:

For selection as a COPC:

ASL = Above Screening Level and site b

For elimination as a COPC:

BKG= Below site background concentration

BSL = Below COPC screening Level

NTX = No toxicity criteria

EN = Essential Nutrient

TABLE 4-8

SUMMARY OF DETECTION - SEDIMENT
CHARLESTON NAVAL COMPLEX
MORTH CHARLESTON, SOUTH CAROLINA

Sample	**044M001501**	**044M001601**	**044M001901**	**044SB00501**	**044SB00701**	**044SB02501**	**044SB02601**	**044SB02701**	**044SB02702**	**044SB02703**	**044SB06601**	**044SB07601**	**044SBC0101**	**044SBC0102**	**044SS00501**	**721MD00101**
Location	**C044M0015**	**C044M0016**	**C044M0019**	**C044SB005**	**C044SB007**	**C044SB025**	**C044SB026**	**C044SB027**	**C044SB027**	**C044SB027**	**C044SB066**	**C044SB076**	**C044SBC01**	**C044SBC01**	**C044SS005**	**C721MD001**
Sample_dat	19950419	19950419	19950411	19950314	19950314	19970117	19970117	19970811	19970811	19970811	20010807	20011109	19990303	19990303	19970723	20030423
Sample_typ	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Qc_type	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Matrix	SD	SD	SD	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SD
Duplicate																
Top_depth	-9999	-9999	-9999	0	0	0	0	0	3	3	0	0	0	3	0	-9999
Bottom_dep	-9999	-9999	-9999	1	1	1	1	1	5	5	1	1	1	5	1	-9999
Depth_unit	NA	NA	NA	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	NA
Submatrix	NA	NA	NA	SS	SS	SS	SS	SS	SB	SB	SS	SS	SS	SB	SS	NA
Depth_stat	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Sample_met	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Composite	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Volatile Organics (mg/kg)																
1,2,4-TRICHLOROBENZENE													0.40 U	0.49 U	0.084 J	
Semivolatile Organics (mg/kg)																
2-METHYLNAPHTHALENE													0.29 J	0.49 U	1.3	0.89 U
BAP EQUIVALENT																0.28157
BENZO(A)ANTHRACENE													0.051 J	0.49 U	0.21 J	0.31 J
BENZO(A)PYRENE													0.049 J	0.49 U	0.18 J	
BENZO(B)FLUORANTHENE													0.067 J	0.49 U	0.25 J	
BENZO(G,H,I)PERYLENE													0.40 U	0.49 U	0.099 J	
BENZO(K)FLUORANTHENE													0.067 J	0.49 U	0.15 J	
CHRYSENE													0.097 J	0.49 U	0.34 J	0.46 J
DIBENZOFURAN													0.085 J	0.49 U	0.30 J	
FLUORANTHENE													0.077 J	0.49 U	0.26 J	0.57 J
INDENO(1,2,3-CD)PYRENE													0.40 U	0.49 U	0.074 J	
NAPHTHALENE													0.16 J	0.49 U	0.77	0.89 U
PHENANTHRENE													0.25 J	0.49 U	0.87	0.15 J
PYRENE													0.079 J	0.49 U	0.33 J	0.76 J
Inorganics (mg/kg)																
ALUMINUM	5900	7760		8790	5920	36600	2800	21900	394	16400					6290	
ANTIMONY	0.35 UJ	0.43 UJ		0.28 UJ	0.42 UJ	0.55 UJ	0.34 UJ	0.48 J	0.21 U	0.55 J					0.71 J	
ARSENIC	67.4	14.7		13.8 J	19 J	26.6	2.8 J	22.4	0.39 U	7.8	18.2 J	11.7 J	11.8 J	5.2 J	21.6 J	15.9
BARIUM	70.7 J	12.3 J		26.1	27.2	46.4 J	6.7 J	29.9	1.4	21.5					25.5	
BERYLLIUM	0.40 U	0.41 U		0.46 J	0.26 J	1.9	0.16 J	1.3 U	0.05 U	1.5 U					0.70 UJ	0.88
CADMIUM	0.84	0.07 U		0.44 J	0.90	0.51 J	0.22 U	0.07 U	0.04 U	0.08 U			0.10 J	0.51 J	0.06 U	
CALCIUM	833 J	1610 J		2030 J	128000 J	27900	5840	3540	268	2650					1160	
CHROMIUM	23.2	12.5		15.1 J	18.2 J	54.3	7.3	38.2	1 J	37.1					13.6	
COBALT	2.2 J	3 J		3.5 J	2.5 J	13.6 J	5.6 J	8.3	0.15 U	6.3 J					1.7 UJ	5.2
COPPER	33.9	32.5		24.1 J	38 J	43.9 J	4.5 J	46.5	0.59 J	7.3			14.3 J	11.6 J	22.4	
IRON	93700	13100		10800 J	8760 J	31900	3520	27800	568	26100					10500	
LEAD	35.1	43.4		32.1 J	82.7 J	64.2	26.1	40.5	0.84	13.5					33.4	
MAGNESIUM	1140	1510		942	2450	5780	514 J	5790 J	326 J	6410 J					703	
MANGANESE	0.06 U	72.4		86.3 J	111 J	408	199	150	5.7	289					23.4	
MERCURY	0.28 J	0.47 J		0.20 J	1 J	0.53	0.15	0.21	0.02 U	0.06 U			0.06	0.04 U	0.34	0.33 J
NICKEL	3.8 J	4.2 J		9.2	16.6	36.9	14	11.6 J	0.32 J	10.9 J			13.1 J	25.9 J	5.5	
POTASSIUM	8240 J	739 J		714 J	1070 J	3810	252 J	3090 J	145 J	3720 J					474 J	
SELENIUM	9.3 J	1 UJ		1.2 J	0.99 J	0.72 J	0.45 U	2.6	0.44 U	2.4			0.52 J	2.2 J	1.6	0.76 U
SODIUM	5860 J	3320 J		518 J	506 J	7270 J	367 J	10100	1880	13100					882 U	
THALLIUM	4.6	1 U		0.68 U	0.62 U	1.6 U	1.3 U	3.7	0.65 U	3.2			0.46 U	0.57 U	0.56 U	0.45 UJ
TIN	1.1 U	1.4 U		0.97 U	1.3 J	14.5 U	11.6 U	3.2 U	1.8 U	3.6 U					2.8 U	
VANADIUM	33.5	22.1		18.7	15	68.2	7.1 J	68.5	0.89 J	36.1					21.9	
ZINC	33.9 J	84.6 J		68.1	93.6	279	65.5	166	1.4 J	39.3					38.3	118 J
Miscellaneous Parameters (mg/kg)																
CHLORIDE																
NITRITE/NITRATE-N																
SULFUR																
TOTAL ORGANIC CARBON	52600	10700	15200													
TOTAL PHOSPHORUS																
Miscellaneous Parameters (UEQ/G)																
CATION EXCHANGE CAPACITY																

TABLE 4-8

SUMMARY OF DETECTION - SEDIMENT
CHARLESTON NAVAL COMPLEX
MORTH CHARLESTON, SOUTH CAROLINA

Sample	**721MD00201**	**721MD00301**	**721MD00401**	**721MD00501**	**721MD00701**	**721MD00801**	**721MD00901**	**721MD01001**	**721MD01101**	**721SB00101**	**721SB00701**	**721SB00801**	**721SB01A01**	**721SB01D01**	**721SB06B01**	**721SB06E01**
Location	**C721MD002**	**C721MD003**	**C721MD004**	**C721MD005**	**C721MD007**	**C721MD008**	**C721MD009**	**C721MD010**	**C721MD011**	**C721SB001**	**C721SB007**	**C721SB008**	**C721SB01A**	**C721SB01D**	**C721SB06B**	**C721SB06E**
Sample_dat	20030423	20030423	20030423	20030423	20030423	20030423	20030423	20030423	20030423	20030424	20030424	20030424	20030603	20030603	20030424	20030603
Sample_typ	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Qc_type	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Matrix	SD	SD	SD	SD	SD	SD	SD	SD	SD	SO	SO	SO	SO	SO	SO	SO
Duplicate																
Top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	0	0	0	0	0	0	0
Bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	1	1	1	1	1	1	1
Depth_unit	NA	NA	NA	NA	NA	NA	NA	NA	NA	FT	FT	FT	FT	FT	FT	FT
Submatrix	NA	NA	NA	NA	NA	NA	NA	NA	NA	SS	SS	SS	SS	SS	SS	SS
Depth_stat	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Sample_met	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Composite	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Volatile Organics (mg/kg)																
1,2,4-TRICHLOROBENZENE																
Semivolatile Organics (mg/kg)																
2-METHYLNAPHTHALENE	0.03 J	0.057 J	0.24 J	0.72 J	0.71 J	0.52 J	0.94	0.90 J	0.38 J	0.51 U					0.62 U	0.27 J
BAP EQUIVALENT	0.49 U	0.43524														
BENZO(A)ANTHRACENE	0.13 J	0.31 J	0.22 J	0.34 J	0.44 J	0.32 J	1.4	0.54 J	0.12 J						0.087 J	0.098 J
BENZO(A)PYRENE																
BENZO(B)FLUORANTHENE																
BENZO(G,H,I)PERYLENE																
BENZO(K)FLUORANTHENE																
CHRYSENE	0.16 J	0.32 J	0.29 J	0.52 J	0.56 J	0.50 J	1.5	0.82 J	0.15 J	0.67			0.12 J	0.51 J	0.18 J	0.22 J
DIBENZOFURAN																
FLUORANTHENE	0.29 J	0.61 J	0.58 J	1 J	0.99 J	0.71 J	4.6	1.4 J	0.23 J						0.16 J	0.12 J
INDENO(1,2,3-CD)PYRENE																
NAPHTHALENE	0.50 U	0.75 U	0.13 J	0.39 J	0.37 J	0.30 J	0.57 J	0.40 J	0.19 J	0.96			0.14 J	0.24 J	0.18 J	0.14 J
PHENANTHRENE	0.074 J	0.14 J	0.29 J	0.83 J	0.66 J	0.50 J	1.1	0.84 J	0.30 J	1.1			0.24 J	0.39 J	0.32 J	0.39 J
PYRENE	0.31 J	0.48 J	0.44 J	0.82 J	0.85 J	0.69 J	3.7	1.2 J	0.23 J	0.65			0.14 J	0.93 J	0.14 J	0.25 J
Inorganics (mg/kg)																
ALUMINUM																
ANTIMONY																
ARSENIC	17.1	15	30.1	75.9	38.4	28	21.6	42.6	12.6						23.7	68.9
BARIUM																
BERYLLIUM	0.40 U	0.72	2	5.4	1.6 U	0.96 U	1.2	2	0.46			1.5				
CADMIUM																
CALCIUM																
CHROMIUM																
COBALT	2.8	4.5	11.6	33.2	7.4	5.2	4.1	10.5	2.3			19.5				
COPPER																
IRON																
LEAD																
MAGNESIUM																
MANGANESE																
MERCURY	0.43 J	0.78 J	0.35 J	0.32 J	0.50 J	0.46 J	0.071 J	1.1 J	0.27 J							
NICKEL																
POTASSIUM																
SELENIUM	0.46 U	0.45 U	1.1 U	1.3 U	1.2 U	0.86 U	0.45 U	2.4 U	0.29 U						2 U	
SODIUM																
THALLIUM	0.64 U	0.39 UJ	2.2 U	1 U	1.1 UJ	0.73 UJ	0.30 UJ	0.74 UJ	0.25 UJ		0.34 U				0.95 U	4 U
TIN																
VANADIUM																
ZINC	50.7 J	132 J	202 J	311 J	398 J	357 J	85.5 J	669 J	113 J			211				
Miscellaneous Parameters (mg/kg)																
CHLORIDE																
NITRITE/NITRATE-N																
SULFUR																
TOTAL ORGANIC CARBON																
TOTAL PHOSPHORUS																
Miscellaneous Parameters (UEQ/G)																
CATION EXCHANGE CAPACITY																

TABLE 4-8

SUMMARY OF DETECTION - SEDIMENT
CHARLESTON NAVAL COMPLEX
MORTH CHARLESTON, SOUTH CAROLINA

Sample	**721SB06F01**	**721SB06G01**	**721SB06H01**	**721SB07A01**	**721SB07B01**	**721SB07C01**	**721SB07D01**	**721SB08A01**	**721SB08B01**	**721SB08C01**	**721SB08D01**	**721SB0101**	**721SBR0201**	**721SBR0301**	**721SBR0301-AVG**	**721SBR0301-D**	**721SBR0401**
Location	**C721SB06F**	**C721SB06G**	**C721SB06H**	**C721SB07A**	**C721SB07B**	**C721SB07C**	**C721SB07D**	**C721SB08A**	**C721SB08B**	**C721SB08C**	**C721SB08D**	**C721SBR01**	**C721SBR02**	**C721SBR03**	**C721SBR03**	**C721SBR03**	**C721SBR04**
Sample_dat	20030603	20030603	20030603	20030424	20030424	20030424	20030424	20030424	20030424	20030424	20030424	20051121	20051121	20051121	20051121	20051121	20051121
Sample_typ	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Qc_type	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	FD	NM
Sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL
Matrix	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SD	SD	SD	SD	SD	SD
Duplicate																721SBR0301	
Top_depth	0	0	0	0	0	0	0	0	0	0	0	-9999	-9999	-9999	-9999	-9999	-9999
Bottom_dep	1	1	1	1	1	1	1	1	1	1	1	-9999	-9999	-9999	-9999	-9999	-9999
Depth_unit	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	NA	NA	NA	NA	NA	NA
Submatrix	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	NA	NA	NA	NA	NA	NA
Depth_stat	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Sample_met	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Composite	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Volatile Organics (mg/kg)																	
1,2,4-TRICHLOROBENZENE																	
Semivolatile Organics (mg/kg)																	
2-METHYLNAPHTHALENE		0.29 J															
BAP EQUIVALENT																	
BENZO(A)ANTHRACENE		0.099 J															
BENZO(A)PYRENE																	
BENZO(B)FLUORANTHENE																	
BENZO(G,H,I)PERYLENE																	
BENZO(K)FLUORANTHENE																	
CHRYSENE		0.20 J															
DIBENZOFURAN																	
FLUORANTHENE		0.14 J															
INDENO(1,2,3-CD)PYRENE																	
NAPHTHALENE		0.15 J															
PHENANTHRENE		0.46 J															
PYRENE		0.28 J	0.063 J														
Inorganics (mg/kg)																	
ALUMINUM																	
ANTIMONY																	
ARSENIC		89.5	25.2									5.4	11	11	11.5	12	43
BARIUM																	
BERYLLIUM								0.57	0.49	1	0.98 J						
CADMIUM																	
CALCIUM																	
CHROMIUM																	
COBALT								4.3	8.1	7	7.5						
COPPER																	
IRON																	
LEAD																	
MAGNESIUM																	
MANGANESE																	
MERCURY																	
NICKEL																	
POTASSIUM																	
SELENIUM																	
SODIUM																	
THALLIUM	1 U	3.8 U	0.88 U	0.38 U	0.40 U	0.37 U	0.37 U										
TIN																	
VANADIUM																	
ZINC								153	74.9	106	147						
Miscellaneous Parameters (mg/kg)																	
CHLORIDE																	
NITRITE/NITRATE-N																	
SULFUR																	
TOTAL ORGANIC CARBON																	
TOTAL PHOSPHORUS																	
Miscellaneous Parameters (UEQ/G)																	
CATION EXCHANGE CAPACITY																	

TABLE 4-9

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection[1]	Minimum Concentration[1]	Maximum Concentration[1]	Location of Maximum Detect	Sample of Maximum Detect	Range of Nondetects[2]	Concentration Used for Screening?[3]	AOC 721 Background Concentration[4]	Screening Toxicity Value[4]	COPC Flag	Rationale For Contaminant Deletion[5]
Volatile Organics (mg/kg)												
120-82-1	1,2,4-TRICHLOROBENZENE	1/3	0.084 J	0.084 J	C044SS005	044SS00501	0.4 - 0.49	0.084	NA	6.2 N[6]	No	BSL
Semivolatile Organics (mg/kg)												
91-57-6	2-METHYLNAPHTHALENE	13/17	0.03 J	**1.3**	C044SS005	044SS00501	0.49 - 0.89	1.3	**ND**	23 N	No	BSL
--	BAP EQUIVALENT	2/3	0.28	**0.44**	C044SS005	044SS00501	0.49 - 0.49	0.44	0.50	**0.015**	No	BKG
56-55-3	**BENZO(A)ANTHRACENE**	15/16	0.051 J	**1.4**	C721MD009	721MD00901	0.49 - 0.49	1.4	**0.23**	**0.15 C**	**Yes**	ASL
50-32-8	BENZO(A)PYRENE	2/3	0.049 J	**0.18 J**	C044SS005	044SS00501	0.49 - 0.49	0.18	0.38	**0.015 C**	No	BKG
205-99-2	BENZO(B)FLUORANTHENE	2/3	0.067 J	**0.25 J**	C044SS005	044SS00501	0.49 - 0.49	0.25	0.42	**0.15 C**	No	BKG
191-24-2	BENZO(G,H,I)PERYLENE	1/3	0.099 J	0.099 J	C044SS005	044SS00501	0.4 - 0.49	0.099	0.2	170 N[7]	No	BSL, BKG
207-08-9	BENZO(K)FLUORANTHENE	2/3	0.067 J	0.15 J	C044SS005	044SS00501	0.49 - 0.49	0.15	0.33	1.5 C	No	BSL, BKG
218-01-9	CHRYSENE	18/19	0.097 J	**1.5**	C721MD009	721MD00901	0.49 - 0.49	1.5	**0.12**	15 C	No	BSL
132-64-9	DIBENZOFURAN	2/3	0.085 J	0.3 J	C044SS005	044SS00501	0.49 - 0.49	0.3	NA	7.8 N	No	BSL
206-44-0	FLUORANTHENE	15/16	0.077 J	**4.6**	C721MD009	721MD00901	0.49 - 0.49	4.6	**0.38**	230 N	No	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	1/3	0.074 J	0.074 J	C044SS005	044SS00501	0.4 - 0.49	0.074	0.19	0.15 C	No	BSL, BKG
91-20-3	NAPHTHALENE	15/19	0.13 J	**0.96**	C721SB001	721SB00101	0.49 - 0.89	0.96	**ND**	3.6 C	No	BSL
85-01-8	PHENANTHRENE	18/19	0.074 J	**1.1**	C721SB001	721SB00101	0.49 - 0.49	1.1	**ND**	170 N[7]	No	BSL
129-00-0	PYRENE	19/20	0.063 J	**3.7**	C721MD009	721MD00901	0.49 - 0.49	3.7	**0.51**	170 N	No	BSL
Inorganics (mg/kg)												
7429-90-5	**ALUMINUM**	10/10	394	**36600**	C044SB025	044SB02501		36600	**27000**	**7700 N**	**Yes**	ASL
7440-36-0	ANTIMONY	3/10	0.48 J	**0.71 J**	C044SS005	044SS00501	0.21 - 0.55	0.71	**ND**	3.1 N	No	BSL
7440-38-2	**ARSENIC**	33/34	2.8 J	**89.5**	C721SB06G	721SB06G01	0.39 - 0.39	89.5	**15**	**0.39 C**	**Yes**	ASL
7440-39-3	BARIUM	10/10	1.4	**70.7 J**	C044M0015	044M001501		70.7	**30**	1500 N	No	BSL
7440-41-7	BERYLLIUM	16/25	0.16 J	**5.4**	C721MD005	721MD00501	0.05 - 1.6	5.4	**1.5**	16 N	No	BSL
7440-43-9	CADMIUM	6/12	0.1 J	**0.9**	C044SB007	044SB00701	0.04 - 0.22	0.9	**ND**	7 N	No	BSL
7440-70-2	CALCIUM	10/10	268	128000 J	C044SB007	044SB00701		128000	140000	NA	No	EN
7440-47-3	CHROMIUM	10/10	1 J	**54.3**	C044SB025	044SB02501		54.3	56	**0.29 C[8]**	No	BKG
7440-48-4	**COBALT**	23/25	2.2 J	**33.2**	C721MD005	721MD00501	0.15 - 1.7	33.2	**8.4**	**2.3 N**	**Yes**	ASL
7440-50-8	COPPER	12/12	0.59 J	**46.5**	C044SB027	044SB02701		46.5	**16**	310 N	No	BSL
7439-89-6	**IRON**	10/10	568	**93700**	C044M0015	044M001501		93700	**33000**	**5500 N**	**Yes**	ASL
7439-92-1	LEAD	10/10	0.84	**82.7 J**	C044SB007	044SB00701		82.7	**21**	400	No	BSL
7439-95-4	MAGNESIUM	10/10	326 J	6410 J	C044SB027	044SB02703		6410	7100	NA	No	EN
7439-96-5	**MANGANESE**	9/10	5.7	**408**	C044SB025	044SB02501	0.06 - 0.06	408	**240**	**180 N**	**Yes**	ASL
7439-97-6	MERCURY	19/22	0.06	**1.1 J**	C721MD010	721MD01001	0.02 - 0.21	1.1	**0.11**	2.3 N[9]	No	BSL
7440-02-0	NICKEL	12/12	0.32 J	**36.9**	C044SB025	044SB02501		36.9	**15**	150 N	No	BSL
7440-09-7	POTASSIUM	10/10	145 J	**8240 J**	C0440015	044M001501		8240	**4200**	NA	No	EN
7782-49-2	SELENIUM	9/23	0.52 J	**9.3 J**	C044M0015	044M001501	0.29 - 2.4	9.3	**ND**	39 N	No	BSL
7440-23-5	SODIUM	9/10	367 J	13100	C044SB027	044SB02703	882 - 882	13100	14000	NA	No	EN, BKG
7440-28-0	**THALLIUM**	3/32	3.2	**4.6**	C044M0015	044M001501	0.25 - 4	4.6	**ND**	**0.078 N**	**Yes**	ASL
7440-31-5	TIN	1/10	1.3 J	1.3 J	C044SB007	044SB00701	0.97 - 14.5	1.3	NA	4700 N	No	BSL
7440-62-2	**VANADIUM**	10/10	0.89 J	**68.5**	C044SB027	044SB02701		68.5	**61**	**39 N**	**Yes**	ASL
7440-66-6	ZINC	25/25	1.4 J	**669 J**	C721MD010	721MD01001		669	**64**	2300 N	No	BSL
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	3/3	10700	52600	C044M0015	044M001501		52600	NA	NA	No	NTX

TABLE 4-9

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection[1]	Minimum Concentration[1]	Maximum Concentration[1]	Location of Maximum Detect	Sample of Maximum Detect	Range of Nondetects[2]	Concentration Used for Screening?[3]	AOC 721 Background Concentration[4]	Screening Toxicity Value[4]	COPC Flag	Rationale For Contaminant Deletion[5]

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - The USEPA Regional Screening Level for residential exposures to soil is presented. Before the factor is applied, the risk based soil screening level is divided by 10 to correspond to a target hazard quotient of 0.1 for noncarcinogens (denoted with a "N" flag), or an incremental cancer risk of 1.0E-6 for carcinogens (denoted with a "C" flag) (May 2012).
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
6 - One-tenth the noncarcinogenic value is less than the carcinogenic value; therefore, the noncarcinogenic value is presented.
7 - Values are for pyrene.
8 - Value is for hexavalent chromium.
9 - Value is for mercuric chloride (and other mercury salts).
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:

C = Carcinogen
N = Noncarcinogen
COPC = Chemical of Potential Concern
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level
For elimination as a COPC:
BSL = Below COPC Screening Level
EN = Essential nutrient
NTX = No toxicity Criteria

Associated Samples:

044M001501	044SBC0101	721MD01101	721SB07B01
044M001601	044SBC0102	721SB00101	721SB07C01
044M001901	044SS00501	721SB00701	721SB07D01
044SB00501	721MD00101	721SB00801	721SB08A01
044SB00701	721MD00201	721SB01A01	721SB08B01
044SB02501	721MD00301	721SB01D01	721SB08C01
044SB02601	721MD00401	721SB06B01	721SB08D01
044SB02701	721MD00501	721SB06E01	721SBR0101
044SB02702	721MD00701	721SB06F01	721SBR0201
044SB02703	721MD00801	721SB06G01	721SBR0301
044SB06601	721MD00901	721SB06H01	721SBR0301-D
044SB07601	721MD01001	721SB07A01	721SBR0401

TABLE 4-10

SUMMARY OF DETECTIONS - SURFACE WATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample	**721WD00101**	**721WD00102**	**721WP00101**
Sample_typ	**NORMAL**	**NORMAL**	**NORMAL**
Qc_type	**NM**	**NM**	**NM**
Sacode	**NORMAL**	**NORMAL**	**NORMAL**
Matrix	**SW**	**SW**	**SW**
Inorganic Elements (µg/l)			
Arsenic	3.6	2.5 U	2.5 U
Beryllium	0.32	0.33	0.30 U
Calcium	169000	125000	164000
Cobalt	1.1 U	1.1 U	1.1
Magnesium	331000	382000	403000
Potassium	126000	147000	152000
Sodium	2340000	2680000	2845000
Thallium	3.2 U	3.2 U	4.3
Miscellaneous Compounds			
Chloride (mg/l)	5280	6170	6165
Conductance(umhos)	16000	18000	17950
Salinity (g/l)	9.6	11.2	11.15
Sulfate,turbid (mg/l)	667	791	864
TDS (mg/l)	10300	11500	11500
TSS	20	4.0 U	47

TABLE 4-11

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE WATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Parameter	Frequency of Detection	Range of Detection	Mean	Concentration Use for Screening	Saltwater Surface Water Chronic[1]	Saltwater Surface Water Acute[1]	COPC Flag	Rationale for Contaminate Delection or Selection
	Inorganic Elements (µg/l)								
7440-38-2	Arsenic	1/3	3.6	3.6	3.6	36	69	No	BSL
7440-41-7	Beryllium	2/3	0.32—0.33	0.325	0.33	NA	NA	No	NTX
7440-70-2	Calcium	3/3	125000-169000	152666.67	169000	NA	NA	No	NTX
7440-48-4	Cobalt	1/3	1.1	1.1	1.1	NA	NA	No	NTX
7439-95-4	Magnesium	3/3	331000—403000	372000	403000	NA	NA	No	NTX
7440-09-7	Potassium	3/3	126000—152000	141666.67	152000	NA	NA	No	NTX
7440-23-5	Sodium	3/3	2340000-2845000	2621666.67	2845000	NA	NA	No	NTX
7440-28-0	Thallium	1/3	4.3	4.3	4.3	NA	NA	No	NTX
	Miscellaneous Compounds								
16887-00-6	Chloride (mg/l)	3/3	5280—6170	5871.67	6170	NA	NA	No	NTX
TTNUS504	Conductance (umhos)	3/3	16000—18000	17316.67	18000	NA	NA	No	NTX
TTNUS036	Salinity (g/l)	3/3	9.6—11.2	10.65	11.2	NA	NA	No	NTX
14808-79-8	Sulfate, turbid (mg/l)	3/3	667—864	774	864	NA	NA	No	NTX
TTNUS040	TDS (mg/l)	3/3	10300—11500	11100	11500	NA	NA	No	NTX
TTNUS003	TSS (mg/l)	2/3	20—47	33.5	47	NA	NA	No	NTX

Footnotes:
1 - National Recommended Water Quality Criteria (USEPA, 2009).

µg/l = Microgram per liter
mg/l = Milligram per liter

NTX= No toxicity criteria
umhos = micro-millohms

Definitions:
COPC= Chemical of Potential Concern

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level

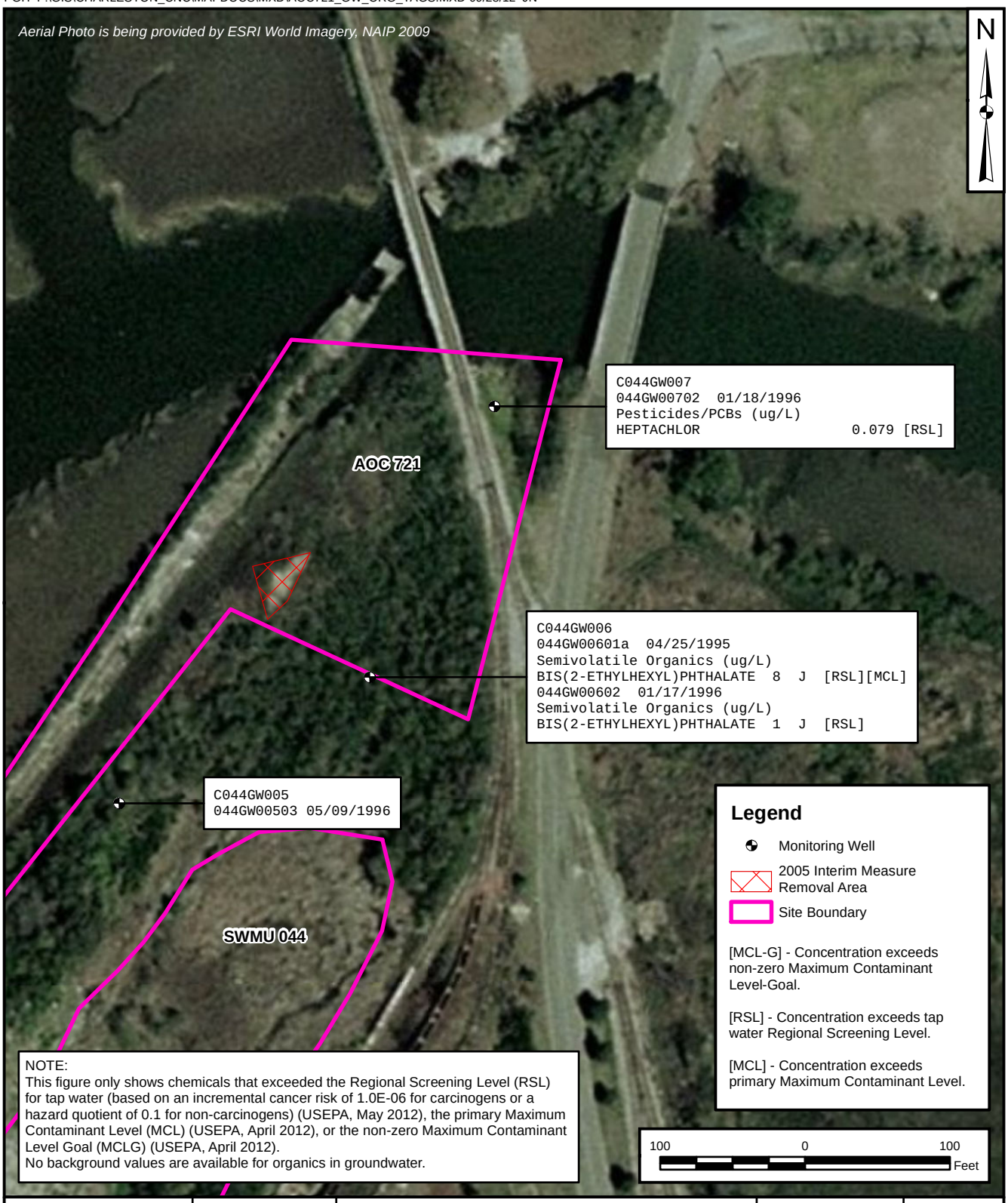
For elimination as a COPC:
BSL= Below COPC screening level
NTX = No toxicity criteria

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_SOIL_TAGS.MXD 09/28/12 JN

NOTE:
This figure only shows chemicals that exceeded both background and the Regional Screening Level (RSL) for residential soil (based on an incremental cancer risk of 1.0E-06 for carcinogens or a hazard quotient of 0.1 for non-carcinogens) (USEPA, May 2012).

DRAWN BY J. ENGLISH	DATE 12/21/11	BACKGROUND AND SCREENING CRITERIA EXCEEDANCES IN SURFACE SOIL AOC 721 CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NUMBER 0349 / CTO NUMBER 017
CHECKED BY L. CIOFANI	DATE 09/28/12		APPROVED BY ___ / DATE ___
REVISED BY J. NOVAK	DATE 09/28/12		APPROVED BY ___ / DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 4-1 / REV 0

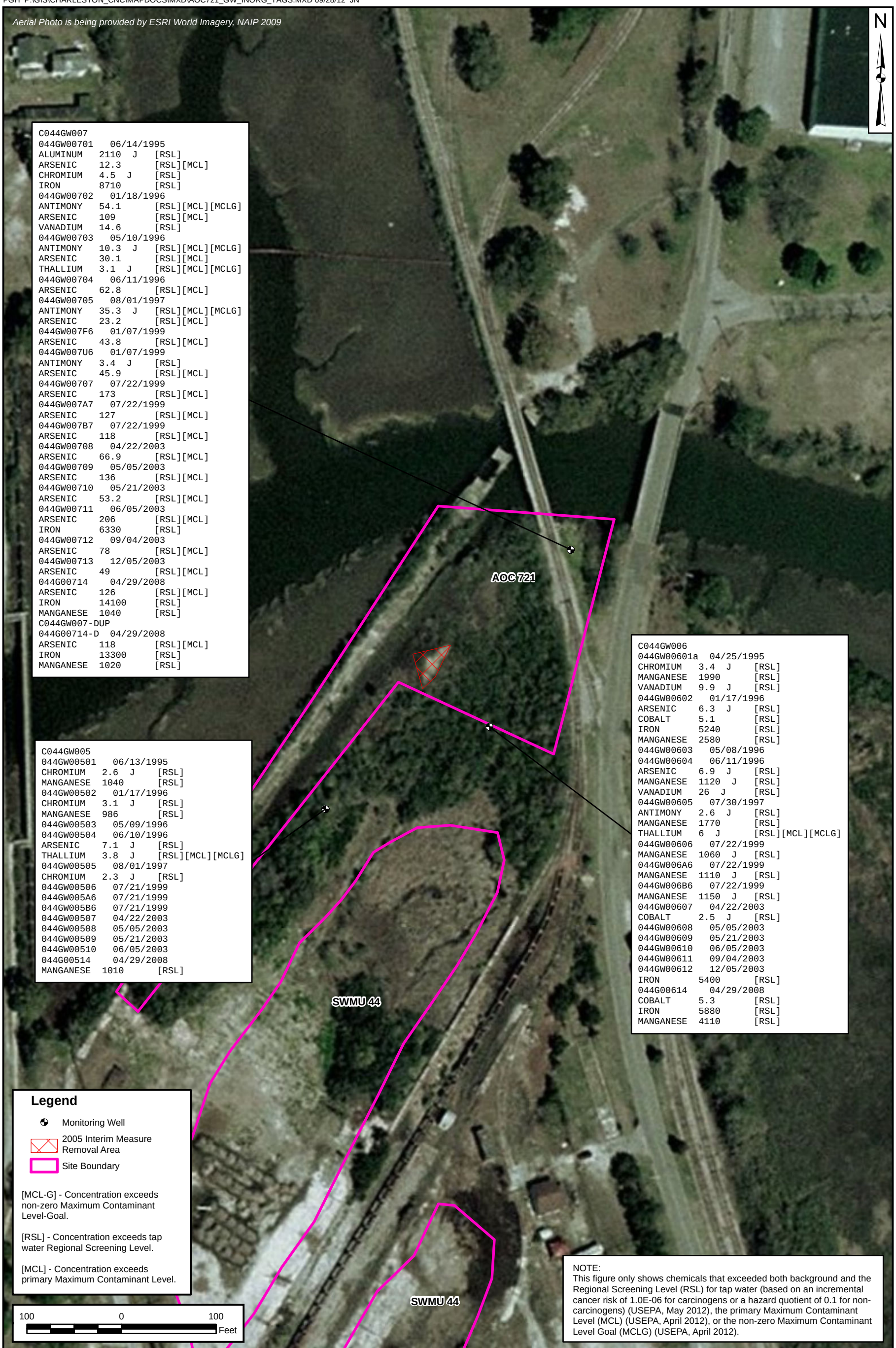
PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_GW_ORG_TAGS.MXD 09/28/12 JN



NOTE:
This figure only shows chemicals that exceeded the Regional Screening Level (RSL) for tap water (based on an incremental cancer risk of 1.0E-06 for carcinogens or a hazard quotient of 0.1 for non-carcinogens) (USEPA, May 2012), the primary Maximum Contaminant Level (MCL) (USEPA, April 2012), or the non-zero Maximum Contaminant Level Goal (MCLG) (USEPA, April 2012).
No background values are available for organics in groundwater.

DRAWN BY J. ENGLISH	DATE 12/21/11	SCREENING CRITERIA EXCEEDANCES IN GROUNDWATER-ORGANICS AOC 721 CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NUMBER 0349 / CTO NUMBER 017
CHECKED BY L. CIOFANI	DATE 09/28/12		APPROVED BY ___ / DATE ___
REVISED BY J. NOVAK	DATE 09/28/12		APPROVED BY ___ / DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 4-2 / REV 0

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_GW_INORG_TAGS.MXD 09/28/12 JN



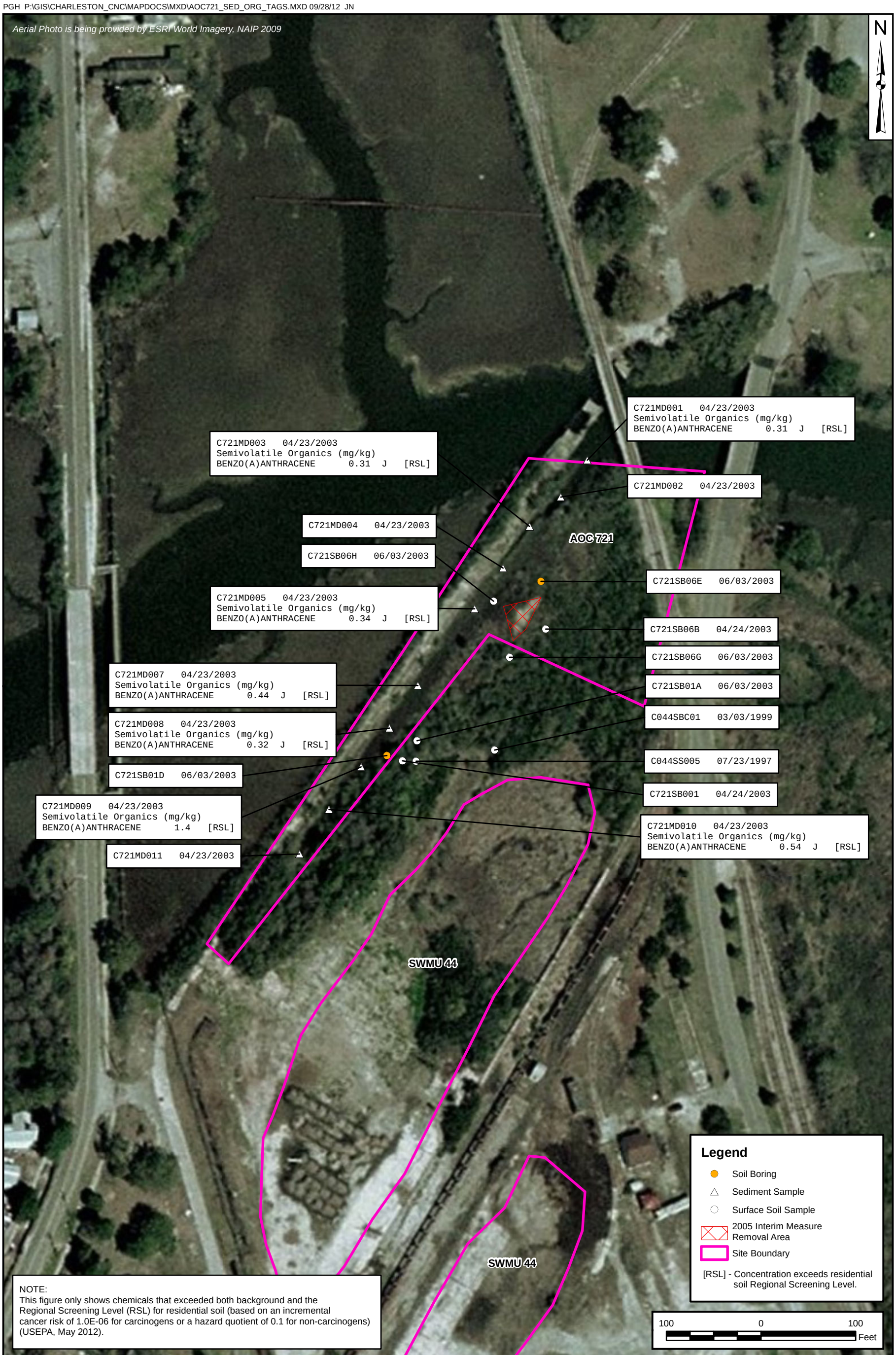
DRAWN BY	DATE
J. ENGLISH	12/21/11
CHECKED BY	DATE
L. CIOFANI	09/28/12
REVISED BY	DATE
J. NOVAK	09/28/12
SCALE	
AS NOTED	

NAVFAC

BACKGROUND AND SCREENING CRITERIA
EXCEEDANCES IN GROUNDWATER-INORGANICS
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NUMBER	CTO NUMBER
0349	017
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 4-3	0

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_SED_ORG_TAGS.MXD 09/28/12 JN



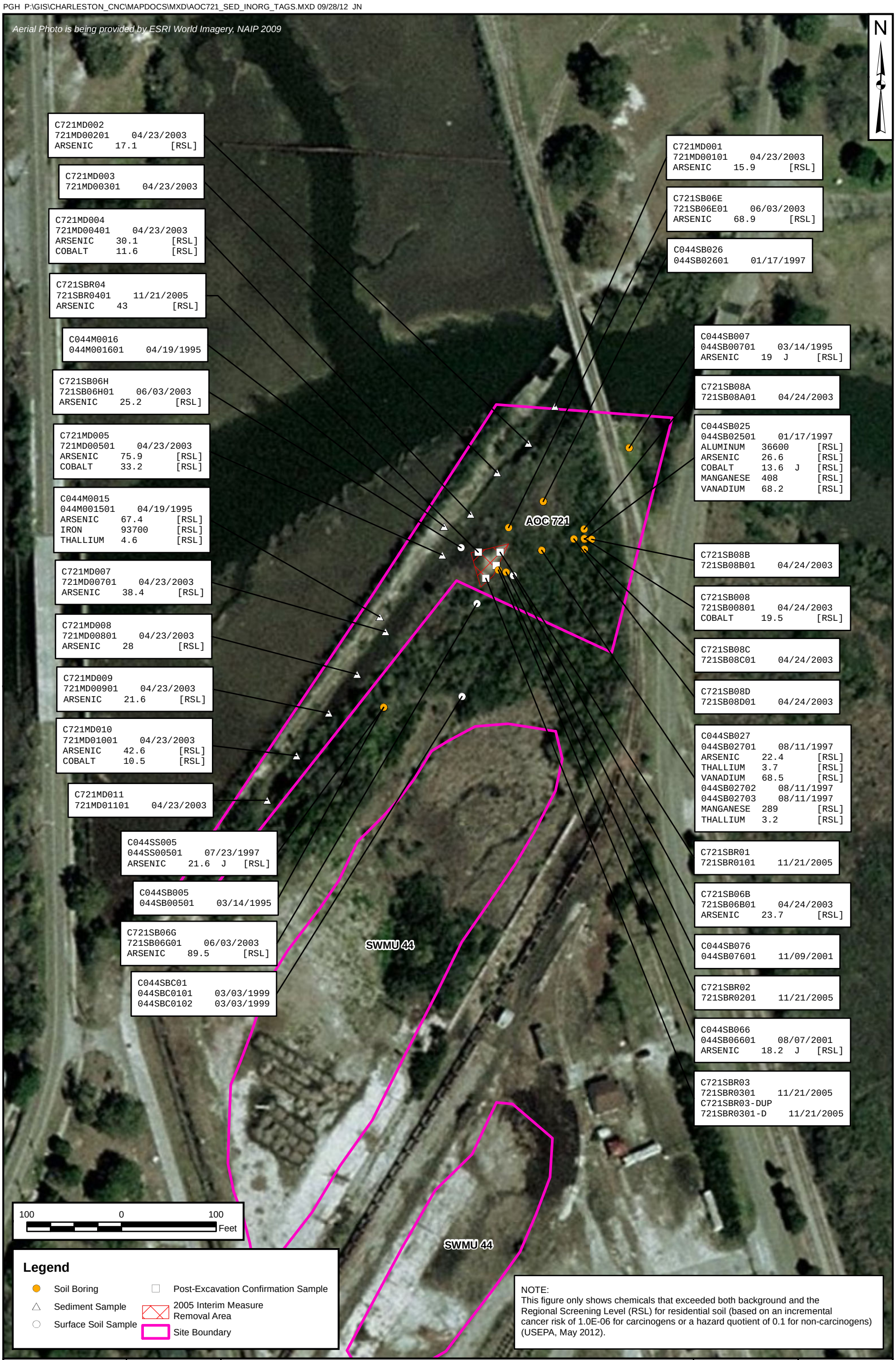
DRAWN BY	DATE
J. ENGLISH	12/21/11
CHECKED BY	DATE
L. CIOFANI	09/28/12
REVISED BY	DATE
J. NOVAK	09/28/12
SCALE	
AS NOTED	

NAVFAC

BACKGROUND AND SCREENING CRITERIA
EXCEEDANCES IN SEDIMENT- ORGANICS
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NUMBER	CTO NUMBER
0349	017
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 4-4	0

PGH P:\GIS\CHARLESTON_CNC\MAPDOCS\MXD\AOC721_SED_INORG_TAGS.MXD 09/28/12 JN



DRAWN BY	DATE
J. ENGLISH	12/21/11
CHECKED BY	DATE
L. CIOFANI	09/28/12
REVISED BY	DATE
J. NOVAK	09/28/12
SCALE	
AS NOTED	

NAVFAC

BACKGROUND AND SCREENING CRITERIA
EXCEEDANCE IN SEDIMENT-INORGANICS
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NUMBER	CTO NUMBER
0349	017
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 4-5	0

5.0 CONTAMINANT FATE AND TRANSPORT

This section discusses the fate and transport of contaminants present at AOC 721. The evaluation focuses on the following primary chemicals of potential concern (COPCs) defined by the human and ecological risk assessments:

- PAHs
- Metals
- Pesticide (heptachlor)
- Phthalate Esters [bis(2-ethylhexyl) phthalate]

Generally, the methods by which the COPCs were transported from source areas to environmental media (and from one environmental medium to another) and the ultimate fate of a chemical in an environmental medium are examined. The discussion is organized by contaminant type and then by environmental medium. The following chemical characteristics are discussed:

- **Henry's Law Constant:** Describes the ratio of atmospheric to solution concentrations at low partial pressures. This constant indicates a chemical's potential to volatilize. In general, chemicals having a Henry's Law constant of less than 1E-05 atmosphere-cubic meter per mole (atm-m^3/mole), such as PAHs, should volatilize very little and be present only in minute amounts in the atmosphere or soil gas. In contrast, for chemicals with a Henry's Law constant greater than 5E-03 atm-m^3/mole, such as many VOCs, volatilization and diffusion could be very significant.

- **Organic carbon partition coefficient (K_{oc}):** Indicates a chemical's potential to bind to organic carbon in soil and sediment. This parameter may be used to infer the relative rates at which chemicals are transported in water. Chemicals with a high K_{oc} value generally have low water solubilities and vice versa.

- **Octanol-water partition coefficient (K_{ow}):** Estimates the potential for an organic chemical to move from water into lipid (or fats). A linear relationship between K_{ow} and the uptake of chemicals by the fatty tissues of animal and human receptors (i.e., the bioconcentration factor) has been established.

5.1 PAHs

PAHs (a subset of SVOCs) have been detected in environmental media at AOC 721, as discussed in Section 4. The physiochemical properties of the PAHs (water solubility, vapor pressure, Henry's law constant, K_{ow}, and K_{oc}) explain, to a large extent, the observed partitioning of these contaminants among

the environmental media (soil, groundwater, surface water, sediment). The transport and partitioning of an individual PAH compound is roughly related to the molecular weight of the compound. PAHs fall into one of three categories: low molecular weight (two to three benzene rings, e.g., acenaphthene, anthracene, fluorene, and phenanthrene), medium molecular weight (four benzene rings, e.g., fluoranthene and pyrene), and high molecular weight [five or more benzene rings, e.g., benzo(a)pyrene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene] compounds. Typically those PAHs with lower molecular weights will be more mobile within a given medium. For example, a low molecular weight PAH will be much more likely to volatilize, whereas high molecular weight compounds will not tend to volatilize as readily. Low molecular weight PAHs tend to have lower K_{oc} values and a moderate potential to be adsorbed to organic carbon in soil and sediments compared to high molecular weight PAHs, which have stronger tendencies to adsorb to organic carbon.

As described in Section 2, AOC 721 is situated on poorly consolidated Quaternary age sediments that overlie the Ta Ashley Formation. The Ashley Formation is described as a clayey silt which provides a high surface area and organic content promoting the absorption of PAHs. Thus, sediment PAH contamination is generally expected to adhere strongly to these sediments and not migrate significantly vertically or horizontally.

In contrast, PAHs were not detected in groundwater or surface water at AOC 721. Thus, the available data indicate that the PAHs have adsorbed strongly to the soil and sediment matrices and have not partitioned significantly to surface water or groundwater. The absence of PAHs in surface water and groundwater is attributable, in part, to the fact that PAHs are not very soluble in water.

A brief summary of the fate of PAH compounds is provided below.

Chemical Fate in Surface Water

In water, PAH compounds tend to be physically removed by volatilization to the atmosphere, by binding to suspended particles or sediments, or by being accumulated by or sorbed onto aquatic biota. The Henry's Law Constant determines how readily an individual PAH compound will volatilize from surface water to air. Ideal conditions for volatilization of PAHs from surface water would be high temperature, low depth (from the water surface), and high wind. However, because of their low solubility and high affinity for organic carbon, PAHs in aquatic systems are primarily found sorbed to particles that either have settled to the bottom or are suspended in the water column. In an estuary, volatilization and adsorption to suspended sediments with subsequent deposition are the primary physical removal processes for medium and high molecular weight PAHs, whereas volatilization and biodegradation are the major removal processes for low molecular weight PAHs. In some instances, PAHs will settle quickly to sediment, but may be recycled back into the water column from the sediment surface. This scenario is

more likely for PAHs with lower molecular weights than for those with higher molecular weights, which appear to become somewhat buried when deposited in sediment. Low molecular weight PAHs will also have a lesser tendency to be adsorbed to organic carbon than high molecular weight PAHs.

The most important chemical/biological processes contributing to the degradation of PAHs in water are photo-oxidation, chemical oxidation, and biodegradation by aquatic microorganisms. Temperature, depth, pollution status, flow rate, and oxygen content of the water impact the overall fate of PAHs in water. The rate and extent of photodegradation vary widely among PAHs and do not follow a discernable pattern. PAHs in water can be chemically oxidized by chlorination and ozonation. However, the PAH-related by-products resulting from chlorination are not fully known, and there appears to be no correlation between biodegradability and molecular weight.

Chemical Fate in Soil and Sediment

In soil, PAHs can volatilize, undergo abiotic degradation (photolysis and oxidation), biodegrade, or accumulate in plants. In sediment, PAHs can biodegrade or accumulate in aquatic organisms. Sorption of PAHs to soil and sediment increases with increasing organic carbon content and with increasing surface area of the sorbent particles (e.g., greater sorption to clays than sands). For example, three to four times more anthracene and about two times more fluoranthene, benzo(a)anthracene and benzo(a)pyrene can be retained by marsh sediment than by sand. Sorption of PAHs to organic matter and soil particulates influences bioavailability and biotransformation potential.

Microbial metabolism is the major process for degradation of PAHs in soil environments. Chemical degradation (photolysis, hydrolysis, and oxidation) is generally not considered as significant. However, PAH losses from surface soil because of volatilization and photolysis can be important for low molecular weight PAHs; losses for medium and high molecular weight compounds are typically insignificant. The rate and extent of biodegradation of PAHs in soil are affected by environmental factors such as the organic content, structure, and particle size of the soil, characteristics of the microbial population, presence of other contaminants such as metals and cyanides that may be toxic to microorganisms, and physical and chemical properties of the individual PAHs. Other environmental factors that influence the rate of PAH degradation in soil include temperature, pH, oxygen concentration, PAH concentrations, and contamination history of soil, soil type, moisture, nutrients, and other substances that may act as substrate co-metabolites. Biodegradation of PAHs in soil is faster for low molecular weight compounds than high molecular weight compounds. The pathways of microbial degradation are well known for some PAHs. Mean half-lives (or the rate of degradation of PAHs) are positively correlated with log K_{ow} and inversely correlated with log water solubility.

The rate of microbial transformation of PAHs in freshwater sediments from both pristine and oil-contaminated streams are 10 to 400 times greater in contaminated sediment than uncontaminated sediment. Absolute rates of PAH transformation were 3,000 to 125,000 times greater in the contaminated sediment. Turnover times in the oil-contaminated sediment increased 30- to 100-fold per additional ring from naphthalene through benzo(a)anthracene; naphthalene was broken down in hours, and the turnover times for benzo(a)anthracene and benzo(a)pyrene were about 400 days and more than 3.3 years, respectively. Therefore, the four- and five-ring PAHs may persist even in sediments that have received chronic PAH inputs. As noted above, the rate of PAH biodegradation may also be decreased by the degree of contamination. Half-lives may be longer when contaminants at the site are toxic to degrading mircoorganisms.

Bioconcentration

PAHs can accumulate in aquatic organisms from water, sediment, and food. Bioconcentration is greater for high molecular weight PAHs than for low molecular weight PAHs. Some organisms are able to metabolize and eliminate PAHs. In some organisms, however, PAHs are transformed into carcinogenic and mutagenic intermediates, and therefore exposure to PAHs has been linked to the development of tumors in fish. Sediment-associated PAHs can accumulate in bottom-dwelling invertebrates and fish. The fate and transport of PAHs in aquatic organisms is discussed in detail in the ecological risk assessment (ERA) (Section 8 of this RFI).

5.2 METALS

As detailed in Section 4, metals concentrations (particularly aluminum, antimony, arsenic, cobalt, chromium, iron, manganese, thallium, and vanadium) in excess of background concentrations have been detected at AOC 721. The elevated metal concentrations are most notable in soil and sediment samples around the previously defined hotspot. Arsenic, a primary COPC for AOC 721, was detected in both soil and sediment at AOC 721.

The metals concentrations detected in most of the sediment samples suggest the direct contamination of sediment by past activities at AOC 721 (e.g., the storage and use of coal).

Overview of Metals Fate and Transport Information

The following narrative provides a brief summary of chemical fate information for metals from the literature.

Metals are highly persistent and do not readily biodegrade, photolyze, hydrolyze, etc. The transport of metals in soil and sediment is a result of a variety of complex mechanisms and interactions. The major fate mechanisms for metals are adsorption to the soil matrix and bioaccumulation. The interactions are not well understood in many cases due to the fact that natural systems are mixtures of various reactive substances that can vary over distances in the subsurface and can vary with time as subsurface conditions change. Transport of metals in the subsurface environment can be a function of the following mechanisms:

- **Advection**: Metals particles are transported with the flow of groundwater. Advection is one of the primary mechanisms by which chemicals are transported from a source area in the form of a plume. Advection results in the reduction of chemical concentrations by dilution with surrounding groundwater but does not result in mass reduction.

- **Dispersion**: Dispersion is the mixing of chemicals in an aquifer primarily caused by the varied movement of groundwater through a complex network of small openings (i.e., pores) located between the individual grains of sand, silt, and clay. Dispersion is one of the primary mechanisms by which chemicals are transported from a source area in the form of a plume. Dispersion results in the reduction of chemical concentrations by dilution with surrounding groundwater, but not by mass reduction.

- **Sorption/Desorption**: The complex chemical processes (e.g., ionic attraction, oxidation- reduction reactions, complexation with an organic chemical, etc.) by which chemicals partition between the aqueous phase and solid phase (soil) in the aquifer matrix. A particular trace metal will typically compete for available adsorption sites with other trace metals, hydrogen, calcium, and sulfate. The sorption (i.e., attachment) of a chemical onto a mineral surface or organic matter results in the retardation (i.e., slowing or delaying) of chemical transport in the aquifer.

- **Speciation:** The process of changing the ionic strength and reactivity of a chemical. Speciation may cause significant differences in the sorption behavior of the chemical.

- **Dissolution/Precipitation:** The dissolving or solidifying of a chemical as a result of a chemical reaction. For trace metals, dissolution and precipitation behavior is strongly a function of pH (i.e., acidity or alkalinity) and the initial distributions of the aqueous, solid, and adsorbed masses of each chemical. Dissolution of a chemical from a source area typically provides a continuous or intermittent influx of chemicals to the groundwater until geochemical equilibrium conditions are achieved.

Many studies have found that the predominant adsorbates of metal ions are iron and manganese oxides and organic matter such as detrial plant material and humic coatings on mineral surfaces. Metal hydroxides of iron, aluminum, and manganese are important reductive surfaces in subsurface materials with respect to interactions with charged species such as hydrogen, aluminum, cadmium, zinc, lead, and copper and with negatively charged species such as phosphate, sulfate, bicarbonate, and fluoride. The adsorption of species on oxides is strongly dependent on pH due to the variable, pH-dependent, surface charge and potential of metal hydroxides and to a pH-dependent speciation of the adsorbate.

5.3 PESTICIDES

Whether pesticides are sprayed, dusted, or applied directly to the soil, the soil is the ultimate sink for these chemicals. Surface soil runoff may carry pesticides to adjacent surface water bodies. Bioconcentration of pesticides in the food chain is another important fate mechanism. In water, they would not be expected to biodegrade or hydrolyze to any significant extent and will likely bioconcentrate in aquatic organisms. Hydrolysis, oxidation, and photolysis are not generally important fate mechanisms for pesticides in soil or water. Hydrolysis half-lives for several pesticides are reported in periods of months to years (USEPA, 1979). Heptachlor was detected only in groundwater at AOC 721 and is discussed below:

The use of heptachlor was restricted in 1983. Heptachlor epoxide is formed by the biological transformation of heptachlor in the environment. These compounds sorb strongly to soil. Heptachlor is subject to biodegradation (forming heptachlor epoxide, which is highly resistant to biodegradation) and hydrolysis. Bioconcentration of both compounds is significant, and volatilization and photolysis are very slow (Howard, 1991).

5.4 PHTHALATE ESTERS

Phthalate esters (a subset of SVOCs) are considered to be relatively persistent chemicals in the environment. Although numerous studies have demonstrated that phthalate esters undergo biodegradation, it appears that this is a slow process in both soils and surface waters. Certain microorganisms have been shown to excrete products that increase the solubility of phthalate esters and enhance their biodegradation (Gibbons and Alexander, 1989).

Biodegradation of bis(2-ethylhexyl) phthalate is an important fate mechanism. However, hydrolysis of bis(2-ethylhexyl) phthalate is very slow, with a calculated half-life of 2000 years (USEPA, 1979). Bioaccumulation is also a significant fate process. Photolysis and volatilization are considered to be insignificant degradation mechanisms (USEPA, 1979; Howard, 1989).

6.0 INTERIM MEASURES

Following completion of RFI sampling activities at AOC 721, an 893 square foot arsenic-contaminated soil hot spot (Figure 1-3) was identified for removal (Spectra Tech, 2006). EnSafe was contracted by the Navy through the CLEAN program to excavate and dispose of the contaminated soil. Spectra Tech was contracted by the Navy to prepare a Completion Report of the interim soil removal action, which was submitted on March 26, 2006 (Spectra Tech, 2006a). Spectra Tech was also subcontracted by EnSafe to provide technical support.

The soil removal was necessitated by preliminary ecological risk assessment results, where arsenic soil concentrations ranged from 50.9 to 340 milligrams per kilogram (mg/kg). The goal of the IM was to remove a hot spot where arsenic levels were above the target cleanup level of 70 mg/kg. The cleanup target level was established by the CNC BCT, and was the NOAA Effects Range Median (ER-M), which is a risk assessment-based value for sediment that indicates when impacts to benthic macro invertebrates are expected.

6.1 INTERIM MEASURE PREPARATION

Prior to excavation, waste profile sampling for Toxicity Characteristic Leaching Procedure (TCLP) analysis of metals, mercury, and SVOCs was conducted on October 27, 2005. Thereafter, analytical results were submitted to Waste Management (WM) with an application for disposal. WM approved the Special Waste Disposal Application on November 14, 2005 for disposal of contaminated soil at the WM Oakridge Landfill facility located in Dorchester, South Carolina.

6.2 EXCAVATION

Spectra Tech, EnSafe, and CE Chinner's Trucking, Inc. mobilized to AOC 721 on November 20, 2005. Upon mobilization of the excavation equipment, preparations such as brush removal, silt fence installation, and backfill material staging were performed. CE Chinner's Trucking, Inc. was subcontracted to provide excavation and hauling services. The excavation pit was divided into four sections for logistical purposes. A Hitachi Long Reach track excavator with a 60-foot extended boom was utilized for soil removal to a depth of two feet.

CE Chinner's Trucking, Inc. excavated and loaded 84.8 tons of contaminated soil into five and a half truck loads, totaling 88 cubic yards. Contaminated soil was thereafter transported to the Oakridge Landfill, a certified Subtitle D landfill, for disposal.

6.3 CONFIRMATORY SAMPLING

Upon completion of excavation in each of the four sections, five post-excavation confirmatory soil samples, including one duplicate, were collected for arsenic analysis and labeled 721SBR0101 through 721SBR0401. Coordinates for each sample location were recorded using a Trimble Pathfinder PRO XRS Differential Global Positioning System (GPS) Receiver and Data Collector. Table 6-1 summarizes the location and results of the confirmatory samples. Confirmatory sample laboratory analytical reports were included in the *AOC 721 Interim Measure Completion Report* (Spectra Tech, 2006). Following receipt of confirmatory sample results, the excavation was backfilled and restored to pre-construction conditions.

TABLE 6-1
POST EXCAVATION CONFIRMATORY SAMPLE SUMMARY LOCATIONS

Sample ID	Parameter	Sample Collection Depth (feet)	Results (mg/kg)	Target Cleanup Level (NOAA ER-M) (mg/kg)	Exceeds Cleanup Level (Y/N)	Northing	Easting
721SBR0101	Arsenic	2	5.4	70	N	379590.0	2315019.0
721SBR0201	Arsenic	2	11	70	N	379576.0	2315015.0
721SBR0301	Arsenic	2	11	70	N	379562.4	2315004.0
721CBR0301*	Arsenic	2	12	70	N	379562.4	2315004.0
721SBR0401	Arsenic	2	43	70	N	379590.0	2314996.0

*Duplicate Sample

6.4 EFFECTS OF SOIL REMOVAL ON OTHER MEDIA

Groundwater in AOC 721 and sediment in Noisette Creek were sampled before and after the soil removal. Surface water was not sampled in 2008 during the Zone J RFI because surface water chemical data can be quite variable at a given location over time, and although numerous surface water samples have been collected and analyzed over the long history of the Zone J investigation, no clear trends in surface water contamination have been identified. Overall, evaluations of surface water samples collected during previous investigations at Zone J have indicated that surface water concentrations at Zone J are similar to surface water concentrations elsewhere in the harbor, or that ecological risks posed by CNC-related chemicals in surface water are negligible. Because of this, and because sediments integrate contaminants over time and indicate a history of contamination, the BCT decided that sampling activities conducted in 2008 would focus on sediment.

Sixteen groundwater samples (from four quarterly sampling events that included a duplicate sample) were collected prior to the 2005 IM removal in 2003 and were analyzed for select metals. Four post-IM

removal groundwater samples were collected in 2008 and were analyzed for metals. These samples were collected from Monitoring Wells 044005, 044006, and 044007 in 2003 and 2008. Both of these data sets have analytical results for six of the metals with groundwater concentrations exceeding background concentrations and screening criteria in Table 4-7. Table 6-2 compares the ranges of detections for these six metals in the 2003 and 2008 groundwater data sets:

TABLE 6-2
COMPARISON OF PRE- AND POST-EXCAVATION METALS CONCENTRATIONS IN GROUNDWATER

Parameter	Range of Detected Concentrations – 2003 Data (µg/L)	Range of Detected Concentrations – 2008 Data (µg/L)
Antimony	Not Detected	Not Detected
Arsenic	2.1 - 206	4 - 126
Cobalt	2.5 – 2.5	5.3 – 5.3
Iron	128 - 6330	400 - 14100
Thallium	Not Detected	Not Detected
Vanadium	1.1 – 4.1	Not Detected

The IM soil removal targeted arsenic. The ranges of detected arsenic concentrations in the 2003 and 2008 data sets are similar. The range of detected iron concentrations is higher in the 2008 data set compared to the 2003 data set; however, the maximum concentrations of these data sets are within one order of magnitude. Concentrations detected in 2008 for the remaining metals presented in the table are similar to or less than concentrations detected in the 2003 sampling event.

No sediment samples were collected from AOC 721 after the interim removal action. However, sediment samples were collected for the Zone J RFI in Noisette Creek both before and after the removal action. A comparison of the results for data collected during the June 1997, December 2005, and April 2008 sampling events at sediment sample location NOIM0004 is provided in the Zone J RFI Report and summarized below.

SVOCs detected in 2008 sediment samples included numerous PAHs. However, sediment concentrations of SVOCs were generally less in 2008 than in 1997 and 2005.

Copper was the only metal detected at concentrations exceeding background concentrations and USEPA Region 4 ecological screening values (ESV) in sediment samples collected from Noisette Creek in 2008. Copper concentrations increased slightly from 15 mg/kg in December 2005 to 19.9 mg/kg in April 2008. Arsenic in one 2008 sample was detected at a concentration of 9.2 mg/kg, exceeding the USEPA Region 4 ESV (7.24 mg/kg) but was less than two times the average background concentration (12.0 mg/kg).

Arsenic concentrations detected at Noisette Creek sample location NOIM0004 were 10.7 mg/kg and 5.9 mg/kg in 1997 and 2005, respectively, whereas the arsenic concentration detected for this location in 2008 was 5.0 mg/kg.

The pesticides 4,4'-DDD and 4,4'-DDE were detected in one or more 2008 Noisette Creek samples. Some detected concentrations of these pesticides slightly exceeded USEPA Region 4 ESVs. No other pesticides or polychlorinated biphenyls (PCBs) were detected in samples collected from Noisette Creek in 2008. No pesticides or PCBs were detected in the 1997 and 2005 samples.

6.5 CONCLUSIONS

The objective of arsenic-contaminated soil excavation within the identified hot spot was satisfied. The NOAA ER-M target levels were achieved, as confirmed by the confirmatory samples, and the IM soil removal appears to have had a positive impact on contaminant concentrations in other media.

7.0 HUMAN HEALTH RISK ASSESSMENT

7.1 INTRODUCTION

The human health risk assessment (HHRA) presents a quantitative and qualitative assessment of the potential risks to public health posed by chemicals detected in soils, groundwater, surface waters, and sediments at AOC 721 of the CNC. The risk assessment was performed to evaluate whether hazardous substances at AOC 721 pose potential health risks to exposed individuals under current or potential future land use.

The risk assessment addresses a variety of chemicals, environmental media, exposure pathways, and receptors as a basis for characterizing the types and range of potential risks associated with site-related contamination. The overall objective of the HHRA was to determine the potential for health risks in the absence of remedial action at the site and, if action is required, to focus the evaluation of remedial action alternatives.

The following current USEPA risk assessment guidance documents were used to develop the framework for the HHRA:

- Risk Assessment Guidance for Superfund (RAGS): Volume I, Human Health Evaluation Manual (Part A) (USEPA, 1989a).

- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Washington, D.C. Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6 03 (USEPA, 1991a).

- Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. OSWER, Washington, D.C. (USEPA, 1993a).

- Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, D.C. EPA/600/P 95/002Fa (USEPA, 1997a).

- RAGS: Volume 1 - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (USEPA, 2001a).

- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. Office of Emergency and Remedial Response (OERR), Washington, D.C. OSWER 9285.6-10 (USEPA, 2002a).

- RAGS, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final. Office of Superfund Remediation and Technology Innovation, Washington, D.C. 20460 EPA/540/R/99/005, OSWER 9285.7-02EP; PB99-963312 (USEPA, 2004).

- Guidelines for Carcinogen Risk Assessment (USEPA, 2005a).

- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b).

- RAGS Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. Office of Superfund Remediation and Technology Innovation, Washington, D.C. EPA-540-R-070-002, OSWER 9285.7-82 (USEPA, 2009a)

An HHRA consists of five components - data evaluation, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. Sections 7.2 through 7.6 contain detailed discussions of the five components of the HHRA.

Three major aspects of chemical contamination and environmental fate and transport were considered to evaluate potential risks: (1) Contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or by human action; (2) potential exposure points must exist; and (3) human receptors must be present at the point of exposure. Risk is a function of both toxicity and exposure. If any one of the factors listed above is absent, the exposure pathway is incomplete, and risks are not quantitatively evaluated.

7.2 DATA EVALUATION

Data evaluation, the first component of an HHRA, is a two-step, medium-specific task involving the compilation and evaluation of analytical data. The first step involves the compilation of the analytical database and an evaluation of data usability for purposes of HHRA. The second step of the data evaluation is the selection of a medium-specific list of chemicals of potential concern (COPCs) which are used to quantitatively or qualitatively determine potential human health risks for site media. COPCs are selected primarily based on a toxicity screen (i.e., a comparison of site contaminant concentrations to

conservative toxicity screening values) and a background screen (i.e., a comparison of site concentrations to background concentrations).

7.2.1 Data Usability

Data collected from this investigation were used to assess potential risks to human receptors. All analytical data used in the quantitative estimation of potential risks was subject to a data quality evaluation. A data validation summary is included in Appendix B of this RFI report.

Fixed-base laboratory analytical results for the targeted analytes for the investigation were used in the quantitative risk evaluation. Typically, unfiltered sample results for groundwater and surface water are used to assess risks associated with those media. Field measurements and data regarded as unreliable (i.e., qualified as "R" during the validation process) were not used in the quantitative risk assessment. The uncertainty associated with the rejection of analytical results is discussed in Section 7.6.

7.2.2 Selection of Chemicals of Potential Concern

This section presents the methodology for and results of the COPC selection for this HHRA.

7.2.2.1 Toxicity Screening Methodology

The following standards, criteria, and risk-based concentrations were used as the basis of the toxicity screening values:

- **Federal Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) for Public Drinking Water Supplies (USEPA, 2012a).** Primary MCLs are enforceable standards promulgated under the federal SDWA and are designed to be protective of human health. Primary MCLs are based on laboratory or epidemiological studies and apply to public water systems. A public water supply is defined as a system which provides water to the public for human consumption and which has at least 15 service connections or regularly serves an average of 25 individuals daily at least 60 days per year. Primary MCLs are designed for the prevention of adverse human health effects but also reflect the technical feasibility of removing a contaminant from groundwater. Primary (i.e., health based) and secondary (aesthetic-based) MCLs are promulgated under the SDWA. In this HHRA, secondary MCLs are provided for reference purposes only and are not used for COPC selection.

- **USEPA RSLs for Tap Water, Soil, and for Migration from Soil to Groundwater (USEPA, 2012b).** The USEPA RSLs were developed and are maintained through a cooperative agreement between Oak Ridge National Laboratories (ORNL) and USEPA's Office of Superfund and are considered to be

USEPA screening criteria. The RSLs are chemical concentrations corresponding to fixed levels of risk:

- A Hazard Quotient (HQ) of 1 for non-carcinogenic chemicals. Adverse noncarcinogenic health effects are not anticipated when the HQ is less than or equal to 1.

- A lifetime cancer risk of 1×10^{-6} for carcinogenic chemicals. A cancer risk of 1×10^{-6} may be interpreted as one additional case in one million exposed individuals.

The USEPA-recommended COPC screening levels for carcinogenic and non-carcinogenic compounds are typically the RSL and one-tenth the RSL, respectively, when selecting COPCs for soil and for groundwater potentially used for domestic purposes. One-tenth the RSL is recommended for non-carcinogenic compounds to account for the potential cumulative effects of multiple compounds affecting the same target organ.

There are no RSLs for surface water and sediment. COPCs in surface water were selected by comparing detected site concentrations in surface water to the RSL screening level established for tap water. COPCs in sediment were selected by comparing site concentrations to the RSL screening level established for soil. These screening values are very conservative as surface water at AOC 721 is not used for domestic purposes (e.g., bathing, cooking, and drinking) and exposures to sediment (particularly those under water) are anticipated to be both less intensive and less frequent than exposures to soil.

RSLs for transfers of contaminants from soil to groundwater were not used for COPC selection but were presented to allow a qualitative evaluation of the potential for chemical migration from soil to groundwater. Chemicals with concentrations exceeding the RSLs for transfers from soil to groundwater may potentially migrate from the soil to groundwater in sufficient quantities to pose concerns about groundwater quality.

- **Screening Levels for Lead.** Guidance from the Office of Prevention, Pesticides, and Toxic Substances and the OSWER recommend 400 mg/kg as the lowest screening level for lead-contaminated soil in a residential setting, where children are frequently present (USEPA, 1994a, b). Conservatively, 400 mg/kg was used as the screening level for COPC selection for soil. However, guidance from the USEPA Technical Review Workgroup for lead indicates that “a reasonable screening level for soil lead at commercial/industrial (i.e., non-residential) sites is approximately 800 mg/kg” for a typical non-contact intensive worker (USEPA, 2011). The aforementioned RSL table lists 800 mg/kg as the RSL for lead in soils assuming an industrial land use scenario. The SDWA Action Level of 15 micrograms per liter (µg/L) was used as the screening level for lead in groundwater.

A site evaluation of the wetlands associated with AOC 721 was conducted in July 2004. Within the area delineated as wetlands, some areas also met the criteria of critical habitat as defined by NOAA's OCRM. All soil samples within the critical habitat were reclassified as sediment samples. Surface soil is defined as 0- to 1-ft bgs. Table 7-1 presents the criteria that were used to select COPCs for soil and sediment. Table 7-2 presents the criteria that were used to select COPCs for groundwater and surface water.

7.2.2.2 Background Screening Methodology

Background concentrations are concentrations that would exist in the absence of influence from site operations. The following Navy and USEPA guidance documents were used to determine appropriate background sampling locations and to select the most appropriate statistical methods for determining if site concentrations differ from naturally occurring or anthropogenic background concentrations:

- Navy Policy on the Use of Chemical Background Levels (Navy, 2004).
- Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. EPA 540-R-01-003. OSWER 9285.7-41. (USEPA, 2002b).
- Guidance for Characterizing Background Chemicals in Soil at Superfund Sites. USEPA OSWER and OERR. OSWER 9285.7-41, EPA 540-R-01-003 (USEPA, 2001b).
- Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities. EPA 530/SW 89 026 and EPA 530/R-93-003 (USEPA, 1989b and 1993b).

Background samples were obtained from locations that have not been influenced by site operations. The development of soil, groundwater and sediment background datasets for AOC 721 is discussed in Section 4.1.

For soil, sediment, and groundwater, a comparison of background maximum concentration to site maximum concentrations was used to determine if site concentrations exceed background concentrations.

7.2.2.3 Other Considerations

The essential nutrients (calcium, magnesium, potassium, and sodium) were not identified as COPCs for AOC 721. These inorganic chemicals are naturally abundant in environmental matrices and are toxic only at high doses.

7.2.2.4 Decision Rules for Establishing COPCs

The applicable decision rules for the selection of COPCs are explained briefly below.

- A chemical detected in soil, sediment, or groundwater was selected as a COPC if, on a media-specific basis, any detected chemical concentration exceeded the screening levels and the background screening level.

- A chemical detected in surface water was selected as a COPC for surface water if the maximum detected concentration in a potentially impacted surface water body exceeded the screening level based on the tap water RSL. A site-specific background surface water dataset is not available for AOC 721.

7.2.3 COPCs Selected for HHRA

Chemicals of potential concern at AOC 721 were selected for surface soil, groundwater, surface water, and sediment using the methodology described in Section 7.2.2. A media-specific discussion of the chemicals identified as COPCs and the rationale for COPC selection are provided in the following subsections. COPC selection tables are presented in Tables 7-3 through 7-7. Chemicals retained as COPCs for AOC 721 are presented in Table 7-8.

7.2.3.1 Surface Soil

Twenty-one metals were detected in AOC 721 surface soil samples. A comparison of the maximum detected surface soil concentrations to screening levels based on USEPA RSLs for residential exposures is presented in Table 7-3. The following chemicals were detected in surface soil at maximum concentrations exceeding the direct contact risk-based COPC screening levels and background concentrations, and were retained as COPCs for surface soil at AOC 721.

- Inorganics (arsenic, cobalt, iron, and thallium)

Concentrations of chromium exceeded the RSL-based screening levels; however, chromium concentrations were within background levels. Chromium was not selected as a COPC for quantitative risk assessment; however, it was further evaluated in the uncertainty section of the HHRA.

Although arsenic was selected as a COPC, note that the maximum concentration of arsenic (92.7 mg/kg) only slightly exceeds the AOC 721 background value (92 mg/kg). Eight other surface soil samples were

analyzed for arsenic, and detected concentrations of arsenic in those samples were less than the background value.

A comparison of the maximum detected surface soil concentrations to screening levels based on USEPA RSLs for chemical migration from soil to groundwater is presented in Table 7-4. Chemicals detected in surface soil at maximum concentrations exceeding the COPC screening levels for migration from soil to groundwater and background are discussed below; note that mercury and selenium are not present in groundwater at concentrations exceeding the RSL value.

- Inorganics (arsenic, cobalt, iron, mercury, selenium, and thallium)

Maximum concentrations of antimony, chromium, copper, lead, manganese, and nickel also exceeded RSLs; however, these inorganics were determined to be within background levels.

7.2.3.2 Groundwater

Five SVOCs, one pesticide, and 23 inorganics were detected in groundwater samples collected at AOC 721. A comparison of the maximum detected groundwater concentrations to screening levels based on USEPA RSLs for tap water and USEPA MCLs is presented in Table 7-5. The following chemicals were detected in groundwater at maximum concentrations exceeding the direct contact risk-based COPC screening levels or MCLs and background, and were retained as COPCs for groundwater at AOC 721:

- SVOCs [bis(2-ethylhexyl) phthalate]
- Pesticides (heptachlor)
- Inorganics (aluminum, antimony, arsenic, chromium, cobalt, iron, manganese, thallium, and vanadium)

As noted previously, mercury and selenium were detected in concentrations greater than the RSL for soil migration to groundwater; however, these chemicals were not detected in groundwater at concentrations greater than the RSL or MCL.

7.2.3.3 Sediment

One VOC, 13 SVOCs, and 23 metals were detected in the sediment samples collected from AOC 721 (Table 7-6). As discussed in Section 7.2.2.1, risk-based screening levels for residential soil were used as the screening criteria for sediment. The following chemicals were detected in sediments at maximum concentrations exceeding the risk-based COPC screening levels and background for sediment and were retained as COPCs at AOC 721:

- SVOCs [benzo(a)anthracene]
- Inorganics (aluminum, arsenic, cobalt, iron, manganese, thallium, and vanadium)

Concentrations of benzo(a)pyrene, benzo(a)pyrene equivalents, benzo(b)fluoranthene, and chromium also exceeded the RSLs but were within background concentrations.

7.2.3.4 Surface Water

Eight metals were detected in the surface water samples collected from AOC 721 (Table 7-7). As discussed in Section 7.2.2.1, risk-based screening levels for tap water were used as the screening criteria for surface water. Arsenic, cobalt, and thallium were the only chemicals detected in surface water at maximum concentrations exceeding the risk-based COPC screening levels for surface water, and thus, arsenic, cobalt, and thallium were surface water COPCs. However, potential receptors are not expected to be exposed to surface water at AOC 721 because surface water at the site is limited to a drainage ditch and small pond. Since human exposure is unlikely, COPCs retained for surface water (arsenic, cobalt, and thallium) were not further evaluated in this HHRA. Also, the arsenic concentration in Table 7-7 is less than the current SDWA MCL, and cobalt and thallium were detected in one sample only. The thallium and cobalt concentrations reported represent relatively marginal exceedances of the SDWA MCL for thallium and the RSL-based screening level for cobalt, respectively.

7.2.3.5 Summary

Table 7-8 summarizes the chemicals retained as COPCs for soil, groundwater, surface water, and sediment at AOC 721. The associated RAGS Part D tables for COPC selection are included in Appendix C.

7.3 EXPOSURE ASSESSMENT

The exposure assessment component of a baseline HHRA defines and provides a means to evaluate, quantitatively or qualitatively, the type and magnitude of human exposure to chemicals present at or migrating from a site. A foundation of the exposure assessment is the conceptual site model (CSM), which identifies site characteristics including potential contaminant sources, contaminant release mechanisms, transport routes, receptors, and other appropriate information. CSMs consider both current and future land use scenarios for AOC 721.

Estimated chemical intakes developed during the exposure assessment are evaluated for complete exposure pathways in the risk characterization to produce quantitative estimates of cancer and non-

cancer risk. A complete exposure pathway has three components: 1) a source of chemicals that can be released to the environment, 2) a route of contaminant transport through an environmental medium, and 3) an exposure or contact point for a human receptor.

7.3.1 Sources of Environmental Contamination

A coal storage facility was located within the adjacent SWMU 44 from 1941 until 1996. Coal was stored in piles, and the amount of coal stored at the facility varied over time. An aerial photograph from 1957 indicates that the coal storage area extended into the southeastern portion of AOC 721. Based on available historical information, sources of contamination at AOC 721 include filling of the marsh with dredge material and the storage of coal.

7.3.2 Potential Contaminant Migration Routes

Past operations at AOC 721 have resulted in the release of contaminants to soil, groundwater, and sediment. Past activities at the site include filling of the marsh with dredge material and the storage and use of coal. Contaminants from past use may be transported to other environmental media by a variety of mechanisms.

Transport with groundwater. Shallow groundwater flow directions in 2002 were north and north-northwest toward Noisette Creek with recharge to the surficial aquifer at AOC 721 occurring by direct recharge from precipitation and by lateral flow from upgradient areas of Zone C. This allows for the migration of soil contaminants through the soil to groundwater. From a risk assessment perspective, the migration of contaminants from contaminated soils to the underlying groundwater is an important pathway for consideration.

Surface soil contaminant transport via wind erosion, surface water runoff, and vaporization. Chemicals adsorbed to soil particulates of AOC 721 may be transported off-site by wind erosion. The particulates (fugitive dusts) may then be deposited off-site if the grain size is small enough and the wind speed is great enough. Adsorbed chemicals could also be transported offsite by surface water runoff during rain events. The bulk coal historically stored at SWMU 44 and AOC 721 was identified as the likely source of site soil and stormwater runoff contamination. As a result, an IM removal of coal and contaminated soil was conducted in 1996. Additional soil removals were conducted in 2001 at SWMU 44 and 2005 at AOC 721. Additionally, contaminants may be released from the soil by volatilization if present at significant concentrations. However, volatile chemicals were not identified as COCs in surface soil.

7.3.3 Potential Current and Future Receptors of Concern and Exposure Pathways

AOC 721 is currently used for industrial purposes. The removal action was anticipated to allow the site to be classified for unrestricted use. Recreational users, trespassers, construction workers, or typical occupational workers are the most plausible receptors for AOC 721.

Table 7-9 provides exposure pathways considered and the basis for inclusion or exclusion of each exposure pathway for each receptor for AOC 721. Table 7-10 provides a summary of the potential receptors and exposure routes that are addressed quantitatively in the HHRA. Based on current and potential future land use, the following potential receptors may be exposed to contaminated environmental media at AOC 721:

- **Construction Workers** – A plausible on-site receptor under future land use. Although there are no major construction activities currently on-site, future excavation and construction at AOC 721 is plausible. Consequently, construction workers could be exposed to surface soils (incidental ingestion; dermal contact; inhalation), and groundwater (incidental ingestion, dermal contact). It should be noted that significant exposures by a construction worker to groundwater and sediments are unlikely because if a construction worker is going to have prolonged contact with groundwater then he/she would most likely wear protective clothing such as rubber boots and/or hip waders, which would limit exposure. In addition, most excavation activities would utilize construction equipment such as a backhoe, which would limit a construction worker's exposure. Also, if significant groundwater was encountered during an excavation of a trench or foundation, the groundwater would most likely be pumped out of the excavation so that the construction activities could be completed. A conservative approach was taken and groundwater was included in the assessment.

- **Typical Industrial Worker** – An on-site receptor under current/future land use. This includes personnel assigned to work full-time at AOC 721. This receptor could be exposed to surface soil (incidental ingestion; dermal contact; inhalation). It is anticipated that this receptor would not be routinely exposed to groundwater or sediments. This receptor is expected to be exposed to surface soils on a more frequent basis (but less intensely) than the construction worker.

- **Trespassers** – A plausible receptor under current and future land use. A trespasser may be exposed to potentially contaminated surface soil (incidental ingestion; dermal contact; inhalation), and sediment (incidental ingestion, dermal contact). Direct contact with groundwater is not anticipated for this receptor.

- **Recreational Users** – A plausible receptor under future land use only. Recreational activities do not currently occur at AOC 721 and there are no formal recreational facilities within the actual AOC 721 boundaries. Recreational users may be exposed to potentially contaminated surface soil (incidental ingestion; dermal contact; inhalation), and sediment (incidental ingestion; dermal contact). Direct contact with groundwater is not anticipated for this receptor.

- **Future On-site Residents** – A future residential scenario, assuming AOC 721 ultimately is used for residential development, is typically evaluated in a risk assessment for decision-making purposes. For example the need for deed restrictions at a site may be eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that the hypothetical resident may be exposed to surface soils (incidental ingestion, dermal contact, inhalation), groundwater (ingestion, dermal contact), and sediment (ingestion, dermal contact).

No volatile COPCs were identified for groundwater for the vapor intrusion pathway, as the only volatile chemical detected in groundwater (acetophenone) is not toxic via the inhalation pathway. Consequently, inhalation of chemicals that have volatilized from groundwater to the indoor air of a building were not evaluated in this HHRA. Additionally, construction workers and hypothetical residents were not evaluated for inhalation of vapors from groundwater because no volatile chemicals were selected as groundwater COPCs.

7.3.4 Calculation of Exposure Point Concentrations

The exposure point concentration (EPC), which is calculated for COPCs only, is an estimate of the chemical concentration within an exposure unit (EU) likely to be contacted over time by a receptor and is used to estimate exposure intakes. An EU is defined as the area typically encountered/traversed by a receptor under a particular land use scenario. For example, a residential lot size of ¼ acre to 2 acres is often used for the evaluation of a hypothetical future resident. However, the size of an EU selected for HHRA is typically based on the distribution of the chemical concentrations in a medium as well as on presumed receptor activity patterns.

One EU was evaluated for AOC 721. The following guidelines were used to calculate the EPCs:

- If a soil or sediment data set for an EU contains less than 10 samples or has fewer than 4 detected results, the EPC for the reasonable maximum exposure (RME) case was defined as the maximum detected concentration.

- If a soil or sediment data set for an EU contains 10 or more samples, the 95 percent upper confidence limit (UCL) on the arithmetic mean, which was based on the distribution of the data set, was selected as the EPC for the RME case. EPCs were calculated following USEPA's Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002a) and using USEPA's ProUCL Version 4.1.01 (USEPA, 2010a).

- For groundwater, the maximum detected concentration of all results was conservatively selected as the EPC for the RME case.

Table 7-11 summarizes the EPCs used in this HHRA. RAGS Part D Tables for the EPCs are presented in Appendix C.

7.3.5 Chemical and Intake Estimation

The methodologies and techniques used to estimate exposure intakes are presented in this section. Traditionally, exposures evaluated in the HHRA are based on the concept of an RME, which is defined as "the maximum exposure that is reasonably expected to occur at a site" (USEPA, 1989a).

Intakes for the identified potential receptor groups are calculated using current USEPA risk assessment guidance and are presented in the risk assessment spreadsheets. Risk assessment results are presented in tables using the USEPA RAGS Part D format. Exposure assumptions for all receptors and exposure pathways used to estimate chemical intakes in the HHRA are summarized in Table 7-12.

Exposures at AOC 721 are dependent on the predicted concentrations of chemicals in environmental media and local land use practices, and both are subject to change over time. There are a large number of possible combinations of receptors, media, exposure pathways, and concentrations. Table 7-10 presents a summary of the receptors and exposure pathways to be evaluated in the quantitative risk assessment. The exposure assumptions reflect current USEPA guidance.

Noncarcinogenic intakes are estimated using the concept of an average annual exposure. Carcinogenic intakes are calculated as an incremental lifetime exposure, which assumes a life expectancy of 70 years.

7.3.5.1 Incidental Ingestion of Soil

Direct physical contact with surface and/or subsurface soil at AOC 721 may result in the incidental ingestion of chemicals. Chemical intake for the incidental ingestion of soil was estimated using the following equation (USEPA, 1989a):

$$\text{Intake} = \frac{(C_{soil})(IR_s)(FI)(EF)(ED)(CF)}{(BW)(AT)}$$

where:

Intake	=	intake of chemical from soil (mg/kg/day)
C_{soil}	=	concentration of chemical in soil (mg/kg)
IR_s	=	ingestion rate (mg/day)
FI	=	fraction ingested from contaminated source (dimensionless)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
CF	=	conversion factor (1×10^{-6} kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for noncarcinogens, AT = ED x 365 days/yr;
		for carcinogens, AT = 70 yr x 365 days/yr

The majority of the exposure assumptions that were used to estimate chemical intakes from incidental ingestion of soil were based on default assumptions described in the standard USEPA guidance and are summarized in Table 7-12. The following paragraph details the non-default receptor-specific exposure assumptions (for incidental ingestion of soil) that were used in the HHRA.

There are no USEPA default recommendations for the exposure frequency for the construction worker, trespasser, or recreational user potentially exposed to soil. Consequently the following values were derived based on professional judgment. It is assumed that construction workers engaged in future excavation projects at AOC 721 are exposed to soil for 150 days a year for one year under the RME scenario. Recreational users are assumed to be exposed to soil 2 days per week (or approximately 100 days a year) under the RME scenario. It is assumed that adolescent trespassers are exposed to soils 40 days a year under the RME scenario.

A summary of the receptor-specific input values that will be used to estimate chemical intakes from incidental ingestion of soil are presented in Table 7-12 for RME exposure scenarios.

7.3.5.2 Dermal Contact with Soil

Direct physical contact with soil may result in the dermal absorption of chemicals. Exposure associated with dermal contact with soil was estimated using the following equation (USEPA, 2004):

$$\text{Intake} = \frac{(C_{soil})(CF)(SA)(AF)(ABS)(EV)(EF)(ED)}{(BW)(AT)}$$

where:

Intake	=	amount of chemical absorbed during contact with soil (mg/kg/day)
C_{soil}	=	concentration of chemical in soil (mg/kg)
SA	=	skin surface area available for contact (cm^2)
AF	=	skin adherence factor (mg/cm^2/event)
ABS	=	absorption factor (dimensionless)
CF	=	conversion factor (1×10^{-6} kg/mg)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for noncarcinogens, AT = ED x 365 days/yr;
		for carcinogens, AT = 70 yr x 365 days/yr

The majority of the exposure assumptions that were used to estimate chemical intakes from dermal contact with soil are based on default assumptions described in the standard USEPA guidance and are summarized in Table 7-12. The following paragraphs detail the non-default receptor-specific exposure assumptions (for dermal contact with soil) that were used in the HHRA.

The exposed skin surface areas of the body available for dermal contact with soils are determined on a receptor-specific basis since they correspond with assumed human activities and clothing worn during exposure events. With the exception of the skin surface area recommended for the adolescent trespasser, all of the skin surface areas presented in Table 7-12 are based on USEPA default values. Current guidance (USEPA, 1997a, 2004) was used to develop the skin surface area available for contact for the adolescent trespasser:

- For the adolescent trespasser, the skin surface area available for soil contact is 3,850 square centimeters (cm^2) (which assumes that the lower arms, hands, lower legs, and feet are exposed).

A summary of the receptor-specific input values that were used to estimate chemical intakes from dermal contact with soil are presented in Table 7-12 for RME exposure scenarios. The same exposure frequencies and durations recommended for the evaluation of the incidental ingestion of soil were used to estimate chemical intakes for dermal contact with soil. The soil adherence factors presented are those

listed in Exhibits 3.3 and 3.5 of RAGS Part E. To the extent possible, chemical specific dermal absorption factors provided in USEPA RSL table/RAGS Part E were used to evaluate the COPCs for soil. USEPA Region 4 dermal absorption factors of 0.01 for organics and 0.001 for inorganics were used for chemicals that do not have dermal absorption factors in the USEPA RSL table/RAGS Part E.

7.3.5.3 Inhalation of Air Containing Fugitive Dust/Volatiles Emitted from Soil

Intakes of both particulates and vapors/gases are calculated using the same equation, as follows (USEPA, 2009a):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{AT \times 24\ \text{hours/day}}$$

where:

EC	=	exposure concentration (mg/m^3)
C_{air}	=	concentration of chemical in air (mg/m^3)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time (days);
	=	for noncarcinogens, AT = ED x 365 days/yr;
	=	for carcinogens, AT = 70 yr x 365 days/yr

Some of the exposure assumptions that will be used to estimate chemical intakes from inhalation of fugitive dusts/volatile emissions from surface soils are based on default assumptions described in the standard USEPA guidance and are summarized in Table 7-12. The same exposure frequencies and durations used to estimate incidental ingestion of soil intakes are used to estimate exposure via inhalation of fugitive dust/volatile emissions for surface soil.

The concentrations of chemicals in air resulting from emissions from soil are developed following procedures presented in USEPA Soil Screening Guidance (USEPA, 2002c). The chemical concentration in air is calculated from:

$$C_{air} = C_{soil} \times \left[\frac{1}{PEF} + \frac{1}{VF}\right]$$

where:

C_{air}	=	chemical concentration in air, mg/m^3
C_s	=	chemical concentration in soil, mg/kg
PEF	=	particulate emission factor, m^3/kg
VF	=	volatilization factor, m^3/kg

No volatile COPCs were identified in soil; therefore, C_{air} is equal to:

$$C_{air} = C_{soil} \times \frac{1}{PEF}$$

The particulate emissions factor (PEF) relates the concentration of the chemical in soil with the concentration of dust particles in air. A PEF value of 9.63 x 10^{+9} m^3/kg was obtained from USEPA's Soil Screening Internet site located at http://rais.gov/epa/ssl1.shtml. This is the default value for Charleston, South Carolina, which is the closest city to the CNC listed on the Internet site. Because air emissions resulting from fugitive dust emissions settings will be different than dust emissions generated during construction activities, a separate PEF was used for construction activities. The PEF for construction workers (1.27 x 10^{+6} m^3/kg) was calculated using the equations presented in the supplemental Soil Screening Level (SSL) guidance document (USEPA, 2002c). A sample calculation showing how the PEF was calculated is presented in Appendix C.

7.3.5.4 Ingestion of Groundwater

Ingestion of groundwater at AOC 721 is expected to be limited to exposure that would occur under a future residential scenario and the incidental ingestion of groundwater by a construction worker. Hypothetical future on-site residential receptors are conservatively assumed to use groundwater as a potable water source and may be exposed to groundwater via direct ingestion. Groundwater exposure for hypothetical future on-site residents would occur on a daily basis. Ingestion of groundwater is not expected by receptors engaged in recreational activities (i.e., the adult recreational user, the hypothetical future on-site residents, and trespassers) or the typical industrial worker.

Chronic daily intakes (CDI) associated with ingestion of groundwater were evaluated using the following equation (USEPA, 1989a):

$$\text{Intake} = \frac{(C_{gw})(CF)(IR)(ET)(EF)(ED)}{(BW)(AT)}$$

where:

Intake	=	intake of chemical from groundwater (mg/kg/day)
C_{gw}	=	concentration of chemical in groundwater (µg/L)
CF	=	conversion factor (0.001 mg/µg)
IR	=	ingestion rate for groundwater (L/day) (IR term for residential receptor)
IR	=	ingestion rate for groundwater (L/hr) (IR term for construction worker exposure to groundwater receptors)
EF	=	exposure frequency (days/yr)
ET	=	exposure time (hrs/day) (construction workers receptors; not applied to intake calculation for resident exposed to groundwater)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time (days); for noncarcinogens, AT = ED x 365 days/yr; for carcinogens, AT = 70 yrs x 365 days/yr

The majority of the exposure assumptions that were used to estimate chemical intakes from ingestion of groundwater are based on default assumptions described in the standard USEPA guidance and are summarized in Table 7-12.

There are no USEPA default recommendations for incidental ingestion of groundwater by a construction worker. Therefore, under RME scenarios the contact rate of 0.01 liters per hour (L/hr) (USEPA, 2000a) was used for the incidental ingestion rate for construction workers exposed to groundwater. The construction worker exposure to groundwater is assumed to occur for four hours per day for 90 days per year under the RME scenario.

7.3.5.5 Dermal Contact with Groundwater

Direct contact with groundwater at AOC 721 is expected to be limited to exposure that would occur under future on-site residential and construction scenarios. Hypothetical future on-site residential receptors are assumed to use groundwater for domestic purposes (e.g., bathing, showering, washing dishes), that can result in a dermal exposure. A construction worker may be dermally exposed to shallow groundwater during potential future excavation activities at AOC 721. Direct contact with groundwater is not expected by receptors engaged in recreational activities.

The following equation was used to assess exposures resulting from dermal contact with groundwater (USEPA, 2004):

$$DAD = \frac{(DA_{event})(EV)(ED)(EF)(A)}{(BW)(AT)}$$

where:

DAD	=	dermally absorbed dose of chemical from water (mg/kg/day)
DA_{event}	=	dermally absorbed dose per event (mg/cm^2 event)
EV	=	event frequency (events/day)
ED	=	exposure duration (yr)
EF	=	exposure frequency (days/yr)
A	=	skin surface area available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for noncarcinogens, AT = ED x 365 days/yr;
		for carcinogens, AT = 70 yrs x 365 days/yr

The majority of the exposure assumptions that were used to estimate chemical intakes from dermal contact with groundwater are based on default assumptions described in the standard USEPA guidance and are summarized in Table 7-12. The following paragraphs detail the non-default receptor-specific exposure assumptions (for dermal contact with groundwater) that were used in the HHRA.

- Exposed surface areas of the body available for dermal contact were determined on a receptor-specific basis since they correspond with assumed human activities and clothing worn during exposure events.

The absorbed dose per event (DA_{event}) was estimated using a non-steady-state approach for organic compounds and a traditional steady-state approach for inorganics. For organics, the following equations apply:

$$\text{If } t_{event} < t^*, \text{ then}: DA_{event} = 2(FA)(K_p)(C_{gw})(CF)\left[\frac{\sqrt{6\,\tau\, t_{event}}}{\pi}\right]$$

$$\text{If } t_{event} < t^*, \text{ then}: DA_{event} = (FA)(K_p)(C_{gw})(CF)\left[\frac{t_{event}}{1+B} + 2\tau\left[\frac{1+3B+3B^2}{(1+B)^2}\right]\right]$$

where:

DA_{event}	=	absorbed dose per event (mg/cm^2-event)
FA	=	fraction absorbed (dimensionless) – chemical specific
t_{event}	=	duration of event (hr/event)
t*	=	time it takes to reach steady-state conditions (hr)
Kp	=	permeability coefficient from water through skin (cm/hr)
C_{gw}	=	concentration of chemical in ground water (µg/L)
τ	=	lag time (hr)
*	=	constant (dimensionless; equal to 3.14159)
CF	=	conversion factor (1 x 10^{-6} L-mg/cm^3-µg)
B	=	partitioning constant derived by Bunge Model (dimensionless)

Values for the chemical-specific parameters (t*, K_p, FA, τ, and B) were obtained from the current dermal guidance (USEPA, 2004, Exhibit B-3). If published values were not available for a particular compound; they were calculated using equations provided in the USEPA dermal guidance.

The following steady-state equation was used to estimate DA_{event} for inorganics:

$$DA_{event} = (K_p)(C_{gw})(t_{event})$$

The dermal permeability (K_p) values recommended in the USEPA dermal guidance (USEPA, 2004) were be used to calculate DA_{event} for inorganic COPCs.

A summary of the receptor-specific input values that were used to estimate chemical intakes from dermal contact with groundwater are presented in Table 7-12 for RME exposure scenarios.

7.3.5.6 Incidental Ingestion of Sediment

Direct physical contact with sediment may result in the incidental ingestion of chemicals while receptors (i.e., the child and adult recreational users, the hypothetical future on-site residents, and trespassers) are involved in recreational activities (e.g., wading). Chemical intake for incidental ingestion of sediment was estimated using the following equation (USEPA, 1989a):

$$\text{Intake} = \frac{(C_{sd})(IR)(FI)(EF)(ED)(CF)}{(BW)(AT)}$$

where:

Intake	=	intake of chemical from sediment (mg/kg/day)
C_{sd}	=	concentration of chemical in sediment (mg/kg)
IR	=	ingestion rate (mg/day)
FI	=	fraction ingested from contaminated source (dimensionless)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
CF	=	conversion factor (1×10^{-6} kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for noncarcinogens, AT = ED x 365 days/yr;
		for carcinogens, AT = 70 yr x 365 days/yr

The majority of the exposure assumptions that were used to estimate chemical intakes from incidental ingestion of sediment are based on default assumptions described in the standard USEPA guidance and are summarized in Table 7-12. The following paragraph details the non-default receptor and pathway-specific exposure assumptions (for incidental ingestion of sediment) that were used in the HHRA.

There are no USEPA default exposure assumptions for recreational exposure to sediment. Conservatively, the soil ingestion rates presented in Table 7-12 are also used as sediment ingestion rates. Because most of the sediments are routinely covered by surface water, the fraction ingested (FI) from the contaminated source is set at 0.5 (or 50 percent) for all exposed receptor groups. The FI of 0.5 is based on the assumption that sediment exposure at AOC 721 is anticipated to be less intense and to occur over shorter periods of time than is typically assumed for soils. It is assumed that receptors would be exposed to sediment 3 days per week during the warm weather months (or approximately 36 days a year) under the RME scenario.

7.3.5.7 Dermal Contact with Sediment

Direct physical contact with sediment may result in the dermal absorption of chemicals while receptors (i.e., the child and adult recreational users, the hypothetical future on-site residents, and trespassers) are involved in recreational activities (e.g., wading). Exposure associated with dermal contact with sediment was estimated using the following equation (USEPA, 2004):

$$\text{Intake} = \frac{(C_{sd})(SA)(AF)(ABS)(CF)(EV)(EF)ED}{(BW)(AT)}$$

where:

Intake	=	amount of chemical absorbed during contact with sediment (mg/kg/day)
C_{sd}	=	concentration of chemical in sediment (mg/kg)
SA	=	skin surface area available for contact (cm^2)
AF	=	skin adherence factor (mg/cm^2-event)
ABS	=	absorption factor (dimensionless)
CF	=	conversion factor (1×10^{-6} kg/mg)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time (days); for noncarcinogens, AT = ED x 365 days/yr; for carcinogens, AT = 70 yr x 365 days/yr

A summary of the receptor-specific input values that were used to estimate chemical intakes from dermal contact with sediment are presented in Table 7-12 for RME exposure scenarios. The skin surface areas are those previously specified for receptor exposure to soils. The same exposure frequency, exposure duration, and fraction ingestion assumptions used for the evaluation of the incidental ingestion of sediment exposure pathway were used to estimate chemical intakes for dermal contact with sediment. The adherence factors presented were selected from those listed in Exhibits 3.3 and 3.5 of RAGS Part E. To the extent possible, chemical specific dermal absorption factors provided in RAGS E were used to evaluate the COPCs for sediments. USEPA Region 4 dermal absorption factors of 0.01 for organics and 0.001 for inorganics were used for chemicals that do not have dermal absorption factors in the USEPA RSL table/RAGS Part E.

7.3.5.8 Assessing Cancer Risks from Early Life Exposures

USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b) recommends making adjustments to the toxicity of carcinogenic chemicals that act via the mutagenic mode of action when evaluating early-life exposures. The guidance recommends using age-dependent adjustment factors (ADAFs) combined with age-specific exposure estimates when assessing cancer risks. In the absence of chemical-specific data, the supplement guidance recommends the following default adjustments, which reflect the fact that cancer risks are generally higher from early-life exposures than from similar exposures later in life:

- For exposures before 2 years of age (i.e., spanning a 2-year interval from the first day of birth until a child's second birthday), a 10-fold adjustment.

- For exposures between 2 and 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday until their sixteenth birthday), a three-fold adjustment.

- For exposures after turning 16 years of age, no adjustment.

The adjustments were applied using the same method as that used by ORNL in the development of RSLs. Adolescents were evaluated as one age group, ages 6 to 16 years. Children were evaluated as two age groups, ages 0 to 2 years and ages 2 to 6 years, and adults were evaluated as two age groups, ages 6 to 16, and ages greater than 16 years old. Using this approach, the intakes for child and adult recreational users, adolescent trespassers, and hypothetical residents were calculated as follows:

$$\text{Intake}_{\text{Child}} = \text{Intake}_{(\text{ages } 0 - 2 \text{ years})} \times 10 + \text{Intake}_{(\text{ages } 2 - 6 \text{ years})} \times 3$$

$$\text{Intake}_{\text{Adolescent}} = \text{Intake}_{(\text{ages } 6\text{-}16 \text{ years})} \times 3$$

$$\text{Intake}_{\text{Adult}} = \text{Intake}_{(\text{ages } 6 - 16 \text{ years})} \times 3 + \text{Intake}_{(\text{ages} > 16 \text{ years})}$$

The above approach was used only for those chemicals that are identified as mutagenic in the RSL table (e.g., hexavalent chromium, benzo(a)pyrene). Sample calculations showing how this approach was applied are included in Appendix C.

7.4 TOXICITY ASSESSMENT

The objective of a toxicity assessment is to identify the potential for human health hazards and adverse effects in exposed populations. Quantitative estimates of the relationship between the magnitude and type of exposures and the severity or probability of human health effects will be defined for the identified COPCs. Quantitative toxicity values [cancer slope factors (CSFs), inhalation unit risks (IURs), reference doses (RfDs), and reference concentrations (RfCs)] determined during this component of the risk assessment will be integrated with outputs of the exposure assessment to characterize the potential for adverse health effects for each receptor group. A cancer slope factor/unit risk factor is an indicator of the potency of a chemical carcinogen (i.e., the greater the CSF/IUR, the more potent the carcinogen). An RfD/RfC is the dose/concentration at which or below which adverse non-carcinogenic effects are not anticipated.

7.4.1 Sources Of Toxicity Criteria

Oral and inhalation toxicity criteria used in the site-specific risk assessments were obtained from the following primary USEPA sources (USEPA, 2003a).

- Tier 1 - Integrated Risk Information System (IRIS) (Online).

- Tier 2 - USEPA Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment (NCEA) Superfund Health Risk Technical Support Center develops PPRTVs on a chemical specific basis when requested by USEPA's Superfund program.

- Tier 3 - Other Toxicity Values – These sources include but are not limited to California Environmental Protection Agency (Cal EPA) toxicity values, the Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs), and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b).

Although toxicity criteria can be found in several toxicological sources, USEPA's IRIS on line database is the preferred source of toxicity values. This database is continuously updated and values presented have been verified by USEPA. The toxicity criteria for COPCs are presented in Tables 7-13 through 7-16.

7.4.2 Toxicity Criteria for Dermal Exposure

RfDs and CSFs found in the literature are frequently expressed as administered doses; therefore, these values are considered to be inappropriate for estimating the risks associated with dermal routes of exposure. Oral dose-response parameters based on administered doses must be adjusted to absorbed doses before the comparison to estimated dermal exposure intakes is made.

When oral absorption is essentially complete (i.e., 100 percent), an absorbed dose is equivalent to the administered dose, and therefore no toxicity adjustment is necessary. Conversely, when the gastrointestinal absorption of a chemical is poor (e.g., 1 percent), the absorbed dose is smaller than the administered dose; thus, toxicity factors based on absorbed dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose. USEPA (2004) recommends a 50 percent absorption cut-off to reflect the intrinsic variability in analyzing absorption studies. Therefore, the adjustment from administered to absorbed dose was performed only when the chemical specific gastrointestinal absorption efficiency was less than 50 percent. The adjustment from administered to absorbed dose was made using chemical-specific absorption efficiencies published in available guidance

[i.e., USEPA 2004 (the primary reference), IRIS, ATSDR toxicological profiles, etc] and the following equations:

$$RfD_{dermal} = (RfD_{oral})(ABS_{GI})$$

$$CSF_{dermal} = (CSF_{oral})/(ABS_{GI})$$

where: ABS_{GI} = absorption efficiency in the gastrointestinal tract

RfD_{dermal}	=	RfD for the dermal route of exposure
RfD_{oral}	=	RfD for the oral route of exposure
CSF_{dermal}	=	CSF for the dermal route of exposure
CSF_{oral}	=	CSF of the oral route of exposure

As noted above, the preceding adjustment of the oral toxicity criteria (e.g., RfDs, CSFs) was necessary to allow quantitative evaluation of the dermal route of exposure in the baseline risk assessment. An explanation of this procedure and the need for this procedure are presented in Appendix A of USEPA (1989a) RAGS Part A.

7.4.3 Toxicity Criteria for the Carcinogenic Effects of PAHs

Limited toxicity values are available to evaluate the carcinogenic effects from exposure to benzo(a)pyrene and related PAHs. Benzo(a)pyrene, which is classified by USEPA as a probable human carcinogen, is the most extensively studied of these compounds. Although CSFs are available for benzo(a)pyrene, insufficient data are available to calculate CSFs for other related PAHs. The toxic effects of these chemicals were evaluated using toxicity equivalency factors (TEFs) based on the potency of each compound relative to that of benzo(a)pyrene, as presented in current USEPA guidance (USEPA, 1993c). TEFs are used to convert each individual PAH concentration into an equivalent concentration of benzo(a)pyrene.

USEPA's Guidelines for Carcinogen Risk Assessment (USEPA, 2005a) and Supplemental Guidance of Assessing Susceptibility from Early Life Exposure to Carcinogens (USEPA, 2005b) specifies the use of ADAFs for carcinogens that act via the mutagenic mode of action, including benzo(a)pyrene and related PAHs. No chemical-specific ADAFs have been derived for these PAHs; therefore, the following default ADAFs were used: 10 for ages 0-2, three for ages 2-16, and 1 (no adjustment) for ages 16-70. These ADAFs were used to evaluate exposures to benzo(a)pyrene equivalents for adolescent trespassers, recreational users, and hypothetical residents using the approach presented in Section 7.3.5.8.

7.4.4 Toxicity Criteria for Chromium

Toxicity criteria are available for different forms of chromium (trivalent and hexavalent), where the hexavalent form is considered to be more toxic. In the absence of speciating the chromium into its different valence states, it is conservatively assumed that the all the chromium exists in its hexavalent form. Hexavalent chromium has carcinogenic and noncarcinogenic toxicity factors. However, hexavalent chromium is a carcinogen that acts via a mutagenic mode of action. USEPA Guidelines for Carcinogen Risk Assessment (2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005b) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. No chemical-specific ADAF is available for hexavalent chromium; therefore, USEPA's default ADAFs are applied to the carcinogenic toxicity factors for hexavalent chromium. The following default ADAFs should be applied: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70. The ADAFs were used in evaluating exposures to chromium (selected as a COPC for groundwater only) for hypothetical residents using the approach presented in Section 7.3.5.8. Noncarcinogenic effects are evaluated like all noncarcinogens in accordance with USEPA's risk assessment guidance (1989a).

7.5 RISK CHARACTERIZATION

Potential risks (noncarcinogenic and carcinogenic) for human receptors resulting from the potential exposures outlined in the exposure assessment are quantitatively determined during the risk characterization component of the baseline HHRA. The quantitative estimates of risk are calculated in accordance with the risk assessment methods outlined in USEPA guidance (USEPA, 1989a).

7.5.1 Quantitative Analysis of Chemicals

Quantitative estimates of risk for chemicals other than lead are calculated according to risk assessment methods outlined in USEPA guidance (USEPA, 1989a). Lifetime cancer risks are expressed in the form of dimensionless probabilities, referred to as incremental lifetime cancer risks (ILCRs), based on CSFs or IURs. Noncarcinogenic risk estimates are presented in the form of HQs that are determined through a comparison of intakes with published RfDs or RfCs.

ILCR estimates are generated for each COPC using estimated exposure intakes and published CSFs/IURs, as follows:

$$\text{ILCR} = (\text{Estimated Exposure Intake})(\text{CSF})$$

or

$$\text{ILCR} = (\text{Exposure Concentration})\ (\text{IUR})\ (1000\ \mu\text{g/mg})$$

If the above equation results in an ILCR greater than 0.01, the following equation will be used:

$$ILCR = 1-[\exp(-\text{Estimated Exposure Intake})(CSF)]$$

An ILCR of 1×10^{-6} indicates that the exposed receptor has a one in-one million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million persons.

As mentioned previously, noncarcinogenic risks were assessed using the concept of HQs and a Hazard Index (HI). The HQ for a COPC is the ratio of the estimated intake or concentration to the RfD or RfC, as follows:

$$HQ_i = \frac{\text{Intake(Concentration)}}{RfD_i(RfC)}$$

An HI will be generated by summing the individual HQs for all COPCs. The HI is not a mathematical prediction of the severity of toxic effects and therefore is not a true "risk"; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects.

7.5.2 Interpretation of Risk Assessment Results

To interpret the quantitative risk estimates and to aid risk managers in determining the need for remediation, quantitative risk estimates were compared to typical USEPA risk benchmarks. The USEPA has defined a “target cancer risk” range of 1×10^{-4} to 1×10^{-6} (i.e., a one-in-ten-thousand to one-in-one-million chance of developing cancer). HQs and HIs are typically evaluated using a value of 1.0. Generally, adverse noncarcinogenic health effects are not anticipated if an HQ or HI, developed on a target organ/effect-specific basis, does not exceed 1.0.

As a general guideline, a “no further action” recommendation will be forwarded to the SCDHEC and USEPA Region 4, if the cancer risk estimates and total HIs (developed on a target organ/target effect basis) for receptors of concern do not exceed 1×10^{-4} and 1.0, respectively, and the USEPA risk benchmark for risks associated with lead exposure are not exceeded. Otherwise, the need for remedial action (including institutional controls) will be evaluated in a CMS.

7.5.3 Results of the Risk Characterization

This section contains a summary of the results of the risk characterization for AOC 721. Quantitative risk estimates for potential human receptors are developed for those chemicals identified as COPCs. Potential cancer risks and HIs were calculated for current/future industrial workers, adolescent trespassers, child and adult recreational users, and future construction workers, and hypothetical child and adult residents under the RME scenario and are summarized in Table 7-17. Sample calculations are presented in Appendix C, and the results of the risk assessment in RAGS Part D format are included in Appendix C.

7.5.3.1 Noncarcinogenic Risks – RME

Cumulative HIs for the typical industrial worker (HI = 0.7), adolescent trespassers (HI = 0.3), and adult recreational users (HI = 0.4) under the RME scenario are less than or equal to unity (1). The cumulative HI for construction workers (HI = 2) does not exceed 1 on a target organ/target effect specific basis.

HIs for the child recreational user exposed to surface soil (HI = 3), for the hypothetical child resident exposed to surface soil (HI = 9), for the hypothetical child resident exposed to groundwater (HI = 108), and for hypothetical adult resident exposed to groundwater (HI= 46) exceeded unity even when calculated on a target organ/target effect specific basis. The primary risk drivers (i.e., COPCs contributing most to the elevated risk estimates) are arsenic and thallium in surface soil and antimony, arsenic, manganese, and thallium in groundwater. As noted in Section 7.2.3.1, the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. For thallium, a provisional toxicity value was provided by USEPA's National Center for Environmental Assessment for the purposes of developing screening levels for soil and groundwater. However, USEPA concluded that available human studies do not support derivation of an oral RfD. Therefore, while the provisional value was used for screening and evaluating the likelihood for noncarcinogenic effects, the results will not be used to determine whether thallium should be a contaminant of concern.

7.5.3.2 Carcinogenic Risks – RME

Cumulative ILCRs for construction workers, typical industrial workers, adolescent trespassers, child recreational users, adult recreational users, and lifelong recreational users exposed to the surface soil, groundwater, and sediments of AOC 721 were less than or within the USEPA's target risk range of 10^{-4} to 10^{-6}. The risk estimates for these receptors are listed below:

Receptor	Media	ILCR
Construction Worker	Surface soil + Groundwater	6E-06
Typical Industrial Worker	Surface soil	6E-05
Adolescent Trespasser	Surface soil + Sediment	8E-06
Child Recreational User	Surface soil + Sediment	5E-05
Adult Recreational User	Surface soil + Sediment	3E-05
Lifelong Recreational User	Surface soil + Sediment	8E-05

In contrast, cumulative ILCRs estimated for the following receptors hypothetically exposed to AOC 721 surface soil and groundwater exceeded the USEPA's target risk range:

Receptor	Medium	ILCR
Child Resident	Surface soil	2E-04
Child Resident	Groundwater	2E-03
Adult Resident	Groundwater	3E-03
Lifelong Resident	Surface Soil	2E-04
Lifelong Resident	Groundwater	5E-03

Arsenic was the main contributor to the ILCRs estimated for receptor exposure to soils. As noted in Section 7.2.3.1, the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. Arsenic, bis(2-ethylhexyl) phthalate, chromium (evaluated using hexavalent chromium toxicity criteria), and heptachlor were the main contributors to the ILCRs for groundwater.

7.6 UNCERTAINTY ANALYSIS

There is uncertainty associated with all aspects of the baseline HHRA. A summary of the uncertainties, including a discussion of how they may affect the final risk numbers, is provided in this section.

Uncertainty in the selection of COPCs is related to the current status of the predictive databases, the grouping of samples, the numbers, types, and distributions of samples, and the procedures used to include or exclude constituents as COPCs. Uncertainty associated with the exposure assessment includes the values used as input variables for a given intake route or scenario, the assumptions made to

determine exposure point concentrations, and the predictions regarding future land use and population characteristics. Uncertainty in the toxicity assessment includes the quality of the existing toxicity data needed to support dose response relationships and the weight of evidence used to determine the carcinogenicity of COPCs. Uncertainty in risk characterization includes that associated with exposure to multiple chemicals and the cumulative uncertainty from combining conservative assumptions made in earlier steps of the risk assessment process.

Whereas there are various sources of uncertainty, the direction of uncertainty can be influenced by the assumptions made throughout the risk assessment, including selection of COPCs and selection of values for dose response relationships. Throughout the entire risk assessment, assumptions are biased toward a margin of safety so that the final calculated risks are overestimated.

Generally, risk assessments carry two types of uncertainty: measurement and informational uncertainty. Measurement uncertainty refers to the usual variance that accompanies scientific measurements. For example, this type of uncertainty is associated with analytical data collected for each site. The risk assessment reflects the accumulated variances of the individual values used.

Informational uncertainty stems from inadequate availability of information needed to complete the toxicity and exposure assessments. Often, this gap is significant, such as the absence of information on the effects of human exposure to low doses of a chemical, on the biological mechanism of action of a chemical, or the behavior of a chemical in soil.

Once the risk assessment is complete, the results must be reviewed and evaluated to identify the type and magnitude of uncertainty involved. Reliance on results from a risk assessment without consideration of uncertainties, limitations, and assumptions inherent in the process can be misleading. For example, to account for uncertainties in the development of exposure assumptions, conservative estimates must be made to ensure that the particular assumptions made are protective of sensitive subpopulations or the maximum exposed individuals. If a number of conservative assumptions are combined in an exposure model, the resulting calculations can propagate the uncertainties associated with those assumptions, thereby producing a much larger uncertainty for the final results. This uncertainty is biased toward over predicting both carcinogenic and noncarcinogenic risks. Thus, both the results of the risk assessment and the uncertainties associated with those results must be considered when making risk management decisions.

This interpretation is especially relevant when the risks exceed the point of departure for defining "acceptable" risk. For example, when risks calculated using a high degree of uncertainty are less than an acceptable risk level (i.e., 10^{-4} to 10^{-6}), the interpretation of no significant risk is typically straightforward.

However, when risks calculated using a high degree of uncertainty exceed an acceptable risk level (i.e., 10^{-4} to 10^{-6}); a conclusion can be difficult unless uncertainty is considered.

7.6.1 Uncertainty in Data Evaluation

The most significant issues related to uncertainty in COPC selection are the screening levels that are used; the absence of screening levels for a few chemicals detected in the site media, and elevated detection limits for some compounds. A brief discussion of each of these issues is provided in the remainder of this section.

7.6.1.1 COPC Screening Levels

The use of risk based screening values based on conservative land use scenarios (e.g., residential land use), corresponding to an ILCR of 10^{-6} and HI of 0.1, should ensure that all the significant contributors to risk from a site are evaluated. The elimination of chemicals that are present at concentrations that correspond to an ILCR less than 10^{-6} and an HI less than 0.1 should not affect the final conclusions of the risk assessment because these chemicals are not expected to cause a potential health concern at the detected concentrations.

7.6.1.2 Chemicals without Established Screening Levels

Risk based screening levels are currently not available for some constituents [e.g., benzo(g,h,i)perylene and phenanthrene]. Therefore, surrogates with similar chemical structures were selected for these chemicals. In the COPC screening, pyrene was selected as a surrogate for benzo(g,h,i)perylene and phenanthrene. Applying toxicity values of one compound to another adds to the uncertainty in the risk assessment both in regard to the selection of COPCs and the subsequently calculated risks.

7.6.2 Uncertainty in the Exposure Assessment

Uncertainty in the exposure assessment arises because of the determination of land use conditions, the selection of receptors and scenarios, the estimation of exposure point concentrations, and the selection of exposure parameters. Each of these is discussed below.

7.6.2.1 Land Use

The current land use patterns at the site are well established, thereby limiting the uncertainty associated with land use assumptions. Land use for AOC 721 is currently industrial. Therefore, the elevated risk estimates presented for future hypothetical residents are not likely to occur. This exposure scenario is primarily evaluated for decision making purposes. The risk assessment assumes that groundwater is

used as a source of domestic drinking water. However, the groundwater is not currently used for this purpose and is not expected to be used as a source of potable water in the future. In addition, the shallow aquifer, monitored during the RFI process, naturally contains significant concentrations of chlorides and TDS. As a result, this water-bearing zone's potential as a source of potable water is questionable. Therefore, the use of tap water-based screening criteria is conservative.

7.6.2.2 Exposure Point Concentrations

Uncertainty was associated with the use of the 95 percent UCL on the mean concentration as the EPC. As a result of using the 95 percent UCL, the estimations of potential risk for the RME scenario were most likely overstated because this is a representation of the upper limit that potential receptors would be exposed to over the entire exposure period. For soil and sediment, in some cases (because datasets contained fewer than 10 samples or because the UCL was greater than the maximum concentration), the maximum concentration was used as the EPC. The maximum concentration was conservatively used as the EPC for all groundwater COPCs. Use of the maximum concentration tends to overestimate potential risks because receptors are assumed to be exposed continuously to the maximum concentration for the entire exposure period.

7.6.2.3 Exposure Routes and Receptor Identification

The determination of various receptor groups and exposure routes of potential concern was based on current land use observed at the site and the anticipated future land use. Therefore, the uncertainty associated with the selection of exposure routes and potential receptors is minimal because they are considered to be well defined.

7.6.2.4 Exposure Parameters

Each exposure factor selected for use in this HHRA has some associated uncertainty. Generally, exposure factors are based on surveys of physiological and lifestyle profiles across the United States. The attributes and activities studied in these surveys generally have a broad distribution. To avoid underestimation of exposure, in most cases, the USEPA guidelines (USEPA, 1991a) for the RME receptor were used, which generally specify the use of the 95th percentile for most parameters. Therefore, the selected values for the RME receptor represent the upper bound of the observed or expected habits of the majority of the population.

Generally, the uncertainty can be assessed quantitatively for many assumptions made in determining factors for calculating exposures and intakes. Many of these parameters were determined from statistical analyses on human population characteristics. Often, the database used to summarize a particular

exposure parameter (e.g., body weight) is quite large. Consequently, the values chosen for such variables in the RME scenario have low uncertainty.

Many of the exposure parameters used to calculate exposures and risks in this report are selected from a distribution of possible values, including USEPA guidance (USEPA, 1991a, 1993a, 1997a, 2004). For the RME scenario, a combination of high-end and average inputs is used with the overall goal that the final risk estimate will be an approximate 95th percentile risk estimate. This risk number is used in risk management decisions but does not indicate what a more average or typical exposure might be or what risk range might be expected for individuals in the exposed population.

7.6.3 Uncertainty in the Toxicity Assessment

Uncertainties associated with the toxicity assessment [determination of RfDs, RfCs, IURs, and CSFs and use of available criteria] are presented in this section.

Derivation of Toxicity Criteria

Uncertainty associated with the toxicity assessment is associated with hazard assessment and dose response evaluations for the COPCs. The hazard assessment deals with characterizing the nature and strength of the evidence of causation or the likelihood that a chemical that induces adverse effects in animals will also induce adverse effects in humans. Hazard assessment of carcinogenicity is evaluated as a weight of evidence determination, using the USEPA methods. Positive animal cancer test data suggest that humans contain tissue(s) that may manifest a carcinogenic response; however, the animal data cannot necessarily be used to predict the target tissue in humans. In the hazard assessment of noncancer effects, however, positive animal data often suggest the nature of the effects (e.g., the target tissues and type of effects) anticipated in humans.

Uncertainty in hazard assessment arises from the nature and quality of the animal and human data. Uncertainty is reduced when similar effects are observed across species, strain, sex, and exposure route; when the magnitude of the response is clearly dose related; when pharmacokinetic data indicate a similar fate in humans and animals; when postulated mechanisms of toxicity are similar for humans and animals; and when the chemical of concern is structurally similar to other chemicals for which the toxicity is more completely characterized.

Uncertainty in the dose response evaluation includes the determination of a CSF/IUR for the carcinogenic assessment and derivation of an RfD/RfC for the noncarcinogenic assessment. Uncertainty is introduced from interspecies (animal to human) extrapolation, which, in the absence of quantitative pharmacokinetic or mechanistic data, is usually based on consideration of interspecies differences in basal metabolic rate.

Uncertainty also results from intraspecies variation. Most toxicity experiments are performed with animals that are very similar in age and genotype, so intragroup biological variation is minimal, but the human population of concern may reflect a great deal of heterogeneity, including unusual sensitivity or tolerance to the COPC. Even toxicity data from human occupational exposure reflect a bias because only those individuals sufficiently healthy to attend work regularly (the "healthy worker effect") and those not unusually sensitive to the chemical are likely to be occupationally exposed. Finally, uncertainty arises from the quality of the key study from which the quantitative estimate is derived and the database. For cancer effects, the uncertainty associated with dose response factors is mitigated by assuming the 95 percent upper bound for the slope factor. Another source of uncertainty in carcinogenic assessment is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linearized multistage model, which is used in nearly all quantitative estimations of human risk from animal data, is based on a nonthreshold assumption of carcinogenesis. Evidence suggests, however, that epigenetic carcinogens, as well as many genotoxic carcinogens, have a threshold below which they are not carcinogenic. Therefore, the use of the linearized multistage model is conservative for chemicals that exhibit a threshold for carcinogenicity.

For noncancer effects, additional uncertainty factors may be applied in the derivation of the RfD/RfC to mitigate poor quality of the key study or gaps in the database. Additional uncertainty for noncancer effects arises from the use of an effect level in the estimation of an RfD/RfC when “no adverse effect level” data (i.e., non-cancer threshold data) are not available or such data are limited. An uncertainty factor is usually applied to estimate a no effect level. Additional uncertainty arises in the estimation of an RfD/RfC for chronic exposure from subchronic data. Unless empirical data indicate that effects do not worsen with increasing duration of exposure, an additional uncertainty factor is applied to the no effect level in the subchronic study. Uncertainty in the derivation of RfDs/RfCs is mitigated by the use of uncertainty and modifying factors that normally range between 3 and 10. The resulting combination of uncertainty and modifying factors may reach 1,000 or more.

The derivation of dermal RfDs and CSFs from oral values may cause uncertainty. This is particularly the case when no gastrointestinal absorption rates are available in the literature or when only qualitative statements regarding absorption are available.

Uncertainty Associated with Evaluation of the Dermal Exposure Pathway

According to RAGS Part E (USEPA, 2004), risks for dermal absorption of chemicals in soil are to be quantitatively evaluated for arsenic, cadmium, chlordane, 2,4 dichlorophenoxyacetic acid, dichlorodiphenyltrichloroethane (DDT), 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) (and other dioxins), PAHs, PCBs, pentachlorophenol, and SVOCs only because of the limited information guidance available

to evaluate dermal exposure to other constituents. Risks from dermal exposure to other chemicals were evaluated following USEPA Region 4 guidance using default dermal absorption factors of 0.01 for organics and 0.001 for inorganics. Consequently there is some uncertainty associated with the estimated risks for aluminum, cobalt, iron, manganese, thallium, and vanadium.

Use of Chronic Toxicity Values for Construction Workers

Under the guidelines established by the Superfund program, exposures to construction workers of one year or less are classified as subchronic exposures. Risks for noncarcinogenic effects associated with subchronic exposures should incorporate toxicity values for subchronic and not chronic effects. Subchronic toxicity values are not as widely available as chronic values. Subchronic toxicity values used in this HHRA were obtained from USEPA's PPRTV Internet site. Also, ATSDR MRLs were used as subchronic toxicity values when PPRTV values were not available. Chronic toxicity values were used when subchronic toxicity values were not available. Using chronic toxicity criteria to evaluate subchronic exposures for construction workers tends to overestimate potential noncarcinogenic risks. However, no HIs estimated for construction workers exceeded acceptance limits for any medium evaluated in this HHRA. Therefore, uncertainty due to the use of chronic toxicity values for construction workers does not affect overall HHRA conclusions.

Uncertainty in the Toxicity Criteria for Chromium

Toxicity criteria are available for different forms of chromium, which is considered to be more toxic in the hexavalent state. The following table compares the maximum total chromium concentrations reported for AOC 721 samples to available USEPA RSLs.

COMPARISON OF AOC 721 CHROMIUM RESULTS TO BACKGROUND AND REGIONAL SCREENING LEVELS FOR HEXAVALENT AND TRIVALENT CHROMIUM			
Maximum Site Chromium Concentration	**Background Value**	**USEPA Residential RSL - Hexavalent Chromium**	**EPA Residential RSL - Trivalent Chromium**
Surface soil: 22.8 mg/kg	32 mg/kg	0.29 mg/kg	120,000 mg/kg
Groundwater: 4.5 µg/L	2 µg/L	0.031 µg/L	16,000 µg/L

Chromium was not selected as a COPC in surface soil because the maximum chromium concentration was less than background; however, chromium was selected as a COPC in groundwater. Although there is no evidence to support the conclusion that hexavalent chromium is present at the AOC 721, risks associated with this chemical were assessed by conservatively assuming that 100 percent of the reported total chromium result is attributable to hexavalent chromium. Therefore, the risks calculated for chromium in groundwater at AOC 721 are likely overestimated. However, because the estimated medium-specific

groundwater ILCRs would exceed the USEPA target cancer risk range (1×10^{-4} to 1×10^{-6}) even without including chromium in the risk assessment, overall risk assessment conclusions are not impacted due to uncertainty associated with toxicity criteria for chromium. Additionally, chromium concentrations in groundwater do not exceed the USEPA MCL for total chromium.

Uncertainty in the Toxicity Criteria for Thallium

Although there are human studies assessing the effects of exposure to thallium, the majority are case reports of poisonings, suicide attempts or accidental ingestion of rodenticides. Occupational exposure studies provide inconclusive associations between thallium exposure and any specific health effects. Generally, available human studies do not support oral RfD derivation (USEPA, 2010b). Animal studies assessing thallium exposure are also generally of poor quality (USEPA, 2012c). The study that was used to generate the USEPA RSL-based screening value suffers from severe study limitations and difficulties regarding the selection of appropriate toxicity endpoints. Therefore, an RfD was not derived and published by USEPA in the IRIS. Hence, any evaluation of thallium using the RfD presented in the current USEPA RSL table (from the PPRTV appendix) suffers from severe limitations and is not used as the basis for identifying thallium as a contaminant of concern.

7.6.4 Uncertainty in the Risk Characterization

Uncertainty in risk characterization results from assumptions made regarding additivity of effects from exposure to multiple COPCs from various exposure routes. High uncertainty exists when summing noncancer risks for several substances across different exposure pathways. This assumes that each substance has a similar effect and/or mode of action. Even when compounds affect the same target organs, they may have different mechanisms of action or differ in their fate in the body, so additivity may not be an appropriate assumption. However, the assumption of additivity is considered because in most cases it represents a conservative estimate of risk.

Risks to any individual may also be overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may be exposed via all pathways considered.

Finally, the risk characterization does not consider antagonistic or synergistic effects. Little or no information is available to determine the potential for antagonism or synergism for the COPCs. Because chemical specific interactions cannot be predicted, the likelihood for risks to be over predicted or under predicted cannot be defined, but the methodology that was used is based on current USEPA guidance.

Uncertainty in the risk characterization also results from the fact that, as itemized below, some chemicals were eliminated as COPCs on the basis of background:

- Chromium was eliminated as a COPC in surface soil on the basis of site-data to background comparisons.

- No chemicals were eliminated as COPCs in AOC 721 groundwater on the basis of site-data to background comparisons.

- Benzo(a)pyrene, benzo(a)pyrene equivalents, benzo(b)fluoranthene, and chromium were eliminated as COPCs in sediment on the basis of site-data to background comparisons.

7.7 SUMMARY

The baseline HHRA for AOC 721 was performed to characterize the potential risks to likely human receptors under current and potential future land use. Potential receptors retained for quantitative evaluation included future construction workers, current/future industrial workers, current/future adolescent trespassers, future adult and child recreational users, and hypothetical child and adult residents. Media evaluated in the HHRA included surface soil, groundwater, surface water, and sediment at AOC 721. A summary of the major contributors to risks at AOC 721 is provided in Table 7-18.

Summary of Chemicals of Potential Concern for AOC 721

Arsenic, cobalt, iron, and thallium are the COPCs for direct contact exposure to surface soil. Bis(2-ethylhexyl) phthalate, heptachlor, aluminum, antimony, arsenic, chromium, cobalt, iron, manganese, thallium, and vanadium are the COPCs for direct contact exposure to groundwater. Arsenic, cobalt, and thallium were selected as COPCs for surface water; however, surface water was eliminated as a potential exposure pathway and was not further evaluated. Arsenic, cobalt, iron, mercury, selenium, and thallium were detected at concentrations exceeding the RSL values for chemical migration from soil to groundwater. Benzo(a)anthracene, aluminum, arsenic, cobalt, iron, manganese, thallium, and vanadium were retained as COPCs for exposure to sediment.

Summary of Cancer and Non-cancer Risk Estimates for Environmental Media at AOC 721

Reasonable Maximum Exposure Scenario

Cancer and non-cancer risk estimates calculated for receptor exposure to the soils, groundwater, and sediments at AOC 721 were compared to the following risk management benchmarks:

- The USEPA "target cancer risk" range of 1 x 10^{-4} to 1 x 10^{-6} (i.e., a one-in-ten-thousand to one-in-one-million chance of developing cancer).

- HI value of 1. Generally, adverse noncarcinogenic health effects are not anticipated if an HI, developed on a target organ/effect-specific basis, does not exceed 1.

Cumulative HIs for the typical industrial worker, adolescent trespassers, and adult recreational users under the RME scenario are less than or equal to unity (1). The cumulative HI for the construction worker is less than 1 on a target organ/target effect specific basis. HIs for the child recreational user exposed to surface soil (HI = 3), for the hypothetical child resident exposed to surface soil (HI = 9), for the hypothetical child resident exposed to groundwater (HI = 108), and for hypothetical adult resident exposed to groundwater (HI = 46) exceeded unity even when calculated on a target organ/target effect specific basis. The primary risk drivers (i.e., COPCs contributing most to the elevated risk estimates) are arsenic and thallium in surface soil and antimony, arsenic, manganese, and thallium in groundwater. However, note that the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. For thallium, a provisional toxicity value was provided by USEPA's National Center for Environmental Assessment for the purposes of developing screening levels for soil and groundwater. However, USEPA concluded that available human studies do not support derivation of an oral RfD. Therefore, while the provisional value was used for screening and evaluating the likelihood for noncarcinogenic effects, the results will not be used to determine whether thallium should be a contaminant of concern.

Cumulative ILCRs for construction workers, typical industrial workers, adolescent trespassers, child recreational users, adult recreational users, and lifelong recreational users exposed to the surface soil, groundwater, and sediments of AOC 721 were less than or within the USEPA's target risk range of 10^{-4} to 10^{-6}. In contrast, cumulative ILCRs estimated for the following receptors hypothetically exposed to AOC 721 surface soil and groundwater exceeded the USEPA's target risk range:

Receptor	**Medium**	**ILCR**
Child Resident	Soil	2E-04
Child Resident	Groundwater	2E-03
Adult Resident	Groundwater	3E-03
Lifelong Resident	Surface Soil	2E-04
Lifelong Resident	Groundwater	5E-03

Arsenic was the main contributor to the ILCRs estimated for receptor exposure to soils. However, note that the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. Arsenic, chromium (conservatively evaluated using toxicity criteria for hexavalent chromium), bis(2-ethylhexyl) phthalate, and heptachlor were the main contributors to the ILCRs for groundwater.

TABLE 7-1

SCREENING CRITERIA FOR SOIL AND SEDIMENT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS No.	Parameter	USEPA Regional Screening Levels[1]	
		Direct Contact Residential (mg/kg)	Protection of Groundwater (mg/kg)
Volatile Organic Compounds			
120-82-1	1,2,4-Trichlorobenzene	62 N[2]	0.0029
Semivolatile Organic Compounds			
91-57-6	2-Methylnaphthalene	230 N	0.14
56-55-3	Benzo(a)anthracene	0.15 C	0.01
50-32-8	Benzo(a)pyrene	0.015 C	0.0035
--	Benzo(a)pyrene Equivalents	0.015 C	0.0035
205-99-2	Benzo(b)fluoranthene	0.15 C	0.035
191-24-2	Benzo(g,h,i)perylene	1,700 N[3]	9.5 [3]
207-08-9	Benzo(k)fluoranthene	1.5 C	0.35
218-01-9	Chrysene	15 C	1.1
132-64-9	Dibenzofuran	78 N	0.11
206-44-0	Fluoranthene	2,300 N	70
193-39-5	Indeno(1,2,3-cd)pyrene	0.15 C	0.12
91-20-3	Naphthalene	3.6 C	0.00047
85-01-8	Phenanthrene	1,700 N[3]	9.5 [3]
129-00-0	Pyrene	1,700 N	9.5
Inorganics			
7429-90-5	Aluminum	77,000 N	23,000
7440-36-0	Antimony	31 N	0.27
7440-38-2	Arsenic	0.39 C	0.0013
7440-39-3	Barium	15,000 N	120
7440-41-7	Beryllium	160 N	13
7440-43-9	Cadmium	70 N	0.52
7440-70-2	Calcium	NA	NA
7440-47-3	Chromium	0.29 C[4]	0.00059 [4]
7440-48-4	Cobalt	23 N	0.21
7440-50-8	Copper	3,100 N	22
7439-89-6	Iron	55,000 N	270
7439-92-1	Lead	400	14 [5]
7439-95-4	Magnesium	NA	NA
7439-96-5	Manganese	1,800 N	21
7439-97-6	Mercury	23 N[6]	0.033
7440-02-0	Nickel	1,500 N	20
7440-09-7	Potassium	NA	NA
7782-49-2	Selenium	390 N	0.4
7440-23-5	Sodium	NA	NA
7440-28-0	Thallium	0.78 N	0.011
7440-31-5	Tin	47000 N	2300
7440-62-2	Vanadium	390 N	78
7440-66-6	Zinc	23,000 N	290
Miscellaneous Parameters			
--	Total Organic Carbon	NA	NA

Notes:
1 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012.
[Cancer benchmark value = 1E-06, Hazard index (HI) = 1.0].
2 - Ten percent of noncarcinogenic screening level is less then the carcinogenic screening level; therefore, the noncarcinogenic value is presented.
3 - Value is for pyrene.
4 - Value is for hexavalent chromium.
5 - MCL-based SSL.
6 - Value is for mercuric chloride and other mercury salts.
C - Carcinogenic
MCL - Maximum Contaminant Level
N - Noncarcinogenic
NA - Not Applicable/Not Available
SSL - Soil screening level

TABLE 7-2

SCREENING CRITERIA FOR GROUNDWATER AND SURFACE WATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS No.	Parameter	USEPA Regional Screening Level[1] Tap Water (ug/L)	USEPA MCL[2] (ug/L)
Semivolatile Organic Compounds			
98-86-2	Acetophenone	1500 N	NA
65-85-0	Benzoic Acid	58000 N	NA
117-81-7	Bis(2-ethylhexyl)phthalate	0.071 C	6
84-74-2	Di-nbutyl phthalate	670 N	NA
84-66-2	Diethyl Phthalate	11,000 N	NA
Pesticides/PCBs			
76-44-8	Heptachlor	0.0018 C	0.4
Inorganics			
7429-90-5	Aluminum	16,000 N	50 to 200 [3]
7440-36-0	Antimony	6 N	6
7440-38-2	Arsenic	0.045 C	10
7440-39-3	Barium	2,900 N	2,000
7440-41-7	Beryllium	16 N	4
7440-70-2	Calcium	NA	NA
7440-47-3	Chromium	0.031 C[4]	100
7440-48-4	Cobalt	4.7 N	NA
7440-50-8	Copper	620 N	1,300
7439-89-6	Iron	11,000 N	300 [3]
7439-92-1	Lead	NA	15
7439-95-4	Magnesium	NA	NA
7439-96-5	Manganese	320 N	50 [3]
7439-97-6	Mercury	4.3 N[5]	2
7440-02-0	Nickel	300 N	NA
7440-09-7	Potassium	NA	NA
7782-49-2	Selenium	78 N	50
7440-22-4	Silver	71 N	100 [3]
7440-23-5	Sodium	NA	NA
7440-28-0	Thallium	0.16 N	2
7440-31-5	Tin	9300 N	NA
7440-62-2	Vanadium	78 N	NA
7440-66-6	Zinc	4,700 N	5,000 [3]
Miscellaneous Parameters			
16887-00-6	Chloride	NA	NA
14808-79-8	Sulfate	NA	NA
--	Total Dissolved Solids	NA	NA
--	Total Organic Carbon	NA	NA

Notes:
1 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. [Cancer benchmark value = 1E-06, Hazard index (HI) = 1.0].
2 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
3 - Secondary MCL.
4 - Value is for hexavalent chromium.
5 - Value is for mercuric chloride and other mercury salts.
C - Carcinogenic
MCL - Maximum Contaminant Level
N - Noncarcinogenic
NA - Not Applicable/Not Available

TABLE 7-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN- SURFACE SOIL- DIRECT CONTACT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection [1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	AOC 721 Background Surface Soil Maximum[4]	Screening Toxicity Value[5]	COPC Flag	Rationale For Contaminant Deletion or Selection [6]
Inorganics (mg/kg)												
7429-90-5	ALUMINUM	1/1	4870	4870	C044M0017	044M001701		4870	9850	7700 N	No	BSL, BKG
7440-36-0	ANTIMONY	1/1	0.97 J	0.97 J	C044M0017	044M001701		0.97	1.4	3.1 N	No	BSL, BKG
7440-38-2	**ARSENIC**	9/9	21.2	**92.7**	C721SB002	721SB00201		92.7	**92**	**0.39 C**	**Yes**	ASL
7440-39-3	BARIUM	1/1	64 J	64 J	C044M0017	044M001701		64	193	1500 N	No	BSL, BKG
7440-43-9	CADMIUM	1/1	0.31	0.31	C044M0017	044M001701		0.31	0.65	7 N	No	BSL, BKG
7440-70-2	CALCIUM	1/1	12600 J	12600 J	C044M0017	044M001701		12600	85600	NA	No	EN, BKG
7440-47-3	CHROMIUM	1/1	22.8	**22.8**	C044M0017	044M001701		22.8	32	**0.29 C[7]**	No	BKG
7440-48-4	**COBALT**	1/1	8.8 J	**8.8 J**	C044M0017	044M001701		8.8	**2.9**	**2.3 N**	**Yes**	ASL
7440-50-8	COPPER	1/1	51.3	51.3	C044M0017	044M001701		51.3	109	310 N	No	BSL, BKG
7439-89-6	**IRON**	1/1	37600	**37600**	C044M0017	044M001701		37600	**12000**	**5500 N**	**Yes**	ASL
7439-92-1	LEAD	1/1	63.6	63.6	C044M0017	044M001701		63.6	588	400	No	BSL, BKG
7439-95-4	MAGNESIUM	1/1	1160 J	1160 J	C044M0017	044M001701		1160	2390	NA	No	EN, BKG
7439-96-5	MANGANESE	1/1	85.9	85.9	C044M0017	044M001701		85.9	101	180 N	No	BSL, BKG
7439-97-6	MERCURY	5/5	0.13	**1.6 J**	C044M0017	044M001701		1.6	**0.75**	2.3 N[8]	No	BSL
7440-02-0	NICKEL	1/1	26.7 J	26.7 J	C044M0017	044M001701		26.7	28	150 N	No	BSL, BKG
7440-09-7	POTASSIUM	1/1	1080 J	**1080 J**	C044M0017	044M001701		1080	**836**	NA	No	EN
7782-49-2	SELENIUM	1/5	7.3 J	**7.3 J**	C044M0017	044M001701	1.9 - 2.4	7.3	**1.3**	39 N	No	BSL
7440-23-5	SODIUM	1/1	1130 J	**1130 J**	C044M0017	044M001701		1130	**729**	NA	No	EN
7440-28-0	**THALLIUM**	1/7	2.7 J	**2.7 J**	C044M0017	044M001701	0.3 - 1.2	2.7	**ND**	**0.08 N**	**Yes**	ASL
7440-62-2	VANADIUM	1/1	26.7	**26.7**	C044M0017	044M001701		26.7	**25**	39 N	No	BSL
7440-66-6	ZINC	1/1	125 J	125 J	C044M0017	044M001701		125	779	2300 N	No	BSL, BKG
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	1/1	22500	22500	C044M0017	044M001701		22500	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.
5 - USEPA Regional Screening Level for residential soil. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.
7 - Value is for hexavalent chromium.
8 - Value is for mercuric chloride (and other mercury salts).

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:
COPC = Chemical of Potential Concern
C = Carcinogenic
N = Noncarcinogenic
NA = Not Applicable/Not Available

Rationale Codes:

For selection as a COPC:
ASL = Above Screening Level and site background

For elimination as a COPC:
BKG = Below site background concentration
BSL = Below COPC screening Level
NTX = No toxicity criteria
EN = Essential Nutrient

TABLE 7-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN- SURFACE SOIL-MIGRATION TO GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection [1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	AOC 721 Background Surface Soil Maximum[4]	Screening Toxicity Value[5]	COPC Flag	Rationale for Contaminant Deletion or Selection [6]
Inorganics (mg/kg)												
7429-90-5	ALUMINUM	1/1	4870	4870	C044M0017	044M001701		4870	9850	23000	No	BSL, BKG
7440-36-0	ANTIMONY	1/1	0.97 J	**0.97 J**	C044M0017	044M001701		0.97	1.4	**0.27**	No	BKG
7440-38-2	**ARSENIC**	9/9	21.2	**92.7**	C721SB002	721SB00201		92.7	**92**	**0.0013**	**Yes**	ASL
7440-39-3	BARIUM	1/1	64 J	64 J	C044M0017	044M001701		64	193	120	No	BSL, BKG
7440-43-9	CADMIUM	1/1	0.31	0.31	C044M0017	044M001701		0.31	0.65	0.52	No	BSL, BKG
7440-70-2	CALCIUM	1/1	12600 J	12600 J	C044M0017	044M001701		12600	85600	NA	No	EN, BKG
7440-47-3	CHROMIUM	1/1	22.8	**22.8**	C044M0017	044M001701		22.8	32	**0.00059** [7]	No	BKG
7440-48-4	**COBALT**	1/1	8.8 J	**8.8 J**	C044M0017	044M001701		8.8	**2.9**	**0.21**	**Yes**	ASL
7440-50-8	COPPER	1/1	51.3	**51.3**	C044M0017	044M001701		51.3	109	**22**	No	BKG
7439-89-6	**IRON**	1/1	37600	**37600**	C044M0017	044M001701		37600	**12000**	**270**	**Yes**	ASL
7439-92-1	LEAD	1/1	63.6	**63.6**	C044M0017	044M001701		63.6	588	**14** [8]	No	BKG
7439-95-4	MAGNESIUM	1/1	1160 J	1160 J	C044M0017	044M001701		1160	2390	NA	No	EN, BKG
7439-96-5	MANGANESE	1/1	85.9	**85.9**	C044M0017	044M001701		85.9	101	**21**	No	BKG
7439-97-6	**MERCURY**	5/5	0.13	**1.6 J**	C044M0017	044M001701		1.6	**0.75**	**0.033**	**Yes**	ASL
7440-02-0	NICKEL	1/1	26.7 J	**26.7 J**	C044M0017	044M001701		26.7	28	**20**	No	BKG
7440-09-7	POTASSIUM	1/1	1080 J	**1080 J**	C044M0017	044M001701		1080	**836**	NA	No	EN
7782-49-2	**SELENIUM**	1/5	7.3 J	**7.3 J**	C044M0017	044M001701	1.9 - 2.4	7.3	**1.3**	**0.4**	**Yes**	ASL
7440-23-5	SODIUM	1/1	1130 J	**1130 J**	C044M0017	044M001701		1130	**729**	NA	No	EN
7440-28-0	**THALLIUM**	1/7	2.7 J	**2.7 J**	C044M0017	044M001701	0.3 - 1.2	2.7	**ND**	**0.011**	**Yes**	ASL
7440-62-2	VANADIUM	1/1	26.7	**26.7**	C044M0017	044M001701		26.7	**25**	78	No	BSL
7440-66-6	ZINC	1/1	125 J	125 J	C044M0017	044M001701		125	779	290	No	BSL, BKG
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	1/1	22500	22500	C044M0017	044M001701		22500	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, Risk-based soil screening level (SSL) for migration to groundwater, May 2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.
7 - Value is for hexavalent chromium.
8 - The MCL-based SSL is presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:
COPC= Chemical of Potential Concern
C = Carcinogenic
N = Noncarcinogenic
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background

For elimination as a COPC:
BKG= Below site background concentration
BSL = Below COPC screening Level
NTX = No toxicity criteria
EN = Essential Nutrient

TABLE 7-5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN-GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection [1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects [2]	Concentration Used for Screening [3]	AOC 721 Background Maximum[4]	Screening Toxicity Value[5]	USEPA MCL[6]	COPC Flag	Rationale for Contaminant Deletion or Selection [7]
Semivolatile Organics (ug/L)													
98-86-2	ACETOPHENONE	1/1	1 J	1 J	C044GW006	044GW00601a		1	NA	150 N	NA	No	BSL
65-85-0	BENZOIC ACID	2/13	2 J	7 J	C044GW005	044GW00503	50 - 95	7	NA	5800 N	NA	No	BSL
117-81-7	**BIS(2-ETHYLHEXYL)PHTHALATE**	2/13	1 J	**8 J**	C044GW006	044GW00601a	10 - 25	8	NA	**0.071 C**	**6**	**Yes**	ASL
84-74-2	DI-N-BUTYL PHTHALATE	1/13	1 J	1 J	C044GW005	044GW00503	10 - 15	1	NA	67 N	NA	No	BSL
84-66-2	DIETHYL PHTHALATE	1/13	1 J	1 J	C044GW005	044GW00503	10 - 15	1	NA	1100 N	NA	No	BSL
Pesticides/PCBs (ug/L)													
76-44-8	**HEPTACHLOR**	1/10	0.079	**0.079**	C044GW007	044GW00702	0.03 - 0.04	0.079	NA	**0.0018 C**	0.4	**Yes**	ASL
Inorganics (ug/L)													
7429-90-5	**ALUMINUM**	5/18	28.3 J	**2110 J**	C044GW007	044GW00701	8 - 258	2110	**620**	**1600 N**	**50 to 200 [8]**	**Yes**	ASL
7440-36-0	**ANTIMONY**	5/38	2.6 J	**54.1**	C044GW007	044GW00702	1.5 - 14.4	54.1	**ND**	**0.6 N**	**6**	**Yes**	ASL
7440-38-2	**ARSENIC**	29/45	2.1 J	**206**	C044GW007	044GW00711	2.5 - 8.5	206	**6**	**0.045 C**	**10**	**Yes**	ASL
7440-39-3	BARIUM	21/27	22.2	**98.1**	C044GW007	044GW00707	8.5 - 35.4	98.1	**16**	290 N	2000	No	BSL
7440-41-7	BERYLLIUM	8/32	0.11 J	**0.91 J**	C044GW005	044GW00505	0.1 - 1.3	0.91	**0.36**	1.6 N	4	No	BSL
7440-70-2	CALCIUM	27/27	81400	**628000**	C044GW006	044G00614		628000	**152000**	NA	NA	No	EN
7440-47-3	**CHROMIUM**	9/29	1.1 J	**4.5 J**	C044GW007	044GW00701	0.5 - 9.7	4.5	**2**	**0.031 C[9]**	100	**Yes**	ASL
7440-48-4	**COBALT**	5/30	0.95 J	**5.3**	C044GW006	044G00614	0.28 - 5.2	5.3	**2**	**0.47 N**	NA	**Yes**	ASL
7440-50-8	COPPER	6/27	2.5	**8.9**	C044GW006	044G00614	0.6 - 5.4	8.9	**ND**	62 N	1300	No	BSL
7439-89-6	**IRON**	39/43	28 J	**14100**	C044GW007	044G00714	24.2 - 518	14100	**4660**	**1100 N**	**300 [8]**	**Yes**	ASL
7439-92-1	LEAD	3/29	2.2 J	**4.9 J**	C044GW007	044GW00701	0.9 - 7	4.9	**4**	NA	15	No	BSL
7439-95-4	MAGNESIUM	27/27	18700	**658000 J**	C044GW005	044GW00504		658000	**9250**	NA	NA	No	EN
7439-96-5	**MANGANESE**	27/27	173	**4110**	C044GW006	044G00614		4110	**789**	**32 N**	**50 [8]**	**Yes**	ASL
7439-97-6	MERCURY	1/32	0.14 J	**0.14 J**	C044GW005	044GW00502	0.02 - 0.2	0.14	**ND**	0.43 N[10]	2	No	BSL
7440-02-0	NICKEL	9/27	0.96 J	**10.5 J**	C044GW006	044GW00602	0.8 - 16.5	10.5	**5**	30 N	NA	No	BSL
7440-09-7	POTASSIUM	27/27	11800	**282000 J**	C044GW005	044GW00501		282000	**6400**	NA	NA	No	EN
7782-49-2	SELENIUM	2/30	4.3 J	**5.7 J**	C044GW007	044GW00708	2.2 - 11	5.7	**ND**	7.8 N	50	No	BSL
7440-22-4	SILVER	2/27	1 J	**2.3**	C044GW007	044GW00703	0.5 - 2.7	2.3	**ND**	7.1 N	100 [8]	No	BSL
7440-23-5	SODIUM	27/27	108000	6590000	C044GW005	044GW00504		6590000	NA	NA	NA	No	EN
7440-28-0	**THALLIUM**	3/32	3.1 J	**6 J**	C044GW006	044GW00605	2 - 10	6	**ND**	**0.016 N**	**2**	**Yes**	ASL
7440-31-5	TIN	2/24	2.6 J	**3.1 J**	C044GW006	044GW00603	2.6 - 29.5	3.1	**ND**	930 N	NA	No	BSL
7440-62-2	**VANADIUM**	21/36	0.94 J	**26 J**	C044GW006	044GW00604	0.5 - 9.6	26	**2**	**7.8 N**	NA	**Yes**	ASL
7440-66-6	ZINC	4/30	13	**24.7 J**	C044GW007	044GW00701	2.9 - 17.7	24.7	**15**	470 N	5000 [8]	No	BSL
Miscellaneous Parameters (ug/L)													
16887-00-6	CHLORIDE	10/10	362000	11500000	C044GW005	044GW00504		11500000	NA	NA	NA	NA	NTX
14808-79-8	SULFATE	8/10	20200	1640000	C044GW006	044GW00602	14400 - 15800	1640000	NA	NA	NA	NA	NTX
--	TOTAL DISSOLVED SOLIDS	26/26	699000	20500000	C044GW005	044GW00504		20500000	NA	NA	NA	NA	NTX
--	TOTAL ORGANIC CARBON	16/16	6200	41000	C044GW005	044GW00510		41000	NA	NA	NA	NA	NTX

Footnotes:
1- Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.
5 - USEPA Regional Screening Level for tapwater. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).
6 - 2012 Edition of the Drinking Water Standards and Health Advisories (USEPA, April 2012).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.
8 - Secondary MCL.
9 - Value is for hexavalent chromium.
10 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:
COPC = Chemical of Potential Concern
C = Carcinogenic
MCL = Maximum Contaminant Level
N = Noncarcinogenic
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background

For elimination as a COPC:
BKG= Below site background concentration
BSL = Below COPC screening Level
NTX = No toxicity criteria
EN = Essential Nutrient

TABLE 7-6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection (1)	Minimum Concentration (1)	Maximum Concentration (1)	Location of Maximum Detect	Sample of Maximum Detect	Range of Nondetects (2)	Concentration Used for Screening?(3)	AOC 721 Background Maximum(4)	Screening Toxicity Value (5)	COPC Flag	Rationale For Contaminant Deletion or Selection (6)
Volatile Organics (mg/kg)												
120-82-1	1,2,4-TRICHLOROBENZENE	1/3	0.084 J	0.084 J	C044SS005	044SS00501	0.4 - 0.49	0.084	NA	6.2 N(7)	No	BSL
Semivolatile Organics (mg/kg)												
91-57-6	2-METHYLNAPHTHALENE	13/17	0.03 J	**1.3**	C044SS005	044SS00501	0.49 - 0.89	1.3	**ND**	23 N	No	BSL
--	BENZO(A)PYRENE EQUIVALENTS	2/3	0.28	**0.44**	C044SS005	044SS00501	0.49 - 0.49	0.44	0.50	**0.015 C**	No	BKG
56-55-3	**BENZO(A)ANTHRACENE**	15/16	0.051 J	**1.4**	C721MD009	721MD00901	0.49 - 0.49	1.4	**0.23**	**0.15 C**	**Yes**	ASL
50-32-8	BENZO(A)PYRENE	2/3	0.049 J	**0.18 J**	C044SS005	044SS00501	0.49 - 0.49	0.18	0.38	**0.015 C**	No	BKG
205-99-2	BENZO(B)FLUORANTHENE	2/3	0.067 J	**0.25 J**	C044SS005	044SS00501	0.49 - 0.49	0.25	0.42	**0.15 C**	No	BKG
191-24-2	BENZO(G,H,I)PERYLENE	1/3	0.099 J	0.099 J	C044SS005	044SS00501	0.4 - 0.49	0.099	0.2	170 N(8)	No	BSL, BKG
207-08-9	BENZO(K)FLUORANTHENE	2/3	0.067 J	0.15 J	C044SS005	044SS00501	0.49 - 0.49	0.15	0.33	1.5 C	No	BSL, BKG
218-01-9	CHRYSENE	18/19	0.097 J	**1.5**	C721MD009	721MD00901	0.49 - 0.49	1.5	**0.12**	15 C	No	BSL
132-64-9	DIBENZOFURAN	2/3	0.085 J	0.3 J	C044SS005	044SS00501	0.49 - 0.49	0.3	NA	7.8 N	No	BSL
206-44-0	FLUORANTHENE	15/16	0.077 J	**4.6**	C721MD009	721MD00901	0.49 - 0.49	4.6	**0.38**	230 N	No	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	1/3	0.074 J	0.074 J	C044SS005	044SS00501	0.4 - 0.49	0.074	0.19	0.15 C	No	BSL, BKG
91-20-3	NAPHTHALENE	15/19	0.13 J	**0.96**	C721SB001	721SB00101	0.49 - 0.89	0.96	**ND**	3.6 C	No	BSL
85-01-8	PHENANTHRENE	18/19	0.074 J	**1.1**	C721SB001	721SB00101	0.49 - 0.49	1.1	**ND**	170 N(8)	No	BSL
129-00-0	PYRENE	19/20	0.063 J	**3.7**	C721MD009	721MD00901	0.49 - 0.49	3.7	**0.51**	170 N	No	BSL
Inorganics (mg/kg)												
7429-90-5	**ALUMINUM**	10/10	394	**36600**	C044SB025	044SB02501		36600	**27000**	**7700 N**	**Yes**	ASL
7440-36-0	ANTIMONY	3/10	0.48 J	**0.71 J**	C044SS005	044SS00501	0.21 - 0.55	0.71	**ND**	3.1 N	No	BSL
7440-38-2	**ARSENIC**	33/34	2.8 J	**89.5**	C721SB06G	721SB06G01	0.39 - 0.39	89.5	**15**	**0.39 C**	**Yes**	ASL
7440-39-3	BARIUM	10/10	1.4	**70.7 J**	C044M0015	044M001501		70.7	**30**	1500 N	No	BSL
7440-41-7	BERYLLIUM	16/25	0.16 J	**5.4**	C721MD005	721MD00501	0.05 - 1.6	5.4	**1.5**	16 N	No	BSL
7440-43-9	CADMIUM	6/12	0.1 J	**0.9**	C044SB007	044SB00701	0.04 - 0.22	0.9	**ND**	7 N	No	BSL
7440-70-2	CALCIUM	10/10	268	128000 J	C044SB007	044SB00701		128000	140000	NA	No	EN, BKG
7440-47-3	CHROMIUM	10/10	1 J	**54.3**	C044SB025	044SB02501		54.3	56	**0.29 C(9)**	No	BKG
7440-48-4	**COBALT**	23/25	2.2 J	**33.2**	C721MD005	721MD00501	0.15 - 1.7	33.2	**8.4**	**2.3 N**	**Yes**	ASL
7440-50-8	COPPER	12/12	0.59 J	**46.5**	C044SB027	044SB02701		46.5	**16**	310 N	No	BSL
7439-89-6	**IRON**	10/10	568	**93700**	C044M0015	044M001501		93700	**33000**	**5500 N**	**Yes**	ASL
7439-92-1	LEAD	10/10	0.84	**82.7 J**	C044SB007	044SB00701		82.7	**21**	400	No	BSL
7439-95-4	MAGNESIUM	10/10	326 J	6410 J	C044SB027	044SB02703		6410	7100	NA	No	EN, BKG
7439-96-5	**MANGANESE**	9/10	5.7	**408**	C044SB025	044SB02501	0.06 - 0.06	408	**240**	**180 N**	**Yes**	ASL
7439-97-6	MERCURY	19/22	0.06	**1.1 J**	C721MD010	721MD01001	0.02 - 0.21	1.1	**0.11**	2.3 N(10)	No	BSL
7440-02-0	NICKEL	12/12	0.32 J	**36.9**	C044SB025	044SB02501		36.9	**15**	150 N	No	BSL
7440-09-7	POTASSIUM	10/10	145 J	**8240 J**	C0440015	044M001501		8240	**4200**	NA	No	EN
7782-49-2	SELENIUM	9/23	0.52 J	**9.3 J**	C044M0015	044M001501	0.29 - 2.4	9.3	**ND**	39 N	No	BSL
7440-23-5	SODIUM	9/10	367 J	13100	C044SB027	044SB02703	882 - 882	13100	14000	NA	No	EN, BKG
7440-28-0	**THALLIUM**	3/32	3.2	**4.6**	C044M0015	044M001501	0.25 - 4	4.6	**ND**	**0.078 N**	**Yes**	ASL
7440-31-5	TIN	1/10	1.3 J	1.3 J	C044SB007	044SB00701	0.97 - 14.5	1.3	NA	4700 N	No	BSL
7440-62-2	**VANADIUM**	10/10	0.89 J	**68.5**	C044SB027	044SB02701		68.5	**61**	**39 N**	**Yes**	ASL
7440-66-6	ZINC	25/25	1.4 J	**669 J**	C721MD010	721MD01001		669	**64**	2300 N	No	BSL

TABLE 7-6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection (1)	Minimum Concentration (1)	Maximum Concentration (1)	Location of Maximum Detect	Sample of Maximum Detect	Range of Nondetects (2)	Concentration Used for Screening?(3)	AOC 721 Background Maximum(4)	Screening Toxicity Value (5)	COPC Flag	Rationale For Contaminant Deletion or Selection (6)
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	3/3	10700	52600	C044M0015	044M001501		52600	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.
5 - USEPA Regional Screening Level for residential soil. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.
7 - Ten percent of the noncarcinogenic value is less than the carcinogenic value; therefore, the noncarcinogenic value is presented.
8 - Value is for pyrene.
9 - Value is for hexavalent chromium.
10 - Value is for mercuric chloride and other mercury salts.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:
C = Carcinogen
N = Noncarcinogen
COPC = Chemical of Potential Concern
NA = Not Applicable/Not Available
ND = Not Detected

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.
For elimination as a COPC:
BKG = Below Background concentration
BSL = Below COPC Screening Level
EN = Essential nutrient
NTX = No toxicity Criteria

TABLE 7-7

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN-SURFACE WATER
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CAS Number	Parameter	Frequency of Detection (1)	Minimum Detected Concentration (1)	Maximum Detected Concentration(1)	Mean	Concentration Used for Screening(2)	Screening Toxicity Value (3)	COPC Flag	Rationale For Contaminant Deletion or Selection (4)
Inorganic Elements (µg/l)									
7440-38-2	**Arsenic**	1/3	3.6	**3.6**	3.6	3.6	**0.045 C**	**Yes**	ASL
7440-41-7	Beryllium	2/3	0.32	0.33	0.33	0.33	1.6 N	No	BSL
7440-70-2	Calcium	3/3	125000	169000	152,667	169000	NA	No	EN
7440-48-4	**Cobalt**	1/3	1.1	**1.1**	1.1	1.1	**0.47 N**	**Yes**	ASL
7439-95-4	Magnesium	3/3	331000	403000	372,000	403000	NA	No	EN
7440-09-7	Potassium	3/3	126000	152000	141,667	152000	NA	No	EN
7440-23-5	Sodium	3/3	2340000	2845000	2,621,667	2845000	NA	No	EN
7440-28-0	**Thallium**	1/3	4.3	**4.3**	4.3	4.3	**0.016 N**	**Yes**	ASL
Miscellaneous Compounds									
16887-00-6	Chloride (mg/l)	3/3	5280	6170	5,872	6170	NA	No	NTX
--	Conductance (umhos)	3/3	16000	18000	17,317	18000	NA	No	NTX
--	Salinity (g/l)	3/3	9.6	11.2	10.7	11.2	NA	No	NTX
--	Sulfate, turbid (mg/l)	3/3	667	864	774	864	NA	No	NTX
--	TDS (mg/l)	3/3	10300	11500	11,100	11500	NA	No	NTX
--	TSS (mg/l)	2/3	20	47	33.5	47	NA	No	NTX

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - The maximum detected concentration is used for screening purposes.
3 - The USEPA Regional Screening level for tapwater is presented. The noncarcinogenic values (denoted with a "N" flag) are divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.

Shaded criterion indicates that the maximum concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria.

Definitions:
C = Carcinogen
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level
For elimination as a COPC:
BSL = Below COPC Screening Level
EN = Essential nutrient
NTX = No toxicity Criteria

TABLE 7-8

CHEMICALS RETAINED AS COPCs
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Parameter	Surface Soil		Groundwater	Surface Water	Sediment
	Direct Contact	Soil to Groundwater	Direct Contact		
Semivolatile Organic Compounds					
Benzo(a)anthracene					X
Bis(2-ethylhexyl)phthalate			X		
Pesticides/PCBs					
Heptachlor			X		
Inorganics					
Aluminum			X		X
Antimony			X		
Arsenic	X	X	X	X	X
Chromium			X		
Cobalt	X	X	X	X	X
Iron	X	X	X		X
Manganese			X		X
Mercury		X			
Selenium		X			
Thallium	X	X	X	X	X
Vanadium			X		X

Notes:
X - Chemical was retained as a COPC.

TABLE 7-9

SELECTION OF EXPOSURE PATHWAYS
AOC 721 - REMEDIAL INVESTIGATION
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Adolescent trespassers may contact surface soil while at the site.
		Air	AOC 721	Typical Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust during normal work activities.
				Trespassers	Adolescent	Inhalation	Quant	Adolescent trespassers may be exposed to fugitive dust while at the site.
Current/Future	Groundwater	Groundwater	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not expected to have contact with groundwater.
				Trespassers	Adolescent	Ingestion Dermal	None None	Adolescent trespassers are not expected to be exposed to groundwater.
		Air	AOC 721	Typical Industrial Worker	Adult	Inhalation	None	No VOCs selected as COPCs.
				Trespassers	Adolescent	Inhalation	None	No VOCs selected as COPCs.
Current/Future	Surface Water	Surface Water	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not expected to be exposed to surface water.
				Trespassers	Adolescent	Ingestion Dermal	None None	Adolescent trespassers are not expected to be exposed to surface water because surface water at the site is limited to a drainage ditch and a small pond.
Current/Future	Sediment	Sediment	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not expected to be exposed to sediment.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Adolescent trespassers may be exposed to sediment while at the site.
Future	Surface Soil	Surface Soil	AOC 721	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	Child recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	Adult recreational users may contact surface soil while at the site.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
		Air	AOC 721	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust during excavation activities.
				Recreational Users	Child	Inhalation	Quant	Child recreational users may be exposed to fugitive dust while at the site.
					Adult	Inhalation	Quant	Adult recreational users may be exposed to fugitive dust while at the site.
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

TABLE 7-9

SELECTION OF EXPOSURE PATHWAYS
AOC 721 - REMEDIAL INVESTIGATION
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	AOC 721	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with groundwater during excavation activities.
				Recreational Users	Child	Ingestion Dermal	None None	Child recreational users are not expected to be exposed to groundwater.
					Adult	Ingestion Dermal	None None	Adult recreational users are not expected to be exposed to groundwater.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
		Air	AOC 721	Construction Workers	Adult	Inhalation	None	No VOCs selected as COPCs.
				Recreational Users	Child	Ingestion Dermal	None None	No VOCs selected as COPCs.
					Adult	Ingestion Dermal	None None	No VOCs selected as COPCs.
				Residents	Child	Inhalation	None	No VOCs selected as COPCs.
					Adult	Inhalation	None	
Future	Surface Water	Surface Water	AOC 721	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not expected to be exposed to surface water.
				Recreational Users	Child	Ingestion Dermal	None None	Child and adult recreational users are not expected to be exposed to surface water because surface water at the site is limited to a drainage ditch and a small pond.
					Adult	Ingestion Dermal	None None	
				Residents	Child	Ingestion Dermal	None None	Child and adult residents are not expected to be exposed to surface water because surface water at the site is limited to a drainage ditch and a small pond.
					Adult	Ingestion	None None	
Future	Sediment	Sediment	AOC 721	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not expected to be exposed to sediment.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	Child and adult recreational users may be exposed to sediment at AOC 721.
					Adult	Ingestion Dermal	Quant Quant	
				Residents	Child	Ingestion Dermal	Quant Quant	Child and adult residents may be exposed to sediment at AOC 721. If they are exposed to sediment then exposures are expected to be similar to those of the child and adult recreational users.
					Adult	Ingestion Dermal	Quant Quant	

Notes:
Quant - Quantitative. Qual - Qualitative Evaluation only.

TABLE 7-10

EXPOSURE ROUTES FOR QUANTITATIVE EVALUATION
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Receptors	**Exposure Routes**
Construction Workers (future land use)	• Soil Dermal Contact (surface) • Soil Ingestion (surface) • Inhalation of Air/Dust from Soil (surface) • Groundwater Incidental Ingestion • Groundwater Dermal Contact
Typical Industrial Worker (current/future land use)	• Soil Dermal Contact (surface) • Soil Ingestion (surface) • Inhalation of Air/Dust from Soil (surface)
Adolescent Trespasser (6 to 17 years) (current/future land use)	• Soil Dermal Contact (surface) • Soil Ingestion (surface) • Inhalation of Air/Dust from Soil (surface) • Sediment Dermal Contact • Sediment Ingestion
Small Child (0 to 6 years) and Adult/Recreational Users (future land use)	• Soil Dermal Contact (surface) • Soil ingestion (surface) • Inhalation of Air/Dust from Soil (surface) • Sediment Dermal Contact • Sediment Ingestion
Hypothetical Future On-Site Residents (future land use)	• Soil Dermal Contact (surface) • Soil Ingestion (surface) • Inhalation of Air/Dust from Soil (surface) • Sediment Dermal Contact (swimming) • Sediment Ingestion (wading) • Groundwater Dermal Contact (showering/bathing) • Groundwater Ingestion

TABLE 7-11

EXPOSURE POINT CONCENTRATIONS
AOC 721
NORTH CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Parameter	Surface Soil (mg/kg)	Groundwater (ug/L)	Sediment (mg/kg)
Semivolatile Organic Compounds			
Benzo(a)anthracene	NA	NA	0.66(2)
Bis(2-Ethylhexyl)phthalate	NA	8(1)	NA
Pesticides/PCBs			
Heptachlor	NA	0.079(1)	NA
Inorganics			
Aluminum	NA	2110(1)	22011(3)
Antimony	NA	54.1(1)	NA
Arsenic	92.7(1)	206(1)	42.5(2)
Chromium	NA	4.5(1)	NA
Cobalt	8.8(1)	5.3(1)	13.2(2)
Iron	37600(1)	14,100(1)	48305(3)
Manganese	NA	4,110(1)	212(4)
Thallium	2.7(1)	6(1)	4.6(1)
Vanadium	NA	26(1)	42.6(5)

Notes
NA - Not applicable. Not a COPC for this media.
1 - The maximum detected concentration was used because there are less than 10 samples or less than 4 detected results; the maximum concentration is also used as the exposure point concentration for groundwater.
2 - 95% KM(Chebyshev) UCL.
3 - 95% Approximate Gamma UCL.
4 - 95% KM(t) UCL.
5 - 95% Student's-t UCL.
RAGS Part D tables for the exposure point concentrations are included in Appendix C.

TABLE 7-12

AOC 721 - SUMMARY OF EXPOSURE INPUT PARAMETERS (RME)
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Exposure Parameter	Adolescent Trespasser	Construction Worker	Typical Industrial Worker	Future Recreational User		Future On-Property Resident	
				Child	Adult	Child	Adult
All Exposures							
C_{soil} and C_{sd}(mg/kg)	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]
C_{gw} (ug/L)	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]
ED (years)	10[2]	1[2,4]	25[3]	6[5]	24[2,5]	6[5]	24[5]
BW (kg)	45[2,6]	70[2,5]	70[5]	15[2,5]	70[2,5]	15[2,5]	70[5]
AT_n (days)	3650[5]	365[5]	9,125[5]	2,190[5]	8760[5]	2,190[5]	8,760[5]
AT_c (days)	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[2,5]	25,550[5]	25,550[5]
Incidental Ingestion/Dermal Contact with Sediment							
IR (mg/day)	100[2]	NA	NA	200[2]	100[2]	200[2]	100[2]
EF-Sediment (days/year)	36[15]	NA	NA	36[15]	36[15]	36[15]	36[15]
FI (unitless)	0.5[2]	NA	NA	0.5[2]	0.5[2]	0.5[2]	0.5[2]
SA (cm^2/day)	3,850[9]	NA	NA	2,800[2]	5,700[2]	2,800[2]	5,700[2]
AF (mg/cm^2)	0.3[2]	NA	NA	0.2[2]	0.07[2]	0.2[2]	0.07[2]
ABS (unitless)	chemical-specific[10]	NA	NA	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
CF (kg/mg)	1E-06	NA	NA	1E-06	1E-06	1E-06	1E-06
Incidental Ingestion/Dermal Contact with Soil							
IR (mg/day)	100[2,3]	330[2,7]	100[3]	200[3]	100[2,3]	200[3]	100[3]
EF-Soil (days/year)	40[2]	150[8]	250[3]	100[2]	100[2]	350[3]	350[3]
FI (unitless)	1	1	1	1	1	1	1
SA (cm^2/day)	3,850[9]	3,300[2,10]	3,300[10]	2,800[10]	5,700[2,10]	2,800[10]	5,700[10]
AF (mg/cm^2)	0.3[2,10]	0.3[2,10]	0.2[2,10]	0.2[10]	0.3[2,10]	0.2[10]	0.07[10]
ABS (unitless)	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
CF (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation of Dust/Particulates							
C_{air} (mg/m^3)	calculated[7]	calculated[7]	calculated[7]	calculated[7]	calculated[7]	calculated[7]	calculated[7]
ET (hours/day)	1.5[2]	8[11]	8[11]	1.5[2]	1.5[2]	24[5]	24[5]
PEF (m^3/kg)	9.63E+09[12]	1.27E+06[7]	9.63E+09[12]	9.63E+09[12]	9.63E+09[12]	9.63E+09[12]	9.63E+09[12]

TABLE 7-12

AOC 721 - SUMMARY OF EXPOSURE INPUT PARAMETERS (RME)
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Exposure Parameter	Adolescent Trespasser	Construction Worker	Typical Industrial Worker	Future Recreational User		Future On-Property Resident	
				Child	Adult	Child	Adult
Ingestion/Dermal Contact with Groundwater							
IR (L/day)	NA	0.04 [13]	NA	NA	NA	1[6]	2[6]
EF (days/year)	NA	90[4]	NA	NA	NA	350[3]	350[3]
ET (hours/day) and t_{event} (hours/event)	NA	4[14]	NA	NA	NA	1[10]	0.58[10]
EV (events/day)	NA	1[2]	NA	NA	NA	1[2]	1[2]
SA (cm^2)	NA	3,300[10]	NA	NA	NA	6,600[10]	18,000[10]
K_p (cm/hour)	NA	chemical-specific[10]	NA	NA	NA	chemical-specific[10]	chemical-specific[10]
t* (hour/event), τ (hour), and B (unitless)	NA	chemical-specific[10]	NA	NA	NA	chemical-specific[10]	chemical-specific[10]
CF (L/cm^3)	NA	1E-03	NA	NA	NA	1E-03	1E-03

Notes:

ABS Absorption factor
AF Soil-to-skin adherence factor
AT_c Averaging time for carcinogenic effects
AT_n Averaging time for noncarcinogenic effects
B Bunge Model partitioning coefficient
BW Body weight
CF Conversion factor
$C_{soil/sd/gw}$ Exposure concentration for soil/sediment/groundwater
ED Exposure duration
EF Exposure frequency
ET Exposure time
EV Event frequency
FI Fraction ingested from contaminated source
IR Ingestion rate (soil or groundwater)
K_p Permeability coefficient from water through skin
PEF Particulate emission factor
SA Skin surface area available for contact
τ Lag time
t* Time it takes to reach steady-state conditions
t_{event} Duration of event

1 - USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - Professional Judgment.
3 - USEPA November, 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
4 - Assumed that construction activities take place over 1/2 year. However, exposures to groundwater are assumed to occur 3 months (90 days) a year.
5 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
6 - USEPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
7 - USEPA, December 2002: Suplemental Guidance for Developing Soil Screening Levels at Superfund Sites (PEF values are site specific).
8 - Assumes construction activities take place 150 days per year.
9 - Assumes that the lower arms, hands, lower legs, and feet are exposed. (Values based on Exposure Factors Handbook 1997.)
10 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) EPA/540/R/99/005.
11 - Assumes an 8-hour work shift.
12 - USEPA, 2011: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Charleston, South Carolina.
13 - Professional judgment assuming 4 hours per event for being onsite.
14 - Assumes construction workers are exposed to groundwater for 4 hours per day.
15 - Assumes swimming 3 days per week during warm summer months.

TABLE 7-13

NON-CANCER TOXICITY DATA -- ORAL/DERMAL
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s) [3]	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
SVOCs										
BENZO(A)ANTHRACENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BIS(2-ETHYLHEXYL)PHTHALATE	Subchronic	1.0E-01	mg/kg/day	1	1.0E-01	mg/kg/day	Liver	100/1	ATSDR	9/2002
	Chronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day	Liver	1000/1	IRIS	8/6/2012
Pesticides/PCBs										
HEPTACHLOR	Subchronic	1.0E-04	mg/kg/day	1	1.0E-04	mg/kg/day	Liver	300/1	IRIS	8/6/2012
	Chronic	5.0E-04	mg/kg/day	1	5.0E-04	mg/kg/day	Liver	300/1	IRIS	8/6/2012
Inorganics										
ALUMINUM	Subchronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	CNS	30/1	ATSDR	9/2008
	Chronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	CNS	100	PPRTV	10/23/2006
ANTIMONY	Subchronic	4.0E-04	mg/kg/day	0.15	6.0E-05	mg/kg/day	Blood	1000/1	PPRTV	7/29/2008
	Chronic	4.0E-04	mg/kg/day	0.15	6.0E-05	mg/kg/day	Blood	1000/1	IRIS	8/6/2012
ARSENIC	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	8/6/2012
CHROMIUM[3]	Subchronic	2.0E-02	mg/kg/day	0.025	5.0E-04	mg/kg/day	None Specified	100/3	HEAST	9/1997
	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	None Specified	300/3	IRIS	8/6/2012
COBALT	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Thyroid	300/1	PPRTV	8/25/2008
	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	3000/1	PPRTV	8/25/2008
IRON	Subchronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
	Chronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
MANGANESE[4]	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	CNS	1	IRIS	8/6/2012
THALLIUM	Subchronic	4.0E-05	mg/kg/day	1	0.0E+00	mg/kg/day	Skin	1000/1	PPRTV	10/8/2010
	Chronic	1.0E-05	mg/kg/day	1	0.0E+00	mg/kg/day	Skin	3000/1	PPRTV	10/8/2010
VANADIUM	Chronic	5.0E-03	mg/kg/day	1	5.0E-03	mg/kg/day	Kidney	300	USEPA	5/2012

Notes:
1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.
3 - Value is for hexavalent chromium.
4 - Adjusted IRIS value in accordance with IRIS.

Definitions:
ATSDR = Agency for Toxic Substances and Disease Registry
CNS = Central nervous system
CVS = Cardiovascular system
IRIS = Integrated Risk Information System
NA = Not Available
USEPA = Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012.
PPRTV = Provisional Peer Reviewed Toxicity Values

TABLE 7-14

NON-CANCER TOXICITY DATA -- INHALATION
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

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)
SVOCs									
BENZO(A)ANTHRACENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
BIS(2-ETHYLHEXYL)PHTHALATE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs									
HEPTACHLOR	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics									
ALUMINUM	Chronic	5.0E-03	mg/m^3	1.4E-03	(mg/kg/day)	CNS	300	PPRTV	10/23/2006
ANTIMONY	NA	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	Chronic	1.5E-05	mg/m^3	4.3E-06	(mg/kg/day)	NA	NA	Cal EPA	9/2009
CHROMIUM[2]	Chronic	1.0E-04	mg/m^3	2.9E-05	(mg/kg/day)	Respiratory	300/1	IRIS	8/6/2012
COBALT	Subchronic	2.0E-05	mg/m^3	5.7E-06	(mg/kg/day)	Respiratory	100/1	PPRTV	8/25/2008
	Chronic	6.0E-06	mg/m^3	1.7E-06	(mg/kg/day)	Respiratory	300/1	PPRTV	8/25/2008
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	Chronic	5.0E-05	mg/m^3	1.4E-05	(mg/kg/day)	CNS	1000/1	IRIS	8/6/2012
THALLIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA
VANADIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - Extrapolated RfD = RfC *$20m^3$/day / 70 kg
2 - Value is for hexavalent chromium.

Definitions:
Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.
CNS = Central nervous system
NA = Not Applicable
PPRTV = Provisional Peer Reviewed Toxicity Values

TABLE 7-15

CANCER TOXICITY DATA -- ORAL/DERMAL
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
SVOCs								
BENZO(A)ANTHRACENE	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	ECAO	1993
BIS(2-ETHYLHEXYL)PHTHALATE	1.4E-02	$(mg/kg/day)^{-1}$	1	1.4E-02	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	8/6/2012
Pesticides/PCBs								
HEPTACHLOR	4.5E+00	$(mg/kg/day)^{-1}$	1	4.5E+00	$(mg/kg/day)^{-1}$	B2 (Probable human carcinogen)	IRIS	8/6/2012
Inorganics								
ALUMINUM	NA	NA	NA	NA	NA	NA	NA	NA
ANTIMONY	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / Known/likely human carcinogen	IRIS	8/6/2012
CHROMIUM[3][4]	5.0E-01	$(mg/kg/day)^{-1}$	0.025	2.0E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	NJDEP	4/8/2009
COBALT	NA	NA	NA	NA	NA	NA	NA	NA
IRON	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	NA	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	8/6/2012
THALLIUM	NA	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	8/6/2012
VANADIUM	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral Absorption Efficiency for Dermal.
3 - Value is for hexavalent chromium.
4 - Hexavalent chromium is considered to act via the mutagenic mode of action and was evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

ECAO = Environmental Criteria and Assessment Office (EPA, 1993).
IRIS = Integrated Risk Information System.
NA = Not Available.
NJDEP = New Jersey Department of Environmental Protection, Derivation of Ingestion-Based Soil Remediation Criterion for Cr+6 Based on the NTP Chronic Bioassay Data for Sodium Dichromate Dihydrate, April 8, 2009.

TABLE 7-16

CANCER TOXICITY DATA -- INHALATION
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

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) (MM/DD/YYYY)
SVOCs							
BENZO(A)ANTHRACENE	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
BIS(2-ETHYLHEXYL)PHTHALATE	2.4E-06	$(ug/m^3)^{-1}$	8.4E-03	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Pesticides/PCBs							
HEPTACHLOR	1.3E-03	$(ug/m^3)^{-1}$	4.6E+00	$(mg/kg/day)^{-1}$	B2 (Probable human carcinogen)	IRIS	8/6/2012
Inorganics							
ALUMINUM	NA	NA	NA	NA	NA	NA	NA
ANTIMONY	NA	NA	NA	NA	NA	NA	NA
ARSENIC	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/6/2012
CHROMIUM[2][3]	8.4E-02	$(ug/m^3)^{-1}$	2.9E+02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/6/2012
COBALT	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
IRON	NA	NA	NA	NA	NA	NA	NA
MANGANESE	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	8/6/2012
THALLIUM	NA	NA	NA	NA	NA	NA	NA
VANADIUM	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.
2 - Value is for hexavalent chromium.
3 - Hexavalent chromium is considered to act via the mutagenic mode of action and was evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:
Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.
IRIS = Integrated Risk Information System.
NA = Not Available.
PPRTV = Provisional Peer Reviewed Toxicity Values

TABLE 7-17

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Construction Workers	Surface Soil	Incidental Ingestion	4E-06	--	--	ARSENIC	0.8	--
		Dermal Contact	3E-07	--	--	--	0.05	--
		Inhalation	7E-07	--	--	--	0.7	--
		Total	5E-06	--	--	ARSENIC	2	Target Organ HIs < 1
	Groundwater	Incidental Ingestion	6E-07	--	--	--	0.2	--
		Dermal Contact	3E-07	--	--	--	0.3	--
		Total	1E-06	--	--	--	0.4	--
		Soil and Groundwater	6E-06				2	
Typical Workers	Surface Soil	Incidental Ingestion	5E-05	--	ARSENIC	--	0.6	--
		Dermal Contact	1E-05	--	--	ARSENIC	0.06	--
		Inhalation	4E-09	--	--	--	0.0002	--
		Total	6E-05	--	ARSENIC	--	0.7	--
Adolescent Trespassers	Surface Soil	Incidental Ingestion	5E-06	--	--	ARSENIC	0.2	--
		Dermal Contact	2E-06	--	--	ARSENIC	0.03	--
		Inhalation	5E-11	--	--	--	0.000005	--
		Total	7E-06	--	--	ARSENIC	0.2	--
	Sediment	Incidental Ingestion	1E-06	--	--	--	0.08	--
		Dermal Contact	8E-07	--	--	--	0.01	--
		Total	2E-06	--	--	ARSENIC	0.1	--
		Soil and Sediment	8E-06				0.3	
Child Recreational Users	Surface Soil	Incidental Ingestion	4E-05	--	ARSENIC	--	2	ARSENIC, THALLIUM
		Dermal Contact	4E-06	--	--	ARSENIC	0.10	--
		Inhalation	7E-11	--	--	--	0.00001	--
		Total	5E-05	--	ARSENIC	--	3	ARSENIC, THALLIUM
	Sediment	Incidental Ingestion	4E-06	--	--	ARSENIC	0.5	--
		Dermal Contact	7E-07	--	--	--	0.02	--
		Total	4E-06	--	--	ARSENIC	0.5	--
		Soil and Sediment	5E-05				3	
Adult Recreational Users	Surface Soil	Incidental Ingestion	2E-05	--	ARSENIC	--	0.3	--
		Dermal Contact	1E-05	--	--	ARSENIC	0.06	--
		Inhalation	3E-10	--	--	--	0.00001	--
		Total	3E-05	--	ARSENIC	--	0.3	--
	Sediment	Incidental Ingestion	2E-06	--	--	ARSENIC	0.05	--
		Dermal Contact	4E-07	--	--	--	0.003	--
		Total	2E-06	--	--	ARSENIC	0.06	--
		Soil and Sediment	3E-05				0.4	
Lifelong Recreational Users (Child and Adult)	Surface Soil	Incidental Ingestion	6E-05	--	ARSENIC	--	NA	--
		Dermal Contact	1E-05	--	--	ARSENIC	NA	--
		Inhalation	4E-10	--	--	--	NA	--
		Total	8E-05	--	ARSENIC	--	NA	--
	Sediment	Incidental Ingestion	5E-06	--	--	ARSENIC	NA	--
		Dermal Contact	1E-06	--	--	--	NA	--
		Total	6E-06	--	--	ARSENIC	NA	--
		Soil and Sediment	8E-05					

TABLE 7-17

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

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 Contributing to an Target Organ HI > 1
Hypothetical Child Residents	Surface Soil	Incidental Ingestion	2E-04	ARSENIC	--	--	8	ARSENIC, THALLIUM
		Dermal Contact	1E-05	--	--	ARSENIC	0.3	--
		Inhalation	4E-09	--	--	--	0.0008	--
		Total	2E-04	ARSENIC	--	--	9	ARSENIC, THALLIUM
	Groundwater	Ingestion	2E-03	ARSENIC	CHROMIUM VI	HEPTACHLOR	105	ANTIMONY, MANGANESE, ARSENIC, THALLIUM
		Dermal Contact	5E-05	--	CHROMIUM VI	ARSENIC	3	MANGANESE
		Total	2E-03	ARSENIC	CHROMIUM VI	BIS(2-ETHYLHEXYL)PHTHALATE, HEPTACHLOR	108	ANTIMONY, MANGANESE, ARSENIC, THALLIUM
	Sediment	Incidental Ingestion	4E-06	--	--	ARSENIC	0.5	--
		Dermal Contact	7E-07	--	--	--	0.02	--
		Total	4E-06	--	--	ARSENIC	0.5	--
		Soil, Groundwater and Sediment	2E-03				117	
Hypothetical Adult Residents	Surface Soil	Incidental Ingestion	7E-05	--	ARSENIC	--	0.9	--
		Dermal Contact	8E-06	--	--	ARSENIC	0.05	--
		Inhalation	2E-08	--	--	--	0.0008	--
		Total	7E-05	--	ARSENIC	--	1	--
	Groundwater	Ingestion	3E-03	ARSENIC	CHROMIUM VI	HEPTACHLOR	45	ANTIMONY, MANGANESE, ARSENIC, THALLIUM
		Dermal Contact	3E-05	--	ARSENIC, CHROMIUM VI	BIS(2-ETHYLHEXYL)PHTHALATE, HEPTACHLOR	1	--
		Total	3E-03	ARSENIC	CHROMIUM VI	BIS(2-ETHYLHEXYL)PHTHALATE, HEPTACHLOR	46	ANTIMONY, MANGANESE, ARSENIC, THALLIUM
	Sediment	Incidental Ingestion	2E-06	--	--	ARSENIC	0.05	--
		Dermal Contact	4E-07	--	--	--	0.003	--
		Total	2E-06	--	--	ARSENIC	0.06	--
		Soil, Groundwater and Sediment	3E-03				47	
Hypothetical Lifelong Residents (Child and Adult)	Surface Soil	Incidental Ingestion	2E-04	ARSENIC	--	--	NA	--
		Dermal Contact	2E-05	--	ARSENIC	--	NA	--
		Inhalation	2E-08	--	--	--	NA	--
		Total	2E-04	ARSENIC	--	--	NA	--
	Groundwater	Ingestion	5E-03	ARSENIC	CHROMIUM VI	BIS(2-ETHYLHEXYL)PHTHALATE, HEPTACHLOR	NA	--
		Dermal Contact	8E-05	--	ARSENIC, CHROMIUM VI	BIS(2-ETHYLHEXYL)PHTHALATE, HEPTACHLOR	NA	--
		Total	5E-03	ARSENIC, CHROMIUM VI	--	BIS(2-ETHYLHEXYL)PHTHALATE, HEPTACHLOR	NA	--
	Sediment	Incidental Ingestion	5E-06	--	--	ARSENIC	NA	--
		Dermal Contact	1E-06	--	--	--	NA	--
		Total	6E-06	--	--	ARSENIC	NA	--
		Soil, Groundwater and Sediment	5E-03					

TABLE 7-18

CHEMICALS RETAINED AS COCs
AOC 721
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Receptor								
	Construction Workers	Industrial Workers	Adolescent Trespassers	Child Recreational Users	Adult Recreational Users	Lifelong Recreational Users	Hypothetical Child Residents	Hypothetical Adult Residents	Hypothetical Lifelong Residents
Surface Soil									
Arsenic				X			X		X
Groundwater									
Bis(2-ethylhexyl)phthalate							X	X	X
Heptachlor							X	X	X
Antimony							X	X	
Arsenic							X	X	X
Chromium VI							X	X	X
Manganese							X	X	
Surface Water									
No COCs were identified for surface water.									
Sediment									
No COCs were identified for sediment.									

A chemical is retained as a COC if it contributed to a total cancer risk greater than 1 $x10^{-4}$ or to a target organ hazard index greater than 1.
X - Chemical was retained as a COC
COC - Chemical of Concern

8.0 ECOLOGICAL RISK ASSESSMENT

This ERA was conducted to evaluate potential site-related risks to ecological receptors at AOC 721. The ecological risk assessment consisted of Steps 1 through 3a of USEPA's eight-step ERA process, and was conducted in accordance with USEPA and Navy guidance (USEPA, 1997c; 2000a; 2001c; Navy, 1999). Steps 1 through 3a consist of the following:

Step 1	Screening-Level Problem Formulation and Ecological Effects Evaluation
Step 2	Screening-Level Exposure Estimate and Risk Calculation
Step 3a	Refinement of Preliminary Chemicals of Potential Concern

Section 8.1.1 describes the environmental setting at AOC 721. The fate and transport characteristics of chemicals detected in soil, sediment, and surface water are provided in Section 8.1.2. The ecotoxicity of site contaminants and potential ecological receptors are described in Section 8.1.3. Section 8.1.4 describes complete exposure pathways, and Section 8.1.5 provides assessment and measures of effects. Sections 8.2, 8.3, and 8.4 describe the ecological effects evaluation, exposure estimates, and risk calculation, respectively. Section 8.5 describes the refinement of preliminary COPCs. Uncertainties inherent in the ERA are discussed in Section 8.6. The summary and conclusions of the ERA are provided in Section 8.7.

8.1 SCREENING-LEVEL PROBLEM FORMULATION

8.1.1 Environmental Setting

AOC 721 is located in the northwestern portion of the CNC (Figure 1-2). The site is approximately 1.6 acres in size and is located west of Avenue D North and adjacent to the southern bank of Noisette Creek. AOC 721 is an extension of the north boundary of SWMU 44, a former coal storage area. AOC 721 includes a 650 foot long drainage ditch on the western side of the site that begins at the northern most portion of SWMU 44, runs northeast along the former perimeter road, and discharges into Noisette Creek (Figure 1-3). The entire area of AOC 721 was formerly a salt marsh that was backfilled with dredge materials in the early 1920s. The surface elevation at the site increases from west to east across the site and rises from 1.5 feet above msl to 8 feet above msl (EnSafe, 2004a).

A small pond is located immediately east of the drainage ditch and is encompassed partially by the AOC 721 boundary. During times of heavy rainfall, the pond overflows and empties into the drainage ditch. A larger pond lies approximately 100 feet southeast of AOC 721. Both ponds are the result of coal pile removal actions conducted in 1996 leaving depressions in the topography (EnSafe, 2004a).

The majority of AOC 721 is densely vegetated with scrub-shrub species such as salt marsh bulrush (*Scirpus robustus*), black grass (*Juncus gerardii*), salt grass (*Distichlis spicata*), sea ox-eye (*Borrichia frutescens*), wax myrtle (*Myrica cerifera*), marsh elder (*Iva frutescens*), laurel oak (*Quercus laurifolia*), Southern dewberry (*Rubus trivialis*), poison ivy (*Toxicodendron*), Virginia creeper (*Parthenocissus quinquefolia*), and sea myrtle (*Baccharis halimifolia*).

A wetland delineation was conducted on July 8, 2004, and much of AOC 721 was verified as an estuarine, intertidal, emergent, persistent, irregularly flooded wetland. Some areas within the wetlands met the criteria of critical habitat as defined by NOAA's OCRM. AOC 721 lies along Noisette Creek and is irregularly flooded by its tidal waters, which occasionally flood portions of the drainage ditch (EnSafe, 2004a).

8.1.2 Contaminant Fate and Transport

AOC 721 is an extension of SWMU 44, and the history for this site is reflected by the remedial activities associated with SWMU 44. The storage of coal at the site is the presumed source of contamination. An IM was performed at SWMU 44 in 1996 to remove the coal pile. During the CMS investigation, elevated levels of arsenic were detected in soil samples collected in the historical coal footprint area. A second IM was conducted in 2001 to remove arsenic impacted soils within SWMU 44. During the planning stages for the AOC 721 RFI, historical photos were found that revealed coal piles extended into the boundary of AOC 721. The extent of the former coal piles is indicated in Figure 1-4.

Metals were detected in surface soil and surface water samples, and metals and PAHs were detected in sediment samples collected at AOC 721. The discussion below is limited to a brief review of the fate and transport of contaminants at AOC 721 as related to migration pathways and ecological exposure.

Contaminant migration pathways applicable at the site include volatilization, erosion, overland runoff, sediment transport, and infiltration. Contaminants in soil could volatilize from surficial material. Soil erosion due to storm water runoff may occur since AOC 721 is slightly elevated compared to the surrounding topography. If surface soil is disturbed through activities such as excavation, soils could serve as a source for airborne transport of contaminants; soil contaminants could then be transported to downwind locations. Infiltrating precipitation could cause contamination of subsurface soil and groundwater at AOC 721. Contaminated groundwater could discharge into Noisette Creek.

All of the SVOCs detected in the AOC 721 sediment samples were PAH compounds. PAHs are a diverse group of compounds consisting of two or more substituted and unsubstituted polynuclear aromatic rings formed by the incomplete combustion of carbonaceous materials. PAHs are ubiquitous in the modern

environment and are common constituents of coal tar, soot, vehicle exhaust, cigarette smoke, certain petroleum products, road tar, mineral oils, creosote, and many cooked foods. PAHs can also be released to the environment through natural sources such as forest fires. PAHs are transferred from surface water by volatilization and sorption to settling particles. The compounds are transformed in surface water by photooxidation, chemical oxidation, and microbial metabolism. In soil and sediments, microbial metabolism is the major process for degradation of PAHs. (ATSDR, 1989).

The fate and transport characteristics of PAHs are dependent on their molecular weights. Low molecular weight PAHs are more soluble and volatile, and therefore more mobile. They may volatilize and photolyze from soil and surface water, and they also may be biodegraded. High molecular weight PAHs tend to be immobile and insoluble, binding strongly to organic matter (reducing the potential for leaching to groundwater), and they are resistant to volatilization, photolysis, and biodegradation (Eisler, 2000). Upper trophic-level organisms are exposed to PAHs primarily through their diet, but most wildlife can metabolize and excrete PAHs. Food-chain transfer and biomagnification of PAHs is expected to be minimal. PAHs may be absorbed by plants but are expected to be translocated, metabolized, and potentially photo-degraded. Accumulation within plants is likely to occur only in heavily polluted locations where uptake exceeds metabolism and degradation (Edwards, 1983). PAHs vary substantially in their toxicity to aquatic organisms. In general, toxicity increases as molecular weight increases, with the exception of some high molecular weight PAHs that have low acute toxicity. Most species of aquatic organisms rapidly accumulate PAHs that occur at low concentrations in the ambient medium. However, uptake of PAHs is highly species-specific, it is higher in algae, mollusks, and other species that are incapable of metabolizing PAHs (Eisler, 1987). The ability of fish to metabolize PAHs may explain why benzo(a)pyrene is frequently not detected or is found at only very low levels in fish from environments heavily contaminated with PAHs (ATSDR, 1989).

Metals were detected in surface soil, sediment, and surface water samples collected at AOC 721. Many metals occur naturally at various concentrations in the surface water and sediment primarily to chemical weathering of rocks and fallout from volcanoes. Most metals are toxic to aquatic (e.g., fish, invertebrates) and terrestrial (e.g., plants, invertebrates, vertebrates) ecological receptors above certain concentrations, with some metals being more toxic at lower concentrations than others. Also, different chemical forms of the metals may be more toxic than others. For example, hexavalent chromium is typically more toxic than trivalent chromium, and methylmercury is more toxic than inorganic mercury. In addition, the toxicity of several metals (cadmium, chromium, copper, lead, nickel, silver, and zinc) to aquatic receptors in freshwater systems decreases with increasing water hardness.

Many factors (e.g., pH, ORP, clay content, organic matter content) influence the bioavailability of metals to invertebrates in sediment. One way to estimate the bioavailable portion of certain divalent metals

(cadmium, copper, lead, nickel, and zinc) in sediment is to measure the amount of acid volatile sulfides (AVS) and simultaneously extracted metals (SEM) in a sediment sample. If the molar concentration of AVS is higher than the molar concentration of SEM, then the SEM metals are expected to be unavailable to aquatic invertebrates and, therefore, nontoxic. AVS plays little or no role in determining interstitial water concentrations of metals in aerobic systems or those with low productivity (i.e., where the absence of organic carbon limits sulfate reduction) (Ankley et al., 1995), or when ingestion of sediments is the primary exposure route (Lee et al., 2000).

8.1.3 Ecotoxicity

Few generalizations can be made about the ecotoxicity of PAHs because of the extreme variability in toxicity and physiochemical properties of PAHs. Adverse impacts to plants from PAHs, however, are rare (Eisler, 2000). In most animal species, PAHs are metabolized by a mixed-function oxidase enzyme system into intermediates that may be toxic, mutagenic, or carcinogenic to the host. Some invertebrate species cannot efficiently metabolize PAHs (Eisler, 2000), and PAHs can be chronically toxic to invertebrates, but overall, very little is known about the toxicological mechanisms of PAHs in invertebrates (Erstfield and Snow-Ashbrook, 1999). PAHs can bind to cellular macromolecules and thereby disrupt their function in higher level organisms such as mammals and birds. Biological macromolecules include polymers of carbohydrates (e.g., starch), amino acids (proteins), and nucleotides [e.g., deoxyribonucleic acid (DNA)]. The cellular functions of these polymers include structure, energy storage, energy transfer, material transport, and the storage and transmittal of genetic information. PAHs show little tendency to biomagnify in the food web (Eisler, 2000). Microbial metabolism is the major process for degradation of PAHs in soil (ATSDR, 1989).

It is difficult to make generalizations about the toxic actions of metals because of diverse affinities for organic molecules in biologic structures, a wide array of biological effects, and a multiplicity of target organs and systems (Amdur et al., 1991). At the molecular level, metals can manifest toxicity in many ways, including selectively accumulating in target organs (such as the kidneys), substituting for “essential” metals, and mimicking essential substrates (Clarkson, 1983). The reactions of metals at the molecular level typically affect enzyme systems, leading to disruption of cellular transport, cellular respiration, cell division, and other physiological processes. Metal toxicity to aquatic organisms is manifested through a broad spectrum of effects that may range from a reduction in growth rate to death.

8.1.4 Complete Exposure Pathways and Potential Receptors

Several groups of terrestrial ecological receptors can be exposed to contaminants in surface soil. Invertebrates such as earthworms are exposed to contaminants as they move through the soil and ingest soil particles while searching for food. Plants are exposed to contaminants via direct contact as

contaminants are absorbed through the roots and are then translocated to different parts of the plants (e.g., leaves, seeds). These pathways were evaluated in the ERA.

Small mammals may be exposed to contaminants in soil via several exposure routes. They may be exposed by direct contact as they search for food or burrow into the soil. Exposure of terrestrial wildlife to contaminants in the soil via dermal contact is unlikely to represent a major exposure pathway because fur, feathers, and chitinous exoskeletons are expected to minimize transfer of contaminants across dermal tissue. Therefore, the dermal pathway was not evaluated in this ERA. Small mammals also may be exposed to contaminants in the soil via incidental ingestion of soil and ingestion of plants and/or invertebrates that have accumulated contaminants from the soil. Larger predatory species such as the long-tailed weasel and red-tailed hawk can be indirectly exposed to soil contaminants by ingesting small mammals that have accumulated contaminants from soil.

Ecological receptors are not directly exposed to contaminants in groundwater at the site. However, exposure to groundwater discharging as a seep or directly to a surface water body represents a potentially complete exposure pathway. In addition, contaminants in soil may enter the drainage ditch and adjacent Noisette Creek at AOC 721 via overland flow from rain events. Invertebrates and fish are present in Noisette Creek and presumably in the drainage ditch when the ditch is inundated during high tides. These aquatic receptors could be exposed to chemical contamination by direct contact with and ingestion of contaminated surface water or sediments.

Inhalation of particulates by mammals and birds is an incomplete pathway at AOC 721 because there are no activities causing air contamination. Also, inhalation pathways are not typically evaluated in ERAs because of the uncertainty inherent in estimating exposure levels and toxicological effects. Therefore, the air inhalation pathway was not evaluated in the ERA.

In summary, complete exposure pathways and routes of entry into biota at AOC 721 that were evaluated in this ERA consist of:

- direct contact with soil, sediment, and surface water
- ingestion of soil, sediment, and surface water
- ingestion of contaminated food items

8.1.5 Preliminary Assessment and Measures of Effects

An assessment endpoint is “an explicit expression of the environmental value that is to be protected,” while a measurement endpoint is “a measurable ecological characteristic that is related to the valued

characteristic chosen as the assessment endpoint" (USEPA, 1997c). Measures of effects represent the assessment endpoints chosen for a site, and are measures of biological effects.

USEPA Region 4 has specified that assessment endpoints for the screening-level assessment should be broad and generic. For the AOC 721 screening-level assessment, the preliminary assessment endpoint is the protection of terrestrial, aquatic, and benthic biota from adverse effects of chemicals on their growth, survival, and reproduction. The preliminary measures of effects are chemical concentrations in surface soil, surface water, and sediment that are associated with no adverse effects on growth, survival, and reproduction of terrestrial, aquatic, and benthic organisms. The measures of effects are represented by USEPA Ecological Soil Screening Levels (Eco SSLs) and USEPA Region 4 ecological screening values (ESVs) for surface soil, surface water, and sediment.

8.2 SCREENING-LEVEL ECOLOGICAL EFFECTS EVALUATION

Maximum soil concentrations were compared to soil screening values, which consisted of Eco SSLs established by USEPA (2005c through 2005j, 2007a through 2007f, and 2008) and ESVs established by USEPA Region 4 (USEPA, 2001c). The lowest Eco SSL among plant, invertebrate, mammal, and avian values was used as the screening value. Eco SSLs were preferentially used as soil screening values, but Eco SSLs are currently available for only a few chemicals. USEPA Region 4 ESVs were used as screening values for chemicals that do not have an Eco SSL. The term "soil ESV" is generally used for brevity in this report to refer to either the Eco SSL or the Region 4 soil ESV.

Maximum surface water and sediment concentrations of detected chemicals were compared to USEPA Region 4 ESVs (USEPA, 2001c). The salinity in surface water samples varied from 9.6 to 11.2 parts per thousand (ppt) (Tables 4-10 and 4-11), so saltwater ESVs were used.

If the maximum concentration of surface soil, surface water, or sediment was less than the ESV, the chemical was eliminated from further consideration for that medium. If the maximum concentration equaled or exceeded the ESV, or if a screening value was not available, the chemical was then considered to be an ecological COPC and was retained for further evaluation.

8.3 SCREENING-LEVEL EXPOSURE ESTIMATE

One surface soil sample was collected in April 1995 and eight samples were collected during two sampling events in April 2003. The surface soil samples were collected from a depth of 0- to 1-foot, and the term "surface soil" is used in this risk assessment to refer to samples collected from this depth, because USEPA Region 4 considers 0- to 1-foot depth to be representative of surface soil. The surface

soil samples were collected at the elevated area near the south eastern extent of AOC 721 and analyzed for select metals.

The surface water data set consisted of three samples. Two samples were collected from a single location in the drainage ditch along the northwest boundary of AOC 721; one sample at low tide and the other sample at high tide on the same day. The third sample was collected from the small pond that adjoins the AOC 721 drainage ditch. All three samples were collected in April 2003.

Sediment samples, many of which were originally classified as surface soil but were reclassified as sediment based on the wetland delineation performed in 2004, were collected in 1995, 1999, 2003, and 2005. Most sediment samples were analyzed for metals, some were also analyzed for SVOCs, and a few were analyzed for VOCs. Most samples were collected from a depth of 0 to 1-foot bgs, but a few samples were included that were collected from a depth of 0 to 20 inches bgs (EnSafe, 2004b).

8.4 SCREENING-LEVEL RISK CALCULATION

The screening level risk calculation step compared maximum concentrations of chemicals in surface soil, sediment, and surface water to ESVs. The ratio of the maximum concentration to the ESV is called the screening ecological effects quotient (EEQ). Analytes whose maximum concentrations were less than ESVs (i.e., EEQ < 1) were dropped from further consideration, and those that equaled or exceeded ESVs (i.e., EEQ $\geq$ 1), or did not have ESVs, were retained as ecological COPCs. An EEQ value greater than 1 indicates that ecological receptors are potentially at risk, and further evaluation or additional data may be necessary to confirm with greater certainty whether ecological receptors are actually at risk, especially since most toxicity benchmarks are developed using conservative exposure assumptions. Chemicals that were retained as COPCs were evaluated in Step 3a to determine if further investigation was warranted.

Calcium, magnesium, potassium, and sodium were not considered to be COPCs because they are essential nutrients that can be tolerated by living systems even at relatively high concentrations. There have been no activities at CNC that have resulted in known releases of high levels of these four chemicals at AOC 721.

In surface soil, nine inorganics were retained as COPCs because their maximum concentrations exceeded ESVs (Table 8-1).

In sediment, 11 individual PAHs plus total PAHs were retained as COPCs. Eight were retained because their maximum concentrations exceeded ESVs (Table 8-2). Four were retained because an ESV was not available. Seventeen inorganics were retained as COPCs. Seven were retained as COPCs because their

maximum concentrations exceeded ESVs. The remaining ten inorganics were retained because a screening level was not available.

Beryllium and cobalt were retained as COPCs in surface water because ESVs were not available (Table 8-3).

8.5 REFINEMENT OF PRELIMINARY CHEMICALS OF POTENTIAL CONCERN

At this point, the first two steps of the ecological risk assessment have been completed. The ecological risk assessment process includes a series of scientific/management decision points (SMDPs) (USEPA, 1997c). The first SMDP occurs at the end of Step 2, and requires the risk managers to evaluate and approve or redirect the work up to that point and determine whether the risk assessment will continue into Step 3. However, USEPA Region 4 recognizes that most ecological risk assessments will proceed into Step 3, and facilities are encouraged to submit the results of Steps 1-3 as a single deliverable document. With this in mind, and since the screening level ecological risk assessment indicates a potential for adverse effects, a more thorough assessment is warranted. Therefore, the risk assessment process for AOC 721 proceeded into Step 3 (Baseline Risk Assessment Problem Formulation).

8.5.1 General Approach

The baseline ERA begins with a more balanced evaluation of the conservativeness inherent in the first two steps of the risk assessment process (USEPA, 1997c; Navy, 1999). The initial phase of Step 3 is typically known as Step 3a, and consists of a refinement of the conservative exposure assumptions in order to more realistically estimate potential risks to ecological receptors. Examples of factors typically considered during Step 3a include toxicological evaluation of COPCs, spatial distribution of contaminants, frequency of detection, and habitat quality. Furthermore, the preliminary assessment and measures of effects are refined, the site conceptual model is developed, and initial food chain modeling is conducted (at sites where applicable) to evaluate risks to upper level receptors (USEPA, 2000a). The objective of the Step 3 refinement is to better define those chemicals that contribute to potentially unacceptable levels of ecological risk, and to identify and eliminate from further consideration those chemicals that were initially selected as COPCs that pose acceptable risks.

Soil data were first compared to site-specific background, which was derived using surface soil samples from CNC. The methodology for selection of background concentrations is provided in Section 4.1. If the maximum detected AOC 721 soil concentration was less than the maximum background soil concentration, the chemical was regarded as being within background and did not undergo further consideration in the Step 3a evaluation.

Sediment data were compared to the sediment background data set derived for the Zone J RFI (Tetra Tech, 2011), which consisted of sediment samples collected in December 2005 from 10 locations in Charleston Harbor. Maximum concentrations in AOC 721 sediment were compared to twice the average background value. Background comparisons are presented in Table 8-2 and the background data are presented in Table 8-4. One-half of the sample-specific method detection limit (MDL) was used to represent nondetect samples when calculating the average concentrations shown in Table 8-4.

8.5.2 Assessment Endpoints and Measures of Effects

Based on the habitats present and migration pathways and routes of exposure of chemicals at AOC 721, the site-specific assessment endpoints are the protection of the following groups of receptors from adverse effects of site-related contaminants on growth, survival, and reproduction:

- Soil invertebrates
- Terrestrial vegetation
- Aquatic organisms
- Benthic invertebrates
- Insectivorous wildlife
- Piscivorous wildlife

The assessment endpoints listed above were selected for evaluation in Step 3a of the baseline ERA for the reasons described in the following subsections.

8.5.2.1 Soil Invertebrates

Earthworms, insect larvae, and other soil invertebrates at AOC 721 aid in the formation of soil and the redistribution and decomposition of organic matter in soil. They can also accumulate bioaccumulative contaminants that can then be transferred to higher trophic-level organisms that consume soil invertebrates.

8.5.2.2 Terrestrial Vegetation

Much of AOC 721 is covered by terrestrial vegetation consisting of numerous species of trees, shrubs, vines, and herbs. These plants serve as a food source and provide shade and cover for many organisms, and they help to prevent soil erosion, among other important functions. They also can accumulate certain contaminants that can then be transferred to the higher trophic-level organisms that consume plants.

8.5.2.3 Aquatic Organisms

Fish and other aquatic organisms are present in Noisette Creek and presumably in the drainage ditch that discharges into the creek, especially when the ditch is inundated during high tides. Aquatic organisms are directly exposed to contaminants in surface water, and they serve as a food source for reptiles, amphibians, birds, and mammals. Aquatic organisms can accumulate contaminants that can then be transferred to higher trophic level organisms when consumed.

8.5.2.4 Benthic invertebrates

Benthic invertebrates are similar to soil invertebrates in that they serve as a food source for higher trophic-level organisms such as fish, reptiles, birds, and mammals. Benthic invertebrates could be directly exposed to site-related contaminants via surface water and sediments. Benthic invertebrates can accumulate contaminants that can then be transferred to higher trophic-level organisms when consumed.

8.5.2.5 Insectivorous Wildlife

Strictly speaking, the term “insectivorous” refers to insect-eating organisms, while “vermivorous” refers to worm-eating organisms. However, most animals that consume worms also consume adult and larval insects and other soil invertebrates, and no animals at AOC 721 are strictly insectivorous or strictly vermivorous. Henceforth in this document, the term “insectivorous” will be used in a broad sense and for brevity to describe birds and mammals that prey on a variety of soil invertebrates (e.g., adult and larval insects, centipedes, millipedes, other arthropods, and worms).

Insectivorous birds and mammals are considered first-level carnivores, and they serve as a food source for higher trophic-level carnivores. Insectivorous birds and mammals can be exposed to and accumulate contaminants present in the food items they consume. Numerous birds likely forage on soil invertebrates at AOC 721, including species such as the woodcock, robin, wren, and several warbler species. Most birds considered to be insectivorous also eat plant material such as berries and seeds. Species such as the wren also would also be likely to eat sediment invertebrates from shallow water or wetland areas. Mammals known or expected to occur at AOC 721 include shrews and moles, which consume worms and other soil invertebrates, and sediment invertebrates in wetland areas.

8.5.2.6 Piscivorous Wildlife

Some chemicals could potentially bioaccumulate in benthic invertebrates and could then be transferred through ingestion to higher trophic level organisms such as birds and mammals. To the extent that this pathway is complete, birds and mammals that forage in water bodies (such as the ditch and Noisette

Creek, both of which border the site, and in the small pond within the site) could be exposed to bioaccumulative chemicals through the food chain. Thus, the protection of piscivorous birds and mammals from adverse effects of site-related contaminants on growth, survival, and reproduction is retained as an assessment endpoint for bioaccumulative COPCs. The term "piscivorous" is used here in a broad sense to describe birds and mammals that prey not only upon fish, but on a variety of crustaceans, mollusks, and other sediment-dwelling organisms.

8.5.2.7 Other Potential Endpoints

As indicated in USEPA guidance (1997c), it is not practical to directly evaluate risks to all of the individual components of the ecosystem. Instead, assessment endpoints focus the risk assessment on particular components of the ecosystem that will tend to yield the highest risks; this should provide protection for endpoints that have lower risks. Thus, for reasons further discussed below, amphibians, reptiles, herbivores, omnivores, and carnivores were not selected as assessment endpoints.

Herbivorous birds and mammals consume only plant tissue. Plants do not accumulate most chemicals as readily as invertebrates, so potential risks to insectivorous birds and mammals are typically greater than to herbivorous birds and mammals. Thus, herbivores (e.g., rabbit, deer, rodents) will be protected by protecting insectivores. Similarly, omnivores were not selected as assessment endpoints because chemical exposure is typically greater for insectivores than for omnivores. Therefore, omnivores (e.g., opossum, raccoon, Eastern wood rat, rice rat) will be protected by protecting insectivores. Threshold oral toxicity values for reptiles and amphibians are not available for most chemicals, so risks to reptiles and amphibians were not quantitatively evaluated.

Carnivorous birds and mammals consume birds, small mammals, and other small animals such as reptiles, amphibians, and invertebrates. Carnivorous birds and mammals are at the top of the food chain. The top carnivores typically are less densely distributed than herbivores and first-level carnivores and require a larger area to hunt for their food. Carnivores can be exposed to and accumulate contaminants that are present in food items they consume. Carnivorous birds and mammals known or expected to occur at AOC 721 include the raccoon, mink, weasel, skunk, fox, hawks, and owls. Mammals such as the raccoon and skunk that are often considered to be carnivorous are actually omnivorous, and consume a wide variety of animals and plants. Because carnivorous species tend to have home ranges much greater than the size of AOC 721, they were not selected for evaluation in this ERA.

8.5.2.7 Measures of Effects

Adverse impacts to plants and soil invertebrates were evaluated by comparing chemical concentrations in soil to plant and soil invertebrate specific USEPA Eco SSLs and USEPA Region 4 surface soil screening

values. When receptor specific values were not available, alternate benchmarks including Canadian Soil Quality Guidelines (SQG) (CCME, 2006 and supporting documents) and ORNL Plant benchmarks (Efroymson et al., 1997) were used to quantify risks to these receptor groups. Adverse impacts on survival, growth, and reproduction of benthic invertebrates were evaluated by comparing chemical concentrations in sediment to USEPA Region 4 sediment screening values. These screening values were largely based on threshold effects levels (TELs) from MacDonald (1994). Chemical concentrations were also compared to the probable effects levels (PELs) from MacDonald (1994) because the PELs represent the higher effects level where impacts to sediment invertebrates are expected. If an ESV was not available for sediment or surface water, NOAA Screening Quick Reference Table (SQuiRT) values (Buchman, 2008) were used if available. Adverse impacts on survival, growth, and reproduction of insectivorous birds and mammals were evaluated by comparing estimated ingested doses of contaminants in surface soil/sediment and food to threshold oral toxicity values, which are described in more detail in Section 8.5.4.3.

8.5.3 Conceptual Exposure Model

The site conceptual exposure model is designed to diagram the potentially exposed receptor populations and applicable exposure pathways based on the physical nature of the site and the potential contaminant source areas. The contaminant transport pathways for AOC 721 are shown schematically in Figure 8-1. These pathways describe the movement from sources of contamination to potential ecological receptors; the linkage of these items is the conceptual site model.

8.5.4 Step 3a Risk Characterization and Discussion

Several chemicals that were detected in surface soil and/or sediment were initially retained as ecological COPCs because their chemical concentrations exceeded ESVs or because ESVs were not available. The remainder of this section characterizes potential risk to terrestrial invertebrates and plants from COPCs in surface soil (Section 8.5.4.1), potential risk to aquatic organisms (Section 8.5.4.2), potential risk to benthic invertebrates from sediment COPCs (Section 8.5.4.3), and potential risk to insectivorous and piscivorous wildlife via the food chain (Section 8.5.4.4). Potential risk is characterized using a weight-of-evidence approach, and underlying uncertainties are discussed where applicable in this section and/or in Section 8.6.

8.5.4.1 Potential Risk to Terrestrial Invertebrates and Plants

Nine inorganics were initially retained as COPCs in surface soil because their maximum detected concentration exceeded the ESV. Of these nine inorganics, five were not detected at concentrations that exceed background concentrations. Therefore, antimony, copper, lead, vanadium, and zinc were not

retained as COPCs for plants and soil invertebrates and are not discussed further for this media and these receptors.

Arsenic

Arsenic was initially selected as a COPC because the maximum soil concentration of 92.7 mg/kg detected in AOC 721 exceeded the Eco SSL for mammals of 18 mg/kg. Because the Eco SSL used in the conservative COPC screening is based on risks to wildlife and not risks to plants and invertebrates, arsenic concentrations were compared to the following Eco SSLs for soil invertebrates and plants to evaluate risks to these receptors.

- USEPA Eco SSL for soil invertebrates – 140 mg/kg (US2005c)
- USEPA Eco SSL for plants – 32 mg/kg (2005c)

The maximum arsenic detection is less than the Eco SSLs soil invertebrates. The maximum detected concentration (92.7 mg/kg) and the average arsenic concentration (59.5 mg/kg) are greater than the plant Eco SSL. However, the site is vegetated and Eco SSLs are typically conservative values. Therefore, risks to plants from arsenic are expected to be minimal, and arsenic is not retained as a COPC for risks to plants and soil invertebrates.

Mercury

Mercury was initially retained as a COPC because the maximum detected concentration of (1.6 mg/kg) C044M0017 in AOC 721 exceeded the USEPA Region 4 ESV for mercury (0.1 mg/kg). The Canadian SQG for mercury (EC, 1999a), which accounts for effects to plants and ecological receptors, is 12 mg/kg. The maximum detected concentration of mercury (1.6 mg/kg) is much less than this benchmark. Therefore, risks to plants and invertebrates from mercury are expected to be minimal and are acceptable, and mercury is eliminated as a COPC for terrestrial plants and soil invertebrates in AOC 721 surface soil.

Selenium

Selenium was initially selected as a COPC because the detected soil concentration (7.3 mg/kg) C044M0017 in AOC 721 exceeded the USEPA Eco SSL for plants of 0.52 mg/kg (USEPA, 2007a). The detected concentration also exceeded the Eco SSL for invertebrates of 4.1 mg/kg (USEPA, 2007a). Selenium was detected in only one of five samples. The average selenium concentration at AOC 721 is 2.34 mg/kg, which is less than the soil invertebrate Eco SSL. Although the detected concentration and average AOC 721 concentration exceeds the plant benchmark, the site is vegetated, and Eco SSLs are

highly conservative screening values. Therefore, risks to plants and invertebrates from selenium are expected to be minimal and selenium is not retained as a COPC for risks to these receptors.

Thallium

Thallium was initially retained as a COPC because the only detected concentration of 2.7 mg/kg at C044M0017 in AOC 721 exceeded the ESV. The average thallium concentration in AOC 721 is 0.64 mg/kg, which is less than the USEPA Region 4 ESV. Additionally, the site is vegetated. Therefore, risks to plants and invertebrates from thallium are expected to be minimal and thallium is not retained as a COPC for risks to these receptors.

8.5.4.2 Potential Risk to Aquatic Organisms

Beryllium and cobalt were the only COPCs in surface water (Table 8-3). USEPA Region 4 does not have an ESV for either beryllium or cobalt.

The NOAA chronic marine surface water ESV for beryllium is 100 µg/L (Buchman, 2008). The maximum detected concentration of beryllium in AOC 721 surface water (0.33 µg/L) is well below the NOAA ESV. Therefore, risks posed by beryllium are assumed to be minimal.

Cobalt was detected in one of three surface water samples, where its detected concentration was 1.1 µg/L. The detected value slightly exceeds the NOAA chronic marine surface water ESV of 1 µg/L for cobalt (Buchman, 2008). The NOAA ESV (1 µg/L) is the marine water concentration established by the Australian and New Zealand Environment and Conservation Council (ANZECC) to protect 95 per cent of aquatic species (ANZECC, 2000). The marine water concentration established by ANZECC to protect 90 percent of aquatic species is 14 µg/L (ANZECC, 2000). Very little toxicity information exists for cobalt in salt water, and no other sources of ESVs were located. The paucity of toxicity data for cobalt results in some uncertainty associated with cobalt-related risks posed to aquatic receptors at AOC 721. However, the single detected concentration (1.1 µg/L) only slightly exceeds the 1 µg/L ESV and is less than the 14 µg/L benchmark, so potential risks posed by cobalt are probably minor at worst.

8.5.4.3 Potential Risk to Benthic Invertebrates

Twelve PAHs (including total PAHs) were retained as COPCs, eight for exceeding ESVs and four for a lack of ESVs. Seventeen inorganics were retained as COPCs, seven for exceeding ESVs and 10 for a lack of ESVs.

PAHS

The toxicity of PAHs is typically assumed to be additive, so evaluating PAH toxicity in sediment by examining total PAH concentrations is especially useful when, as at AOC 721, several PAHs were detected. The maximum total PAH concentration in sediment at AOC 721 was 13.81 mg/kg at location C721MD009. The ESV (1.684) was based on the TEL from MacDonald (1994), which "represents the upper limit of the range of sediment contaminant concentrations dominated by no effects data entries (i.e., the minimal effects range). Within this range, concentrations of sediment-associated contaminants are not considered to represent significant hazards to aquatic organisms." The PEL from MacDonald (1994), which is the concentration above which effects to sediment invertebrates are expected, is 16.77 mg/kg. All of the detected concentrations of total PAHs are less than the PEL. The average total PAH concentration in AOC 721 sediment is 3.0 mg/kg, which is well below the PEL. Therefore, risks to sediment invertebrates from PAHs at AOC 721 are expected to be minimal and PAHs are not retained as COPCs for risks to these receptors.

Inorganics

Aluminum was initially retained as a COPC because a screening level was not available. The NOAA apparent effects threshold (AET) for aluminum is 18,000 mg/kg (Buchman, 2008). This value is based on the twenty-day growth rate of the juvenile polychaete *Neanthes arenaceodentata*. Only two of the detected concentrations exceed the AET, 36,600 mg/kg at C044SB007 and 21,900 mg/kg at C044SB027. Furthermore, only one concentration was greater than the maximum background concentration. For these reasons, risks are expected to be minimal, and aluminum is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Arsenic was retained as a COPC because the maximum detected concentration (89.5 mg/kg at C721SB06G) exceeded the ESV of 7.24 mg/kg. The screening level is based on the threshold effect level from MacDonald (1994). The PEL for arsenic (MacDonald, 1994) is 41.6 mg/kg. Six of the detected concentrations of arsenic exceed the PEL. Therefore, risks are possible, and arsenic is retained as a COPC for sediment invertebrates in AOC 721 sediment.

Barium was initially retained as a COPC because a screening level was not available. The NOAA AET (Buchman, 2008) for marine sediment is 48 mg/kg. Barium is not generally considered toxic. Only the maximum detected concentration (70.7 mg/kg at C044M0015) exceeded this benchmark. The average barium concentration in AOC 721 sediment is 26.8 mg/kg, which is less than the AET. Therefore, risks are expected to be minimal, and barium is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Beryllium was initially retained as a COPC because a screening level was not available. An alternate benchmark was not available for beryllium. Beryllium was detected in 16 of 25 samples with a maximum detected concentration of 5.4 mg/kg at C721MD005 and an average concentration of 0.95 mg/kg. The uncertainties involved in not having toxicity data available are discussed in Section 8.6.

Chromium was retained as a COPC because the maximum detected concentration (54.3 mg/kg at C044SB025) exceeded the ESV of 52.3 mg/kg. The screening level is based on the TEL from MacDonald (1994). The maximum concentration is the only detection that exceeds the ESV. Furthermore, the average chromium concentration in AOC 721 sediment (22.1 mg/kg) is less than the ESV. Therefore, chromium is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Cobalt was initially retained as a COPC because an ESV was not available. The NOAA AET for cobalt is 10 mg/kg (Buchman, 2008). The maximum detected concentration (33.2 mg/kg at C721MD005) and concentrations in four other samples exceeded the AET. The average cobalt concentration is 7.2 mg/kg, which is also less than the AET. However, because concentrations in five samples exceeded the AET, risks are possible, and cobalt is retained as a COPC for sediment invertebrates in AOC 721 sediment.

Iron was initially retained as a COPC because an ESV was not available. The NOAA AET for iron is 220,000 mg/kg (Buchman, 2008). This value is based on the 20-day growth rate of the juvenile polychaete *Neanthes arenaceodentata*. All iron concentrations in AOC 721 sediment were less than this benchmark. Therefore, iron is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Lead was retained as a COPC because the maximum detected concentration (82.7 mg/kg at C044SB007) exceeded the ESV of 30.2 mg/kg. The screening level is based on the TEL from MacDonald (1994). The PEL for lead (MacDonald, 1994) is 112 mg/kg. None of the concentrations of lead exceed the PEL. Furthermore, the average lead concentration in AOC 721 sediment (37.2 mg/kg) is only slightly greater than the ESV and well below the PEL. Therefore, risks are expected to be minimal, and lead is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Manganese was initially retained as a COPC because an ESV was not available. The NOAA AET for manganese is 260 mg/kg (Buchman, 2008). Two of the detected concentrations (408 mg/kg at C044SB025 and 289 mg/kg at C044SB027) exceeded the AET. However, only the maximum greatly exceeds the AET. Furthermore, the average manganese concentration is 134 mg/kg, which is much less than the AET. Therefore, manganese is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Mercury was retained as a COPC because the maximum detected concentration (1.1 mg/kg at C721MD010) exceeded the ESV of 0.13 mg/kg. The screening level is based on the TEL from MacDonald (1994). The PEL for mercury (MacDonald, 1994) is 0.7 mg/kg. Mercury concentrations in three samples exceeded the PEL. The average mercury concentration in AOC 721 sediment (0.36 mg/kg) is greater than the TEL and less than the PEL. However, because concentrations in three samples exceeded the PEL, risks are possible, and mercury is retained as a COPC for sediment invertebrates in AOC 721 sediment.

Nickel was retained as a COPC because the maximum detected concentration (36.9 mg/kg at C044SB025) exceeded the ESV of 15.9 mg/kg. The screening level is based on the TEL from MacDonald (1994). The PEL for nickel (MacDonald, 1994) is 42.8 mg/kg. None of the concentrations of nickel exceed the PEL. Furthermore, the average nickel concentration in AOC 721 sediment (12.7 mg/kg) is less than the TEL and well below the PEL. Therefore, risks are expected to be minimal, and nickel is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Selenium was initially retained as a COPC because and ESV was not available. The NOAA AET for selenium is 1 mg/kg (Buchman, 2008). The maximum detected concentration (9.3 mg/kg at C044M0015) and concentrations in five other samples exceeded the AET. The average selenium concentration is 1.2 mg/kg, which is also greater than the AET. Therefore risks are possible, and selenium is retained as a COPC for sediment invertebrates.

Thallium was initially retained as a COPC because a screening level was not available. Alternate benchmarks were not available, but thallium was detected in only three of thirty-two samples. Therefore, because of the infrequent detection, risks to sediment invertebrates from thallium are expected to be minimal, and thallium is not retained as a COPC for sediment invertebrates.

Tin was initially retained as a COPC because a screening level was not available. The NOAA TEL for tin is 0.05 mg/kg (Buchman, 2008). Tin was detected in only one of ten samples at a concentration of 1.3 mg/kg, which does exceed the TEL. However, because of the infrequent detection, risks to sediment invertebrates from tin are expected to be minimal, and tin is not retained as a COPC for sediment invertebrates.

Vanadium was initially retained as a COPC because a screening level was not available. The NOAA AET (Buchman, 2008) for marine sediment is 57 mg/kg. Vanadium concentrations in only two samples exceeded the AET (C044SB027 68.5 mg/kg and C044SB025 at 68.2 mg/kg). Furthermore, the maximum concentration is similar to the maximum background concentration (61 mg/kg). Additionally, the average vanadium concentration in AOC 721 sediment is 29.2 mg/kg, which is much less than the AET.

Therefore, risks are expected to be minimal, and vanadium is not retained as a COPC for sediment invertebrates in AOC 721 sediment.

Zinc was retained as a COPC because the maximum detected concentration (669 mg/kg at C721MD010) exceeded the ESV of 124 mg/kg. The screening level is based on the TEL from MacDonald (1994). The PEL for zinc (MacDonald, 1994) is 271 mg/kg. Zinc concentrations in five samples exceeded the PEL. The average zinc concentration in AOC 721 sediment (160 mg/kg) is greater than the TEL and less than the PEL. However, because concentrations in five samples exceed the PEL, risks are possible, and zinc is retained as a COPC for sediment invertebrates in AOC 721 sediment.

8.5.4.4 Potential Risks to Wildlife

Food-chain modeling was conducted to evaluate potential risks to representative receptors from ingested doses of surface soil and sediment COPCs that are known to bioaccumulate or biomagnify (USEPA, 2000b). The surface soil and sediment data sets were combined to provide a more comprehensive exposure scenario, since the distinction between soil and sediment is difficult to discern in some portions of the site; as mentioned previously, much of the site is an estuarine wetland. Representative birds and mammals were selected to evaluate potential risks to insectivores and piscivores. The methods used to model the doses that representative receptors could receive are described below. Additional supporting information is provided in Appendix D of this RFI Report.

Risk to wildlife from exposure to bioaccumulative chemicals in surface soil and sediment were determined by estimating the chronic daily intake (CDI) using food chain models and comparing the CDI to toxicity reference values (TRVs) representing acceptable daily doses in mg/kg-day. The TRVs were developed from No Observed Adverse Effect Levels (NOAELs) and Lowest Observed Adverse Effect Levels (LOAELs) obtained from wildlife studies. The majority of the TRVs were obtained from the ORNL *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample et al., 1996) and the USEPA Eco SSL documents and were supplemented with other toxicity information when necessary. Appendix D of this RFI Report presents the TRVs and the sources of the TRVs used in this ERA. COPCs considered by USEPA Region 4 to be important bioaccumulative chemicals were included in the food chain model. Specifically, COPCs designated as bioaccumulative in *Appendix to Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment, Status and Needs, Chemical-Specific Summary Tables* (USEPA, 2000b), with the exception of PAHs, were evaluated in the food-chain modeling. Region 4 considers the potential toxicity of PAHs via bioaccumulation in the food web to be generally negligible unless PAHs are present at extremely high concentrations [i.e., percent levels: (10,000 mg/kg)] in soil or sediment

If a subchronic study was used to develop the TRV, the final value was multiplied by a factor of 0.1 to account for uncertainty between subchronic and chronic effects. Also, the LOAEL was multiplied by a factor of 0.1 to estimate a NOAEL TRV if only a LOAEL study was available. The chemical-specific Eco SSL documents provide both NOAELs and LOAELS for various studies, but overall TRVs are calculated in those documents only for NOAELs. The geometric mean of the chemical-specific growth and reproduction LOAELs from the chemical-specific Eco SSL documents were used as the LOAEL TRVs.

As discussed above, the total exposure dose to chemicals in soil, sediment, and associated food items such as invertebrates were estimated using food chain models. The selection of a particular species is required so that intake through eating can be estimated. The availability of exposure parameters (e.g., body mass, ingestion rates) are factors in selecting surrogate species. The following surrogate species were used for the food chain modeling:

- Insectivorous mammal: short-tailed shrew
- Insectivorous bird: American robin
- Wetland insectivorous mammal: star-nosed mole
- Wetland insectivorous bird: Carolina wren
- Piscivorous mammal: mink
- Piscivorous bird: green heron

Receptor profiles for the surrogate species, including the exposure parameters used in the food-chain modeling are included in Appendix D of this RFI Report.

The following equation was used to calculate the CDI for wildlife receptors:

$$CDI = \frac{[(Cf * If) + (Cs * Is)] * H}{BW}$$

Where:

CDI	=	Chronic daily intake (mg/kg-day)
Cf	=	Chemical concentration in food – (see discussion below)
Cs	=	Chemical concentration in surface soil or sediment (mg/kg)
If	=	Food ingestion rate (kg/day)
Is	=	Incidental surface soil or sediment ingestion rate (kg/day)
H	=	Portion of food intake from the contaminated area (unitless)
BW	=	Body weight (kg)

Chemical concentrations in food items of soil insectivores were calculated using soil-to-invertebrate bioaccumulation factors (BAFs) and regression equations from the USEPA Eco SSL Guidance Document (2007b) or other published sources. The sources of the BAFs are documented in Appendix D of this RFI Report. The following equation was used to calculate the chemical concentration in soil invertebrates when BAFs are used:

$$Cf = Cs * BAF$$

Where:

Cf	=	Contaminant concentration in food (mg/kg)
Cs	=	Contaminant concentration in surface soil (mg/kg)
BAF	=	Biota-soil bioaccumulation factor (unitless)

Chemical concentrations in food items of wetland insectivorous receptors and piscivorous receptors were calculated using sediment-to-invertebrate biota sediment accumulation factors (BSAFs) from the *Biota Sediment Accumulation Factors for Invertebrates: Review and recommendations for the Oak Ridge Reservation* (ORNL, 1998). Contaminant concentrations in food items of wetland insectivorous mammals and birds and piscivorous mammals and birds were calculated as follows:

$$Cf \text{ (for metals)} = Csd * BSAF$$

Where:

Cf	=	Contaminant concentration in food (mg/kg)
Csd	=	Contaminant concentration in sediment (mg/kg)
BSAF	=	Biota-sediment bioaccumulation factor (unitless)

Table 8-5 summarizes the exposure factors that were used for the food chain model. The food ingestion rates were on a dry weight basis. The following input parameters were used in the dose equations under the conservative screening scenario in Step 3a:

- Maximum surface soil and sediment concentrations
- Maximum BAFs and BSAFs
- Conservative receptor body weights and ingestion rate

For refining the conservative exposure assumptions in Step 3a, the following input parameters were used:

- Average surface soil and sediment concentrations
- Average BAFs or BSAFs
- Average receptor body weights and ingestion rates

The risk characterization is the final phase of an ERA that compares exposure to ecological effects. It is at this phase that the likelihood of adverse effects occurring as a result of exposure to a stressor is evaluated. An EEQ approach was used to characterize the potential risk to wildlife receptors by comparing exposure concentrations/doses to effects data.

The EEQs for terrestrial wildlife were calculated as follows:

$$EEQ = \frac{CDI}{TRV}$$

where:

EEQ	=	Ecological effects quotient (unitless)
CDI	=	Chronic daily intake dose (mg/kg-day)
TRV	=	Toxicity reference value (NOAEL or LOAEL) (mg/kg-day)

Based on maximum concentrations and conservative assumptions, NOAEL EEQs exceeded 1.0 for the following chemicals and receptors (see Tables 8-6, 8-7, and 8-8):

- American robin (arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc)
- Short-tailed shrew (mercury, nickel, selenium, and zinc)
- Carolina wren (arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc)
- Star-nosed mole (arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc)
- Green heron (arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc)
- Mink (arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc

The average food chain scenario provides a less conservative evaluation of risk compared to the maximum (conservative) food chain scenario, but it is nevertheless conservative. Based on average concentrations and less conservative exposure assumptions, NOAEL EEQs exceeded 1.0 for the following chemicals and receptors (see Tables 8-9, 8-10, and 8-11):

- American robin (lead, mercury, and zinc)
- Short-tailed shrew (mercury)
- Carolina wren (copper, mercury, and zinc)

- Star-nosed mole (mercury)
- Green heron (copper and mercury)

NOAEL EEQs under the average scenario for the robin for lead (1.6) and zinc (1.03), for the shrew for mercury (2.2), for the wren for copper (2.4), for the mole for mercury (1.1), and the green heron for copper (1.4) were not much greater in magnitude than 1.0. Furthermore, all of the LOAEL EEQs for these chemicals and receptors were less than 1.0. Therefore, food chain related risks to these receptors from the aforementioned metals are expected to be minimal.

In the average scenario for the wren, the zinc NOAEL EEQ was 5.1 and the zinc LOAEL EEQ was 0.56 (Table 8-10). The food chain EEQs in Tables 8-6 through 8-11 assume an area use factor (AUF) of 1.0, meaning the representative receptors are assumed to forage exclusively in the area where samples were collected. Birds forage over large areas and would obtain only a fraction of their food from AOC 721, which is only 1.6 acres in size. Precise AUFs for insectivorous birds such as wrens cannot be determined, but considering the small size of AOC 721, food chain related risks for the wren from zinc are not significant.

NOAEL EEQs under the average scenario for mercury for the robin (19), wren (16), and green heron (9.9) were considerably higher than 1.0 (Tables 8-9, 8-10, and 8-11). The LOAEL EEQs also exceeded 1.0 for the robin (1.9) and wren (1.6). As mentioned above, these EEQs assume that insectivorous birds such as robins and wrens, and piscivorous birds such as green herons, forage exclusively at AOC 721. Insectivorous and piscivorous birds often forage over large areas and would typically obtain only a fraction of their food from the 1.6 acre area that comprises AOC 721. During nesting season, however, the home range of adult birds can be relatively small. Mercury is a neurotoxin, so there is uncertainty regarding the degree of potential risk posed by mercury to insectivorous birds such as wrens and robins, and piscivorous birds such as green herons, particularly during nesting season.

8.6 ECOLOGICAL RISK UNCERTAINTY ANALYSIS

This section discusses some of the uncertainties associated with the AOC 721 ERA.

8.6.1 Measures of Effects and Assessment Endpoints

Measures of effects were used to evaluate the assessment endpoints selected for the ERA. For the ERA, the measures of effects were not the same as the assessment endpoints. Measures were used to predict effects to the assessment endpoints by selecting surrogate species to be evaluated. For example, a decrease in reproduction of a shrew was used to assess a decrease in reproduction of the small mammal population. However, predicting a decrease in reproduction of a shrew may either under protect or

overprotect the small mammal population based on differences in ingestion rates, toxicity, food preferences, home ranges, etc. between different species.

Risks to reptiles were not quantitatively evaluated because exposure factors are not established for most species and toxicity data are very limited. Potential risks to reptiles cannot be evaluated in this ERA because of a lack of toxicity and exposure data.

There is uncertainty involved in assessing potential risks to demersal fish (fish that live or forage along the sediment surface). Various fish species are probably present in the small pond at AOC 721, and fish undoubtedly inhabit Noisette Creek and the ditch along the west boundary of the site. The mummichog (*Fundulus heteroclitus*), for example, is probably abundant in the area, and is a species that is a food source of other organisms. Red drum (*Sciaenops ocellatus*) an upper trophic level fish, occurs in coastal and estuarine waters in the area, and red drum forage primarily on organisms such as crabs, shrimp, fish, copepods, and amphipods. Red drum and mummichogs, as well as other fish species and various aquatic invertebrates, are exposed to contamination through direct contact with sediment and surface water, and the ingestion of prey. The assessment endpoint category of “aquatic organisms” that was discussed in Section 8.5.2.3 includes fish.

There are two approaches for evaluating risks to fish. Potential risk is typically assessed by comparing chemical concentrations in surface water and sediment to surface water and sediment ecological screening values. Water quality criteria, for example, are based on toxicity tests with at least eight different families of aquatic organisms, and are intended to be protective of species such as fish. To some extent, sediment criteria should be protective of fish because the criteria are generated to be protective of benthic invertebrates, which typically have a greater exposure to chemicals in sediment than fish. However, fish are sometimes exposed to bioaccumulative chemicals to a greater extent than are benthic invertebrates. One approach to evaluate potential risks to demersal fish would be to estimate ingested contaminant dosages in a representative species such as the mummichog or red drum, and then compare the dosages to NOAEL-based and LOAEL-based toxicity thresholds. However, the uncertainty associated with this approach would be great. Furthermore, the Zone J RFI (currently being finalized to incorporate SCDHEC and South Carolina Department of Natural Resources [SCDNR] review comments) concluded that sediment contamination in Noisette Creek posed minimal risks to aquatic and benthic receptors in the creek. Thus, sediment contamination at AOC 721 is localized and apparently is not a major contributor of contaminants to Noisette Creek.

8.6.2 Exposure Characterization

The contaminant dose for terrestrial wildlife is calculated using an equation that incorporates ingestion rates, body weights, BAFs/BSAFs, and other exposure factors. These exposure factors are obtained from literature studies or predicted using various equations. Ingestion rates and body weights vary among species, especially among species inhabiting different areas.

Bioaccumulation of contaminants into various biological media (e.g., invertebrates and small mammals) depends on characteristics of the media, such as pH, organic carbon, etc. Therefore, actual BAFs at the sites may be different than those used in the ERA and obtained from the literature. Also, the bioavailability of contaminants reported in toxicity studies is typically greater than the contaminants in environmental media. Typically, highly bioavailable forms of the chemicals are used when conducting toxicity tests and/or conducting dosing studies for wildlife.

There is also uncertainty in the chemical data collected at the site. Measured levels of chemicals are only estimates of the true site chemical concentrations. For surface soil, most metals were analyzed in only one sample. This leads to considerable uncertainty in evaluating risks to surface soil receptors.

There is uncertainty in not evaluating the dermal and air inhalation pathways for wildlife, although these pathways would likely not increase risks significantly.

The surface water pathway was not evaluated. There is some uncertainty in not evaluating groundwater as surface water, but there is considerable uncertainty regarding how groundwater concentrations impact surface water adjacent to the site.

8.6.3 Ecological Effects Data

Several alternative benchmark values were used to gain a better understanding of the relationship between maximum concentrations of the selected COPCs to the overall ecological assessment of the site. There is some uncertainty involved when using these alternative benchmarks; however, attempts were made to lessen the uncertainties by providing the toxicological basis of the alternate benchmarks when they were used.

PAHs were evaluated in the Step 3a refinement as total PAHs. There is also uncertainty with evaluating the PAHs as total PAHs and not individually comparing each individual PAH to toxicological data.

A sediment benchmark was not available for beryllium, and therefore, risks were not able to be quantified. Therefore, there is inherent uncertainty in not evaluating risks to sediment invertebrates from beryllium.

8.6.4 Risk Characterization

Uncertainty in risk characterization results from the combination of the above uncertainties. Risks are possible if an EEQ is greater than or equal to 1.0 regardless of the magnitude of the EEQ. However, the magnitude of effects to ecological receptors cannot be inferred based on the magnitude of the EEQ. Rather, an EEQ greater than 1.0 simply indicates that the dose used to derive the toxicity reference value was exceeded.

Finally, there is uncertainty in how the predicted risks to a species at a site translate into risk to the population in the area as a whole.

8.7 SUMMARY AND CONCLUSIONS

AOC 721 encompasses an area of approximately 1.6 acres. The site was an extension of SWMU 44, a former coal storage area. Much of the site is a tidally influenced wetland that has been considered as critical habitat in the coastal zone and includes salt tolerant plant species. Sediment and surface soil samples were collected during multiple sampling events from 1995 through 2005. Many samples that were originally classified as soil were more recently classified as sediment based on the wetland delineation performed in 2004.

An ERA was performed for AOC 721 consisting of Steps 1, 2, and 3a of the ERA process. After the Step 3a refinement, no COPCs were retained for aquatic organisms, terrestrial plants, or soil invertebrates. COPCs retained after the Step 3a refinement for sediment consisted of arsenic, cobalt, mercury, selenium, and zinc. During the Step 3a refinement, food chain modeling was conducted for bioaccumulative chemicals to evaluate potential risks to terrestrial wildlife from chemical concentrations in surface soil and sediment. The surface soil and sediment data sets were combined to provide a more robust exposure scenario for wildlife. Potential risks to insectivorous and piscivorous birds and mammals were evaluated by selecting species representative of those that would likely inhabit AOC 721; these consisted of the short-tailed shrew, American robin, star-nosed mole, Carolina wren, mink, and green heron. Under the average scenario, mercury was retained as a COPC for insectivorous birds represented by the robin and wren, and piscivorous birds represented by the green heron.

The decision of whether to carry the ERA for AOC 721 beyond Step 3A involves risk management and thus will be determined by risk managers. This ERA is intended to assist the risk managers so that a decision regarding further assessment or no further action can be made. A factor for risk managers to consider is that areas of contamination are relatively small; the entire site is only 1.6 acres in size, so contamination is not extensive. In addition, the remediation of small areas of contaminated soil or

sediment within the site should be weighed against the detriment of possible damage to wetland habitat at the site. Finally, the Draft Zone J RFI Report, which is currently being finalized to address SCHDEC and SCDNR review comments, concluded that sediment contamination in Noisette Creek posed minimal risks to benthic receptors in the creek, and to piscivorous birds and mammals foraging in the creek (Tetra Tech, 2011). Thus, sediment contamination in the ditch at AOC 721 is localized and apparently is not a major contributor of contaminants to Noisette Creek.

TABLE 8-1

SURFACE SOIL COPC SELECTION
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Frequency of Detection[1]	Minimum Concentration[1]	Maximum Concentration[1]	Location of Maximum Detect	Average of Postive Results[1]	Average of all Results [1]	Above Background?[2]	Soil COPC Screening Level[3]	Ecological Effects Quotient[4]	Retain as a COPC	Rationale for Contaminant Deletion or Selection
Inorganics (mg/kg)											
ALUMINUM	1/1	4870	4870	C044M0017	4870	4870	NO	pH[5]	NA	NO	BSL
ANTIMONY	1/1	0.97 J	0.97 J	C044M0017	0.97	0.97	NO	0.27	3.6	YES	ASL
ARSENIC	9/9	21.2	92.7	C721SB002	59.5	59.5	YES	18	5.2	YES	ASL
BARIUM	1/1	64 J	64 J	C044M0017	64	64	NO	330	0.19	NO	BSL
CADMIUM	1/1	0.31	0.31	C044M0017	0.31	0.31	NO	0.36	0.86	NO	BSL
CALCIUM	1/1	12600 J	12600 J	C044M0017	12600	12600	NO	NA	NA	NO	NUT
CHROMIUM	1/1	22.8	22.8	C044M0017	22.8	22.8	NO	26	0.88	NO	BSL
COBALT	1/1	8.8 J	8.8 J	C044M0017	8.8	8.8	YES	13	0.68	NO	BSL
COPPER	1/1	51.3	51.3	C044M0017	51.3	51.3	NO	28	1.8	YES	ASL
IRON	1/1	37600	37600	C044M0017	37600	37600	YES	pH[5]	NA	NO	BSL
LEAD	1/1	63.6	63.6	C044M0017	63.6	63.6	NO	11	5.8	YES	ASL
MAGNESIUM	1/1	1160 J	1160 J	C044M0017	1160	1160	NO	NA	NA	NO	NUT
MANGANESE	1/1	85.9	85.9	C044M0017	85.9	85.9	NO	220	0.39	NO	BSL
MERCURY	5/5	0.13	1.6 J	C044M0017	0.454	0.454	YES	0.1	16	YES	ASL
NICKEL	1/1	26.7 J	26.7 J	C044M0017	26.7	26.7	NO	38	0.7	NO	BSL
POTASSIUM	1/1	1080 J	1080 J	C044M0017	1080	1080	YES	NA	NA	NO	NUT
SELENIUM	1/5	7.3 J	7.3 J	C044M0017	7.3	2.34	YES	0.52	14.04	YES	ASL
SODIUM	1/1	1130 J	1130 J	C044M0017	1130	1130	NO	NA	NA	NO	NUT
THALLIUM	1/7	2.7 J	2.7 J	C044M0017	2.7	0.641	YES	1	2.7	YES	ASL
VANADIUM	1/1	26.7	26.7	C044M0017	26.7	26.7	YES	7.8	3.4	YES	ASL
ZINC	1/1	125 J	125 J	C044M0017	125	125	NO	46	2.7	YES	ASL
Miscellaneous Parameters (mg/kg)											
TOTAL ORGANIC CARBON	1/1	22500	22500	C044M0017	22500	22500	NA	NA	NA	NA	NA

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations, but were averaged and considered one sample for average calculations.
2 - Background concentrations are provided in Section 4.1.
3 - The sources of the screening levels are the USEPA Eco SSLs (2003, 2005, 2007, 2008) or USEPA Region 4 Ecological Soil Screening Value (USEPA, 2001c). When an EPA Ecological Soil Screening Level (Eco SSL) was used for screening, the lowest of the plant, invertebrate, avian, or mammal value (if available) was used to be conservative.
4 - Ecological effects quotient is calculated by dividing the maximum detected concentration by the COPC screening level.
5 - Aluminum is considered a COPC only when the soil pH is less than 5.5; iron is not expected to be toxic to plants with a soil pH between 5 and 8. Site specific pH data for soils was not available; however, the site is heavily vegetated, and therefore the pH is not expected to be less than 5.5 or greater than 8.

Associated Samples:

044M001701
721SB00201
721SB00301
721SB00401
721SB00501
721SB02A01
721SB03A01
721SB04A01
721SB05A01

COPC = Chemical of Potential Concern
NA = Not Applicable

Rationale Codes

For Selection as a COPC:

ASL = Above COPC screening level

For Elimination as a COPC:
BSL = Below COPC screening level
NUT = Essential nutrient

TABLE 8-2

SEDIMENT COPC SELECTION
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Frequency of Detection[1]	Minimum Concentration[1]	Maximum Concentration[1]	Location of Maximum Concentration	Average of Postive Results[2]	Average of all Results [2]	Maximum Greater than 2X Background Concentration[3]	Sediment COPC Screening Level[4]	Ecological Effects Quotient[5]	Retain as a COPC	Rationale for Contaminant Deletion or Selection
Volatile Organics (mg/kg)											
1,2,4-TRICHLOROBENZENE	1/3	0.084 J	0.084 J	C044SS005	0.084	0.18	NA	9.2	0.009	NO	BSL
Semivolatile Organics (mg/kg)											
2-METHYLNAPHTHALENE	13/17	0.03 J	1.3	C044SS005	0.51	0.46	YES	0.33	3.94	**YES**	ASL
BENZO(A)ANTHRACENE	15/16	0.051 J	1.4	C721MD009	0.31	0.31	YES	0.33	4.24	**YES**	ASL
BENZO(A)PYRENE	2/3	0.049 J	0.18 J	C044SS005	0.11	0.16	YES	0.33	0.545	NO	BSL
BENZO(B)FLUORANTHENE	2/3	0.067 J	0.25 J	C044SS005	0.16	0.19	YES	NA	NA	**YES**	NSL
BENZO(G,H,I)PERYLENE	1/3	0.099 J	0.099 J	C044SS005	0.099	0.18	YES	NA	NA	**YES**	NSL
BENZO(K)FLUORANTHENE	2/3	0.067 J	0.15 J	C044SS005	0.11	0.15	YES	NA	NA	**YES**	NSL
CHRYSENE	18/19	0.097 J	1.5	C721MD009	0.42	0.41	NO	0.33	4.55	**YES**	ASL
DIBENZOFURAN	2/3	0.085 J	0.3 J	C044SS005	0.19	0.21	NA	2	0.150	NO	BSL
FLUORANTHENE	15/16	0.077 J	4.6	C721MD009	0.78	0.75	YES	0.33	13.9	**YES**	ASL
INDENO(1,2,3-CD)PYRENE	1/3	0.074 J	0.074 J	C044SS005	0.074	0.17	NO	NA	NA	**YES**	NSL
NAPHTHALENE	15/19	0.13 J	0.96	C721SB001	0.34	0.34	YES	0.33	2.91	**YES**	ASL
PHENANTHRENE	18/19	0.074 J	1.1	C721SB001	0.49	0.48	YES	0.33	3.33	**YES**	ASL
PYRENE	19/20	0.063 J	3.7	C721MD009	0.65	0.63	YES	0.33	11.2	**YES**	ASL
TOTAL PAHS	18/19	0.64	13.81	C721MD009	3.2	3.0	YES	1.684	8.20	**YES**	ASL
Inorganics (mg/kg)											
ALUMINUM	10/10	394	36600	C044SB025	11275	11275.4	YES	NA	NA	**YES**	NSL
ANTIMONY	3/10	0.48 J	0.71 J	C044SS005	0.58	0.303	NO	12	0.059	NO	BSL
ARSENIC	33/34	2.8 J	89.5	C721SB06G	25	24.2	YES	7.24	12.4	**YES**	ASL
BARIUM	10/10	1.4	70.7 J	C044M0015	26.77	26.77	YES	NA	NA	**YES**	NSL
BERYLLIUM	16/25	0.16 J	5.4	C721MD005	1.24	0.946	YES	NA	NA	**YES**	NSL
CADMIUM	6/12	0.1 J	0.9	C044SB007	0.55	0.298	YES	1	0.900	NO	BSL
CALCIUM	10/10	268	128000 J	C044SB007	17383	17383	YES	NA	NA	NO	NUT
CHROMIUM	10/10	1 J	54.3	C044SB025	22.1	22.1	YES	52.3	1.04	**YES**	ASL
COBALT	23/25	2.2 J	33.2	C721MD005	7.7	7.17	YES	NA	NA	**YES**	NSL
COPPER	12/12	0.59 J	46.5	C044SB027	23.3	23.3	YES	18.7	2.49	**YES**	ASL
IRON	10/10	568	93700	C044M0015	22674	22674	YES	NA	NA	**YES**	NSL
LEAD	10/10	0.84	82.7 J	C044SB007	37.2	37.2	YES	30.2	2.74	**YES**	ASL
MAGNESIUM	10/10	326 J	6410 J	C044SB027	2556	2556	NO	NA	NA	NO	NUT
MANGANESE	9/10	5.7	408	C044SB025	149	134	YES	NA	NA	**YES**	NSL
MERCURY	19/22	0.06	1.1 J	C721MD010	0.41	0.36	YES	0.13	8.46	**YES**	ASL
NICKEL	12/12	0.32 J	36.9	C044SB025	12.7	12.7	YES	15.9	2.32	**YES**	ASL
POTASSIUM	10/10	145 J	8240 J	C0440015	2225	2225	YES	NA	NA	NO	NUT
SELENIUM	9/23	0.52 J	9.3 J	C044M0015	2.4	1.2	YES	NA	NA	**YES**	NSL
SODIUM	9/10	367 J	13100	C044SB027	4769	4336	NO	NA	NA	NO	NUT
THALLIUM	3/32	3.2	4.6	C044M0015	3.8	0.79	YES	NA	NA	**YES**	NSL
TIN	1/10	1.3 J	1.3 J	C044SB007	1.3	2.18	NA	NA	NA	**YES**	NSL
VANADIUM	10/10	0.89 J	68.5	C044SB027	29.2	29.2	YES	NA	NA	**YES**	NSL
ZINC	25/25	1.4 J	669 J	C721MD010	160	160	YES	124	5.40	**YES**	ASL
Miscellaneous Parameters (mg/kg)											
TOTAL ORGANIC CARBON	3/3	10700	52600	C044M0015	26167	26167	NA	NA	NA	NA	NA

Footnotes:

1- Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Sample and duplicate were averaged and considered one sample for average calculations.
3 - Background concentrations are provided in Table 8-3.
4 - USEPA Region IV values.
5 - Ecological effects quotient is calculated by dividing the maximum detected concentration by the COPC screening level.

COPC = Chemical of Potential Concern
NA = Not Applicable

Rationale Codes
For Selection as a COPC:
ASL = Above COPC screening level
NSL = No screening level

For Elimination as a COPC:
BSL = Below COPC screening level
NUT = Essential nutrient

Associated Samples:

	044SB02703	721MD00501	721SB01D01
044M001501	044SB06601	721MD00701	721SB06B01
044M001601	044SB07601	721MD00801	721SB06E01
044M001901	044SBC0101	721MD00901	721SB06F01
044SB00501	044SBC0102	721MD01001	721SB06G01
044SB00701	044SS00501	721MD01101	721SB06H01
044SB02501	721MD00101	721SB00101	721SB07A01
044SB02601	721MD00201	721SB00701	721SB07B01
044SB02701	721MD00301	721SB00801	721SB07C01
044SB02702	721MD00401	721SB01A01	721SB07D01

TABLE 8-3

SURFACE WATER COPC SELECTION
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Frequency of Detection	Range of Detected Values	Sample of Maximum Detection	Saltwater Chronic Screening Value[1]	Ecological Effects Quotient[2]	Retain as COPC	Rationale for Deletion or Selection as COPC
Inorganics (µg/L)							
Arsenic	1/3	3.6	721WD00101	36	0.1	No	BSL
Beryllium	2/3	0.32 - 0.33	721WD00102	NA	NA	Yes	NSL
Calcium	3/3	125000-169000	721WD00101	NA	NA	No	NUT
Cobalt	1/3	1.1	721WP00101	NA	NA	Yes	NSL
Magnesium	3/3	331000 - 403000	721WP00101	NA	NA	No	NUT
Potassium	3/3	126000 - 152000	721WP00101	NA	NA	No	NUT
Sodium	3/3	2340000-2845000	721WP00101	NA	NA	No	NUT
Thallium	1/3	4.3	721WP00101	21.3	0.2	No	BSL

Footnotes:
COPC= Chemical of Potential Concern
1 - USEPA Region 4 screening values (USEPA, 2001c)
2 - Ecological effects quotient = maximum detected concentration divided by the ecological screening value.
3 - Rationale Codes:
BSL= Below ecological screening value
NSL = No screening value available from USEPA Region 4
NUT = Essential nutrient

TABLE 8-4

BACKGROUND SEDIMENT DATA[1]
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Range of Detected Values	Average Value[2]	2 x Average Value	Range of Nondetects[3]	ESV	BSLM000101		BSLM000201		BSLM000301		BSLM000401		BSLM000501		BSLM000601		BSLM000701		BSLM000801		BSLM000901		BSLM001001	
Inorganics (mg/kg)																									
Aluminum	1600-27000	10720.0	21440	-	NA	27000		19000		7700		1600		7900		4300		8300		14000		12000		5400	
Antimony	-	0.4	0.9	0.62 - 1.6	12	1.2	U	1.6	U	0.74	U	0.62	U	0.72	U	0.71	U	0.69	U	0.93	U	0.92	U	0.64	U
Arsenic	0.98-15	6.0	12.0	-	7.24	15		11		3.8		0.98	J	5.9		2.4		3.6		9		5.2		3.2	
Barium	8.8-30	17.3	34.6	-	NA	30		27		9.7		9.4		11		18		18		25		16		8.8	
Beryllium	0.12 - 1.5	0.55	1.1	-	NA	1.5		1	J	0.35	J	0.12	J	0.42	J	0.23	J	0.36	J	0.67	J	0.51	J	0.33	J
Cadmium	-	0.2	0.4	0.3 - 0.8	1	0.56	U	0.8	U	0.36	U	0.3	U	0.35	U	0.35	U	0.34	U	0.46	U	0.45	U	0.31	U
Calcium	3000-140000	26630.0	53260	-	NA	3100		16000		19000		3000		40000		6400		4800		140000		19000		15000	
Chromium	4.5-56	21.8	43.5	-	52.3	56		42		16		4.5		17		10		15		21		23		13	
Cobalt	0.49-8.4	3.2	6.4	-	NA	7.4		8.4		1.8		0.49	J	2		1.2	J	1.9		3.4		3.9		1.3	J
Copper	1.1-16	7.5	14.9	-	18.7	7.7		16		5.9		1.1	J	4.3		3.2		5.9		15		13		2.4	J
Iron	1800-33000	11800.0	23600	-	NA	33000		22000		7900		1800		8900		5000		8600		14000		11000		5800	
Lead	2.7-21	9.0	18.1	-	30.2	14		15		6.7		2.7		4.9		4.3		8.6		21		9.8		3.4	
Magnesium	530-7100	3213.0	6426	-	NA	7100		6300		2200		530		2800		1600		2100		3900		3700		1900	
Manganese	33-240	108.0	216	-	NA	240		180		74		33		97		41		57		160		140		58	
Mercury	0.0053-0.11	0.036	0.072	-	0.13	0.035	J	0.059	J	0.031	J	0.0053	J	0.016	J	0.018	J	0.034		0.11		0.045		0.0078	J
Nickel	1.1-15	6.2	12.42	-	15.9	15		12	J	5.2	J	1.1	J	4.8	J	2.4	J	4.6	J	6.9	J	6.9	J	3.2	J
Potassium	240-4200	1523	3046	-	NA	4200		2800		970		240		1200		690		1000		1800		1500		830	
Selenium	-	0.9	1.8	1.2 - 3.3	NA	2.3	U	3.3	U	1.5	U	1.2	U	1.4	U	1.4	U	1.4	U	1.9	U	1.8	U	1.3	U
Sodium	2000-14000	6940	13880	-	NA	10000		14000		5100		2000		6400		4600		5300		9900		7900		4200	
Thallium	-	1.3	2.5	1.8 - 4.7	NA	3.3	U	4.7	U	2.1	U	1.8	U	2.1	U	2.1	U	2.0	U	2.7	U	2.7	U	1.9	U
Vanadium	4.2-61	24.4	48.8	-	NA	61		43		17		4.2		18		11		21		32		25		12	
Zinc	9.7-64	35.8	71.5	-	124	53		64		25		9.7		21		18		40		60		43		24	
Pesticides and PCBs (µg/kg)																									
4,4'-DDD	-	3.1	6.2	4.3 - 11	3.3	8.5	U	11	U	5.6	U	4.3	U	5.1	U	4.8	U	5.0	U	6.3	U	6.9	U	4.4	U
4,4'-DDE	-	3.1	6.2	4.3 - 11	3.3	8.5	U	11	U	5.6	U	4.3	U	5.1	U	4.8	U	5.0	U	6.3	U	6.9	U	4.4	U
Dieldrin	-	3.6	7.2	5 - 13	3.3	9.9	U	13	U	6.5	U	5.0	U	5.9	U	5.6	U	5.9	U	7.4	U	8.0	U	5.2	U
PCB-1260	-	66.4	132.7	92 - 240	33	180	U	240	U	120	U	92	U	110	U	100	U	110	U	130	U	150	U	95	U
Semivolatile Organic Compounds (µg/kg)																									
2-Methylnaphthalene	-	25.0	49.9	35 - 90	330	68	U	90	U	44	U	35	U	41	U	39	U	40	U	51	U	55	U	36	U
Acenaphthene	-	19.7	39.4	27 - 71	330	54	U	71	U	35	U	27	U	32	U	31	U	32	U	40	U	44	U	28	U
Acenaphthylene	69	22.6	45.1	24 - 64	330	48	U	64	U	31	U	24	U	29	U	27	U	29	U	36	U	69	J	25	U
Anthracene	88	30.0	60.0	33 - 86	330	65	U	86	U	43	U	33	U	39	U	37	U	39	U	48	U	88	J	34	U
Benzo[a]anthracene	230	51.8	103.5	45 - 120	330	87	U	120	U	57	U	45	U	53	U	50	U	52	U	65	U	230	J	46	U
Benzo[a]pyrene	140-380	67.5	135.0	27 - 71	330	54	U	71	U	35	U	27	U	32	U	31	U	32	U	140	J	380	J	28	U
Benzo[b]fluoranthene	170-420	80.2	160.4	37 - 98	NA	73	U	98	U	48	U	37	U	44	U	42	U	44	U	170	J	420	J	38	U
Benzo[g,h,i]perylene	69-200	45.7	91.4	33 - 86	NA	65	U	86	U	43	U	33	U	39	U	37	U	39	U	69	J	200	J	34	U
Benzo[k]fluoranthene	140-330	76.6	153.1	52 - 140	NA	100	U	140	U	67	U	52	U	61	U	58	U	60	U	140	J	330	J	53	U
Bis(2-ethylhexyl)phthalate	58-180	83.2	166.4	61 - 80	182	140	J	170	J	70	U	58	J	65	U	61	U	65	J	80	U	180	J	81	J
Chrysene	94-120	73.1	146.2	36 - 71	330	71	U	94	J	46	U	36	U	42	U	40	U	42	U	120	J	360	J	37	U
Dibenz(a,h)anthracene	-	25.5	50.9	35 - 90	330	78	U	90	U	44	U	35	U	41	U	39	U	40	U	51	U	55	U	36	U
Fluoranthene	52-380	71.1	142.1	37 - 73	330	73	U	110	J	48	U	37	U	52	J	42	U	44	U	55	U	380	J	38	U
Fluorene	-	22.9	45.7	32 - 83	330	62	U	83	U	41	U	32	U	37	U	36	U	37	U	46	U	50	U	33	U
Indeno[1,2,3-cd]pyrene	61-190	46.3	92.6	37 - 98	NA	73	U	98	U	48	U	37	U	44	U	42	U	44	U	61	J	190	J	38	U
Naphthalene	-	19.7	39.4	27 - 71	330	54	U	71	U	35	U	27	U	32	U	31	U	32	U	40	U	44	U	28	U
Phenanthrene	-	30.2	60.3	42 - 110	330	82	U	110	U	54	U	42	U	49	U	47	U	49	U	61	U	66	U	43	U
Pyrene	50-510	89.1	178.2	29 - 56	330	56	U	170	J	37	U	29	U	50	J	32	U	34	U	52	J	510	J	30	U
Total PAHs (detects only)[4]	-	438.5	877	27 - 140	1684	-		374		-		-		102		-		-		752		3157		-	

Notes
ESV: Ecological screening value.
NA: Ecological screening value not available.
U: Non Detect; U values shown here are method detection limits (MDLs); see footnote #1.
J: Estimated value; the analyte was positively identified but its concentration was less than the reporting limit (RL) but greater than MDL.
(1) This table was excerpted from the Zone J RFI (Tetra Tech, 2011); data are originally from Table 3-1 of Spectra Tech (2006b) except U values shown here are MDLs from Appendix A of the Spectra Tech report; U values in Table 3-1 of Spectra Tech (2006b) are RLs.
(2) Average of all samples calculated using ½ the sample specific MDL for nondetected samples.
(3) Sample-specific MDLs in nondetect samples.
(4) Total PAHs = the sum of detected concentrations of individual PAH compounds (non-detected compounds ignored).

TABLE 8-5

EXPOSURE PARAMETERS FOR THE TERRESTRIAL WILDLIFE MODEL
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Species/Exposure Inputs	Conservative Inputs		Average Inputs	
	Values	Units	Values	Units
American Robin				
Body Weight	7.73E-02	kg	8.04E-02	kg
Food Ingestion Rate	1.25E-02	kg/day	1.19E-02	kg/day
Soil/Sediment Ingestion Rate	2.046E-03	kg/day	7.601E-04	kg/day
Short-Tailed Shrew				
Body Weight	1.500E-02	kg	1.610E-02	kg
Food Ingestion Rate	1.600E-03	kg/day	1.433E-03	kg/day
Soil/Sediment Ingestion Rate	4.801E-05	kg/day	1.289E-05	kg/day
Carolina Wren				
Body Weight	1.420E-02	kg	1.760E-02	kg
Food Ingestion Rate	4.630E-03	kg/day	4.070E-03	kg/day
Soil/Sediment Ingestion Rate	7.593E-04	kg/day	2.605E-04	kg/day
Star-Nosed Mole				
Body Weight	3.400E-02	kg	5.600E-02	kg
Food Ingestion Rate	5.610E-03	kg/day	4.560E-03	kg/day
Soil/Sediment Ingestion Rate	1.683E-04	kg/day	4.104E-05	kg/day
Mink				
Body Weight	5.50E-01	kg	5.68E-01	kg
Food Ingestion Rate	6.78E-02	kg/day	2.27E-02	kg/day
Soil/Sediment Ingestion Rate	6.4E-03	kg/day	2.1E-03	kg/day
Green Heron				
Body Weight	2.00E-01	kg	2.12E-01	kg
Food Ingestion Rate	3.10E-02	kg/day	3.00E-02	kg/day
Soil/Sediment Ingestion Rate	1.60E-03	kg/day	1.50E-03	kg/day

Notes:
The exposure factors were derived as presented in Appendix D.
Food ingestion rates are dry-weight values.

The soil/sediment ingestion rates were calculated by multiplying the food ingestion rates by the following incidental soil/sediment ingestion rates:

	Conservative	Average	Source
American Robin	16.40%	6.40%	1,2
Short-tailed Shrew	3%	0.90%	1
Carolina Wren	16.40%	6.40%	1,2
Star-Nosed Mole	3%	0.90%	3
Mink	9.4%	9.4%	4
Green Heron	5%	5%	see Appendix D

1 - USEPA (U.S. Environmental Protection Agency), 2007b. Attachment 4-1. Ecological Soil Screening Level Guidance, Office of Emergency and Remedial Response. February.
2 - Based on the American woodcock
3 - Based on the Short-tailed shrew
4 - Based on the Raccoon

TABLE 8-6

TERRESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO
INSECTIVOROUS RECEPTORS
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Insectivorous Receptors EEQs			
	Robin		Short-Tailed Shrew	
	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics				
ARSENIC	1.5E+00	7.6E-01	8.9E-01	2.0E-01
CHROMIUM	1.5E+00	2.6E-01	8.1E-01	3.3E-02
COPPER	1.4E+00	1.6E-01	5.3E-01	3.6E-02
LEAD	4.2E+00	1.5E-01	7.0E-01	1.8E-02
MERCURY	3.9E+01	3.9E+00	4.4E+00	8.8E-01
NICKEL	1.1E+00	3.9E-01	2.5E+00	2.9E-01
SELENIUM	3.5E+00	1.2E+00	3.8E+00	8.1E-01
ZINC	2.0E+00	7.8E-01	1.1E+00	2.7E-01

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE 8-7

TERRESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO
WETLAND INVERTIVORE RECEPTORS
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Wetland Insectivores EEQs			
	Star-nosed Mole		Carolina wren	
	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics				
ARSENIC	4.5E+00	2.4E+00	1.2E+01	5.7E+00
CHROMIUM	1.9E+00	7.7E-02	4.2E+00	7.2E-01
COPPER	7.7E+00	5.5E-01	2.2E+01	2.6E+00
LEAD	1.8E+00	4.7E-02	1.3E+01	4.7E-01
MERCURY	2.4E+01	4.8E+00	2.5E+02	2.5E+01
NICKEL	8.4E+00	9.7E-01	4.5E+00	1.6E+00
SELENIUM	7.9E+00	4.8E+00	8.8E+00	4.4E+00
ZINC	5.2E+00	2.6E+00	1.2E+02	1.3E+01

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE 8-8

TERESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO
PISCIVOROUS RECEPTORS
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Mink EEQ_{NOAEL}	Mink EEQ_{LOAEL}	Green Heron EEQ_{NOAEL}	Green Heron EEQ_{LOAEL}
Inorganics				
Arsenic	8.6E+00	2.0E+00	4.8E+00	2.4E+00
Chromium	1.6E+00	6.5E-02	1.6E+00	2.8E-01
Copper	6.0E+00	4.1E-01	1.0E+01	1.2E+00
Lead	1.5E+00	3.8E-02	5.2E+00	1.9E-01
Mercury	1.8E+01	3.7E+00	1.1E+02	1.1E+01
Nickel	6.5E+00	7.4E-01	2.0E+00	7.3E-01
Selenium	8.8E+00	1.9E+00	5.2E+00	1.9E+00
Zinc	8.3E+00	2.1E+00	1.2E+01	4.6E+00

Notes:
Cells are shaded if the HQ is greater than 1.0.
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level

TABLE 8-9

TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO
INSECTIVOROUS RECEPTORS
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Insectivorous Receptors EEQs			
	Robin		Short-Tailed Shrew	
	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics				
ARSENIC	3.3E-01	1.6E-01	2.7E-01	6.2E-02
CHROMIUM	4.5E-01	7.7E-02	2.6E-01	1.1E-02
COPPER	5.4E-01	6.2E-02	2.1E-01	1.4E-02
LEAD	1.6E+00	6.0E-02	3.0E-01	7.6E-03
MERCURY	1.9E+01	1.9E+00	2.2E+00	4.3E-01
NICKEL	3.4E-01	1.2E-01	7.7E-01	8.8E-02
SELENIUM	6.6E-01	2.3E-01	7.6E-01	1.6E-01
ZINC	1.03E+00	4.0E-01	5.3E-01	1.3E-01

Cells are shaded if the value is greater than 1.0.

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE 8-10

TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO
WETLAND INVERTIVORE RECEPTORS
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA

Chemical	Wetland Insectivores EEQs			
	Star-nosed Mole		Carolina Wren	
	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics				
ARSENIC	1.7E-01	9.0E-02	7.1E-01	3.5E-01
CHROMIUM	8.2E-02	3.4E-03	3.2E-01	5.4E-02
COPPER	5.6E-01	4.0E-02	2.4E+00	2.7E-01
LEAD	5.5E-02	1.4E-03	7.6E-01	2.8E-02
MERCURY	1.1E+00	2.2E-01	1.6E+01	1.6E+00
NICKEL	3.3E-01	3.8E-02	2.6E-01	9.4E-02
SELENIUM	5.8E-01	3.5E-01	8.7E-01	4.4E-01
ZINC	1.6E-01	7.8E-02	5.1E+00	5.6E-01

Cells are shaded if the value is greater than 1.0.

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

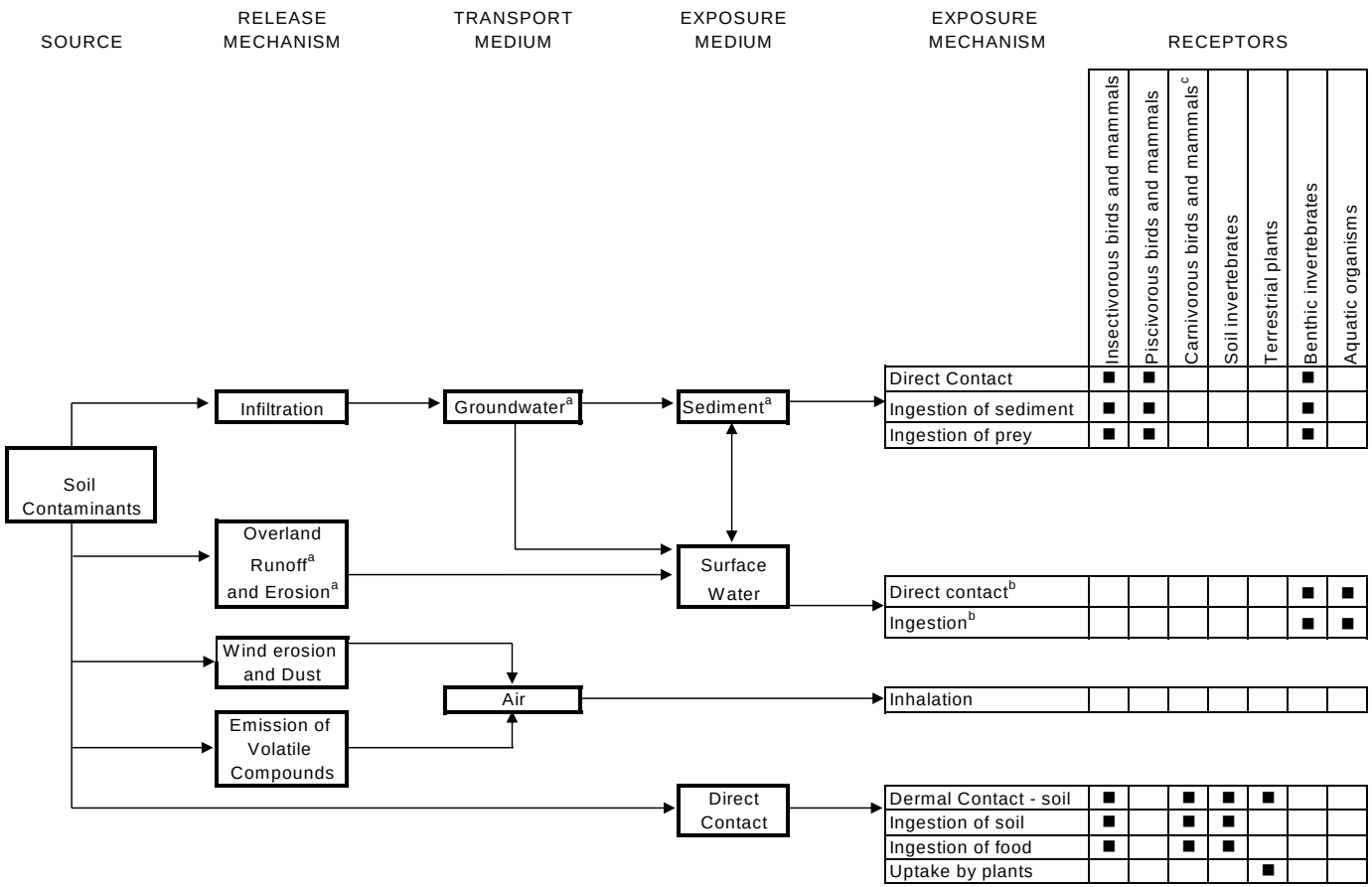
TABLE 8-11

TERESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO
PISCIVOROUS RECEPTORS
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Mink EEQ_{NOAEL}	Mink EEQ_{LOAEL}	Green Heron EEQ_{NOAEL}	Green Heron EEQ_{LOAEL}
Inorganics				
Arsenic	3.0E-01	6.8E-02	4.0E-01	2.0E-01
Chromium	7.1E-02	2.9E-03	1.8E-01	3.0E-02
Copper	3.0E-01	2.0E-02	1.4E+00	1.7E-01
Lead	5.5E-02	1.4E-03	4.2E-01	1.5E-02
Mercury	5.8E-01	1.2E-01	9.9E+00	9.9E-01
Nickel	1.9E-01	2.1E-02	1.5E-01	5.6E-02
Selenium	4.3E-01	9.4E-02	7.3E-01	2.6E-01
Zinc	1.7E-01	4.3E-02	6.8E-01	2.6E-01

Notes:
Cells are shaded if the HQ is greater than 1.0.
EEQ - Ecological Hazard Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level

FIGURE 8-1
CONCEPTUAL EXPOSURE MODEL
AOC 721
CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SOUTH CAROLINA



■ Complete exposure pathway

a The grounwdwater, overland runoff, and erosion pathways are probably minimal, but are assumed to be complete.

b The surface water salinity in samples collected at the site (9.6 to 11.2 ppt) was too saline for drinking by most wildife. In addition, no bioaccumulative chemicals were COPCs in surface water. Thus, surface water was not included in food chain modeling for insectivorous and piscivorous wildlife.

c Not quantitatively evaluated; see Section 8.5.2.6.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 SUMMARY OF HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

9.1.1 Baseline Human Health Risk Assessment

The baseline HHRA for AOC 721 was performed to characterize the potential risks to likely human receptors under current and possible future land use. Potential receptors retained for quantitative evaluation included current/future construction workers, industrial workers, adolescent trespassers, adult and child recreational users, and hypothetical child and adult residents. Surface soil, groundwater, surface water, and sediment were evaluated in the assessment.

Cumulative HIs for the typical industrial worker, adolescent trespassers, and adult recreational users under the RME scenario are less than or equal to unity (1). The cumulative HI for the construction worker exceeded unity, but HIs calculated on a target organ/target effect specific basis did not exceed unity. HIs for the child recreational user exposed to surface soil (HI = 3), for the hypothetical child resident exposed to surface soil (HI = 9), for the hypothetical child resident exposed to groundwater (HI = 108), and for hypothetical adult resident exposed to groundwater (HI= 46) exceeded unity even when calculated on a target organ/target effect specific basis. The primary risk drivers (i.e., COPCs contributing most to the elevated risk estimates) are arsenic and thallium in surface soil and antimony, arsenic, manganese, and thallium in groundwater. However, note that the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. For thallium, a provisional toxicity value was provided by USEPA's National Center for Environmental Assessment for the purposes of developing screening levels for soil and groundwater. However, USEPA concluded that available human studies do not support derivation of an oral RfD. Therefore, while the provisional value was used for screening and evaluating the likelihood for noncarcinogenic effects, the results will not be used to determine whether thallium should be a contaminant of concern.

Cumulative ILCRs for construction workers, typical workers, adolescent trespassers, child recreational users, adult recreational users, and lifelong recreational users exposed to the surface soil, groundwater, and sediments of AOC 721 were less than or within the USEPA's target risk range of 10^{-4} to 10^{-6}. In contrast, cumulative ILCRs estimated for the following receptors hypothetically exposed to AOC 721 surface soil and groundwater exceeded the USEPA's target risk range:

Receptor	Medium	ILCR
Child Resident	Surface soil	2E-04
Child Resident	Groundwater	2E-03

Adult Resident	Groundwater	3E-03
Lifelong Resident	Surface Soil	2E-04
Lifelong Resident	Groundwater	5E-03

Arsenic was the main contributor to the ILCRs for exposure to soil. However, note that the maximum concentration of arsenic detected in surface soil only slightly exceeds the AOC 721 background value. Arsenic, chromium (evaluated using hexavalent chromium toxicity criteria), bis(2-ethylhexyl) phthalate, and heptachlor were the main contributors to the ILCRs for groundwater.

9.1.2 Ecological Risk Assessment

The ERA for AOC 721 consisted of Steps 1, 2, and 3a of the eight-step ERA process. After the Step 3a refinement, no COPCs were retained for aquatic organisms, terrestrial plants, or soil invertebrates. COPCs retained after the Step 3a refinement for sediment consisted of arsenic, cobalt, mercury, selenium, and zinc; because concentrations of these chemicals in some samples exceeded their respective PEL or AET values, indicating expected impacts to sediment invertebrates.

Food chain modeling was conducted to evaluate potential risks to terrestrial wildlife from bioaccumulative COPCs in surface soil and sediment. The surface soil and sediment data sets were combined to provide a more robust exposure scenario for wildlife. Insectivorous and piscivorous species of birds and mammals representative of those that would likely inhabit AOC 721 were selected as surrogate species; these consisted of the short-tailed shrew, American robin, star-nosed mole, Carolina wren, mink, and green heron. Under the average scenario, mercury was retained as a COPC for insectivorous birds represented by the robin and wren, and for piscivorous birds represented by the green heron.

9.2 RECOMMENDATIONS

Cumulative HIs for the child recreational user (HI = 3) and child resident (HI = 9) exposed to surface soil exceeded unity even when calculated on a target organ/target effect specific basis, due primarily to arsenic and thallium. Cumulative HIs for the child resident (HI = 108) and adult resident (HI = 46) exposed to groundwater exceeded unity, due primarily to antimony, arsenic, manganese, and thallium. Cumulative ILCRs for various resident scenarios exceeded the USEPA's target risk range due primarily to arsenic in soil, and to arsenic, chromium (evaluated using toxicity criteria for hexavalent chromium) bis(2-ethylhexyl) phthalate, and heptachlor in groundwater. As noted previously for thallium, a provisional toxicity value was provided by USEPA's National Center for Environmental Assessment for the purposes of developing screening levels for soil and groundwater. However, USEPA concluded that available human studies do not support derivation of an oral RfD. Therefore, while the provisional value was used for screening and evaluating the likelihood for noncarcinogenic effects, the results will not be used to

determine whether thallium should be a contaminant of concern. The ERA recommended that arsenic, cobalt, mercury, selenium, and zinc be retained as COPCs because concentrations of these five chemicals in some samples indicated expected impacts to sediment invertebrates. The ERA also recommended that mercury in sediment be retained as a COPC for insectivorous and piscivorous birds based on food chain modeling. It is therefore recommended that a CMS be conducted to address the above chemicals with the exception of thallium in soil/sediment and groundwater.

10.0 REFERENCES

ANZECC (Australian and New Zealand Environment and Conservation Council). 2000. ANZECC Water Quality Guidelines, Volume 1, The Guidelines. Available online at http://www.mfe.govt.nz/publications/oceans.

ATSDR (Agency for Toxic Substances and Disease Registry), 1989. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Public Health Service. Atlanta, Georgia. October.

Amdur, M.O., J. Doull C.D. Klassen eds., 1991. Casarett and Doull's Toxicology: The Basic Science of Poisons 3rd edition Macmillan Press New York, New York.

Ankley, Gerald T., D.M. Di Toro, D.J. Hansen, and W.J. Berry, 1995. Technical Basis and Proposal for Deriving Sediment Quality Criteria for Metals. Environmental Toxicology and Chemistry. Vol. 15(12), pp. 2056-2066.

Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pages. http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html.

CCME (Canadian Council of Ministers of the Environment), 2006. Recommended Canadian Soil Quality Guidelines. Ottawa, Ontario. November.

CH2M-Jones (CH2MHill, Inc./J.A. Jones, Inc.), 2002. CMS Work Plan/Interim Measure Completion Report, SWMU 44, Zone C. Charleston, South Carolina. May.

Clarkson, Thomas W., 1983. "Molecular Targets of Metal Toxicity" in Chemical Toxicology and Clinical Chemistry of Metals Academic Press, Inc., Orlando, Florida.

EC (Environment Canada), 1999a. Canadian Soil Quality Guidelines for Mercury. Scientific Supporting Document. National Guidelines and Standards Office, Environmental Quality Branch, Environment Canada. Ottawa.

Edwards, N.T., 1983. Polycyclic Aromatic Hydrocarbons (PAHs) in the Terrestrial Environment – a Review. Journal of Environmental Quality 12:427-441.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten, 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory. November. ES/ER/TM-85/R3.

Eisler, R., 1987. Polycyclic Aromatic Hydrocarbon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. US Department of Interior - Fish and Wildlife Service. Biological Report 85 (1.11). May

Eisler, R., 2000. Handbook of Chemical Risk Assessment: Health Hazards to Humans, Plants, and Animals; Volume 2, Organics. Lewis Publishers, Boca Raton, FL.

EnSafe/Allen & Hoshall, 1995a. Final RCRA Facility Assessment, Naval Base Charleston. Charleston, South Carolina. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. June.

EnSafe/Allen & Hoshall, 1995b. Zone C RFI Work Plan, Naval Base Charleston. Charleston, South Carolina. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. February.

EnSafe/Allen & Hoshall, 1996. Comprehensive Sampling and Analysis Plan, RCRA Facility Investigation. Charleston, South Carolina. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. July.

EnSafe, 1997. Zone C RFI Report. Charleston, South Carolina. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. November.

EnSafe, 1998. Zone A RFI Report. NAVBASE Charleston. North Charleston, South Carolina. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. August.

EnSafe, 2003. AOC 721 RFI Work Plan, Revision 1, Charleston Naval Complex. Charleston, South Carolina. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. April.

Ensafe, 2004a. Wetland Delineation Report – Approximately 1.6-Acre Parcel Charleston Naval Complex – AOC 721 Charleston, South Carolina. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. September.

Ensafe, 2004b. AOC 721 RFI Interim Measures Work Plan, Charleston Naval Complex. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. October.

Erstfield, K.M. and J. Snow-Ashbrook, 1999. Effects of Chronic Low Level PAH Contamination on Soil Invertebrate Communities. Chemosphere 39 (12): 2117-2139.

Gibbons, J.A., and M. Alexander, 1989. Microbial Degradation of Sparingly Soluble Organic Chemicals: Phthalate Esters. Environmental Toxicology and Chemistry. 8(4): 283-291.

Howard, Philip H., 1989. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume 1.

Howard, Philip H., 1991. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume 3, Pesticides.

Lee, Byeong-Gweon, Sarah B. Griscom, Jung-Suk Lee, Heesun J. Choi, Chul-Hwan Koh, Samuel N Lucoma, and Nicholas S. Fisher, 2000. Influences of Dietary Uptake and Reactive Sulfides on Metal Bioavailability from Aquatic Sediments. Science, Volume 287, pp. 282-284. January 14.

MacDonald, D.D., 1994. Approach to the Assessment of Sediment Quality in Florida Coastal Waters Florida Department of Environmental Protection.

Navy (Department of the Navy), 1999. Navy Policy for Conducting Ecological Risk Assessments. Memo from Chief of Naval Operations to Commander, Naval Facilities Engineering Command, 05 April 1999. Department of the Navy, Washington, DC.

Navy, 2004. Navy Policy on the Use of Chemical Background Levels. January 30.

ORNL (Oak Ridge National Laboratory), 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and recommendations for the Oak Ridge Reservation. BJC/OR-112. August.

Sample, B.E., D.M. Opresko, and G.W. Suter II, 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. June. ES/ER/TM-86/R3.

Spectra Tech (Spectra Tech, Inc.), 2006a. Completion Report, AOC 721 Interim Measure, Charleston Naval Complex, North Charleston, SC. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. March 26.

Spectra Tech, Inc., 2006b. Zone J Sediment Sampling Report, Charleston Naval Complex, North Charleston, SC. Prepared for Department of the Navy, Naval Facilities Engineering Command, Southern Division. May 5.

Tetra Tech (Tetra Tech NUS, Inc.), 2008. Quality Assurance Project Plan for Supplemental RCRA Facility Investigation of AOC 721.

Tetra Tech, 2011. RCRA Facility Investigation Report for Zone J at Charleston Naval Complex, Charleston, South Carolina. Prepared for BRAC Program Management Office Southeast, North Charleston, South Carolina, November.

USEPA (U.S. Environmental Protection Agency), 1979. Water-Related Environmental Fate of 129 Priority Pollutants. EPA/440/4-79/029. Washington, D.C. December.

USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual. Part A. Interim Final. EPA/540/1-89/002. (RAGS, Part A). December.

USEPA, 1989b. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities. EPA/530-SW-89-026.

USEPA, 1991a. Standard Default Exposure Factors. Risk Assessment Guidance for Superfund. Volume I. Part A. Supplemental Guidance. NTIS PB91-921314. March.

USEPA, 1993a. Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Office of Solid Waste and Emergency Response, Washington, D.C. May.

USEPA, 1993b. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities. EPA 530/R-93-003.

USEPA, 1993c. Provisional Guidance for Quantitative Risk Assessment for Polycyclic Aromatic-Hydrocarbons. Office of Research and Development. Washington, D.C. EPA/600/R-93-089. July.

USEPA, 1994a. Revised Interim Guidance on Establishing Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive 9355.4-12, July 14, 1994.

USEPA, 1994b. Guidance Manual for the Integrated Exposure Uptake Kinetic Model for Lead in Children. EPA/540/R-93-081. Office of Emergency and Remedial Response, Washington, D.C. February.

USEPA, 1996. Region IV Standard Operating Procedures and Quality Assurance Manual (SOPQAM). May.

USEPA, 1997a. Exposure Factors Handbook. Office of Research and Development, Washington, D.C. EPA/600/P-95/002F. August.

USEPA, 1997b. Health Effects Assessment Summary Tables (HEAST), FY 1997 Update (NTIS PB97-921199). July.

USEPA, 1997c. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. Environmental Response Team. June 5.

USEPA, 2000a. Region 4 Amended Guidance on Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Activities, and Inclusion of Stakeholders. June 23.

USEPA, 2000b. Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment, Status and Needs. Office of Water, Office of Solid Waste. EPA 823-R-00-001. February.

USEPA, 2001a. Risk Assessment for Superfund (RAGS), Human Health Evaluation Manual, Part D: "Standardized Planning, Reporting, and Review of Superfund Risk Assessments" (RAGS Part D), Publication 9285.7-01D, December.

USEPA, 2001b. Guidance for Characterizing Background Chemicals in Soil at Superfund Sites. Office of Emergency and Remedial Response. EPA 540-R-01-003. OSWER 9285.7-41. June.

USEPA, 2001c. Region 4 Ecological Risk Assessment Bulletins – Supplement to RAGS. Effective April 20. http://www.epa.gov/region04/waste/ots/ecolbul.htm.

USEPA, 2002a. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10. Office of Emergency and Remedial Response, Washington, D.C., December.

USEPA, 2002b. Guidance for Characterizing Background Chemicals in Soil for CERCLA Sites. Office of Emergency and Remedial Response. EPA 540-R-01-003. OSWER 9285.7-41. September.

USEPA, 2002c. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. Office of Solid Waste and Emergency Response, Washington, D.C., December.

USEPA, 2004. Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual, Part E, "Supplemental Guidance for Dermal Risk Assessment." Office of Emergency and Remedial Response, Washington, D.C., July.

USEPA, 2005a. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001B. Risk Assessment Forum, Washington, D.C. March.

USEPA, 2005b. Supplemental Guidance on Assessing Susceptibility from Early Life Exposure to Carcinogens. EPA/630/R-03/003F. Risk Assessment Forum, Washington, D.C. March.

USEPA, 2005c. Guidance for Developing Ecological Soil Screening Level. Office of Solid Waste and Emergency and Response. OSWER Directive 92857-55. February.

USEPA, 2005d. Ecological Soil Screening Level for Antimony, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-61. February.

USEPA, 2005e. Ecological Soil Screening Level for Arsenic, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-62. March.

USEPA, 2005f. Ecological Soil Screening Level for Barium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-63. February.

USEPA, 2005g. Ecological Soil Screening Level for Cadmium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-65. March.

USEPA, 2005h. Ecological Soil Screening Level for Cobalt, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-67. March.

USEPA, 2005i. Ecological Soil Screening Level for Lead, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-70. March.

USEPA, 2005j. Ecological Soil Screening Level for Vanadium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-75. April.

USEPA, 2007a. Ecological Soil Screening Level for Selenium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-72. November.

USEPA, 2007b. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

USEPA. 2007c Ecological Soil Screening Level for Copper, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-68. February.

USEPA, 2007d. Ecological Soil Screening Level for Manganese, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-71. April.

USEPA, 2007e. Ecological Soil Screening Level for Nickel, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-76. March.

USEPA, 2007f. Ecological Soil Screening Level for Zinc, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-73. November.

USEPA, 2008. Ecological Soil Screening Level for Chromium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-66. April.

USEPA, 2009a. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, “Supplemental Guidance for Inhalation Risk Assessment”), Final. Office of Superfund Remediation and Technology Innovation, Washington, D.C. 20460 EPA-540-R-070-002, OSWER 9285.7-82, January.

USEPA, 2010a. ProUCL Version 4.1.00 User Guide. Office of Research and Development, Washington, D.C. EPA/600/R-07/038, May.

USEPA, 2010b. Provisional Peer-Reviewed Toxicity Values for Thallium and Compounds. Superfund Health Risk Technical Support Center, National Center for Environmental Assessment. Cincinnati, Ohio. October.

USEPA, 2011. USEPA Technical Review Workgroup for Lead. Guidance Document. "Frequently Asked Question (FAQs) on the Adult-Lead Model." http://www.epa.gov/superfund/lead/almfaq.htm. February.

USEPA, 2012a. 2012 Edition of the Drinking Water Standards and Health Advisories. Office of Water, Washington, D.C. EPA 822-S-12-001. April.

USEPA, 2012b. Regional Screening Levels for Chemical Contaminants at Superfund Sites, prepared by Oak Ridge National Laboratory. http://epa-prgs.ornl.gov/chemicals/index.shtml. May.

USEPA, 2012c. Integrated Risk Information System (IRIS) - On-Line Database, August.

APPENDIX A

ANALYTICAL DATA

A-1 SOIL ANALYTICAL RESULTS SUMMARY

A-2 GROUNDWATER ANALYTICAL RESULTS SUMMARY

A-3 SEDIMENT ANALYTICAL RESULTS SUMMARY

A-4 SURFACE WATER ANALYTICAL RESULTS SUMMARY (2003)

A-5 SURFACE WATER ANALYTICAL RESULTS SUMMARY (1995 AND 1998)

APPENDIX A-1

SOIL ANALYTICAL RESULTS SUMMARY

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SB001	C044SB002	C044SB003	C044SB004	C044SB004	C044SB005	C044SB006	C044SB006	C044SB007	C044SB008	C044SB023	C044SB024	C044SB025	C044SB026	C044SB027	C044SB027	C044SB027	C044SB028	C044SB028	C044SB028	C044SB028	C044SB029	C044SB029
SAMPLE ID	044SB00101	044SB00201	044SB00301	044SB00402	044SB00401	044SB00501	044SB00601a	044SB00601b	044SB00701	044SB00801	044SB02301	044SB02401	044SB02501	044SB02601	044SB02702	044SB02703	044SB02701	044SB02801	044SB02804	044SB02802	044SB02803	044SB02901	044SB02901_LGCY
TOP DEPTH	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	3	0	0	3	3	3	0	0
BOTTOM DEPTH	1	1	1	5	1	1	1	1	1	1	1	1	1	1	5	5	1	1	5	5	5	1	1
SAMPLE DATE	3/13/1995	3/13/1995	3/14/1995	3/14/1995	3/14/1995	3/14/1995	3/14/1995	9/13/1995	3/14/1995	3/14/1995	6/27/1995	6/27/1995	1/17/1997	1/17/1997	8/11/1997	8/11/1997	8/11/1997	8/11/1997	8/11/1997	8/11/1997	8/11/1997	6/28/2001	6/28/2001
METALS (MG/KG)																							
ALUMINUM	1240	6220	5040	28900	4540	8790	17500	--	5920	5230	2570	2440	36600	2800	394	16400	21900	25100	3440	15000	6020	--	--
ANTIMONY	0.21 UJ	0.21 UJ	0.27 UJ	0.34 UJ	0.23 UJ	0.28 UJ	0.48 UJ	--	0.42 UJ	0.60 UJ	1.1 J	0.85 J	0.55 UJ	0.34 UJ	0.21 U	0.55 J	0.48 J	0.31 J	0.21 U	0.29 U	0.26 U	--	--
ARSENIC	1.3 J	6.5 J	5 J	12.3 J	4.1 J	13.8 J	103 J	--	19 J	53.6 J	12.6	7.6	26.6	2.8 J	0.39 U	7.8	22.4	19.4	5.5	15.9	8.2	85 S	69.3
BARIUM	7 J	16.1 J	12.2 J	37.4	23 J	26.1	55.4	--	27.2	39	45.4	28.2	46.4 J	6.7 J	1.4	21.5	29.9	38.3	7.5	28.6	8.7	--	--
BERYLLIUM	0.10 UJ	0.28 J	0.22 J	1.3 J	0.65 J	0.46 J	2 J	--	0.26 J	0.55 J	0.24 U	0.19 U	1.9	0.16 J	0.05 U	1.5 U	1.3 U	1.5 U	0.24 U	1.1 U	0.60 U	--	--
CADMIUM	0.05 U	0.09 J	0.11 J	1.2	0.40 J	0.44 J	3.6	--	0.9	0.49 J	0.41 U	0.26 U	0.51 J	0.22 U	0.04 U	0.08 U	0.07 U	0.05 U	0.04 U	0.06 U	0.05 U	--	--
CALCIUM	76700 J	3140 J	14000 J	5700 J	43300 J	2030 J	1350 J	--	128000 J	7270 J	31300	28900	27900	5840	268	2650	3540	5060	400	22800	1410	--	--
CHROMIUM	3.4 J	7.1 J	12.8 J	43.7 J	19 J	15.1 J	46.9 J	--	18.2 J	61.5 J	11.2	22.7	54.3	7.3	1 J	37.1	38.2	43.4	8.4	28.1	16.1	--	--
COBALT	0.88 J	1.7 J	1.7 J	7.9 J	5 J	3.5 J	8.6 J	--	2.5 J	4.8 J	1.4 J	6.4	13.6 J	5.6 J	0.15 U	6.3 J	8.3	8.6	0.70 U	6.8	2.3 U	--	--
COPPER	1 UJ	6.5 J	11.8 J	37.1 J	14.8 J	24.1 J	122 J	--	38 J	34.9 J	33.7	207	43.9 J	4.5 J	0.59 J	7.3	46.5	33.6	1.4 J	23.6	3.3 J	--	--
CYANIDE	0.56 U	0.55 U	0.57 U	0.90 U	0.62 U	0.64 U	1.3 U	--	0.56 U	0.60 U	--	--	0.16 U	0.12 U	--	--	--	--	--	--	--	--	--
IRON	2420 J	8010 J	4350 J	29700 J	6340 J	10800 J	99500 J	--	8760 J	11000 J	4070	4200	31900	3520	568	26100	27800	42900	7760	25200	13300	--	--
LEAD	1.7 J	7 J	20.1 J	46 J	11 J	32.1 J	37.8 J	--	82.7 J	50.3 J	65.2	80.6	64.2	26.1	0.84	13.5	40.5	53	2.5	33.1	6.2	--	--
MAGNESIUM	437 J	245 J	711	4170	1630	942	2090	--	2450	692	556	918	5780	514 J	326 J	6410 J	5790 J	5350 J	576 J	4080 J	2510 J	--	--
MANGANESE	42.9 J	38.5 J	34 J	171 J	57.3 J	86.3 J	96.3 J	--	111 J	104 J	56	52.4	408	199	5.7	289	150	780	11.3	513	121	--	--
MERCURY	0.11 UJ	0.11 UJ	0.72 J	0.46 J	0.12 UJ	0.20 J	0.21 UJ	--	1 J	0.12 J	0.25	0.12	0.53	0.15	0.02 U	0.06 U	0.21	0.83	0.04 U	0.24	0.03 U	--	--
NICKEL	2.4 J	4.4	4.4 J	13.6	15.3	9.2	43.4	--	16.6	11.8	6.6	15.3	36.9	14	0.32 J	10.9 J	11.6 J	12.8 J	0.89 J	11.3 J	4.4 J	--	--
POTASSIUM	156 J	215 J	308 J	2660 J	672 J	714 J	8610 J	--	1070 J	566 J	194 J	163 J	3810	252 J	145 J	3720 J	3090 J	3100 J	382 J	1980 J	1480 J	--	--
SELENIUM	0.48 UJ	1.1 J	0.51 UJ	1.8 J	1.6 J	1.2 J	8.8 J	--	0.99 J	1.4 J	0.64	0.51 U	0.72 J	0.45 U	0.44 U	2.4	2.6	2.8	0.62 J	1.9	1.1	--	--
SILVER	0.07 UJ	0.07 UJ	0.07 UJ	0.11 UJ	0.07 UJ	0.07 UJ	0.15 UJ	--	0.07 UJ	0.07 UJ	0.05 U	0.08 J	0.36 UJ	0.29 UJ	0.13 U	0.26 U	0.23 U	0.18 U	0.13 U	0.18 U	0.16 U	--	--
SODIUM	1120 J	132 U	162 J	458 J	360 J	518 J	3240 J	--	506 J	147 U	237 J	261 J	7270 J	367 J	1880	13100	10100	4200	832	3300	2790	--	--
THALLIUM	0.60 U	0.61 U	0.63 U	0.97 U	0.67 U	0.68 U	2.4 J	--	0.62 U	0.66 U	0.49 U	0.52 U	1.6 U	1.3 U	0.65 U	3.2	3.7	5.8	0.77 J	2.8	1.3 J	--	--
TIN	1 J	0.87 U	1.3 J	1.4 U	0.96 U	0.97 U	2 U	--	1.3 J	1.5 J	3.3 J	3.4 J	14.5 U	11.6 U	1.8 U	3.6 U	3.2 U	3.3 J	1.8 U	2.6 U	2.2 U	--	--
VANADIUM	3.8 J	11.7	10.5	71.7	12.6	18.7	42	--	15	18.8	7.4	6.3	68.2	7.1 J	0.89 J	36.1	68.5	85.3	13.1	49.5	20.5	--	--
ZINC	6.4	14	37.1	132	49.3	68.1	123	--	93.6	141	74.4 J	87.8 J	279	65.5	1.4 J	39.3	166	120	4	97.3	17.4	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	0.10 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	3600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	0.955	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	0.22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	8570	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	2.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	52	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZOIC ACID	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	**C044SB001**	**C044SB002**	**C044SB003**	**C044SB004**	**C044SB004**	**C044SB005**	**C044SB006**	**C044SB006**	**C044SB007**	**C044SB008**	**C044SB023**	**C044SB024**	**C044SB025**	**C044SB026**	**C044SB027**	**C044SB027**	**C044SB027**	**C044SB028**	**C044SB028**	**C044SB028**	**C044SB028**	**C044SB029**	**C044SB029**
SAMPLE ID	**044SB00101**	**044SB00201**	**044SB00301**	**044SB00402**	**044SB00401**	**044SB00501**	**044SB00601a**	**044SB00601b**	**044SB00701**	**044SB00801**	**044SB02301**	**044SB02401**	**044SB02501**	**044SB02601**	**044SB02702**	**044SB02703**	**044SB02701**	**044SB02801**	**044SB02804**	**044SB02802**	**044SB02803**	**044SB02901**	**044SB02901_LGCY**
TOP DEPTH	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**0**	**0**	**3**	**3**	**3**	**0**	**0**
BOTTOM DEPTH	**1**	**1**	**1**	**5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**5**	**5**	**1**	**1**	**5**	**5**	**5**	**1**	**1**
SAMPLE DATE	**3/13/1995**	**3/13/1995**	**3/14/1995**	**3/14/1995**	**3/14/1995**	**3/14/1995**	**3/14/1995**	**9/13/1995**	**3/14/1995**	**3/14/1995**	**6/27/1995**	**6/27/1995**	**1/17/1997**	**1/17/1997**	**8/11/1997**	**8/11/1997**	**8/11/1997**	**8/11/1997**	**8/11/1997**	**8/11/1997**	**8/11/1997**	**6/28/2001**	**6/28/2001**
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SB030	C044SB030	C044SB031	C044SB031	C044SB032	C044SB032	C044SB033	C044SB034	C044SB035	C044SB036	C044SB037	C044SB038	C044SB039	C044SB040	C044SB041	C044SB042	C044SB043	C044SB044	C044SB045	C044SB046	C044SB047	C044SB048	C044SB049
SAMPLE ID	044SB03001_LGCY	044SB03001	044SB03101_LGCY	044SB03101	044SB03201_LGCY	044SB03201	044SB03302	044SB03402	044SB03502	044SB03601	044SB03701	044SB03801	044SB03901	044SB04001	044SB04101	044SB04201	044SB04301	044SB04402	044SB04502	044SB04602	044SB04701	044SB04801	044SB04901
TOP DEPTH	0	0	0	0	0	0	3	3	3	0	0	0	0	0	0	0	0	3	3	3	0	0	0
BOTTOM DEPTH	1	1	1	1	1	1	5	5	5	1	1	1	1	1	1	1	1	5	5	5	1	1	1
SAMPLE DATE	6/28/2001	6/28/2001	6/28/2001	6/28/2001	6/28/2001	6/28/2001	7/31/2001	7/31/2001	7/31/2001	7/30/2001	7/30/2001	7/30/2001	7/30/2001	7/30/2001	7/30/2001	7/30/2001	7/30/2001	7/31/2001	7/31/2001	7/31/2001	7/31/2001	7/31/2001	7/31/2001
METALS (MG/KG)																							
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	104	130 S	283	340 S	110 S	97.8	31.3 J	9.87 J	9.36 J	11.1 J	10 J	21 J	23.8 J	18.7 J	8 J	12.1 J	13.8 J	168	10.3 J	35 J	56.8 J	18.3 J	9.04 J
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NICKEL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZOIC ACID	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	**C044SB030**	**C044SB030**	**C044SB031**	**C044SB031**	**C044SB032**	**C044SB032**	**C044SB033**	**C044SB034**	**C044SB035**	**C044SB036**	**C044SB037**	**C044SB038**	**C044SB039**	**C044SB040**	**C044SB041**	**C044SB042**	**C044SB043**	**C044SB044**	**C044SB045**	**C044SB046**	**C044SB047**	**C044SB048**	**C044SB049**
SAMPLE ID	**044SB03001_LGCY**	**044SB03001**	**044SB03101_LGCY**	**044SB03101**	**044SB03201_LGCY**	**044SB03201**	**044SB03302**	**044SB03402**	**044SB03502**	**044SB03601**	**044SB03701**	**044SB03801**	**044SB03901**	**044SB04001**	**044SB04101**	**044SB04201**	**044SB04301**	**044SB04402**	**044SB04502**	**044SB04602**	**044SB04701**	**044SB04801**	**044SB04901**
TOP DEPTH	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**3**	**0**	**0**	**0**
BOTTOM DEPTH	**1**	**1**	**1**	**1**	**1**	**1**	**5**	**5**	**5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**5**	**5**	**5**	**1**	**1**	**1**
SAMPLE DATE	**6/28/2001**	**6/28/2001**	**6/28/2001**	**6/28/2001**	**6/28/2001**	**6/28/2001**	**7/31/2001**	**7/31/2001**	**7/31/2001**	**7/30/2001**	**7/30/2001**	**7/30/2001**	**7/30/2001**	**7/30/2001**	**7/30/2001**	**7/30/2001**	**7/30/2001**	**7/31/2001**	**7/31/2001**	**7/31/2001**	**7/31/2001**	**7/31/2001**	**7/31/2001**
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SB050	C044SB051	C044SB052	C044SB053	C044SB054	C044SB055	C044SB056	C044SB057	C044SB058	C044SB059	C044SB060	C044SB061	C044SB062	C044SB063	C044SB064	C044SB065	C044SB066	C044SB067	C044SB068	C044SB069	C044SB070	C044SB071	C044SB072
SAMPLE ID	044SB05001	044SB05101	044SB05201	044SB05302	044SB05402	044SB05502	044SB05602	044SB05702	044SB05802	044SB05902	044SB06002	044SB06102	044SB06201	044SB06301	044SB06401	044SB06501	044SB06601	044SB06702	044SB06802	044SB06902	044SB07002	044SB07101	044SB07201
TOP DEPTH	0	0	0	3	3	3	3	3	3	3	3	3	0	0	0	0	0	3	3	3	3	0	0
BOTTOM DEPTH	1	1	1	5	5	5	5	5	5	5	5	5	1	1	1	1	1	5	5	5	5	1	1
SAMPLE DATE	7/31/2001	7/31/2001	7/31/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001	7/31/2001	7/31/2001	7/31/2001	7/31/2001	7/30/2001	8/7/2001	8/7/2001	8/7/2001	8/7/2001	9/6/2001	9/6/2001	9/6/2001	9/6/2001	9/6/2001	9/6/2001
METALS (MG/KG)																							
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	13 J	9.81 J	57.5	17.3	20.2	5.94	62.7	99.4	16.4	15	23	24	39.9	76.8 J	233 J	85.6 J	18.2 J	6.69	7.36	9.72	15.3	15.1	40.5
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NICKEL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZOIC ACID	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	**C044SB050**	**C044SB051**	**C044SB052**	**C044SB053**	**C044SB054**	**C044SB055**	**C044SB056**	**C044SB057**	**C044SB058**	**C044SB059**	**C044SB060**	**C044SB061**	**C044SB062**	**C044SB063**	**C044SB064**	**C044SB065**	**C044SB066**	**C044SB067**	**C044SB068**	**C044SB069**	**C044SB070**	**C044SB071**	**C044SB072**
SAMPLE ID	**044SB05001**	**044SB05101**	**044SB05201**	**044SB05302**	**044SB05402**	**044SB05502**	**044SB05602**	**044SB05702**	**044SB05802**	**044SB05902**	**044SB06002**	**044SB06102**	**044SB06201**	**044SB06301**	**044SB06401**	**044SB06501**	**044SB06601**	**044SB06702**	**044SB06802**	**044SB06902**	**044SB07002**	**044SB07101**	**044SB07201**
TOP DEPTH	**0**	**0**	**0**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**3**	**3**	**0**	**0**
BOTTOM DEPTH	**1**	**1**	**1**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**1**	**1**	**1**	**1**	**1**	**5**	**5**	**5**	**5**	**1**	**1**
SAMPLE DATE	**7/31/2001**	**7/31/2001**	**7/31/2001**	**8/3/2001**	**8/3/2001**	**8/3/2001**	**8/3/2001**	**8/3/2001**	**7/31/2001**	**7/31/2001**	**7/31/2001**	**7/31/2001**	**7/30/2001**	**8/7/2001**	**8/7/2001**	**8/7/2001**	**8/7/2001**	**9/6/2001**	**9/6/2001**	**9/6/2001**	**9/6/2001**	**9/6/2001**	**9/6/2001**
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SB073	C044SB074	C044SB075	C044SB076	C044SBC01	C044SBC01	C044SBC02	C044SBC02	C044SBC03	C044SBC03	C044SBC04	C044SBC04	C044SBC05	C044SBC05	C044SBC06	C044SBC06	C044SBC07	C044SBC07	C044SBC08	C044SBC08	C044SBC09	C044SBC10	C044SBC10
SAMPLE ID	044SB07301	044SB07401	044SB07501	044SB07601	044SBC0102	044SBC0101	044SBC0201	044SBC0202	044SBC0302	044SBC0301	044SBC0401	044SBC0402	044SBC0501	044SBC0502	044SBC0602	044SBC0601	044SBC0702	044SBC0701	044SBC0802	044SBC0801	044SBC0901	044SBC1002	044SBC1001
TOP DEPTH	0	0	0	0	3	0	0	3	3	0	0	3	0	3	3	0	3	0	3	0	0	3	0
BOTTOM DEPTH	1	1	1	1	5	1	1	5	5	1	1	5	1	5	5	1	5	1	5	1	1	5	1
SAMPLE DATE	11/9/2001	11/9/2001	11/9/2001	11/9/2001	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999
METALS (MG/KG)																							
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	50.9 J	68.4 J	73.8 J	11.7 J	5.2 J	11.8 J	7.5 J	11 J	11.3 J	20.2	4.2 J	3.3 J	5.7 J	17.5 J	16.7 J	6.4 J	4.9 J	4 J	15.3 J	5.2 J	17.3 J	16.3 J	9.5 J
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	--	--	--	--	0.51 J	0.10 J	0.42 J	0.68 J	0.56 J	0.24 J	0.51 J	0.35 J	0.48 J	0.27 J	0.29 J	0.04 U	0.22 J	0.47 J	0.05 U	0.28 J	0.68 J	0.06 J	0.03 U
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	--	--	--	--	11.6 J	14.3 J	11.5 J	16.6 J	27.5 J	24.1 J	16 J	11.7 J	14.4 J	27.3 J	21.4 J	4.2 J	5.7 J	11.2 J	8.9 J	11 J	14 J	5.4 J	4.9 J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	0.04 U	0.06	0.28	0.05 J	0.05 U	0.3	0.05 J	0.05 U	0.04 U	0.24	0.24	0.04 U	0.04 U	0.04 U	0.07	0.05 U	0.05 U	0.04 U	0.06
NICKEL	--	--	--	--	25.9 J	13.1 J	29 J	38 J	41.2 J	12.7 J	30.7 J	23.5 J	28.6 J	20.2 J	18.2 J	14.1 J	12.4 J	22.2 J	9 J	20.7 J	32.8 J	32.2 J	6.6 J
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	--	--	--	2.2 J	0.52 J	0.61 J	2.2 J	1.4 J	0.80 J	0.76 J	1 J	2.8 J	0.83 U	0.75 U	0.55 U	0.58 J	1 J	1.1 J	1.7 J	2.5 J	1.2 J	2.2 J
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	0.57 U	0.46 U	0.50 U	0.64 U	0.58 U	0.44 U	0.53 U	0.64 U	0.56 U	0.80 U	0.73 U	0.54 U	0.52 U	0.56 U	1 J	0.64 U	0.75 J	0.60 U	1.2 J
TIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
1,2-DICHLOROBENZENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
1,3-DICHLOROBENZENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
1,4-DICHLOROBENZENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2,4,5-TRICHLOROPHENOL	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
2,4,6-TRICHLOROPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2,4-DICHLOROPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2,4-DIMETHYLPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2,4-DINITROPHENOL	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
2,4-DINITROTOLUENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2,6-DINITROTOLUENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2-CHLORONAPHTHALENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2-CHLOROPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2-METHYLNAPHTHALENE	--	--	--	--	0.49 U	0.29 J	0.23 J	0.54 U	0.036 J	0.41	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.04 J
2-METHYLPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
2-NITROANILINE	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
2-NITROPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
3,3'-DICHLOROBENZIDINE	--	--	--	--	0.97 U	0.79 U	0.84 U	1.1 U	0.98 U	0.72 UJ	0.95 U	1.1 U	0.94 U	1.4 U	1.2 U	0.92 U	0.87 U	0.94 U	1.2 U	1.1 U	1 U	1 U	0.79 U
3-NITROANILINE	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
4-CHLORO-3-METHYLPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
4-CHLOROANILINE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
4-METHYLPHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
4-NITROANILINE	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
4-NITROPHENOL	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
ACENAPHTHENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
ACENAPHTHYLENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
ANTHRACENE	--	--	--	--	0.49 U	0.40 U	0.027 J	0.54 U	0.49 U	0.031 J	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
BAP EQUIVALENT	--	--	--	--	0.49 U	0.281567	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	0.49 U	0.051 J	0.052 J	0.54 U	0.49 U	0.10 J	0.47 U	0.55 U	0.47 U	0.69 U	0.056 J	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
BENZO(A)PYRENE	--	--	--	--	0.49 U	0.049 J	0.057 J	0.54 U	0.49 U	0.13 J	0.47 U	0.55 U	0.47 U	0.037 J	0.095 J	0.46 U	0.086 J	0.47 U	0.035 J	0.55 U	0.50 U	0.056 J	0.39 U
BENZO(B)FLUORANTHENE	--	--	--	--	0.49 U	0.067 J	0.068 J	0.54 U	0.49 U	0.20 J	0.47 U	0.55 U	0.47 U	0.69 U	0.11 J	0.46 U	0.44 U	0.47 U	0.04 J	0.55 U	0.50 U	0.52 U	0.39 U
BENZO(G,H,I)PERYLENE	--	--	--	--	0.49 U	0.40 U	0.029 J	0.54 U	0.49 U	0.073 J	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
BENZO(K)FLUORANTHENE	--	--	--	--	0.49 U	0.067 J	0.077 J	0.54 U	0.49 U	0.17 J	0.47 U	0.55 U	0.47 U	0.057 J	0.12 J	0.46 U	0.44 U	0.47 U	0.038 J	0.55 U	0.50 U	0.52 U	0.39 U
BENZOIC ACID	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
BENZYL ALCOHOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SB073	C044SB074	C044SB075	C044SB076	C044SBC01	C044SBC01	C044SBC02	C044SBC02	C044SBC03	C044SBC03	C044SBC04	C044SBC04	C044SBC05	C044SBC05	C044SBC06	C044SBC06	C044SBC07	C044SBC07	C044SBC08	C044SBC08	C044SBC09	C044SBC10	C044SBC10
SAMPLE ID	044SB07301	044SB07401	044SB07501	044SB07601	044SBC0102	044SBC0101	044SBC0201	044SBC0202	044SBC0302	044SBC0301	044SBC0401	044SBC0402	044SBC0501	044SBC0502	044SBC0602	044SBC0601	044SBC0702	044SBC0701	044SBC0802	044SBC0801	044SBC0901	044SBC1002	044SBC1001
TOP DEPTH	0	0	0	0	3	0	0	3	3	0	0	3	0	3	3	0	3	0	3	0	0	3	0
BOTTOM DEPTH	1	1	1	1	5	1	1	5	5	1	1	5	1	5	5	1	5	1	5	1	1	5	1
SAMPLE DATE	11/9/2001	11/9/2001	11/9/2001	11/9/2001	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999	3/3/1999
BUTYL BENZYL PHTHALATE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
CHRYSENE	--	--	--	--	0.49 U	0.097 J	0.10 J	0.54 U	0.49 U	0.19 J	0.47 U	0.55 U	0.47 U	0.035 J	0.074 J	0.46 U	0.44 U	0.47 U	0.033 J	0.55 U	0.50 U	0.52 U	0.02 J
DIBENZO(A,H)ANTHRACENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.044 J	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
DIBENZOFURAN	--	--	--	--	0.49 U	0.085 J	0.071 J	0.54 U	0.49 U	0.12 J	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
DIETHYL PHTHALATE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
DIMETHYL PHTHALATE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
DI-N-BUTYL PHTHALATE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
DI-N-OCTYL PHTHALATE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
FLUORANTHENE	--	--	--	--	0.49 U	0.077 J	0.097 J	0.54 U	0.49 U	0.15 J	0.47 U	0.55 U	0.47 U	0.69 U	0.11 J	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
FLUORENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.022 J	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
HEXACHLOROBENZENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
HEXACHLOROBUTADIENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
HEXACHLOROETHANE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
INDENO(1,2,3-CD)PYRENE	--	--	--	--	0.49 U	0.40 U	0.026 J	0.54 U	0.49 U	0.067 J	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
ISOPHORONE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
NAPHTHALENE	--	--	--	--	0.49 U	0.16 J	0.13 J	0.54 U	0.49 U	0.22 J	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
NITROBENZENE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
N-NITROSODIPHENYLAMINE	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
PENTACHLOROPHENOL	--	--	--	--	1.2 U	0.99 U	1 U	1.4 U	1.2 U	0.91 U	1.2 U	1.4 U	1.2 U	1.7 U	1.6 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.2 U	1.3 U	0.98 U
PHENANTHRENE	--	--	--	--	0.49 U	0.25 J	0.24 J	0.54 U	0.033 J	0.37	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.04 J
PHENOL	--	--	--	--	0.49 U	0.40 U	0.42 U	0.54 U	0.49 U	0.36 U	0.47 U	0.55 U	0.47 U	0.69 U	0.63 U	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
PYRENE	--	--	--	--	0.49 U	0.079 J	0.089 J	0.54 U	0.49 U	0.16 J	0.47 U	0.55 U	0.47 U	0.12 J	0.15 J	0.46 U	0.44 U	0.47 U	0.58 U	0.55 U	0.50 U	0.52 U	0.39 U
TOTAL PAHS	--	--	--	--	0 U	1.187	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC11	C044SBC11	C044SBC12	C044SBC12	C044SBC13	C044SBC13	C044SBC14	C044SBC14	C044SBC15	C044SBC15	C044SBC16	C044SBC16	C044SBC17	C044SBC17	C044SBC18	C044SBC18	C044SBC19	C044SBC19	C044SBC20	C044SBC20	C044SBC21	C044SBC21	C044SBC22
SAMPLE ID	044SBC1102	044SBC1101	044SBC1202	044SBC1201	044SBC1301	044SBC1302	044SBC1401	044SBC1402	044SBC1502	044SBC1501	044SBC1602	044SBC1601	044SBC1702	044SBC1701	044SBC1802	044SBC1801	044SBC1902	044SBC1901	044SBC2002	044SBC2001	044SBC2102	044SBC2101	044SBC2202
TOP DEPTH	3	0	3	0	0	3	0	3	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
BOTTOM DEPTH	5	1	5	1	1	5	1	5	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5
SAMPLE DATE	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999
METALS (MG/KG)																							
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	6.1 J	8.1 J	1.3 J	26.2	11.2 J	5.8 J	5.5 J	21.7 J	24.4	12.1 J	1.8 J	6.6 J	1.3 J	24	8.1 J	8.9 J	8.2 J	39.8	104	33.6	20.1 J	19.6	14.3 J
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	0.38 J	0.46 J	0.04 U	0.43 J	0.54 J	0.43 J	0.45 J	0.05 U	0.19 J	0.54 J	0.06 J	0.26 J	0.05 J	0.88 J	0.51 J	0.51 J	0.49 J	0.05 J	0.06 J	0.28 J	0.09 J	0.31 J	0.17 J
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	9.6 J	15.2 J	1.9 J	18.7 J	11.6 J	9.4 J	14.3 J	33.9 J	22.7 J	14.8 J	1.6 J	7.5 J	1 J	54.9 J	11.7 J	14 J	8.9 J	21.4 J	4.3 J	10.9 J	26.6 J	11.7 J	23.1 J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	0.05 U	0.05 U	0.04 U	0.07	0.05 U	0.05 U	0.05 U	0.29	0.3	0.05	0.04 U	0.03 U	0.04 U	0.06	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.06	0.24	0.04 U	5.8
NICKEL	25.9 J	44.6 J	1.7 J	28.3 J	23.8 J	18.8 J	24.6 J	18.2 J	37.5 J	26.2 J	2.5 J	17.1 J	1.7 J	58.1 J	24 J	26.9 J	53.1 J	5.5 J	3.2 J	8.6 J	23.4 J	9.7 J	21.1 J
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	1.8 J	2.3 J	0.59 U	2.4 J	1.7 J	1.8 J	1.9 J	1.9 J	0.64 U	0.95 J	0.56 J	1.3 J	0.45 U	2.3 J	1.6 J	1.9 J	1.2 J	3.9 J	1.2 J	1.5 J	0.92 U	0.58 J	0.83 U
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.57 U	0.63 U	0.49 U	0.75 J	0.54 U	0.52 U	0.56 U	1.2 J	1.3 J	0.52 U	0.47 U	0.46 U	0.44 U	0.47 U	0.58 U	0.54 U	0.51 U	0.47 U	0.48 J	0.43 U	0.76 U	0.41 U	0.69 U
TIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
1,2-DICHLOROBENZENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
1,3-DICHLOROBENZENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
1,4-DICHLOROBENZENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2,2'-OXYBIS(1-CHLOROPROPANE)	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2,4,5-TRICHLOROPHENOL	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
2,4,6-TRICHLOROPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2,4-DICHLOROPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2,4-DIMETHYLPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2,4-DINITROPHENOL	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
2,4-DINITROTOLUENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2,6-DINITROTOLUENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2-CHLORONAPHTHALENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2-CHLOROPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2-METHYLNAPHTHALENE	0.50 U	0.54 U	0.41 U	0.086 J	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.032 J	0.41 U	0.40 U	0.38 U	0.6	0.48 U	0.44 U	0.43 U	0.40 U	0.087 J	0.28 J	0.63 U	0.48	0.54 U
2-METHYLPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
2-NITROANILINE	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
2-NITROPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
3,3'-DICHLOROBENZIDINE	0.99 U	1.1 U	0.82 U	0.86 U	0.97 U	0.91 U	0.98 UJ	1.1 U	1.1 U	0.88 U	0.82 U	0.79 U	0.76 U	0.85 U	0.96 U	0.89 U	0.87 UJ	0.80 U	0.78 U	0.73 UJ	1.2 U	0.72 U	1.1 U
3-NITROANILINE	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
4,6-DINITRO-2-METHYLPHENOL	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
4-BROMOPHENYL PHENYL ETHER	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
4-CHLORO-3-METHYLPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
4-CHLOROANILINE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
4-CHLOROPHENYL PHENYL ETHER	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
4-METHYLPHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
4-NITROANILINE	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
4-NITROPHENOL	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
ACENAPHTHENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
ACENAPHTHYLENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
ANTHRACENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.024 J	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.033 J	0.63 U	0.052 J	0.54 U
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.062 J	0.48 U	0.44 U	0.43 U	0.40 U	0.037 J	0.13 J	0.10 J	0.16 J	0.09 J
BENZO(A)PYRENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.03 J	0.028 J	0.44 U	0.41 U	0.40 U	0.38 U	0.037 J	0.48 U	0.44 U	0.43 U	0.40 U	0.035 J	0.16 J	0.12 J	0.16 J	0.086 J
BENZO(B)FLUORANTHENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.042 J	0.035 J	0.027 J	0.41 U	0.40 U	0.38 U	0.056 J	0.48 U	0.44 U	0.43 U	0.40 U	0.045 J	0.19 J	0.16 J	0.22 J	0.094 J
BENZO(G,H,I)PERYLENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.027 J	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.10 J	0.63 U	0.073 J	0.54 U
BENZO(K)FLUORANTHENE	0.50 U	0.54 U	0.023 J	0.43 U	0.48 U	0.45 U	0.49 U	0.038 J	0.037 J	0.44 U	0.41 U	0.40 U	0.38 U	0.043 J	0.48 U	0.44 U	0.43 U	0.40 U	0.035 J	0.18 J	0.18 J	0.16 J	0.098 J
BENZOIC ACID	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.021 J	0.92 U	1.6 U	0.90 U	1.3 U
BENZYL ALCOHOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
BIS(2-CHLOROETHOXY)METHANE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
BIS(2-CHLOROETHYL)ETHER	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
BIS(2-ETHYLHEXYL)PHTHALATE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC11	C044SBC11	C044SBC12	C044SBC12	C044SBC13	C044SBC13	C044SBC14	C044SBC14	C044SBC15	C044SBC15	C044SBC16	C044SBC16	C044SBC17	C044SBC17	C044SBC18	C044SBC18	C044SBC19	C044SBC19	C044SBC20	C044SBC20	C044SBC21	C044SBC21	C044SBC22
SAMPLE ID	044SBC1102	044SBC1101	044SBC1202	044SBC1201	044SBC1301	044SBC1302	044SBC1401	044SBC1402	044SBC1502	044SBC1501	044SBC1602	044SBC1601	044SBC1702	044SBC1701	044SBC1802	044SBC1801	044SBC1902	044SBC1901	044SBC2002	044SBC2001	044SBC2102	044SBC2101	044SBC2202
TOP DEPTH	3	0	3	0	0	3	0	3	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
BOTTOM DEPTH	5	1	5	1	1	5	1	5	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5
SAMPLE DATE	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999
BUTYL BENZYL PHTHALATE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
CHRYSENE	0.50 U	0.54 U	0.41 U	0.036 J	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.038 J	0.41 U	0.40 U	0.38 U	0.11 J	0.48 U	0.44 U	0.43 U	0.40 U	0.06 J	0.19 J	0.10 J	0.24 J	0.099 J
DIBENZO(A,H)ANTHRACENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.058 J	0.63 U	0.042 J	0.54 U
DIBENZOFURAN	0.50 U	0.54 U	0.41 U	0.027 J	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.16 J	0.48 U	0.44 U	0.43 U	0.40 U	0.026 J	0.082 J	0.63 U	0.15 J	0.54 U
DIETHYL PHTHALATE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
DIMETHYL PHTHALATE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
DI-N-BUTYL PHTHALATE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
DI-N-OCTYL PHTHALATE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 UJ	0.54 U
FLUORANTHENE	0.50 U	0.54 U	0.41 U	0.022 J	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.076 J	0.48 U	0.44 U	0.43 U	0.40 U	0.08 J	0.26 J	0.28 J	0.22 J	0.32 J
FLUORENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.029 J	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.026 J	0.54 U
HEXACHLOROBENZENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
HEXACHLOROBUTADIENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
HEXACHLOROCYCLOPENTADIENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
HEXACHLOROETHANE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
INDENO(1,2,3-CD)PYRENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.082 J	0.63 U	0.066 J	0.54 U
ISOPHORONE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
NAPHTHALENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.35 J	0.48 U	0.44 U	0.43 U	0.40 U	0.051 J	0.16 J	0.63 U	0.25 J	0.54 U
NITROBENZENE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
N-NITROSO-DI-N-PROPYLAMINE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
N-NITROSODIPHENYLAMINE	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
PENTACHLOROPHENOL	1.2 U	1.4 U	1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.4 U	1.4 U	1.1 U	1 U	0.99 U	0.95 U	1.1 U	1.2 U	1.1 U	1.1 U	1 U	0.98 U	0.92 U	1.6 U	0.90 U	1.3 U
PHENANTHRENE	0.50 U	0.54 U	0.41 U	0.085 J	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.045 J	0.41 U	0.40 U	0.38 U	0.41 J	0.48 U	0.44 U	0.43 U	0.40 U	0.10 J	0.29 J	0.63 U	0.48	0.54 U
PHENOL	0.50 U	0.54 U	0.41 U	0.43 U	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.43 U	0.48 U	0.44 U	0.43 U	0.40 U	0.39 U	0.37 U	0.63 U	0.36 U	0.54 U
PYRENE	0.50 U	0.54 U	0.41 U	0.027 J	0.48 U	0.45 U	0.49 U	0.57 U	0.54 U	0.44 U	0.41 U	0.40 U	0.38 U	0.099 J	0.48 U	0.44 U	0.43 U	0.40 U	0.071 J	0.23 J	0.51 J	0.26 J	0.40 J
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC22	C044SBC23	C044SBC23	C044SBC24	C044SBC24	C044SBC25	C044SBC25	C044SBC26	C044SBC26	C044SBC27	C044SBC27	C044SBC28	C044SBC28	C044SBC29	C044SBC29	C044SBC30	C044SBC30	C044SBC31	C044SBC31	C044SBC32	C044SBC32	C044SBC33	C044SBC33
SAMPLE ID	**044SBC2201**	**044SBC2302**	**044SBC2301**	**044SBC2402**	**044SBC2401**	**044SBC2501**	**044SBC2502**	**044SBC2602**	**044SBC2601**	**044SBC2702**	**044SBC2701**	**044SBC2801**	**044SBC2802**	**044SBC2902**	**044SBC2901**	**044SBC3002**	**044SBC3001**	**044SBC3102**	**044SBC3101**	**044SBC3202**	**044SBC3201**	**044SBC3302**	**044SBC3301**
TOP DEPTH	**0**	**3**	**0**	**3**	**0**	**0**	**3**	**3**	**0**	**3**	**0**	**0**	**3**	**3**	**0**	**3**	**0**	**3**	**0**	**3**	**0**	**3**	**0**
BOTTOM DEPTH	**1**	**5**	**1**	**5**	**1**	**1**	**5**	**5**	**1**	**5**	**1**	**1**	**5**	**5**	**1**	**5**	**1**	**5**	**1**	**5**	**1**	**5**	**1**
SAMPLE DATE	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/4/1999**	**3/5/1999**	**3/5/1999**	**3/5/1999**	**3/5/1999**	**3/5/1999**	**3/5/1999**
METALS (MG/KG)																							
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	9.3 J	25.7	11.2 J	3.4 J	11.2 J	5.3 J	14.5 J	12.9 J	7.7 J	6.6 J	24.9	4.3 J	19.4 J	10.9 J	7.3 J	20.3 J	7 J	6.4 J	10.9 J	5.6 J	6.3 J	5.4 J	8.3 J
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	0.35 J	0.51 J	2.5 J	0.04 U	0.29 J	0.24 J	0.04 U	0.04 U	0.03 U	0.49 J	0.96 J	0.37 J	0.13 J	1.4 J	0.48 J	0.12 J	0.33 J	0.39 J	0.57 J	0.03 U	0.03 U	0.15 J	0.03 U
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	66.8 J	53.1 J	17.3 J	2.4 J	13.7 J	5.5 J	17.7 J	23.9 J	1.9 J	28.6 J	74.2 J	9 J	24.6 J	9.5 J	10.5 J	17.6 J	9.3 J	7.9 J	8.9 J	9.7 J	4 J	10.1 J	7.2 J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	0.04 U	0.44	0.04 U	0.04 U	0.05	0.04 U	0.55	0.15	0.03 U	0.29	0.65	0.04 U	0.2	0.08	0.05 U	0.08	0.04 U	0.05 U	0.04 U	0.04	0.03 U	0.07	0.03 U
NICKEL	19.9 J	45.1 J	37.4 J	29.3 J	16.4 J	14.2 J	7.6 J	9.8 J	2.5 J	11 J	14.6 J	15.3 J	17 J	67.8 J	24.8 J	18.8 J	54.6 J	16.6 J	25.1 J	5.6 J	1.8 J	7.5 J	5 J
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	0.51 U	1.3 J	0.54 U	0.63 U	0.95 J	0.66 J	0.67 U	0.69 U	0.51 U	0.81 U	0.51 U	1.2 J	0.89 U	0.93 U	1.3 J	0.83 U	0.87 J	1.5 J	0.55 U	0.45 U	0.42 U	0.45 U	0.44 U
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.43 U	0.62 U	0.45 U	0.53 U	0.47 U	0.44 U	0.55 U	0.57 U	0.42 U	0.67 U	0.43 U	0.45 U	0.74 U	0.77 U	0.55 U	0.69 U	0.49 U	0.63 U	0.54 U	0.44 U	0.58 J	0.44 U	0.43 U
TIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.026 J	0.36 U	0.38 U	0.02 J
1,2-DICHLOROBENZENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
1,3-DICHLOROBENZENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
1,4-DICHLOROBENZENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2,2'-OXYBIS(1-CHLOROPROPANE)	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2,4,5-TRICHLOROPHENOL	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
2,4,6-TRICHLOROPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2,4-DICHLOROPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2,4-DIMETHYLPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2,4-DINITROPHENOL	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
2,4-DINITROTOLUENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2,6-DINITROTOLUENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2-CHLORONAPHTHALENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2-CHLOROPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2-METHYLNAPHTHALENE	0.15 J	0.52 U	0.39 U	0.44 U	0.10 J	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.29 J	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.12 J	0.12 J	0.16 J	0.20 J
2-METHYLPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
2-NITROANILINE	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
2-NITROPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
3,3'-DICHLOROBENZIDINE	0.74 U	1 U	0.78 U	0.88 U	0.82 U	0.72 U	0.98 U	0.97 U	0.73 U	1.1 U	0.75 UJ	0.72 U	1.2 U	1.2 U	0.98 U	1.1 U	0.83 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
3-NITROANILINE	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
4,6-DINITRO-2-METHYLPHENOL	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
4-BROMOPHENYL PHENYL ETHER	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
4-CHLORO-3-METHYLPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
4-CHLOROANILINE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
4-CHLOROPHENYL PHENYL ETHER	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
4-METHYLPHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
4-NITROANILINE	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
4-NITROPHENOL	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
ACENAPHTHENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.46	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
ACENAPHTHYLENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.24 J	0.36 U	0.036 J	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
ANTHRACENE	0.37 U	0.038 J	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	1.5	0.36 U	0.054 J	0.053 J	0.49 U	0.033 J	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	0.025 J	0.13 J	0.39 U	0.024 J	0.024 J	0.36 U	0.056 J	0.48 U	0.37 U	0.11 J	2.7 J	0.36 U	0.15 J	0.16 J	0.49 U	0.084 J	0.42 U	0.027 J	0.44 U	0.36 U	0.36 U	0.021 J	0.034 J
BENZO(A)PYRENE	0.067 J	0.15 J	0.39 U	0.033 J	0.41 U	0.36 U	0.12 J	0.036 J	0.37 U	0.15 J	2.7 J	0.36 U	0.17 J	0.20 J	0.49 U	0.10 J	0.42 U	0.51 U	0.059 J	0.36 U	0.36 U	0.38 U	0.024 J
BENZO(B)FLUORANTHENE	0.021 J	0.17 J	0.39 U	0.024 J	0.031 J	0.36 U	0.11 J	0.048 J	0.37 U	0.17 J	2.5 J	0.36 U	0.24 J	0.24 J	0.49 U	0.12 J	0.42 U	0.51 U	0.44 U	0.027 J	0.36 U	0.027 J	0.036 J
BENZO(G,H,I)PERYLENE	0.37 U	0.52 UJ	0.39 U	0.44 U	0.41 U	0.36 U	0.063 J	0.48 U	0.37 U	0.076 J	0.79 J	0.36 U	0.62 U	0.59 UJ	0.49 U	0.54 UJ	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.031 J
BENZO(K)FLUORANTHENE	0.37 U	0.23 J	0.39 U	0.028 J	0.41 U	0.36 U	0.094 J	0.045 J	0.37 U	0.17 J	3.1 J	0.36 U	0.22 J	0.28 J	0.49 U	0.14 J	0.42 U	0.031 J	0.44 U	0.36 U	0.36 U	0.38 U	0.025 J
BENZOIC ACID	0.92 U	0.34 J	0.98 U	1.1 U	1 U	0.24 J	0.31 J	0.34 J	0.92 U	0.29 J	0.94 U	0.90 U	1.6 U	0.38 J	1.2 U	0.34 J	1 U	0.38 J	0.32 J	0.90 U	0.89 U	0.96 U	0.91 U
BENZYL ALCOHOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
BIS(2-CHLOROETHOXY)METHANE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
BIS(2-CHLOROETHYL)ETHER	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
BIS(2-ETHYLHEXYL)PHTHALATE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 UJ	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC22	C044SBC23	C044SBC23	C044SBC24	C044SBC24	C044SBC25	C044SBC25	C044SBC26	C044SBC26	C044SBC27	C044SBC27	C044SBC28	C044SBC28	C044SBC29	C044SBC29	C044SBC30	C044SBC30	C044SBC31	C044SBC31	C044SBC32	C044SBC32	C044SBC33	C044SBC33
SAMPLE ID	044SBC2201	044SBC2302	044SBC2301	044SBC2402	044SBC2401	044SBC2501	044SBC2502	044SBC2602	044SBC2601	044SBC2702	044SBC2701	044SBC2801	044SBC2802	044SBC2902	044SBC2901	044SBC3002	044SBC3001	044SBC3102	044SBC3101	044SBC3202	044SBC3201	044SBC3302	044SBC3301
TOP DEPTH	0	3	0	3	0	0	3	3	0	3	0	0	3	3	0	3	0	3	0	3	0	3	0
BOTTOM DEPTH	1	5	1	5	1	1	5	5	1	5	1	1	5	5	1	5	1	5	1	5	1	5	1
SAMPLE DATE	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/4/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999
BUTYL BENZYL PHTHALATE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 UJ	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
CHRYSENE	0.043 J	0.18 J	0.39 U	0.029 J	0.045 J	0.36 U	0.071 J	0.04 J	0.37 U	0.17 J	2.7 J	0.36 U	0.17 J	0.19 J	0.49 U	0.11 J	0.42 U	0.041 J	0.44 U	0.028 J	0.025 J	0.034 J	0.051 J
DIBENZO(A,H)ANTHRACENE	0.37 U	0.52 UJ	0.39 U	0.44 U	0.41 U	0.36 U	0.028 J	0.48 U	0.37 U	0.56 U	0.53 J	0.36 U	0.62 U	0.59 UJ	0.49 U	0.54 UJ	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
DIBENZOFURAN	0.041 J	0.52 U	0.39 U	0.44 U	0.028 J	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.65	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.032 J	0.032 J	0.044 J	0.052 J
DIETHYL PHTHALATE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
DIMETHYL PHTHALATE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
DI-N-BUTYL PHTHALATE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
DI-N-OCTYL PHTHALATE	0.37 U	0.52 UJ	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 UJ	0.36 U	0.62 UJ	0.59 UJ	0.49 U	0.54 UJ	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
FLUORANTHENE	0.37 U	0.32 J	0.39 U	0.11 J	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.26 J	7	0.36 U	0.47 J	0.37 J	0.49 U	0.16 J	0.42 U	0.072 J	0.44 U	0.02 J	0.02 J	0.024 J	0.041 J
FLUORENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.6	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
HEXACHLOROBENZENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
HEXACHLOROBUTADIENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
HEXACHLOROCYCLOPENTADIENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
HEXACHLOROETHANE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
INDENO(1,2,3-CD)PYRENE	0.37 U	0.52 UJ	0.39 U	0.44 U	0.41 U	0.36 U	0.057 J	0.48 U	0.37 U	0.074 J	0.88 J	0.36 U	0.62 U	0.59 UJ	0.49 U	0.54 UJ	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
ISOPHORONE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
NAPHTHALENE	0.089 J	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.31 J	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.06 J	0.064 J	0.078 J	0.086 J
NITROBENZENE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
N-NITROSO-DI-N-PROPYLAMINE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
N-NITROSODIPHENYLAMINE	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
PENTACHLOROPHENOL	0.92 U	1.3 U	0.98 U	1.1 U	1 U	0.90 U	1.2 U	1.2 U	0.92 U	1.4 U	0.94 U	0.90 U	1.6 U	1.5 U	1.2 U	1.4 U	1 U	1.3 U	1.1 U	0.90 U	0.89 U	0.96 U	0.91 U
PHENANTHRENE	0.12 J	0.039 J	0.39 U	0.44 U	0.093 J	0.36 U	0.49 U	0.048 J	0.37 U	0.14 J	7.9	0.36 U	0.044 J	0.068 J	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.096 J	0.086 J	0.12 J	0.14 J
PHENOL	0.37 U	0.52 U	0.39 U	0.44 U	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.56 U	0.38 U	0.36 U	0.62 U	0.59 U	0.49 U	0.54 U	0.42 U	0.51 U	0.44 U	0.36 U	0.36 U	0.38 U	0.36 U
PYRENE	0.37 U	0.48 J	0.39 U	0.097 J	0.41 U	0.36 U	0.49 U	0.48 U	0.37 U	0.23 J	7.1	0.36 U	0.65	0.48 J	0.49 U	0.31 J	0.42 U	0.068 J	0.44 U	0.022 J	0.36 U	0.023 J	0.046 J
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC34	C044SBC35	C044SBC35	C044SBC36	C044SBC37	C044SBC37	C044SBC38	C044SBC38	C044SBC39	C044SBC39	C044SBC40	C044SBC40	C044SBC41	C044SBC41	C044SBC42	C044SBC42	C044SBC43	C044SBC43	C044SBC44	C044SBC44	C044SBC45	C044SBC45	C044SBC46
SAMPLE ID	044SBC3401	044SBC3502	044SBC3501	044SBC3601	044SBC3702	044SBC3701	044SBC3802	044SBC3801	044SBC3902	044SBC3901	044SBC4002	044SBC4001	044SBC4102	044SBC4101	044SBC4202	044SBC4201	044SBC4302	044SBC4301	044SBC4402	044SBC4401	044SBC4501	044SBC4502	044SBC4602
TOP DEPTH	0	3	0	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	0	3	3
BOTTOM DEPTH	1	5	1	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	1	5	5
SAMPLE DATE	3/5/1999	3/3/1999	3/3/1999	3/4/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999
METALS (MG/KG)																							
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	6.7 J	6.8 J	90.8	12.9 J	2.8 J	14.4 J	26.8 J	6.8 J	24.2 J	14.6 J	12.3 J	14.6 J	19 J	7.6 J	12.3 J	45.7	3.3 J	28.9	19.3 J	18.4	3.4 J	3.5 J	29.7 J
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	0.04 J	0.51 J	0.44 J	0.30 J	0.12 J	0.36 J	0.18 J	0.20 J	0.20 J	0.26 J	0.04 U	0.13 J	0.29 J	0.10 J	0.19 J	1.9 J	0.08 J	0.05 J	0.51 J	0.03 U	0.59 J	0.04 U	1 J
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	7.4 J	8.9 J	35.3 J	9.2 J	23.4 J	33.1 J	37.9 J	7.1 J	35.4 J	13.1 J	13 J	26.1 J	17.9 J	5.3 J	16.7 J	73 J	5 J	39 J	158 J	7.7 J	14.2 J	4.6 J	39.1 J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	0.03 U	0.04 U	0.04 U	0.04 U	0.04	0.08	0.29	0.04 U	0.22	0.04 U	0.11	0.08	0.14	0.05	0.2	0.04 U	0.04 U	0.04 U	0.04 U	0.8	0.04 U	0.04 U	0.04 U
NICKEL	4.9 J	21.1 J	33.8 J	9.9 J	5.4 J	14.8 J	14 J	13.8 J	18.3 J	25.3 J	16.2 J	25.3 J	10.2 J	4.8 J	89.5 J	76.2 J	61.4 J	1.2 J	27.8 J	1.6 J	26.5 J	48.5 J	39.8 J
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	0.43 U	1.7 J	5.4 J	0.89 J	0.47 U	0.70 J	0.82 U	0.49 U	0.80 U	0.54 U	0.58 U	0.63 J	0.70 U	0.46 U	0.64 U	1.8 J	0.69 J	0.64 J	0.85 J	0.74 J	1.8 J	0.57 U	1.1 J
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.42 U	0.54 U	1.8 J	0.45 U	0.46 U	0.43 U	0.80 U	0.47 U	0.78 U	0.53 U	0.56 U	0.46 U	0.68 U	0.45 U	0.62 U	0.55 U	0.58 U	0.46 U	0.52 U	0.45 U	0.51 U	0.56 U	0.51 U
TIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	0.028 J	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
1,2-DICHLOROBENZENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
1,3-DICHLOROBENZENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
1,4-DICHLOROBENZENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2,2'-OXYBIS(1-CHLOROPROPANE)	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2,4,5-TRICHLOROPHENOL	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
2,4,6-TRICHLOROPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2,4-DICHLOROPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2,4-DIMETHYLPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2,4-DINITROPHENOL	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
2,4-DINITROTOLUENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2,6-DINITROTOLUENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2-CHLORONAPHTHALENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2-CHLOROPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2-METHYLNAPHTHALENE	0.27 J	0.46 U	0.22 J	0.25 J	0.088 J	0.7	0.65 U	0.40 U	0.66 U	0.11 J	0.45 U	0.039 J	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.026 J	0.42 U	0.47 U	0.44 U
2-METHYLPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
2-NITROANILINE	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
2-NITROPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
3,3'-DICHLOROBENZIDINE	0.36 U	0.93 U	0.91 U	0.77 UJ	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
3-NITROANILINE	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
4,6-DINITRO-2-METHYLPHENOL	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
4-BROMOPHENYL PHENYL ETHER	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
4-CHLORO-3-METHYLPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
4-CHLOROANILINE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
4-CHLOROPHENYL PHENYL ETHER	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
4-METHYLPHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
4-NITROANILINE	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
4-NITROPHENOL	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
ACENAPHTHENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
ACENAPHTHYLENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.027 J	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
ANTHRACENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.035 J	0.033 J	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	0.031 J	0.46 U	0.035 J	0.14 J	0.028 J	0.11 J	0.11 J	0.40 U	0.093 J	0.034 J	0.023 J	0.039 J	0.10 J	0.027 J	0.044 J	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BENZO(A)PYRENE	0.024 J	0.46 U	0.036 J	0.19 J	0.027 J	0.09 J	0.15 J	0.08 J	0.12 J	0.028 J	0.032 J	0.056 J	0.17 J	0.027 J	0.061 J	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BENZO(B)FLUORANTHENE	0.36 U	0.46 U	0.04 J	0.21 J	0.026 J	0.23 J	0.17 J	0.40 U	0.11 J	0.047 J	0.049 J	0.072 J	0.16 J	0.03 J	0.069 J	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BENZO(G,H,I)PERYLENE	0.026 J	0.46 U	0.45 U	0.076 J	0.39 U	0.079 J	0.089 J	0.40 U	0.053 J	0.44 U	0.45 U	0.04 J	0.073 J	0.38 U	0.035 J	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BENZO(K)FLUORANTHENE	0.045 J	0.46 U	0.03 J	0.22 J	0.027 J	0.37 U	0.13 J	0.40 U	0.11 J	0.042 J	0.028 J	0.058 J	0.15 J	0.026 J	0.068 J	0.48 U	0.46 U	0.37 U	0.024 J	0.38 U	0.42 U	0.47 U	0.44 U
BENZOIC ACID	0.27 J	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	0.48 J	0.29 J	0.50 J	1.1 U	0.36 J	0.31 J	0.44 J	0.94 U	1.4 U	0.23 J	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	0.21 J
BENZYL ALCOHOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BIS(2-CHLOROETHOXY)METHANE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BIS(2-CHLOROETHYL)ETHER	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
BIS(2-ETHYLHEXYL)PHTHALATE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC34	C044SBC35	C044SBC35	C044SBC36	C044SBC37	C044SBC37	C044SBC38	C044SBC38	C044SBC39	C044SBC39	C044SBC40	C044SBC40	C044SBC41	C044SBC41	C044SBC42	C044SBC42	C044SBC43	C044SBC43	C044SBC44	C044SBC44	C044SBC45	C044SBC45	C044SBC46
SAMPLE ID	044SBC3401	044SBC3502	044SBC3501	044SBC3601	044SBC3702	044SBC3701	044SBC3802	044SBC3801	044SBC3902	044SBC3901	044SBC4002	044SBC4001	044SBC4102	044SBC4101	044SBC4202	044SBC4201	044SBC4302	044SBC4301	044SBC4402	044SBC4401	044SBC4501	044SBC4502	044SBC4602
TOP DEPTH	0	3	0	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	0	3	3
BOTTOM DEPTH	1	5	1	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	1	5	5
SAMPLE DATE	3/5/1999	3/3/1999	3/3/1999	3/4/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999
BUTYL BENZYL PHTHALATE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.022 J	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
CHRYSENE	0.057 J	0.46 U	0.067 J	0.20 J	0.048 J	0.21 J	0.10 J	0.40 U	0.094 J	0.053 J	0.035 J	0.065 J	0.12 J	0.033 J	0.066 J	0.48 U	0.46 U	0.37 U	0.037 J	0.38 U	0.42 U	0.47 U	0.44 U
DIBENZO(A,H)ANTHRACENE	0.36 U	0.46 U	0.45 U	0.06 J	0.39 U	0.028 J	0.032 J	0.40 U	0.66 U	0.44 U	0.45 U	0.021 J	0.033 J	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
DIBENZOFURAN	0.07 J	0.46 U	0.065 J	0.076 J	0.027 J	0.21 J	0.65 U	0.40 U	0.66 U	0.029 J	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
DIETHYL PHTHALATE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.027 J	0.40 U	0.067 J	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
DIMETHYL PHTHALATE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
DI-N-BUTYL PHTHALATE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.032 J	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.042 J	0.54 U	0.48 U	0.46 U	0.018 J	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
DI-N-OCTYL PHTHALATE	0.36 U	0.46 U	0.45 U	0.38 UJ	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
FLUORANTHENE	0.043 J	0.46 U	0.45 U	0.22 J	0.052 J	0.22 J	0.18 J	0.40 U	0.21 J	0.053 J	0.039 J	0.08 J	0.19 J	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
FLUORENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
HEXACHLOROBENZENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
HEXACHLOROBUTADIENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
HEXACHLOROCYCLOPENTADIENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
HEXACHLOROETHANE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
INDENO(1,2,3-CD)PYRENE	0.36 U	0.46 U	0.45 U	0.072 J	0.39 U	0.046 J	0.072 J	0.40 U	0.058 J	0.44 U	0.45 U	0.03 J	0.067 J	0.38 U	0.031 J	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
ISOPHORONE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
NAPHTHALENE	0.15 J	0.46 U	0.12 J	0.12 J	0.051 J	0.43	0.65 U	0.40 U	0.66 U	0.068 J	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
NITROBENZENE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
N-NITROSO-DI-N-PROPYLAMINE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
N-NITROSODIPHENYLAMINE	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
PENTACHLOROPHENOL	0.91 U	1.2 U	1.1 U	0.96 U	0.97 U	0.92 U	1.6 U	1 U	1.6 U	1.1 U	1.1 U	1 U	1.5 U	0.94 U	1.4 U	1.2 U	1.2 U	0.92 U	1.1 U	0.96 U	1 U	1.2 U	1.1 U
PHENANTHRENE	0.19 J	0.46 U	0.18 J	0.26 J	0.076 J	0.56	0.65 U	0.40 U	0.66 U	0.088 J	0.45 U	0.045 J	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
PHENOL	0.36 U	0.46 U	0.45 U	0.38 U	0.39 U	0.37 U	0.65 U	0.40 U	0.66 U	0.44 U	0.45 U	0.40 U	0.60 U	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
PYRENE	0.036 J	0.46 U	0.058 J	0.26 J	0.041 J	0.17 J	0.32 J	0.40 U	0.21 J	0.059 J	0.028 J	0.061 J	0.31 J	0.38 U	0.54 U	0.48 U	0.46 U	0.37 U	0.45 U	0.38 U	0.42 U	0.47 U	0.44 U
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC46	C044SBC47	C044SBC47	C044SBC48	C044SBC48	C044SBC49	C044SBC49	C044SBC50	C044SS001	C044SS001	C044SS002	C044SS003	C044SS004	C044SS005	C044SS006	C044SS007	C044SS008	C044SS009	C721SB001	C721SB002	C721SB003	C721SB004	C721SB005
SAMPLE ID	044SBC4601	044SBC4702	044SBC4701	044SBC4802	044SBC4801	044SBC4902	044SBC4901	044SBC5001	044SS00101a	044SS00101	044SS00201	044SS00301	044SS00401	044SS00501	044SS00601	044SS00701	044SS00801	044SS00901	721SB00101	721SB00201	721SB00301	721SB00401	721SB00501
TOP DEPTH	0	3	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOTTOM DEPTH	1	5	1	5	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SAMPLE DATE	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	7/23/1997	5/23/2001	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/24/1997	7/24/1997	7/28/1997	4/24/2003	4/24/2003	4/24/2003	4/24/2003	4/24/2003
METALS (MG/KG)																							
ALUMINUM	--	--	--	--	--	--	--	--	4610	--	5560	5680	3810	6290	8560	2140	3630	11700	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	0.52 J	--	0.32 UJ	0.53 J	0.33 J	0.71 J	1 J	1.1 J	0.56 J	0.46 J	--	--	--	--	--
ARSENIC	12.8 J	2 J	12.5 J	7.3 J	6.4 J	4 J	14.7 J	3.7 J	19.9 J	75	22.2 J	19.3 J	3.3 J	21.6 J	98.5 J	45.6 J	15.7 J	25.6 J	--	92.7	28.6	75.6	33.8
BARIUM	--	--	--	--	--	--	--	--	13.4	--	9.6	17.9	8.4	25.5	62	45.2	28.6	24.8	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	0.95 UJ	--	1.1 UJ	0.85 UJ	0.52 UJ	0.70 UJ	1.2 UJ	0.98 UJ	0.49 UJ	0.84 UJ	--	--	--	--	--
CADMIUM	0.44 J	0.11 J	0.05 J	0.57 J	0.25 J	0.48 J	0.55 J	0.04 J	0.26 U	--	0.06 U	0.06 U	0.12 U	0.06 U	0.08 U	0.07 U	0.06 U	0.07 U	--	--	--	--	--
CALCIUM	--	--	--	--	--	--	--	--	57900	--	15000	56100	74100	1160	7850	3860	8790	120000	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	18.2	--	11.2	19.6	21.7	13.6	45.1	22.1	57.3	43.8	--	--	--	--	--
COBALT	--	--	--	--	--	--	--	--	8.9	--	4.9	5.9	0.99 UJ	1.7 UJ	5.6	6.2	2.4	4.3	--	--	--	--	--
COPPER	9.1 J	10.1 J	14 J	10.4 J	6.1 J	8.2 J	52 J	4.3 J	19.1	--	36	17.8	5.1	22.4	69.4	29.3	24.4	22.6	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	11400	--	11400	12700	4320	10500	90500	14500	8570	16700	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	5.3	--	4.1	7.4	4.2	33.4	49.7	51.5	33.3	14.2	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	1970	--	620	1930	2330	703	1870	508	522	4660	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	123	--	47.1	77.1	53.3	23.4	37.5	92	58	126	--	--	--	--	--
MERCURY	0.03 U	0.04 J	0.04 U	0.04 U	0.05 U	0.04 U	0.1	0.04	0.09 UJ	--	0.07 UJ	0.08 UJ	0.06 UJ	0.34	0.14 UJ	0.27	0.10 UJ	0.15 UJ	--	0.17	0.24	0.13	0.13
NICKEL	40.6 J	7.6 J	7.7 J	31 J	15.1 J	24.6 J	35.1 J	3.5 J	24.2	--	19	18.6	10.2	5.5	21.3	27.4	7.1	26.1	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	537 J	--	426 J	644 J	553 J	474 J	3620	278 J	285 J	1380	--	--	--	--	--
SELENIUM	0.47 U	0.49 U	0.53 J	1.7 J	1 J	0.76 J	1.2 J	0.46 U	1.8	--	1.4	1.9	0.93	1.6	6.1	2.5	0.53 J	1.9	--	2.4 U	2.3 U	1.9 U	2.2 U
SILVER	--	--	--	--	--	--	--	--	0.21 U	--	0.20 U	0.19 U	0.20 U	0.21 U	0.26 U	0.22 U	0.20 U	0.24 U	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	562 U	--	314 U	621 U	575 U	882 U	2880 U	278 U	273 U	1300 U	--	--	--	--	--
THALLIUM	0.46 U	0.48 U	0.48 U	0.59 U	0.60 U	0.52 U	0.44 U	0.45 U	1.2 J	--	0.75 J	0.84 J	0.53 U	0.56 U	8.3	0.68 J	0.55 U	0.64 U	--	0.32 U	0.67 U	0.61 U	0.30 U
TIN	--	--	--	--	--	--	--	--	0.62 U	--	0.70 U	1.2 U	0.80 U	2.8 U	2.6 U	2.6 U	2.2 U	2.4 U	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	12.3	--	8.4	15	13.4	21.9	45.7	19.6	10.4	33.8	--	--	--	--	--
ZINC	--	--	--	--	--	--	--	--	68.9	--	42.2	53.1	25.7	38.3	78.8	105	89.3	79	--	--	--	--	--
MISCELLANEOUS PARAMETERS																							
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																							
1,2,4-TRICHLOROBENZENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.084 J	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
1,2-DICHLOROBENZENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
1,3-DICHLOROBENZENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
1,4-DICHLOROBENZENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2,4-DICHLOROPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2,4-DIMETHYLPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2,4-DINITROPHENOL	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
2,4-DINITROTOLUENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2,6-DINITROTOLUENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2-CHLORONAPHTHALENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2-CHLOROPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2-METHYLNAPHTHALENE	0.40 U	0.41 U	0.12 J	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.51	--	0.12 J	0.61	0.38 U	1.3	2.4	0.33 J	0.39 U	0.21 J	0.51 U	--	--	--	--
2-METHYLPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
2-NITROANILINE	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
2-NITROPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.80 U	--	0.78 U	0.75 U	0.76 U	0.80 U	1 U	0.86 U	0.78 U	0.93 U	--	--	--	--	--
3-NITROANILINE	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
4-CHLOROANILINE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
4-METHYLPHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
4-NITROANILINE	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
4-NITROPHENOL	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
ACENAPHTHENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.09 J	0.082 J	0.39 U	0.46 U	--	--	--	--	--
ACENAPHTHYLENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.46	0.39 U	0.46 U	--	--	--	--	--
ANTHRACENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.12 J	0.85	0.051 J	0.46 U	--	--	--	--	--
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	0.43524	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	0.40 U	0.41 U	0.062 J	0.49 U	0.52 U	0.45 U	0.38 U	0.022 J	0.08 J	--	0.39 U	0.12 J	0.38 U	0.21 J	0.38 J	1.9	0.13 J	0.079 J	--	--	--	--	--
BENZO(A)PYRENE	0.028 J	0.41 U	0.042 J	0.49 U	0.52 U	0.45 U	0.38 U	0.029 J	0.40 U	--	0.39 U	0.06 J	0.38 U	0.18 J	0.22 J	2.6	0.14 J	0.067 J	--	--	--	--	--
BENZO(B)FLUORANTHENE	0.40 U	0.41 U	0.093 J	0.49 U	0.52 U	0.45 U	0.024 J	0.037 J	0.067 J	--	0.39 U	0.066 J	0.38 UJ	0.25 J	0.40 J	4.7	0.32 J	0.11 J	--	--	--	--	--
BENZO(G,H,I)PERYLENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.099 J	0.11 J	1.6	0.13 J	0.46 U	--	--	--	--	--
BENZO(K)FLUORANTHENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.029 J	0.033 J	0.40 U	--	0.39 U	0.076 J	0.38 UJ	0.15 J	0.21 J	2.9	0.21 J	0.079 J	--	--	--	--	--
BENZOIC ACID	0.99 U	1 U	1 U	0.03 J	0.05 J	0.042 J	0.18 J	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	2.1 U	1.9 U	2.2 U	--	--	--	--	--
BENZYL ALCOHOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.38 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C044SBC46	C044SBC47	C044SBC47	C044SBC48	C044SBC48	C044SBC49	C044SBC49	C044SBC50	C044SS001	C044SS001	C044SS002	C044SS003	C044SS004	C044SS005	C044SS006	C044SS007	C044SS008	C044SS009	C721SB001	C721SB002	C721SB003	C721SB004	C721SB005
SAMPLE ID	044SBC4601	044SBC4702	044SBC4701	044SBC4802	044SBC4801	044SBC4902	044SBC4901	044SBC5001	044SS00101a	044SS00101	044SS00201	044SS00301	044SS00401	044SS00501	044SS00601	044SS00701	044SS00801	044SS00901	721SB00101	721SB00201	721SB00301	721SB00401	721SB00501
TOP DEPTH	0	3	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOTTOM DEPTH	1	5	1	5	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SAMPLE DATE	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	3/5/1999	7/23/1997	5/23/2001	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/24/1997	7/24/1997	7/28/1997	4/24/2003	4/24/2003	4/24/2003	4/24/2003	4/24/2003
BUTYL BENZYL PHTHALATE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
CHRYSENE	0.40 U	0.41 U	0.12 J	0.49 U	0.52 U	0.45 U	0.022 J	0.032 J	0.14 J	--	0.39 U	0.21 J	0.38 U	0.34 J	0.76	3.3	0.27 J	0.13 J	0.67	--	--	--	--
DIBENZO(A,H)ANTHRACENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.79	0.047 J	0.46 U	--	--	--	--	--
DIBENZOFURAN	0.40 U	0.41 U	0.039 J	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.14 J	--	0.39 U	0.19 J	0.38 U	0.30 J	0.67	0.20 J	0.39 U	0.065 J	--	--	--	--	--
DIETHYL PHTHALATE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
DIMETHYL PHTHALATE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
DI-N-BUTYL PHTHALATE	0.40 U	0.41 U	0.40 U	0.051 J	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
DI-N-OCTYL PHTHALATE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
FLUORANTHENE	0.40 U	0.41 U	0.082 J	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.088 J	--	0.39 U	0.12 J	0.38 U	0.26 J	0.69	4.2	0.27 J	0.17 J	--	--	--	--	--
FLUORENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.063 J	0.086 J	0.39 U	0.46 U	--	--	--	--	--
HEXACHLOROBENZENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
HEXACHLOROBUTADIENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
HEXACHLOROETHANE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	0.40 U	0.41 U	0.022 J	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.074 J	0.07 J	1.6	0.12 J	0.46 U	--	--	--	--	--
ISOPHORONE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
NAPHTHALENE	0.40 U	0.41 U	0.058 J	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.30 J	--	0.39 U	0.32 J	0.38 U	0.77	1.2	0.29 J	0.39 U	0.13 J	0.96	--	--	--	--
NITROBENZENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
N-NITROSODIPHENYLAMINE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
PENTACHLOROPHENOL	0.99 U	1 U	1 U	1.2 U	1.3 U	1.1 U	0.95 U	0.95 U	2 U	--	1.9 U	1.8 U	1.8 U	1.9 U	2.4 U	0.082 J	1.9 U	2.2 U	--	--	--	--	--
PHENANTHRENE	0.40 U	0.41 U	0.15 J	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.38 J	--	0.099 J	0.52	0.38 U	0.87	2.6	1.4	0.07 J	0.23 J	1.1	--	--	--	--
PHENOL	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.40 U	--	0.39 U	0.38 U	0.38 U	0.40 U	0.50 U	0.43 U	0.39 U	0.46 U	--	--	--	--	--
PYRENE	0.40 U	0.41 U	0.40 U	0.49 U	0.52 U	0.45 U	0.38 U	0.38 U	0.096 J	--	0.39 U	0.14 J	0.38 U	0.33 J	0.59	4.8	0.35 J	0.14 J	0.65	--	--	--	--
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--	--	--	4.833	--	--	--	--	3.38	--	--	--	--

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	C721SB006	C721SB007	C721SB008	C721SB01A	C721SB01B	C721SB01C	C721SB01D	C721SB02A	C721SB03A	C721SB04A	C721SB05A	C721SB06A	C721SB06B	C721SB06C	C721SB06D	C721SB06E
SAMPLE ID	721SB00601	721SB00701	721SB00801	721SB01A01	721SB01B01	721SB01C01	721SB01D01	721SB02A01	721SB03A01	721SB04A01	721SB05A01	721SB06A01	721SB06B01	721SB06C01	721SB06D01	721SB06E01
TOP DEPTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOTTOM DEPTH	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SAMPLE DATE	4/24/2003	4/24/2003	4/24/2003	6/3/2003	6/3/2003	6/3/2003	6/3/2003	6/3/2003	6/3/2003	6/3/2003	6/3/2003	4/24/2003	4/24/2003	4/24/2003	4/24/2003	6/3/2003
METALS (MG/KG)																
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	68.6	--	--	--	--	--	--	79.2	44.8	21.2	90.7	216	23.7	160	175	68.9
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	19.5	--	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NICKEL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	5.1 U	--	--	--	--	--	--	--	--	--	--	7.2	2 U	5	7.6	--
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.54 U	0.34 U	--	--	--	--	--	--	1.2 U	0.47 U	--	2 U	0.95 U	2.9 U	0.58 U	4 U
TIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	211	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS																
AMMONIA-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORIDE (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE/NITRATE-N (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFUR (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CATION EXCHANGE CAPACITY (UEQ/G)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)																
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	0.98 U	0.62 U	2.5	2 J	0.27 J
2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAP EQUIVALENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	0.43 J	--	--	--	--	--	--	--	--	--	--	0.35 J	0.087 J	0.44 J	0.33 J	0.098 J
BENZO(A)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZOIC ACID	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-1
Soil Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SOIL

LOCATION	**C721SB006**	**C721SB007**	**C721SB008**	**C721SB01A**	**C721SB01B**	**C721SB01C**	**C721SB01D**	**C721SB02A**	**C721SB03A**	**C721SB04A**	**C721SB05A**	**C721SB06A**	**C721SB06B**	**C721SB06C**	**C721SB06D**	**C721SB06E**
SAMPLE ID	**721SB00601**	**721SB00701**	**721SB00801**	**721SB01A01**	**721SB01B01**	**721SB01C01**	**721SB01D01**	**721SB02A01**	**721SB03A01**	**721SB04A01**	**721SB05A01**	**721SB06A01**	**721SB06B01**	**721SB06C01**	**721SB06D01**	**721SB06E01**
TOP DEPTH	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
BOTTOM DEPTH	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SAMPLE DATE	**4/24/2003**	**4/24/2003**	**4/24/2003**	**6/3/2003**	**6/3/2003**	**6/3/2003**	**6/3/2003**	**6/3/2003**	**6/3/2003**	**6/3/2003**	**6/3/2003**	**4/24/2003**	**4/24/2003**	**4/24/2003**	**4/24/2003**	**6/3/2003**
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	0.12 J	0.09 J	0.29 J	0.51 J	--	--	--	--	0.73 J	0.18 J	0.97	0.71 J	0.22 J
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	0.61 J	0.16 J	0.97	0.64 J	0.12 J
FLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	0.14 J	0.055 J	0.23 J	0.24 J	--	--	--	--	0.64 J	0.18 J	1.2	0.96	0.14 J
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	2 J	--	--	0.24 J	0.10 J	0.34 J	0.39 J	--	--	--	--	1.4	0.32 J	2.4	1.8	0.39 J
PHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	0.60 J	--	--	0.14 J	0.12 J	0.52 J	0.93 J	--	--	--	--	0.53 J	0.14 J	0.81 J	0.54 J	0.25 J
TOTAL PAHS	--	--	--	0.64	--	--	2.07	--	--	--	--	--	1.067	--	--	1.488

SOIL Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

APPENDIX A-2

GROUNDWATER ANALYTICAL RESULTS SUMMARY

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW002	C044GW002	C044GW002	C044GW002	C044GW002	C044GW002
SAMPLE ID	044GW00101	044GW00102	044GW00103	044GW00104	044GW00105	044GW00106	044GW001B7	044GW001A7	044GW00107	044GW00201	044GW00202	044GW00203	044GW00204	044GW00205	044GW002B6
SAMPLE DATE	6/13/1995	1/18/1996	5/6/1996	6/11/1996	7/28/1997	1/8/1999	7/20/1999	7/20/1999	7/20/1999	6/13/1995	1/18/1996	5/7/1996	6/7/1996	7/28/1997	7/20/1999
DIOXINS/FURANS (PG/L)															
1,2,3,4,6,7,8,9-OCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-OCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)															
ALUMINUM	38000 J	50900	39600	53600	20400	--	6140 J	5670 J	5570 J	1660 J	32.8 J	120 U	76.9 U	30.1 UJ	--
ANTIMONY	3.9 J	11.1 U	49.1 U	2.1 U	2.1 J	2.7 U	5 U	5 U	5 U	1.9 U	2.1 U	13 U	2.1 U	1.6 UJ	5 U
ARSENIC	3.9 J	2.5 UJ	2.5 UJ	2.5 UJ	6.6 J	4.3 J	3.3 U	3.3 U	3.3 U	3.2 U	6 J	3.9 J	2.7 J	5 J	3.5 J
BARIUM	6.4 J	7 J	3.9 U	0.30 UJ	5 J	--	6.8 J	5.9 J	5.9 J	60.2 J	46.3	40.6 U	44.5 U	36.9	31.2
BERYLLIUM	21.9	20.8	19.8	32.9	17.5	10	5	4.7 J	4.6 J	0.26 U	0.46 J	0.30 U	0.43 J	0.99 UJ	0.30 U
CADMIUM	0.30 U	3.5 J	0.50 U	0.50 U	0.30 U	--	6.9 J	6.6 J	7 J	0.30 U	0.50 U	0.50 U	0.50 U	0.30 U	0.30 U
CALCIUM	341000 J	432000 J	471000	446000 J	552000	--	504000	494000	497000	347000 J	348000 J	319000	314000 J	275000	135000
CHROMIUM	1.3 J	1.6 J	2.2 U	0.80 U	5.5 J	0.70 U	0.50 UJ	0.50 UJ	0.50 UJ	2.5 J	0.80 U	2.2 U	1.2 U	1.1 U	0.50 UJ
COBALT	75.5	73.8	57	47.9	60.9	--	48.8	47.5	48.9	2.4 J	2.5 J	5.2 U	5.2 U	2.8 UJ	1.7 U
COPPER	18.2 J	2.8 UJ	1.4 UJ	5.1 U	11 J	--	9.3 U	23.2 J	11.9 U	3.8 J	1.3 UJ	1.4 UJ	1.3 U	1.4 U	1.2 U
CYANIDE	10 U	2 U	2 U	2 U	--	--	--	--	--	10 U	2 U	2 U	2 U	--	--
IRON	239000	353000	319000	450000	167000	--	62300	58800	57900	5640	3770	1750	1330	1340	443
LEAD	19.8 J	2.4 J	5.7	5.6 UJ	1.6 UJ	1.5 U	2.1 U	2.1 U	2.1 U	4.4 J	1.7 U	1.7 U	1.7 U	0.90 UJ	2.1 U
MAGNESIUM	26000	47100	50500	59200 J	66700	--	44200 J	42000 J	42000 J	23200	22400	19000	18800 J	16700	7560 J
MANGANESE	1940	3150	3460	4400 J	3660	--	1920 J	1850 J	1810 J	673	273	184	120 J	307	165 J
MERCURY	0.20 U	0.11 J	0.10 U	0.10 U	0.10 UJ	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ	0.20 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
NICKEL	221	232 J	199	209 J	191	--	97.8	93.5	105	3 J	0.81 J	5.3 U	1.6 UJ	1.7 J	13 U
POTASSIUM	7460 J	15900 J	8400 U	12200	12500	--	14100 J	13400 J	13800 J	9910 J	9800 U	6270 U	7020 U	6810	5040 J
SELENIUM	7.2	5 J	2.8 U	19.6 J	3.4 U	--	4.5 J	5.4 J	4.6 J	4.4 U	2.8 UJ	3.5 U	2.8 U	3.4 U	5.6 J
SILVER	0.50 U	1.2 U	1.2 U	1.2 UJ	1 U	--	2 U	2 U	2 U	0.50 U	1.2 U	1.2 U	1.2 UJ	1 U	2 U
SODIUM	22100	34200	29200 U	40700 U	35100	--	28700	26300	27500	13200	9510	11900 U	10700 U	17400	9330
THALLIUM	4.5 U	2.7 UJ	13.6 UJ	34.5 J	19.9	7.3 J	3.3 U	4 U	4.8 U	4.5 U	2.7 U	5 UJ	2.7 UJ	5 U	2.3 U
TIN	5.9 U	4.8 J	3.3 J	2.6 UJ	14 U	--	29.5 U	29.5 U	29.5 U	5.9 U	2.6 U	2.6 U	3.7 UJ	14 U	29.5 U
VANADIUM	26 J	21.1	12.6 J	14.5 J	10.9 J	--	2.1 J	2.2 J	2.9 J	3.2 U	0.50 U	3.4 U	0.50 U	1.1 U	0.90 U
ZINC	592 J	518	438	458 J	378	--	154	152	146	608 J	150	93.2 U	47 U	487	249
DISSOLVED METALS (UG/L)															
ANTIMONY	--	--	--	--	--	2.7 U	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	2.9 U	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	9.8	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	0.70 U	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	1.7 U	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	0.10 U	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	7.3 J	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS															
CHLORIDE (UG/L)	--	18800	16200 U	20700 U	--	--	--	--	--	--	4600	9600 U	9360 U	--	--
SULFATE (UG/L)	--	2480000	2730000	2950000	--	--	--	--	--	--	879000	777000	778000	--	--
TOTAL DISSOLVED SOLIDS (UG/L)	--	3850000	3970000	4430000	--	--	--	--	--	--	1500000	1410000	1360000	--	--
TOTAL ORGANIC CARBON (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL SUSPENDED SOLIDS (UG/L)	--	--	--	--	--	4000 U	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)															
DIALLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THIONAZIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (UG/L)															
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
1,2-DICHLOROBENZENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
1,2-DIPHENYLHYDRAZINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
1,3-DINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
1,4-NAPHTHOQUINONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW002	C044GW002	C044GW002	C044GW002	C044GW002	C044GW002
SAMPLE ID	044GW00101	044GW00102	044GW00103	044GW00104	044GW00105	044GW00106	044GW001B7	044GW001A7	044GW00107	044GW00201	044GW00202	044GW00203	044GW00204	044GW00205	044GW002B6
SAMPLE DATE	6/13/1995	1/18/1996	5/6/1996	6/11/1996	7/28/1997	1/8/1999	7/20/1999	7/20/1999	7/20/1999	6/13/1995	1/18/1996	5/7/1996	6/7/1996	7/28/1997	7/20/1999
1-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	11 UJ	--	10 UJ	--	--	--	--	--	--	11 U	10 U	10 UJ	10 U	--
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	58 U	50 U	50 U	50 U	--	--	--	--	--	53 U	50 U	50 U	50 U	--
2,4,6-TRICHLOROPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2,4-DICHLOROPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2,4-DIMETHYLPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2,4-DINITROPHENOL	--	58 U	50 U	50 U	50 U	--	--	--	--	--	53 U	50 U	50 U	50 U	--
2,4-DINITROTOLUENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2,6-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2-ACETYLAMINOFLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2-CHLOROPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2-METHYLPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	53 UJ	--	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--
2-NITROPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
2-PICOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	21 UJ	--	--	--	--	--	--	--	--	21 U	20 UJ	20 U	20 U	--
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLCHOLANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	53 UJ	--	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	58 U	50 U	50 U	50 U	--	--	--	--	--	53 U	50 U	50 U	50 U	--
4-AMINOBIPHENYL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
4-CHLORO-3-METHYLPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
4-CHLOROANILINE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
4-CHLOROPHENYL PHENYL ETHER	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
4-METHYLPHENOL	--	12 U	10 U	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
4-NITROANILINE	--	53 UJ	--	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--
4-NITROPHENOL	--	58 U	50 U	50 U	50 U	--	--	--	--	--	53 U	50 U	50 U	50 U	--
5-NITRO-O-TOLUIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
ACENAPHTHYLENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
ACETOPHENONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
ARAMITE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BENZO(A)PYRENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BENZO(B)FLUORANTHENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BENZO(G,H,I)PERYLENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BENZO(K)FLUORANTHENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BENZOIC ACID	--	53 UJ	50 U	50 U	50 U	--	--	--	--	--	53 U	50 U	50 U	50 U	--
BENZOTRICHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	11 UJ	10 U	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BENZYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BIS(2-CHLOROETHYL)ETHER	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	4 U	--	--	--	--	--	--	--	--	11 U	10 U	10 U	130 U	--
BUTYL BENZYL PHTHALATE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
CHLOROBENZILATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
DIBENZOFURAN	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
DIETHYL PHTHALATE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
DIMETHYL PHTHALATE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
DI-N-BUTYL PHTHALATE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
DI-N-OCTYL PHTHALATE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
DIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
FLUORENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
HEXACHLOROBENZENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
HEXACHLOROBUTADIENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
HEXACHLOROCYCLOPENTADIENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 UJ	10 U	10 U	--
HEXACHLOROETHANE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
HEXACHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
ISOPHORONE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
ISOSAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHAPYRILENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW001	C044GW002	C044GW002	C044GW002	C044GW002	C044GW002	C044GW002
SAMPLE ID	044GW00101	044GW00102	044GW00103	044GW00104	044GW00105	044GW00106	044GW001B7	044GW001A7	044GW00107	044GW00201	044GW00202	044GW00203	044GW00204	044GW00205	044GW002B6
SAMPLE DATE	6/13/1995	1/18/1996	5/6/1996	6/11/1996	7/28/1997	1/8/1999	7/20/1999	7/20/1999	7/20/1999	6/13/1995	1/18/1996	5/7/1996	6/7/1996	7/28/1997	7/20/1999
METHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
NITROBENZENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
N-NITROSODIETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIMETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 UJ	10 U	10 U	--
N-NITROSODIPHENYLAMINE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOMORPHOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPIPERIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPYRROLIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PARALDEHYDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLORONITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	58 U	50 U	50 U	50 U	--	--	--	--	--	53 U	50 U	50 U	50 U	--
PHENACETIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
PHENOL	--	12 U	--	10 U	10 U	--	--	--	--	--	11 U	10 U	10 U	10 U	--
PRONAMIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	11 UJ	--	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--
PYRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SOLVENT YELLOW 2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILES (UG/L)															
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-CHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACROLEIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON DISULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL IODIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PROPIONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
STYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL ACETATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB CONGENERS (UG/L)															
AROCLOR-1016	--	1.1 U	1 U	1 U	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--
AROCLOR-1221	--	1.1 U	1 U	1 U	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--
AROCLOR-1232	--	1.1 U	1 U	1 U	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--
AROCLOR-1242	--	1.1 U	1 U	1 U	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW001**	**C044GW001**	**C044GW001**	**C044GW001**	**C044GW001**	**C044GW001**	**C044GW001**	**C044GW001**	**C044GW001**	**C044GW002**	**C044GW002**	**C044GW002**	**C044GW002**	**C044GW002**	**C044GW002**
SAMPLE ID	**044GW00101**	**044GW00102**	**044GW00103**	**044GW00104**	**044GW00105**	**044GW00106**	**044GW001B7**	**044GW001A7**	**044GW00107**	**044GW00201**	**044GW00202**	**044GW00203**	**044GW00204**	**044GW00205**	**044GW002B6**
SAMPLE DATE	**6/13/1995**	**1/18/1996**	**5/6/1996**	**6/11/1996**	**7/28/1997**	**1/8/1999**	**7/20/1999**	**7/20/1999**	**7/20/1999**	**6/13/1995**	**1/18/1996**	**5/7/1996**	**6/7/1996**	**7/28/1997**	**7/20/1999**
AROCLOR-1248	--	1.1 U	1 U	1 U	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--
AROCLOR-1254	--	2.2 U	2 U	2 U	--	--	--	--	--	--	2.2 U	2 U	2 U	--	--
AROCLOR-1260	--	2.2 U	2 U	2 U	--	--	--	--	--	--	2.2 U	2 U	2 U	--	--
PESTICIDES/PCBS (UG/L)															
4,4'-DDD	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
4,4'-DDE	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
4,4'-DDT	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 UJ	--	--
ALDRIN	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
ALPHA-BHC	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
ALPHA-CHLORDANE	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
BETA-BHC	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
CHLORDANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DELTA-BHC	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
DIELDRIN	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
ENDOSULFAN I	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
ENDOSULFAN II	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
ENDOSULFAN SULFATE	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
ENDRIN	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
ENDRIN ALDEHYDE	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
ENDRIN KETONE	--	0.086 U	0.08 U	0.08 U	--	--	--	--	--	--	0.089 U	0.08 U	0.08 U	--	--
GAMMA-BHC (LINDANE)	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
GAMMA-CHLORDANE	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
HEPTACHLOR	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
HEPTACHLOR EPOXIDE	--	0.043 U	0.04 U	0.04 U	--	--	--	--	--	--	0.044 U	0.04 U	0.04 U	--	--
ISODRIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHOXYCHLOR	--	0.41 U	0.38 UJ	0.38 U	--	--	--	--	--	--	0.42 U	0.38 U	0.38 UJ	--	--
TOXAPHENE	--	2.7 U	2.5 U	2.5 U	--	--	--	--	--	--	2.8 U	2.5 U	2.5 U	--	--

GROUNDWATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW002	C044GW002	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW004	C044GW004	C044GW004	C044GW004
SAMPLE ID	044GW00206	044GW002A6	044GW00301	044GW00302	044GW00303	044GW00304	044GW00305	044GW00306	044GW003B6	044GW003A6	044GW00401	044GW00402	044GW00403	044GW00404
SAMPLE DATE	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/6/1996	6/7/1996	7/28/1997	7/20/1999	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/7/1996	6/7/1996
DIOXINS/FURANS (PG/L)														
1,2,3,4,6,7,8,9-OCDD	--	--	--	--	--	--	--	--	--	--	--	--	99.7	46.8 J
1,2,3,4,6,7,8,9-OCDF	--	--	--	--	--	--	--	--	--	--	--	--	5.22 U	6.36
1,2,3,4,6,7,8-HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	5.83 U	6.21 U
1,2,3,4,6,7,8-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	3.09 U	6.8 J
1,2,3,4,7,8,9-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	4.3 U	6.06 U
1,2,3,4,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	8.28 U	11.7 U
1,2,3,4,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	2.82 U	4.48 U
1,2,3,6,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	4.94 U	7.32 U
1,2,3,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	1.7 U	2.86 U
1,2,3,7,8,9-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	6.01 U	8.5 U
1,2,3,7,8,9-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	2.97 U	4.41 U
1,2,3,7,8-PECDD	--	--	--	--	--	--	--	--	--	--	--	--	10.2 U	8.7 U
1,2,3,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	4.72 U	4.81 U
2,3,4,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	2.63 U	4.3 U
2,3,4,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	4.81 U	4.83 U
2,3,7,8-TCDD	--	--	--	--	--	--	--	--	--	--	--	--	7.53 U	11.2 U
2,3,7,8-TCDF	--	--	--	--	--	--	--	--	--	--	--	--	3.74 U	4.18 U
TOTAL HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	5.83 U	6.21 U
TOTAL HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	3.09 U	5.04 U
TOTAL HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	4.94 U	7.32 U
TOTAL HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	1.7 U	2.86 U
TOTAL PECDD	--	--	--	--	--	--	--	--	--	--	--	--	10.2 U	8.7 U
TOTAL PECDF	--	--	--	--	--	--	--	--	--	--	--	--	4.81 U	4.83 U
TOTAL TCDD	--	--	--	--	--	--	--	--	--	--	--	--	7.53 U	11.2 U
TOTAL TCDF	--	--	--	--	--	--	--	--	--	--	--	--	3.74 U	4.18 U
METALS (UG/L)														
ALUMINUM	--	--	2660 J	495	33.6 U	106 U	27.7 UJ	301 J	--	--	2510 J	98.8	463 U	19.7 U
ANTIMONY	5 U	5 U	1.9 U	2.1 U	14.9 U	2.1 U	1.6 J	5 U	5 U	5 U	3.3 J	2.1 U	18.7 U	2.1 U
ARSENIC	7.6 J	3.3 U	3.2 U	5.1 J	2.5 UJ	3.2 J	2.1 U	3.3 U	3.3 U	3.3 U	11.6	10.5 J	10.5 J	12.4 J
BARIUM	32.9	31.4	29.2 J	24.6	24.5 U	26.1 U	27.8	26.4	31.1	26	53.4 J	30.7	27.8 U	29.4 U
BERYLLIUM	0.30 U	0.30 U	0.33 U	0.53 J	0.35 U	0.53 J	0.84 UJ	0.30 U	0.30 U	0.30 U	0.42 U	0.36 J	0.30 U	0.45 J
CADMIUM	0.30 U	0.30 U	0.30 U	1.1 J	0.50 U	0.50 U	0.30 U	1.3 J	1.3 J	1.3 J	0.30 U	0.50 U	0.50 U	0.50 U
CALCIUM	142000	140000	447000 J	442000 J	444000	444000 J	528000	440000	429000	448000	377000 J	377000 J	340000	341000 J
CHROMIUM	0.50 UJ	0.50 UJ	3.3 J	1.1 J	2.2 U	1.6 U	1 U	0.50 UJ	0.50 UJ	0.50 UJ	7.1 J	0.86 J	2.2 U	0.80 U
COBALT	1.7 U	1.7 U	58.3	37.1	43.4	49	33.5	30.7	30.9	31.2	0.60 U	0.90 U	5.2 U	5.2 U
COPPER	1.2 U	1.3 U	3 J	8	1.4 UJ	2.5 U	1.4 U	1 U	2 U	1 U	15.6 J	0.60 UJ	1.4 UJ	0.62 U
CYANIDE	--	--	10 U	2 U	2 U	2 U	--	--	--	--	10 U	2 U	2 U	3.1 U
IRON	2230	632	67800	40100	37400	58400	38200	21000	14200	16600	18500	17900	15400	17500
LEAD	2.1 U	2.1 U	7.8 J	1.7 U	1.7 U	1.7 U	0.90 UJ	2.1 U	2.1 U	2.1 U	12.6 J	1.7 U	1.7 U	1.7 U
MAGNESIUM	7930 J	7810 J	45500	39600	36800	40800 J	34100	29000 J	27800 J	29200 J	138000	162000	142000	160000 J
MANGANESE	178 J	171 J	1160	843	905	1080 J	703	526 J	513 J	523 J	1350	1780	1470	1680 J
MERCURY	0.10 UJ	0.10 UJ	0.20 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.20 U	0.10 J	0.10 U	0.10 U
NICKEL	13 U	13 U	84.4	74.4 J	78.3	82.4	70.1	46.2	45.2	45.8	16.8 J	0.80 U	5.3 U	0.85 UJ
POTASSIUM	5160 J	5160 J	7170 J	6840 U	4150 U	4710 U	4410 J	3070 J	2950 J	3200 J	54600 J	43200	36600	45200
SELENIUM	7.2 J	7.6 J	4.4 U	2.8 UJ	2.8 U	3.8 J	3.4 U	2.9 U	2.9 U	2.9 U	4.4 U	2.8 UJ	2.8 U	2.8 U
SILVER	2 U	2 U	0.50 U	1.2 U	1.4 U	1.2 UJ	1 U	2 U	2 U	2 U	0.50 U	1.2 U	1.2 U	1.2 UJ
SODIUM	9570	9530	20700	15000	11300 U	15000 U	10500 U	12500	12000	12500	149000	194000	210000	239000
THALLIUM	2.3 U	2.3 U	4.5 U	2.7 U	2.7 UJ	8.4 J	5 U	2.3 U	2.3 U	2.3 U	4.5 U	3.7 U	7 UJ	2.7 UJ
TIN	29.5 U	29.5 U	5.9 U	2.6 U	2.6 U	4.1 UJ	14 U	29.5 U	29.5 U	29.5 U	5.9 U	2.6 U	2.6 U	2.6 UJ
VANADIUM	0.90 U	0.90 U	6.3 J	4.2	3.4 U	0.50 U	1.1 U	0.90 U	0.90 U	0.90 U	6.1 J	1.4 J	3.5 U	0.50 UJ
ZINC	293	257	124 J	92.2	84.6 U	106 U	77.9	77.6	68.3	74.3	113 J	5.3 U	11.8 U	5.3 U
DISSOLVED METALS (UG/L)														
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS														
CHLORIDE (UG/L)	--	--	--	11100	10100 U	12000 U	--	--	--	--	--	118000	154000 U	165000
SULFATE (UG/L)	--	--	--	1140000	1240000	1220000	--	--	--	--	--	607000	499000	488000
TOTAL DISSOLVED SOLIDS (UG/L)	--	--	--	2090000	2030000	2060000	--	--	--	--	--	2430000	2580000	2550000
TOTAL ORGANIC CARBON (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL SUSPENDED SOLIDS (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)														
DIALLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THIONAZIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (UG/L)														
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
1,2-DICHLOROBENZENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
1,2-DIPHENYLHYDRAZINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
1,3-DINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
1,4-NAPHTHOQUINONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW002	C044GW002	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW004	C044GW004	C044GW004	C044GW004
SAMPLE ID	044GW00206	044GW002A6	044GW00301	044GW00302	044GW00303	044GW00304	044GW00305	044GW00306	044GW003B6	044GW003A6	044GW00401	044GW00402	044GW00403	044GW00404
SAMPLE DATE	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/6/1996	6/7/1996	7/28/1997	7/20/1999	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/7/1996	6/7/1996
1-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 UJ
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	50 U	50 UJ	50 U	50 U	--	--	--	--	50 U	50 U	50 U
2,4,6-TRICHLOROPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
2,4-DICHLOROPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
2,4-DINITROPHENOL	--	--	--	50 U	50 UJ	50 U	50 U	--	--	--	--	50 U	50 U	50 U
2,4-DINITROTOLUENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
2,6-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
2-ACETYLAMINOFLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
2-CHLOROPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
2-METHYLPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
2-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	50 U	50 UJ	50 UJ	50 U	--	--	--	--	50 U	50 U	50 U
2-NITROPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
2-PICOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	20 U	20 UJ	20 UJ	20 U	--	--	--	--	20 U	20 UJ	20 U
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLCHOLANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	50 U	50 UJ	50 UJ	50 U	--	--	--	--	50 U	50 U	50 U
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	50 U	50 UJ	50 U	50 U	--	--	--	--	50 U	50 U	50 U
4-AMINOBIPHENYL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
4-CHLORO-3-METHYLPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
4-CHLOROANILINE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
4-METHYLPHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
4-NITROANILINE	--	--	--	50 U	50 UJ	50 UJ	50 U	--	--	--	--	50 U	50 U	50 U
4-NITROPHENOL	--	--	--	50 U	50 UJ	50 U	50 U	--	--	--	--	50 U	50 U	50 U
5-NITRO-O-TOLUIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
ACENAPHTHYLENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
ACETOPHENONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
ARAMITE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BENZO(A)PYRENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BENZO(B)FLUORANTHENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BENZO(G,H,I)PERYLENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BENZOIC ACID	--	--	--	50 U	50 UJ	50 U	50 U	--	--	--	--	50 U	50 U	50 U
BENZOTRICHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BENZYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	10 U	10 UJ	10 U	11 U	--	--	--	--	10 U	10 U	10 U
BUTYL BENZYL PHTHALATE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
CHLOROBENZILATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
DIBENZOFURAN	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
DIETHYL PHTHALATE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
DIMETHYL PHTHALATE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
DIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
FLUORENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
HEXACHLOROBENZENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
HEXACHLOROBUTADIENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
HEXACHLOROCYCLOPENTADIENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 UJ	10 U
HEXACHLOROETHANE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
HEXACHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
ISOPHORONE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
ISOSAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHAPYRILENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW002	C044GW002	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW004	C044GW004	C044GW004	C044GW004
SAMPLE ID	044GW00206	044GW002A6	044GW00301	044GW00302	044GW00303	044GW00304	044GW00305	044GW00306	044GW003B6	044GW003A6	044GW00401	044GW00402	044GW00403	044GW00404
SAMPLE DATE	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/6/1996	6/7/1996	7/28/1997	7/20/1999	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/7/1996	6/7/1996
METHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
NITROBENZENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
N-NITROSODIETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIMETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 UJ	10 U
N-NITROSODIPHENYLAMINE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOMORPHOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPIPERIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPYRROLIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PARALDEHYDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLORONITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	50 U	50 UJ	50 U	50 U	--	--	--	--	50 U	50 U	50 U
PHENACETIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
PHENOL	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	10 U	10 U	10 U
PRONAMIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	10 U	10 UJ	10 UJ	10 U	--	--	--	--	10 U	10 U	10 U
PYRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SOLVENT YELLOW 2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILES (UG/L)														
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-CHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACROLEIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON DISULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL IODIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PROPIONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
STYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL ACETATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB CONGENERS (UG/L)														
AROCLOR-1016	--	--	--	1 U	1 U	1 U	--	--	--	--	--	1 U	1 U	1 U
AROCLOR-1221	--	--	--	1 U	1 U	1 U	--	--	--	--	--	1 U	1 U	1 U
AROCLOR-1232	--	--	--	1 U	1 U	1 U	--	--	--	--	--	1 U	1 U	1 U
AROCLOR-1242	--	--	--	1 U	1 U	1 U	--	--	--	--	--	1 U	1 U	1 U

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW002	C044GW002	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW003	C044GW004	C044GW004	C044GW004	C044GW004
SAMPLE ID	044GW00206	044GW002A6	044GW00301	044GW00302	044GW00303	044GW00304	044GW00305	044GW00306	044GW003B6	044GW003A6	044GW00401	044GW00402	044GW00403	044GW00404
SAMPLE DATE	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/6/1996	6/7/1996	7/28/1997	7/20/1999	7/20/1999	7/20/1999	6/13/1995	1/17/1996	5/7/1996	6/7/1996
AROCLOR-1248	--	--	--	1 U	1 U	1 U	--	--	--	--	--	1 U	1 U	1 U
AROCLOR-1254	--	--	--	2 U	2 U	2 U	--	--	--	--	--	2 U	2 U	2 U
AROCLOR-1260	--	--	--	2 U	2 U	2 U	--	--	--	--	--	2 U	2 U	2 U
PESTICIDES/PCBS (UG/L)														
4,4'-DDD	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
4,4'-DDE	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
4,4'-DDT	--	--	--	0.08 U	0.08 U	0.08 UJ	--	--	--	--	--	0.08 U	0.08 U	0.08 UJ
ALDRIN	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
ALPHA-BHC	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
ALPHA-CHLORDANE	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
BETA-BHC	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
CHLORDANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DELTA-BHC	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
DIELDRIN	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
ENDOSULFAN I	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
ENDOSULFAN II	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
ENDOSULFAN SULFATE	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
ENDRIN	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
ENDRIN ALDEHYDE	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
ENDRIN KETONE	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	0.08 U	0.08 U	0.08 U
GAMMA-BHC (LINDANE)	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
GAMMA-CHLORDANE	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
HEPTACHLOR	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
HEPTACHLOR EPOXIDE	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	0.04 U	0.04 U	0.04 U
ISODRIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHOXYCHLOR	--	--	--	0.38 U	0.38 UJ	0.38 UJ	--	--	--	--	--	0.38 U	0.38 U	0.38 UJ
TOXAPHENE	--	--	--	2.5 U	2.5 U	2.5 U	--	--	--	--	--	2.5 U	2.5 U	2.5 U

GROUNDWATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW004	C044GW004	C044GW004	C044GW004	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005
SAMPLE ID	044GW00405	044GW004B6	044GW00406	044GW004A6	044GW00501	044GW00502	044GW00503	044GW00504	044GW00505	044GW005B6	044GW005A6	044GW00506	044GW00507	044GW00508
SAMPLE DATE	7/30/1997	7/21/1999	7/21/1999	7/21/1999	6/13/1995	1/17/1996	5/9/1996	6/10/1996	8/1/1997	7/21/1999	7/21/1999	7/21/1999	4/22/2003	5/5/2003
DIOXINS/FURANS (PG/L)														
1,2,3,4,6,7,8,9-OCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-OCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)														
ALUMINUM	21.4 UJ	189 J	1430 J	250 J	481 J	18 U	38.2 U	110 U	8 U	--	--	--	--	--
ANTIMONY	1.6 UJ	5 U	5 U	5 U	1.9 U	2.1 U	3.7 U	2.1 U	1.6 U	5 U	5 U	5 U	3.4 U	5 U
ARSENIC	34	19.2	20.8	20.2	3.2 U	3.8 J	2.5 UJ	7.1 J	3.3 J	3.3 U	3.3 U	3.3 U	2.5 U	2.5 U
BARIUM	33.2	44.3	35.9	34.8	45.6 J	32.1 J	22.4 U	24.2 U	39.6	31	30.3	31.3	--	--
BERYLLIUM	0.62 UJ	1.4 U	2.1 J	1.5 U	0.41 U	0.66 J	0.54 U	0.75 J	0.91 J	0.46 U	0.47 U	0.49 U	0.54 J	--
CADMIUM	0.30 U	0.66 J	0.71 J	0.64 J	0.30 U	0.50 U	0.50 U	0.50 U	0.30 U	0.30 U	0.30 U	0.30 U	--	--
CALCIUM	137000	343000	362000	350000	359000 J	280000 J	202000	211000 J	322000	275000	270000	277000	--	--
CHROMIUM	1 U	0.50 UJ	0.50 UJ	0.50 UJ	2.6 J	3.1 J	1.8 U	2.9 U	2.3 J	1.7 J	1.3 UJ	1.7 J	--	--
COBALT	3.4 UJ	41.3	45.2	42.6	0.60 U	0.95 J	5.2 U	5.2 U	0.96 U	1.7 U	1.7 U	1.7 U	1.1 U	--
COPPER	1.4 U	1 U	2.1 U	1 U	3.2 J	0.60 UJ	0.60 UJ	2.2 U	1.4 U	1 U	1 U	1 U	--	--
CYANIDE	--	--	--	--	10 U	2 U	2 U	2 U	--	--	--	--	--	--
IRON	22300	28200	31200	29600	2660	2380	1380	1380	2800	24.2 U	28 J	1390	725	128 J
LEAD	0.90 UJ	2.1 U	2.1 U	2.1 U	2.2 J	1.7 UJ	1.7 U	1.7 U	0.90 U	2.1 U	2.1 U	2.1 U	--	--
MAGNESIUM	157000	239000 J	252000 J	243000 J	653000	523000	489000	658000 J	636000	473000 J	464000 J	477000 J	--	--
MANGANESE	1250	15300 J	16800 J	15800 J	1040	986	454	221 J	692	487 J	476 J	522 J	--	--
MERCURY	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.20 U	0.14 J	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 U	--
NICKEL	0.70 J	55.1	61.4	56.9	3.2 J	1.1 J	0.80 U	1.9 UJ	0.96 J	13 U	13 U	13 U	--	--
POTASSIUM	55500	48400 J	49500 J	48600 J	282000 J	226000 J	143000	225000	172000	194000 J	188000 J	194000 J	--	--
SELENIUM	3.4 U	2.9 U	2.9 U	2.9 U	4.4 U	2.8 UJ	2.8 U	2.8 U	3.4 U	2.9 U	2.9 U	2.9 U	2.3 U	--
SILVER	1 U	2 U	2 U	2 U	0.50 U	1.2 U	1.2 U	1.2 UJ	1 U	2 U	2 U	2 U	--	--
SODIUM	1130000	405000	395000	399000	4640000	5430000	4580000	6590000	5180000	4920000	4830000	5030000	--	--
THALLIUM	6.7 J	2.3 U	2.3 U	2.3 U	4.5 U	2.7 UJ	2.7 UJ	3.8 J	5 U	2.3 U	2.3 U	2.3 U	3.2 U	--
TIN	14 U	29.5 U	29.5 U	29.5 U	5.9 U	2.6 U	2.6 U	6.4 UJ	14 U	29.5 U	29.5 U	29.5 U	--	--
VANADIUM	1.4 J	0.90 J	1.7 J	0.90 U	2.1 U	2.7 J	2.3 U	2.4 UJ	3.3 J	1.6 J	1.7 J	1.8 J	0.97 U	1.1 J
ZINC	5.8 U	131	182	122	18.1 J	5.3 UJ	6.9 U	5.3 U	5.8 U	2.9 U	2.9 U	2.9 U	5 U	--
DISSOLVED METALS (UG/L)														
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS														
CHLORIDE (UG/L)	--	--	--	--	--	8190000	10700000	11500000	--	--	--	--	--	--
SULFATE (UG/L)	--	--	--	--	--	381000	232000	14400 U	--	--	--	--	--	--
TOTAL DISSOLVED SOLIDS (UG/L)	--	--	--	--	--	17900000	19700000	20500000	--	--	--	--	12600000	14000000
TOTAL ORGANIC CARBON (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	28300	31100
TOTAL SUSPENDED SOLIDS (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)														
DIALLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THIONAZIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (UG/L)														
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
1,2-DICHLOROBENZENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
1,2-DIPHENYLHYDRAZINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
1,3-DINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
1,4-NAPHTHOQUINONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW004	C044GW004	C044GW004	C044GW004	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005
SAMPLE ID	044GW00405	044GW004B6	044GW00406	044GW004A6	044GW00501	044GW00502	044GW00503	044GW00504	044GW00505	044GW005B6	044GW005A6	044GW00506	044GW00507	044GW00508
SAMPLE DATE	7/30/1997	7/21/1999	7/21/1999	7/21/1999	6/13/1995	1/17/1996	5/9/1996	6/10/1996	8/1/1997	7/21/1999	7/21/1999	7/21/1999	4/22/2003	5/5/2003
1-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	10 U	--	--	--	--	10 U	10 U	10 UJ	10 U	--	--	--	--	--
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2,4-DICHLOROPHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2,4-DIMETHYLPHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2,4-DINITROPHENOL	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
2,4-DINITROTOLUENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2,6-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2-ACETYLAMINOFLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2-CHLOROPHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	10 U	--
2-METHYLPHENOL	10 U	--	--	--	--	10 U	10 UJ	10 U	10 U	--	--	--	--	--
2-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
2-NITROPHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
2-PICOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	20 U	--	--	--	--	20 U	20 U	20 UJ	20 U	--	--	--	--	--
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLCHOLANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
4-AMINOBIPHENYL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
4-CHLOROANILINE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
4-METHYLPHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
4-NITROANILINE	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
4-NITROPHENOL	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
5-NITRO-O-TOLUIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
ACENAPHTHYLENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
ACETOPHENONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
ARAMITE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	10 U	--
BENZO(A)PYRENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
BENZO(B)FLUORANTHENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
BENZO(G,H,I)PERYLENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
BENZO(K)FLUORANTHENE	10 UJ	--	--	--	--	10 U	10 U	10 U	10 UJ	--	--	--	--	--
BENZOIC ACID	50 U	--	--	--	--	50 U	7 J	50 U	50 U	--	--	--	--	--
BENZOTRICHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
BENZYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	--	--	--	--	10 U	10 U	25 U	10 U	--	--	--	--	--
BUTYL BENZYL PHTHALATE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
CHLOROBENZILATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	10 U	--
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
DIBENZOFURAN	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
DIETHYL PHTHALATE	10 U	--	--	--	--	10 U	1 J	10 U	10 U	--	--	--	--	--
DIMETHYL PHTHALATE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
DI-N-BUTYL PHTHALATE	10 U	--	--	--	--	10 U	1 J	10 U	10 U	--	--	--	--	--
DI-N-OCTYL PHTHALATE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
DIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	10 U	--
FLUORENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
HEXACHLOROBENZENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
HEXACHLOROBUTADIENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	10 U	--	--	--	--	10 U	10 U	10 U	10 UJ	--	--	--	--	--
HEXACHLOROETHANE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
HEXACHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
ISOPHORONE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
ISOSAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHAPYRILENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW004	C044GW004	C044GW004	C044GW004	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005	C044GW005
SAMPLE ID	044GW00405	044GW004B6	044GW00406	044GW004A6	044GW00501	044GW00502	044GW00503	044GW00504	044GW00505	044GW005B6	044GW005A6	044GW00506	044GW00507	044GW00508
SAMPLE DATE	7/30/1997	7/21/1999	7/21/1999	7/21/1999	6/13/1995	1/17/1996	5/9/1996	6/10/1996	8/1/1997	7/21/1999	7/21/1999	7/21/1999	4/22/2003	5/5/2003
METHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	10 U	--
NITROBENZENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
N-NITROSODIETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIMETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
N-NITROSODIPHENYLAMINE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOMORPHOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPIPERIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPYRROLIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PARALDEHYDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLORONITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	50 U	--	--	--	--	50 U	50 U	50 U	50 U	--	--	--	--	--
PHENACETIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	10 U	--
PHENOL	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--	--
PRONAMIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	10 U	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	10 U	--
PYRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SOLVENT YELLOW 2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILES (UG/L)														
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-CHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACROLEIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON DISULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL IODIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PROPIONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
STYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL ACETATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB CONGENERS (UG/L)														
AROCLOR-1016	--	--	--	--	--	1 U	1 U	1 U	--	--	--	--	--	--
AROCLOR-1221	--	--	--	--	--	1 U	1 U	1 U	--	--	--	--	--	--
AROCLOR-1232	--	--	--	--	--	1 U	1 U	1 U	--	--	--	--	--	--
AROCLOR-1242	--	--	--	--	--	1 U	1 U	1 U	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW004**	**C044GW004**	**C044GW004**	**C044GW004**	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW005**
SAMPLE ID	**044GW00405**	**044GW004B6**	**044GW00406**	**044GW004A6**	**044GW00501**	**044GW00502**	**044GW00503**	**044GW00504**	**044GW00505**	**044GW005B6**	**044GW005A6**	**044GW00506**	**044GW00507**	**044GW00508**
SAMPLE DATE	**7/30/1997**	**7/21/1999**	**7/21/1999**	**7/21/1999**	**6/13/1995**	**1/17/1996**	**5/9/1996**	**6/10/1996**	**8/1/1997**	**7/21/1999**	**7/21/1999**	**7/21/1999**	**4/22/2003**	**5/5/2003**
AROCLOR-1248	--	--	--	--	--	1 U	1 U	1 U	--	--	--	--	--	--
AROCLOR-1254	--	--	--	--	--	2 U	2 U	2 U	--	--	--	--	--	--
AROCLOR-1260	--	--	--	--	--	2 U	2 U	2 U	--	--	--	--	--	--
PESTICIDES/PCBS (UG/L)														
4,4'-DDD	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
4,4'-DDE	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
4,4'-DDT	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
ALDRIN	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
ALPHA-BHC	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
ALPHA-CHLORDANE	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
BETA-BHC	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
CHLORDANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DELTA-BHC	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
DIELDRIN	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
ENDOSULFAN I	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
ENDOSULFAN II	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
ENDOSULFAN SULFATE	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
ENDRIN	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
ENDRIN ALDEHYDE	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
ENDRIN KETONE	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--	--
GAMMA-BHC (LINDANE)	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
GAMMA-CHLORDANE	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
HEPTACHLOR	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
HEPTACHLOR EPOXIDE	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--	--
ISODRIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHOXYCHLOR	--	--	--	--	--	0.38 U	0.38 U	0.38 U	--	--	--	--	--	--
TOXAPHENE	--	--	--	--	--	2.5 U	2.5 U	2.5 U	--	--	--	--	--	--

GROUNDWATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW005	C044GW005	C044GW005	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006
SAMPLE ID	044GW00509	044GW00510	044G00514	044GW00601a_LGCY	044GW00601a	044GW00601b	044GW00602	044GW00603	044GW00604	044GW00605	044GW006A6	044GW00606	044GW006B6	044GW00607
SAMPLE DATE	5/21/2003	6/5/2003	4/29/2008	4/25/1995	4/25/1995	5/1/1995	1/17/1996	5/8/1996	6/11/1996	7/30/1997	7/22/1999	7/22/1999	7/22/1999	4/22/2003
DIOXINS/FURANS (PG/L)														
1,2,3,4,6,7,8,9-OCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-OCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)														
ALUMINUM	--	--	258 U	--	119 J	--	18 U	23 U	156 U	8 UJ	--	--	--	--
ANTIMONY	14.4 U	--	7.5 U	--	1.9 U	--	2.1 U	4 U	3.3 U	2.6 J	5 U	5 U	5 U	3.4 U
ARSENIC	2.1 J	2.8 J	8.5 U	--	3.2 U	--	6.3 J	2.5 UJ	6.9 J	4.2 J	3.3 U	3.3 U	3.3 U	2.5 U
BARIUM	--	--	52.5	--	56 J	--	23.2	19.1 U	35.4 UJ	40.4	36	38.4	33.5	--
BERYLLIUM	--	--	0.12 U	--	0.20 U	--	0.45 J	0.30 U	0.44 J	1.3 UJ	0.30 U	0.30 U	0.30 U	0.30 U
CADMIUM	--	--	0.50 U	--	0.30 U	--	0.50 U	0.50 U	0.50 U	0.30 U	0.30 U	0.30 U	0.30 U	--
CALCIUM	--	--	542000	--	327000	--	446000 J	401000	267000 J	448000	400000	391000	404000	--
CHROMIUM	--	--	9.7 U	--	3.4 J	--	1.6 J	0.80 U	0.86 U	1.7 U	0.50 UJ	0.50 UJ	0.50 UJ	--
COBALT	--	--	2.3 U	--	0.96 J	--	5.1	5.2 U	5.2 U	3.8 UJ	1.7 U	1.7 U	1.7 U	2.5 J
COPPER	--	--	4 U	--	4 U	--	0.60 UJ	1.2 UJ	5.4 U	1.4 U	1.5 U	2 U	1 U	--
CYANIDE	--	--	--	--	10 U	--	2 U	3.6 U	2 U	--	--	--	--	--
IRON	55.6 U	55.6 U	400	--	851	--	5240	1110	518 U	4630	1690	2890	1160	4620
LEAD	--	--	7 U	--	2.4 J	--	1.7 U	1.7 U	1.7 UJ	0.90 UJ	2.1 U	2.1 U	2.1 U	--
MAGNESIUM	--	--	498000	--	245000	--	128000	76700	347000 J	152000	128000 J	129000 J	123000 J	--
MANGANESE	--	--	1010	--	1990	--	2580	546	1120 J	1770	1110 J	1060 J	1150 J	--
MERCURY	--	--	0.02 U	--	0.20 U	--	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 U
NICKEL	--	--	5.7 U	--	2.6 J	--	10.5 J	5.7 U	5.3 UJ	7.7 J	13 U	13 U	13 U	--
POTASSIUM	--	--	149000	--	148000	--	35500	29500	114000	60700	47500 J	48800 J	41800 J	--
SELENIUM	--	--	11 U	--	4.4 U	--	2.8 UJ	2.8 U	2.8 U	3.4 U	2.9 U	2.9 U	2.9 U	2.3 U
SILVER	--	--	2.7 U	--	0.50 U	--	1.2 U	2.7 U	1.2 UJ	1 J	2 U	2 U	2 U	--
SODIUM	--	--	4140000	--	1690000	--	643000	354000	3110000	939000	1070000	1100000	998000	--
THALLIUM	--	--	10 U	--	4.5 UJ	--	2.7 U	2.7 UJ	2.7 UJ	6 J	2.8 U	2.3 U	2.3 U	3.2 U
TIN	--	--	--	--	5.9 UJ	--	2.6 U	3.1 J	2.6 UJ	14 U	29.5 U	29.5 U	29.5 U	--
VANADIUM	1 U	--	3.4 U	--	9.9 J	--	0.50 U	3.9 U	26 J	1.9 J	1.1 J	1.2 J	1 J	0.94 U
ZINC	--	--	10.9 U	--	19.9 J	--	5.3 U	6.9 U	5.3 UJ	5.8 U	2.9 U	5 U	3.7 U	5 U
DISSOLVED METALS (UG/L)														
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS														
CHLORIDE (UG/L)	--	--	--	--	--	3530000	663000	362000	5280000	--	--	--	--	--
SULFATE (UG/L)	--	--	--	--	--	1010000	1640000	1370000	380000	--	--	--	--	--
TOTAL DISSOLVED SOLIDS (UG/L)	13800000	15100000	--	--	--	8860000	4340000	3050000	10500000	--	--	--	--	7830000
TOTAL ORGANIC CARBON (UG/L)	31700	41000	--	--	--	--	--	--	--	--	--	--	--	11800
TOTAL SUSPENDED SOLIDS (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)														
DIALLATE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
DIMETHOATE	--	--	--	--	15 UJ	--	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	110 U	--	--	--	--	--	--	--	--	--
THIONAZIN	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (UG/L)														
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	--	5 U	--	10 U	10 U	10 U	10 U	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
1,2-DIPHENYLHYDRAZINE	--	--	--	--	15 UJ	--	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
1,3,5-TRINITROBENZENE	--	--	--	--	45 U	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
1,3-DINITROBENZENE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
1,4-NAPHTHOQUINONE	--	--	--	--	35 U	--	--	--	--	--	--	--	--	--
1-CHLORONAPHTHALENE	--	--	--	--	25 U	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW005	C044GW005	C044GW005	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006
SAMPLE ID	044GW00509	044GW00510	044G00514	044GW00601a_LGCY	044GW00601a	044GW00601b	044GW00602	044GW00603	044GW00604	044GW00605	044GW006A6	044GW00606	044GW006B6	044GW00607
SAMPLE DATE	5/21/2003	6/5/2003	4/29/2008	4/25/1995	4/25/1995	5/1/1995	1/17/1996	5/8/1996	6/11/1996	7/30/1997	7/22/1999	7/22/1999	7/22/1999	4/22/2003
1-METHYLNAPHTHALENE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
1-NAPHTHYLAMINE	--	--	--	--	35 U	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	--	--	10 U	10 U	10 U	10 U	--	--	--	--
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	35 U	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	--	25 U	--	53 U	50 U	50 U	50 U	--	--	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	--	25 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2,4-DICHLOROPHENOL	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2,4-DIMETHYLPHENOL	--	--	--	--	35 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2,4-DINITROPHENOL	--	--	--	--	75 U	--	53 U	50 U	50 U	50 U	--	--	--	--
2,4-DINITROTOLUENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2,6-DICHLOROPHENOL	--	--	--	--	25 U	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2-ACETYLAMINOFLUORENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2-CHLOROPHENOL	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	25 U	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	10 U
2-METHYLPHENOL	--	--	--	--	20 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2-NAPHTHYLAMINE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	--	20 UJ	--	53 U	50 U	50 U	50 U	--	--	--	--
2-NITROPHENOL	--	--	--	--	5 U	--	10 U	10 U	10 U	10 U	--	--	--	--
2-PICOLINE	--	--	--	--	45 U	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	--	10 U	--	21 U	20 U	20 U	20 U	--	--	--	--
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	--	100 U	--	--	--	--	--	--	--	--	--
3-METHYLCHOLANTHRENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
3-METHYLPHENOL	--	--	--	--	35 U	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	--	30 U	--	53 U	50 U	50 U	50 U	--	--	--	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	45 U	--	53 U	50 U	50 U	50 U	--	--	--	--
4-AMINOBIPHENYL	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
4-CHLOROANILINE	--	--	--	--	5 U	--	10 U	10 U	10 U	10 U	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
4-METHYLPHENOL	--	--	--	--	35 U	--	10 U	10 U	10 U	10 U	--	--	--	--
4-NITROANILINE	--	--	--	--	35 U	--	53 U	50 U	50 U	50 U	--	--	--	--
4-NITROPHENOL	--	--	--	--	45 U	--	53 U	50 U	50 U	50 U	--	--	--	--
5-NITRO-O-TOLUIDINE	--	--	--	--	30 U	--	--	--	--	--	--	--	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
ACETOPHENONE	--	--	--	--	1 J	--	--	--	--	--	--	--	--	--
ANILINE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
ARAMITE	--	--	--	--	20 UJ	--	--	--	--	--	--	--	--	--
BENZIDINE	--	--	--	--	25 UJ	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	10 U
BENZO(A)PYRENE	--	--	--	--	5 U	--	10 U	10 U	10 U	10 U	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	10 UJ	--	10 U	10 U	10 U	10 U	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	20 U	--	10 U	10 U	10 U	10 U	--	--	--	--
BENZOIC ACID	--	--	--	--	95 U	--	2 J	50 U	50 U	50 U	--	--	--	--
BENZOTRICHLORIDE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	--	20 U	--	10 U	10 U	10 U	10 U	--	--	--	--
BENZYL CHLORIDE	--	--	--	--	5 UJ	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	20 U	--	10 U	10 U	10 U	10 U	--	--	--	--
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	15 UJ	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	8 J	--	1 J	10 U	10 U	10 U	--	--	--	--
BUTYL BENZYL PHTHALATE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
CHLOROBENZILATE	--	--	--	--	10 UJ	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	10 U
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
DIBENZOFURAN	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
DIPHENYLAMINE	--	--	--	--	30 U	--	--	--	--	--	--	--	--	--
ETHYL METHACRYLATE	--	--	--	10 U	15 UJ	--	--	--	--	--	--	--	--	--
ETHYL METHANE SULFONATE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	20 U	--	10 U	10 U	10 U	10 U	--	--	--	10 U
FLUORENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	5 U	--	10 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	25 U	--	10 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROPROPENE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	10 U	--	10 U	10 U	10 U	10 U	--	--	--	--
ISOPHORONE	--	--	--	--	10 UJ	--	10 U	10 U	10 U	10 U	--	--	--	--
ISOSAFROLE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
METHAPYRILENE	--	--	--	--	30 UJ	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW005	C044GW005	C044GW005	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006
SAMPLE ID	044GW00509	044GW00510	044G00514	044GW00601a_LGCY	044GW00601a	044GW00601b	044GW00602	044GW00603	044GW00604	044GW00605	044GW006A6	044GW00606	044GW006B6	044GW00607
SAMPLE DATE	5/21/2003	6/5/2003	4/29/2008	4/25/1995	4/25/1995	5/1/1995	1/17/1996	5/8/1996	6/11/1996	7/30/1997	7/22/1999	7/22/1999	7/22/1999	4/22/2003
METHYL METHACRYLATE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
METHYL METHANE SULFONATE	--	--	--	--	20 UJ	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	5 U	--	10 U	10 U	10 U	10 U	--	--	--	10 U
NITROBENZENE	--	--	--	--	10 UJ	--	10 UJ	10 U	10 U	10 U	--	--	--	--
N-NITROSODIETHYLAMINE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
N-NITROSODIMETHYLAMINE	--	--	--	--	15 UJ	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	10 UJ	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	20 UJ	--	10 U	10 U	10 U	10 U	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	30 U	--	10 U	10 U	10 U	10 U	--	--	--	--
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
N-NITROSOMORPHOLINE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
N-NITROSOPIPERIDINE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
N-NITROSOPYRROLIDINE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
PARALDEHYDE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
PENTACHLOROBENZENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
PENTACHLOROETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
PENTACHLORONITROBENZENE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	55 U	--	53 U	50 U	50 U	50 U	--	--	--	--
PHENACETIN	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	10 U
PHENOL	--	--	--	--	15 U	--	10 U	10 U	10 U	10 U	--	--	--	--
PRONAMIDE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	10 UJ	--	10 U	10 U	10 U	10 U	--	--	--	10 U
PYRIDINE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
SAFROLE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
SOLVENT YELLOW 2	--	--	--	--	10 UJ	--	--	--	--	--	--	--	--	--
VOLATILES (UG/L)														
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	25 UJ	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	--	--	--	--	5 UJ	--	--	--	--	--	--	--	--	--
1,2-DICHLOROPROPANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
2-BUTANONE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	--	15 UJ	--	--	--	--	--	--	--	--	--
3-CHLOROPROPENE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	--	--	10 UJ	--	--	--	--	--	--	--	--	--
ACETONE	--	--	--	--	15 UJ	--	--	--	--	--	--	--	--	--
ACETONITRILE	--	--	--	--	60 U	--	--	--	--	--	--	--	--	--
ACROLEIN	--	--	--	--	90 U	--	--	--	--	--	--	--	--	--
ACRYLONITRILE	--	--	--	--	95 U	--	--	--	--	--	--	--	--	--
BENZENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
BROMOFORM	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
BROMOMETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
CARBON DISULFIDE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	--	--	--	--	10 UJ	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
CHLOROETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
CHLOROFORM	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
CHLOROMETHANE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
DIBROMOMETHANE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
METHACRYLONITRILE	--	--	--	--	20 U	--	--	--	--	--	--	--	--	--
METHYL IODIDE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
PROPIONITRILE	--	--	--	--	220 U	--	--	--	--	--	--	--	--	--
STYRENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
TOLUENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	10 UJ	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	10 UJ	--	--	--	--	--	--	--	--	--
VINYL ACETATE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
VINYL CHLORIDE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
PCB CONGENERS (UG/L)														
AROCLOR-1016	--	--	--	--	0.50 U	--	1 U	1 U	1 U	--	--	--	--	--
AROCLOR-1221	--	--	--	--	0.50 U	--	1 U	1 U	1 U	--	--	--	--	--
AROCLOR-1232	--	--	--	--	0.50 U	--	1 U	1 U	1 U	--	--	--	--	--
AROCLOR-1242	--	--	--	--	0.50 U	--	1 U	1 U	1 U	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW005**	**C044GW005**	**C044GW005**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**
SAMPLE ID	**044GW00509**	**044GW00510**	**044G00514**	**044GW00601a_LGCY**	**044GW00601a**	**044GW00601b**	**044GW00602**	**044GW00603**	**044GW00604**	**044GW00605**	**044GW006A6**	**044GW00606**	**044GW006B6**	**044GW00607**
SAMPLE DATE	**5/21/2003**	**6/5/2003**	**4/29/2008**	**4/25/1995**	**4/25/1995**	**5/1/1995**	**1/17/1996**	**5/8/1996**	**6/11/1996**	**7/30/1997**	**7/22/1999**	**7/22/1999**	**7/22/1999**	**4/22/2003**
AROCLOR-1248	--	--	--	--	0.50 U	--	1 U	1 U	1 U	--	--	--	--	--
AROCLOR-1254	--	--	--	--	0.50 U	--	2 U	2 U	2 U	--	--	--	--	--
AROCLOR-1260	--	--	--	--	0.50 U	--	2 U	2 U	2 U	--	--	--	--	--
PESTICIDES/PCBS (UG/L)														
4,4'-DDD	--	--	--	--	0.10 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
4,4'-DDE	--	--	--	--	0.10 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
4,4'-DDT	--	--	--	--	0.10 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
ALDRIN	--	--	--	--	0.03 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
ALPHA-BHC	--	--	--	--	0.03 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
ALPHA-CHLORDANE	--	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
BETA-BHC	--	--	--	--	0.03 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
CHLORDANE	--	--	--	--	0.12 U	--	--	--	--	--	--	--	--	--
DELTA-BHC	--	--	--	--	0.03 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
DIELDRIN	--	--	--	--	0.03 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
ENDOSULFAN I	--	--	--	--	0.05 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
ENDOSULFAN II	--	--	--	--	0.10 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
ENDOSULFAN SULFATE	--	--	--	--	0.05 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
ENDRIN	--	--	--	--	0.05 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
ENDRIN ALDEHYDE	--	--	--	--	0.03 U	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
ENDRIN KETONE	--	--	--	--	--	--	0.08 U	0.08 U	0.08 U	--	--	--	--	--
GAMMA-BHC (LINDANE)	--	--	--	--	0.03 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
GAMMA-CHLORDANE	--	--	--	--	--	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
HEPTACHLOR	--	--	--	--	0.03 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
HEPTACHLOR EPOXIDE	--	--	--	--	0.03 U	--	0.04 U	0.04 U	0.04 U	--	--	--	--	--
ISODRIN	--	--	--	--	15 U	--	--	--	--	--	--	--	--	--
METHOXYCHLOR	--	--	--	--	0.30 U	--	0.38 U	0.38 U	0.38 U	--	--	--	--	--
TOXAPHENE	--	--	--	--	1 U	--	2.5 U	2.5 U	2.5 U	--	--	--	--	--

GROUNDWATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007
SAMPLE ID	044GW00608	044GW00609	044GW00610	044GW00611	044GW00612	044G00614	044GW00701	044GW00702	044GW00703	044GW00704	044GW00705	044GW007F6	044GW007U6
SAMPLE DATE	5/5/2003	5/21/2003	6/5/2003	9/4/2003	12/5/2003	4/29/2008	6/14/1995	1/18/1996	5/10/1996	6/11/1996	8/1/1997	1/7/1999	1/7/1999
DIOXINS/FURANS (PG/L)													
1,2,3,4,6,7,8,9-OCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-OCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)													
ALUMINUM	--	--	--	--	--	58.8 U	2110 J	350	31.5 U	25.1 U	28.3 J	--	--
ANTIMONY	4.2 U	12.4 U	--	--	--	2.7 U	1.9 U	54.1	10.3 J	8.2 U	35.3 J	2.7 U	3.4 J
ARSENIC	2.5 U	2.1 J	2.2 J	2.5 U	3.7 J	4	12.3	109	30.1	62.8	23.2	43.8	45.9
BARIUM	--	--	--	--	--	78.8	22.6 J	22.2	8.5 U	9.4 U	45.9	--	--
BERYLLIUM	--	--	--	--	--	0.12 U	0.24 U	0.30 U	0.30 U	0.30 U	0.25 J	0.11 J	0.10 U
CADMIUM	--	--	--	--	--	0.10 U	0.30 U	0.50 U	0.50 U	0.50 U	0.30 U	--	--
CALCIUM	--	--	--	--	--	628000	85000 J	85500 J	81400	84800 J	154000	--	--
CHROMIUM	--	--	--	--	--	2.8 U	4.5 J	1.1 J	2.2 U	0.87 U	1 U	0.70 U	0.70 U
COBALT	--	--	--	--	--	5.3	0.60 U	0.90 U	0.90 U	5.2 U	0.80 U	--	--
COPPER	--	--	--	--	--	8.9	8.8 J	4.9 J	3 U	0.60 U	2.6 J	--	--
CYANIDE	--	--	--	--	--	--	10 U	2 U	2 U	2 U	--	--	--
IRON	3520	2900	1430	1090	5400	5880	8710	2350	1550	4440	567	--	--
LEAD	--	--	--	--	--	4.4 U	4.9 J	1.7 U	1.7 U	1.7 U	0.90 U	1.5 U	1.5 U
MAGNESIUM	--	--	--	--	--	270000	86500	67200	74500	87700 J	18700	--	--
MANGANESE	--	--	--	--	--	4110	418	354	293	362 J	173	--	--
MERCURY	--	--	--	--	--	0.02 U	0.20 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 U	0.10 U
NICKEL	--	--	--	--	--	16.5 U	4.9 J	1.4 J	3.6 U	0.80 UJ	0.97 J	--	--
POTASSIUM	--	--	--	--	--	71100	87400 J	48800	38800	56200	11800	--	--
SELENIUM	--	--	--	--	--	2.2 U	4.4 U	2.8 UJ	2.8 UJ	2.8 U	4.3 J	--	--
SILVER	--	--	--	--	--	0.54 U	0.50 U	1.2 U	2.3	1.2 UJ	1 U	--	--
SODIUM	--	--	--	--	--	2280000	784000	614000	686000	749000	108000	--	--
THALLIUM	--	--	--	--	--	2 U	4.5 U	4.2 U	3.1 J	2.7 UJ	5 U	3.1 U	3.1 U
TIN	--	--	--	--	--	--	5.9 U	2.6 U	2.6 J	2.6 UJ	14 U	--	--
VANADIUM	1.3 J	1 U	--	--	--	0.52 U	6.9 J	14.6	9.6 U	7.4 UJ	2.1 J	--	--
ZINC	--	--	--	--	--	9.6 U	24.7 J	5.3 U	13	5.3 U	5.8 U	--	--
DISSOLVED METALS (UG/L)													
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS													
CHLORIDE (UG/L)	--	--	--	--	--	--	--	759000	689000	1010000	--	--	--
SULFATE (UG/L)	--	--	--	--	--	--	--	20200	25100	15800 U	--	--	--
TOTAL DISSOLVED SOLIDS (UG/L)	7330000	7690000	7560000	8170000	15000000	--	--	2030000	2260000	2660000	--	--	--
TOTAL ORGANIC CARBON (UG/L)	14600	17500	11000	17500	14000	--	--	--	--	--	--	--	--
TOTAL SUSPENDED SOLIDS (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)													
DIALLATE	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHOATE	--	--	--	--	--	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	--	--	--	--	--	--	--	--	--
THIONAZIN	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (UG/L)													
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
1,2-DIPHENYLHYDRAZINE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
1,3-DINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
1,4-NAPHTHOQUINONE	--	--	--	--	--	--	--	--	--	--	--	--	--
1-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW006	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007
SAMPLE ID	044GW00608	044GW00609	044GW00610	044GW00611	044GW00612	044G00614	044GW00701	044GW00702	044GW00703	044GW00704	044GW00705	044GW007F6	044GW007U6
SAMPLE DATE	5/5/2003	5/21/2003	6/5/2003	9/4/2003	12/5/2003	4/29/2008	6/14/1995	1/18/1996	5/10/1996	6/11/1996	8/1/1997	1/7/1999	1/7/1999
1-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2,4-DICHLOROPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2,4-DIMETHYLPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2,4-DINITROPHENOL	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
2,4-DINITROTOLUENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2,6-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2-ACETYLAMINOFLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2-CHLOROPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2-METHYLPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
2-NITROPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
2-PICOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	--	--	--	--	21 U	20 U	20 U	20 U	--	--
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLCHOLANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
4-AMINOBIPHENYL	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
4-CHLOROANILINE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
4-METHYLPHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
4-NITROANILINE	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
4-NITROPHENOL	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
5-NITRO-O-TOLUIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
ACETOPHENONE	--	--	--	--	--	--	--	--	--	--	--	--	--
ANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
ARAMITE	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	11 U	10 UJ	10 U	10 UJ	--	--
BENZOIC ACID	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
BENZOTRICHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
BENZYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	11 U	10 U	10 U	11 U	--	--
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
CHLOROBENZILATE	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
DIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
FLUORENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 UJ	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
HEXACHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
ISOPHORONE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
ISOSAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--
METHAPYRILENE	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**
SAMPLE ID	**044GW00608**	**044GW00609**	**044GW00610**	**044GW00611**	**044GW00612**	**044G00614**	**044GW00701**	**044GW00702**	**044GW00703**	**044GW00704**	**044GW00705**	**044GW007F6**	**044GW007U6**
SAMPLE DATE	**5/5/2003**	**5/21/2003**	**6/5/2003**	**9/4/2003**	**12/5/2003**	**4/29/2008**	**6/14/1995**	**1/18/1996**	**5/10/1996**	**6/11/1996**	**8/1/1997**	**1/7/1999**	**1/7/1999**
METHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
NITROBENZENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
N-NITROSODIETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIMETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOMORPHOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPIPERIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPYRROLIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
PARALDEHYDE	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLORONITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	53 U	50 U	50 U	50 U	--	--
PHENACETIN	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
PHENOL	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
PRONAMIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	11 U	10 U	10 U	10 U	--	--
PYRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--
SAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--
SOLVENT YELLOW 2	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILES (UG/L)													
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	--	--	--	--	--	--	--	--	--	--
3-CHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONE	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--
ACROLEIN	--	--	--	--	--	--	--	--	--	--	--	--	--
ACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOFORM	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON DISULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--
METHACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL IODIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
PROPIONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--
STYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL ACETATE	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB CONGENERS (UG/L)													
AROCLOR-1016	--	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--	--
AROCLOR-1221	--	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--	--
AROCLOR-1232	--	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--	--
AROCLOR-1242	--	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW006**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**
SAMPLE ID	**044GW00608**	**044GW00609**	**044GW00610**	**044GW00611**	**044GW00612**	**044G00614**	**044GW00701**	**044GW00702**	**044GW00703**	**044GW00704**	**044GW00705**	**044GW007F6**	**044GW007U6**
SAMPLE DATE	**5/5/2003**	**5/21/2003**	**6/5/2003**	**9/4/2003**	**12/5/2003**	**4/29/2008**	**6/14/1995**	**1/18/1996**	**5/10/1996**	**6/11/1996**	**8/1/1997**	**1/7/1999**	**1/7/1999**
AROCLOR-1248	--	--	--	--	--	--	--	1.1 U	1 U	1 U	--	--	--
AROCLOR-1254	--	--	--	--	--	--	--	2.3 U	2 U	2 U	--	--	--
AROCLOR-1260	--	--	--	--	--	--	--	2.3 U	2 U	2 U	--	--	--
PESTICIDES/PCBS (UG/L)													
4,4'-DDD	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
4,4'-DDE	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
4,4'-DDT	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
ALDRIN	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
ALPHA-BHC	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
ALPHA-CHLORDANE	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
BETA-BHC	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
CHLORDANE	--	--	--	--	--	--	--	--	--	--	--	--	--
DELTA-BHC	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
DIELDRIN	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
ENDOSULFAN I	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
ENDOSULFAN II	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
ENDOSULFAN SULFATE	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
ENDRIN	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
ENDRIN ALDEHYDE	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
ENDRIN KETONE	--	--	--	--	--	--	--	0.091 U	0.08 U	0.08 U	--	--	--
GAMMA-BHC (LINDANE)	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
GAMMA-CHLORDANE	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
HEPTACHLOR	--	--	--	--	--	--	--	0.079	0.04 U	0.04 U	--	--	--
HEPTACHLOR EPOXIDE	--	--	--	--	--	--	--	0.045 U	0.04 U	0.04 U	--	--	--
ISODRIN	--	--	--	--	--	--	--	--	--	--	--	--	--
METHOXYCHLOR	--	--	--	--	--	--	--	0.43 U	0.38 U	0.38 U	--	--	--
TOXAPHENE	--	--	--	--	--	--	--	2.8 U	2.5 U	2.5 U	--	--	--

GROUNDWATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW008
SAMPLE ID	044GW00706	044GW007B7	044GW00707	044GW007A7	044GW00708	044GW00709	044GW00710	044GW00711	044GW00712	044GW00713	044G00714-AVG	044G00714-D	044G00714	044GW00801
SAMPLE DATE	1/7/1999	7/22/1999	7/22/1999	7/22/1999	4/22/2003	5/5/2003	5/21/2003	6/5/2003	9/4/2003	12/5/2003	4/29/2008	4/29/2008	4/29/2008	6/14/1995
DIOXINS/FURANS (PG/L)														
1,2,3,4,6,7,8,9-OCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-OCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HPCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL HXCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL PECDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL TCDF	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)														
ALUMINUM	--	--	--	--	--	--	--	--	--	--	56.6 U	53.1 U	60.1 U	214 J
ANTIMONY	--	5 U	5 U	5 U	9.3 U	9.5 U	12.4 U	--	--	--	1.85 U	2.2 U	1.5 U	1.9 U
ARSENIC	--	118	173	127	66.9	136	53.2	206	78	49	122	118	126	15.3
BARIUM	--	84.3	98.1	91.1	--	--	--	--	--	--	86.05	85.6	86.5	41.6 J
BERYLLIUM	--	0.30 U	0.30 U	0.30 U	0.30 U	--	--	--	--	--	0.12 U	0.12 U	0.12 U	0.22 U
CADMIUM	--	0.30 U	0.30 U	0.30 U	--	--	--	--	--	--	0.10 U	0.10 U	0.10 U	0.30 U
CALCIUM	--	138000	139000	138000	--	--	--	--	--	--	172000	171000	173000	159000 J
CHROMIUM	--	0.50 UJ	0.50 UJ	0.50 UJ	--	--	--	--	--	--	1.2 U	1 U	1.4 U	1.8 J
COBALT	--	1.7 U	1.7 U	1.7 U	1.1 U	--	--	--	--	--	0.28 U	0.28 U	0.28 U	0.60 U
COPPER	--	1.6 U	1.5 U	1 U	--	--	--	--	--	--	2.7	2.9	2.5	2 J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	10 U
IRON	--	2440	3330	2860	1190	4420	1280	6330	2570	1900	13700	13300	14100	3800
LEAD	--	2.1 U	2.1 U	2.1 U	--	--	--	--	--	--	4 U	4 U	4 U	3 J
MAGNESIUM	--	22100 J	24100 J	23100 J	--	--	--	--	--	--	43100	43100	43100	71000
MANGANESE	--	216 J	278 J	231 J	--	--	--	--	--	--	1030	1020	1040	944
MERCURY	--	0.10 UJ	0.10 UJ	0.10 UJ	0.10 U	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.20 U
NICKEL	--	13 U	13 U	13 U	--	--	--	--	--	--	1.705 U	0.91 U	2.5 U	2 J
POTASSIUM	--	13100 J	13100 J	13200 J	--	--	--	--	--	--	20500	20400	20600	59100 J
SELENIUM	--	2.9 U	2.9 U	2.9 U	5.7 J	--	--	--	--	--	2.2 U	2.2 U	2.2 U	4.4 U
SILVER	--	2 U	2 U	2 U	--	--	--	--	--	--	0.54 U	0.54 U	0.54 U	0.50 U
SODIUM	--	171000	168000	166000	--	--	--	--	--	--	273000	276000	270000	488000
THALLIUM	--	2.7 U	2.3 U	2.3 U	3.2 U	--	--	--	--	--	2 U	2 U	2 U	4.5 U
TIN	--	29.5 U	29.5 U	29.5 U	--	--	--	--	--	--	--	--	--	5.9 U
VANADIUM	--	0.94 J	1 J	0.90 U	3.9 J	1.8 J	4.1 J	--	--	--	2.55 U	2.2 U	2.9 U	1.3 U
ZINC	--	17.7 U	6.5 U	6 U	5 U	--	--	--	--	--	8.2 U	8.6 U	7.8 U	36 J
DISSOLVED METALS (UG/L)														
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS														
CHLORIDE (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFATE (UG/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL DISSOLVED SOLIDS (UG/L)	--	--	--	--	699000	1150000	940000	1130000	1270000	2600000	--	--	--	--
TOTAL ORGANIC CARBON (UG/L)	--	--	--	--	6200	8600	6600	14200	10100	7500	--	--	--	--
TOTAL SUSPENDED SOLIDS (UG/L)	4000 U	--	--	--	--	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)														
DIALLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THIONAZIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (UG/L)														
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIPHENYLHYDRAZINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DINITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-NAPHTHOQUINONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW008
SAMPLE ID	044GW00706	044GW007B7	044GW00707	044GW007A7	044GW00708	044GW00709	044GW00710	044GW00711	044GW00712	044GW00713	044G00714-AVG	044G00714-D	044G00714	044GW00801
SAMPLE DATE	1/7/1999	7/22/1999	7/22/1999	7/22/1999	4/22/2003	5/5/2003	5/21/2003	6/5/2003	9/4/2003	12/5/2003	4/29/2008	4/29/2008	4/29/2008	6/14/1995
1-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DICHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-ACETYLAMINOFLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NAPHTHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-PICOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLCHOLANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-AMINOBIPHENYL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-NITRO-O-TOLUIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETOPHENONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANILINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARAMITE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZOIC ACID	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZOTRICHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZILATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
FLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOSAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHAPYRILENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW007	C044GW008
SAMPLE ID	044GW00706	044GW007B7	044GW00707	044GW007A7	044GW00708	044GW00709	044GW00710	044GW00711	044GW00712	044GW00713	044G00714-AVG	044G00714-D	044G00714	044GW00801
SAMPLE DATE	1/7/1999	7/22/1999	7/22/1999	7/22/1999	4/22/2003	5/5/2003	5/21/2003	6/5/2003	9/4/2003	12/5/2003	4/29/2008	4/29/2008	4/29/2008	6/14/1995
METHYL METHACRYLATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL METHANE SULFONATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIMETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOMORPHOLINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPIPERIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSOPYRROLIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PARALDEHYDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLORONITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENACETIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRONAMIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	10 U	--	--	--	--	--	--	--	--	--
PYRIDINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SAFROLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SOLVENT YELLOW 2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOLATILES (UG/L)														
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-CHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACETONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACROLEIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON DISULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHACRYLONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL IODIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PROPIONITRILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
STYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL ACETATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VINYL CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB CONGENERS (UG/L)														
AROCLOR-1016	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AROCLOR-1221	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AROCLOR-1232	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AROCLOR-1242	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW007**	**C044GW008**
SAMPLE ID	**044GW00706**	**044GW007B7**	**044GW00707**	**044GW007A7**	**044GW00708**	**044GW00709**	**044GW00710**	**044GW00711**	**044GW00712**	**044GW00713**	**044G00714-AVG**	**044G00714-D**	**044G00714**	**044GW00801**
SAMPLE DATE	**1/7/1999**	**7/22/1999**	**7/22/1999**	**7/22/1999**	**4/22/2003**	**5/5/2003**	**5/21/2003**	**6/5/2003**	**9/4/2003**	**12/5/2003**	**4/29/2008**	**4/29/2008**	**4/29/2008**	**6/14/1995**
AROCLOR-1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AROCLOR-1254	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AROCLOR-1260	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDES/PCBS (UG/L)														
4,4'-DDD	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ALDRIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ALPHA-BHC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ALPHA-CHLORDANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BETA-BHC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLORDANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DELTA-BHC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIELDRIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ENDOSULFAN I	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ENDOSULFAN II	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ENDOSULFAN SULFATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ENDRIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ENDRIN ALDEHYDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ENDRIN KETONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GAMMA-BHC (LINDANE)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GAMMA-CHLORDANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEPTACHLOR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEPTACHLOR EPOXIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISODRIN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHOXYCHLOR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOXAPHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

GROUNDWATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW008	C044GW008	C044GW008	C044GW008	C044GW008	C044GW008	C044GW008	C044SB006
SAMPLE ID	044GW00802	044GW00803	044GW00804	044GW00805	044GW008B6	044GW008A6	044GW00806	044SB00601b_GW
SAMPLE DATE	1/18/1996	5/8/1996	6/12/1996	7/28/1997	7/21/1999	7/21/1999	7/21/1999	9/13/1995
DIOXINS/FURANS (PG/L)								
1,2,3,4,6,7,8,9-OCDD	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-OCDF	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDD	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HPCDF	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-HPCDF	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDD	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HXCDF	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDD	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HXCDF	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDD	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HXCDF	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDD	--	--	--	--	--	--	--	--
1,2,3,7,8-PECDF	--	--	--	--	--	--	--	--
2,3,4,6,7,8-HXCDF	--	--	--	--	--	--	--	--
2,3,4,7,8-PECDF	--	--	--	--	--	--	--	--
2,3,7,8-TCDD	--	--	--	--	--	--	--	--
2,3,7,8-TCDF	--	--	--	--	--	--	--	--
TOTAL HPCDD	--	--	--	--	--	--	--	--
TOTAL HPCDF	--	--	--	--	--	--	--	--
TOTAL HXCDD	--	--	--	--	--	--	--	--
TOTAL HXCDF	--	--	--	--	--	--	--	--
TOTAL PECDD	--	--	--	--	--	--	--	--
TOTAL PECDF	--	--	--	--	--	--	--	--
TOTAL TCDD	--	--	--	--	--	--	--	--
TOTAL TCDF	--	--	--	--	--	--	--	--
METALS (UG/L)								
ALUMINUM	901	434 U	357	7780	--	--	1020 J	191 U
ANTIMONY	2.1 U	2.1 U	2.1 U	2.2 J	5 U	5 U	5 U	1.9 U
ARSENIC	11.5 J	7.6 J	22 U	7.2 J	12	11.6	14.6	2.7 U
BARIUM	21.7	14.1 U	25.8	43	13.7 J	15 J	16.7 J	426
BERYLLIUM	0.53 J	0.30 U	0.36 J	1.7 UJ	0.30 U	0.30 U	0.30 U	0.10 U
CADMIUM	0.50 U	0.50 U	0.50 U	0.30 U	0.30 U	0.30 U	0.30 U	0.50 U
CALCIUM	163000 J	139000	190000	218000	105000	108000	110000	16700
CHROMIUM	3.3 J	2.4 U	4.9 J	16	0.60 UJ	0.74 UJ	2.5 J	2 J
COBALT	0.90 U	5.2 U	5.2 U	6.5 UJ	1.7 U	1.7 U	1.7 U	0.50 U
COPPER	3.6 J	0.77 UJ	1 U	12.6 J	1 U	1.6 U	1.9 U	4.7 U
CYANIDE	2 U	2.7 U	2 U	--	--	--	--	--
IRON	3390	2460	1780	9290	7350	8110	9270	64.6 U
LEAD	1.7 U	1.7 U	1.7 U	8.3 UJ	2.1 U	2.1 U	2.1 U	1.7 U
MAGNESIUM	279000	127000	368000	339000	32900 J	32500 J	31900 J	8420
MANGANESE	722	945	955	467	546 J	562 J	577 J	0.58 U
MERCURY	0.11 J	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.20 U
NICKEL	1.8 J	1.3 U	2.1 UJ	7.4 J	13 U	13 U	13 U	2.4 U
POTASSIUM	143000	50700	129000	109000	21700 J	21500 J	21800 J	7620
SELENIUM	2.8 UJ	2.8 U	2.8 U	3.4 U	2.9 U	2.9 U	3.1 J	3.4 U
SILVER	1.2 U	1.2 U	1.2 UJ	1 U	2 U	2 U	2 U	0.60 U
SODIUM	2520000	1000000	3080000	2590000	173000	170000	159000	90300
THALLIUM	2.7 U	2.7 UJ	2.7 UJ	5 U	2.3 U	2.3 U	2.3 U	3.6 U
TIN	2.6 U	2.6 U	2.6 UJ	14 U	29.5 U	29.5 U	29.5 U	5 U
VANADIUM	8.7	5.9 J	5.7 J	22.6	1.4 J	1.5 J	3.4 J	1.5 U
ZINC	5.3 U	6.9 U	5.3 U	166	2.9 U	3.4 U	11.8 U	24.8
DISSOLVED METALS (UG/L)								
ANTIMONY	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS								
CHLORIDE (UG/L)	3700000	1590000	4880000	--	--	--	--	--
SULFATE (UG/L)	139000	239000	41000	--	--	--	--	--
TOTAL DISSOLVED SOLIDS (UG/L)	8910000	4090000	10600000	--	--	--	--	--
TOTAL ORGANIC CARBON (UG/L)	--	--	--	--	--	--	--	--
TOTAL SUSPENDED SOLIDS (UG/L)	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)								
DIALLATE	--	--	--	--	--	--	--	--
DIMETHOATE	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	--	--	--	--
THIONAZIN	--	--	--	--	--	--	--	--
SEMIVOLATILES (UG/L)								
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	11 U	10 U	10 U	10 U	--	--	--	--
1,2-DICHLOROBENZENE	11 U	10 U	10 U	10 U	--	--	--	--
1,2-DIPHENYLHYDRAZINE	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	--	--	--	--	--
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	11 U	10 U	10 U	10 U	--	--	--	--
1,3-DINITROBENZENE	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	11 U	10 U	10 U	10 U	--	--	--	--
1,4-NAPHTHOQUINONE	--	--	--	--	--	--	--	--
1-CHLORONAPHTHALENE	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	C044GW008	C044GW008	C044GW008	C044GW008	C044GW008	C044GW008	C044GW008	C044SB006
SAMPLE ID	044GW00802	044GW00803	044GW00804	044GW00805	044GW008B6	044GW008A6	044GW00806	044SB00601b_GW
SAMPLE DATE	1/18/1996	5/8/1996	6/12/1996	7/28/1997	7/21/1999	7/21/1999	7/21/1999	9/13/1995
1-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--
1-NAPHTHYLAMINE	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	11 U	10 U	10 U	10 U	--	--	--	--
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	53 U	50 U	50 U	50 U	--	--	--	--
2,4,6-TRICHLOROPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
2,4-DICHLOROPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
2,4-DIMETHYLPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
2,4-DINITROPHENOL	53 U	50 U	50 UJ	50 U	--	--	--	--
2,4-DINITROTOLUENE	11 U	10 U	10 U	10 U	--	--	--	--
2,6-DICHLOROPHENOL	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	11 U	10 U	10 U	10 U	--	--	--	--
2-ACETYLAMINOFLUORENE	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	11 U	10 U	10 U	10 U	--	--	--	--
2-CHLOROPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	11 U	10 U	10 U	10 U	--	--	--	--
2-METHYLPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
2-NAPHTHYLAMINE	--	--	--	--	--	--	--	--
2-NITROANILINE	53 U	50 U	50 U	50 U	--	--	--	--
2-NITROPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
2-PICOLINE	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	21 U	20 U	20 U	20 U	--	--	--	--
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	--	--	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	--	--	--	--	--
3-METHYLCHOLANTHRENE	--	--	--	--	--	--	--	--
3-METHYLPHENOL	--	--	--	--	--	--	--	--
3-NITROANILINE	53 U	50 U	50 U	50 U	--	--	--	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	53 U	50 U	50 UJ	50 U	--	--	--	--
4-AMINOBIPHENYL	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	--	--	--	--
4-CHLORO-3-METHYLPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
4-CHLOROANILINE	11 U	10 U	10 U	10 U	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	--	--	--	--
4-METHYLPHENOL	11 U	10 U	10 U	10 U	--	--	--	--
4-NITROANILINE	53 U	50 U	50 U	50 U	--	--	--	--
4-NITROPHENOL	53 U	50 U	50 U	50 U	--	--	--	--
5-NITRO-O-TOLUIDINE	--	--	--	--	--	--	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	--	--	--	--
ACENAPHTHENE	11 U	10 U	10 U	10 U	--	--	--	--
ACENAPHTHYLENE	11 U	10 U	10 U	10 U	--	--	--	--
ACETOPHENONE	--	--	--	--	--	--	--	--
ANILINE	--	--	--	--	--	--	--	--
ANTHRACENE	11 U	10 U	10 U	10 U	--	--	--	--
ARAMITE	--	--	--	--	--	--	--	--
BENZIDINE	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	11 U	10 U	10 U	10 U	--	--	--	--
BENZO(A)PYRENE	11 U	10 U	10 U	10 U	--	--	--	--
BENZO(B)FLUORANTHENE	11 U	10 U	10 U	10 U	--	--	--	--
BENZO(G,H,I)PERYLENE	11 U	10 U	10 U	10 U	--	--	--	--
BENZO(K)FLUORANTHENE	11 U	10 U	10 U	10 U	--	--	--	--
BENZOIC ACID	53 U	50 U	3 J	50 U	--	--	--	--
BENZOTRICHLORIDE	--	--	--	--	--	--	--	--
BENZYL ALCOHOL	11 U	10 U	10 U	10 U	--	--	--	--
BENZYL CHLORIDE	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	11 U	10 U	10 U	10 U	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	11 U	10 U	10 U	10 U	--	--	--	--
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	11 U	10 U	10 U	110 U	--	--	--	--
BUTYL BENZYL PHTHALATE	11 U	10 U	10 U	10 U	--	--	--	--
CHLOROBENZILATE	--	--	--	--	--	--	--	--
CHRYSENE	11 U	10 U	10 U	10 U	--	--	--	--
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	11 U	10 U	10 U	10 U	--	--	--	--
DIBENZOFURAN	11 U	10 U	10 U	10 U	--	--	--	--
DIETHYL PHTHALATE	11 U	10 U	10 U	10 U	--	--	--	--
DIMETHYL PHTHALATE	11 U	10 U	10 U	10 U	--	--	--	--
DI-N-BUTYL PHTHALATE	11 U	10 U	1 J	10 U	--	--	--	--
DI-N-OCTYL PHTHALATE	11 U	10 U	10 U	10 U	--	--	--	--
DIPHENYLAMINE	--	--	--	--	--	--	--	--
ETHYL METHACRYLATE	--	--	--	--	--	--	--	--
ETHYL METHANE SULFONATE	--	--	--	--	--	--	--	--
FLUORANTHENE	11 U	10 U	10 U	10 U	--	--	--	--
FLUORENE	11 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROBENZENE	11 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROBUTADIENE	11 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	11 U	10 U	10 UJ	10 U	--	--	--	--
HEXACHLOROETHANE	11 U	10 U	10 U	10 U	--	--	--	--
HEXACHLOROPROPENE	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	11 U	10 U	10 U	10 U	--	--	--	--
ISOPHORONE	11 U	10 U	10 U	10 U	--	--	--	--
ISOSAFROLE	--	--	--	--	--	--	--	--
METHAPYRILENE	--	--	--	--	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044SB006**
SAMPLE ID	**044GW00802**	**044GW00803**	**044GW00804**	**044GW00805**	**044GW008B6**	**044GW008A6**	**044GW00806**	**044SB00601b_GW**
SAMPLE DATE	**1/18/1996**	**5/8/1996**	**6/12/1996**	**7/28/1997**	**7/21/1999**	**7/21/1999**	**7/21/1999**	**9/13/1995**
METHYL METHACRYLATE	--	--	--	--	--	--	--	--
METHYL METHANE SULFONATE	--	--	--	--	--	--	--	--
NAPHTHALENE	11 U	10 U	10 U	10 U	--	--	--	--
NITROBENZENE	11 U	10 U	10 U	10 U	--	--	--	--
N-NITROSODIETHYLAMINE	--	--	--	--	--	--	--	--
N-NITROSODIMETHYLAMINE	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	11 U	10 U	10 U	10 U	--	--	--	--
N-NITROSODIPHENYLAMINE	11 U	10 U	10 U	10 U	--	--	--	--
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	--	--	--	--
N-NITROSOMORPHOLINE	--	--	--	--	--	--	--	--
N-NITROSOPIPERIDINE	--	--	--	--	--	--	--	--
N-NITROSOPYRROLIDINE	--	--	--	--	--	--	--	--
PARALDEHYDE	--	--	--	--	--	--	--	--
PENTACHLOROBENZENE	--	--	--	--	--	--	--	--
PENTACHLOROETHANE	--	--	--	--	--	--	--	--
PENTACHLORONITROBENZENE	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	53 U	50 U	50 U	50 U	--	--	--	--
PHENACETIN	--	--	--	--	--	--	--	--
PHENANTHRENE	11 U	10 U	10 U	10 U	--	--	--	--
PHENOL	11 U	10 U	10 U	10 U	--	--	--	--
PRONAMIDE	--	--	--	--	--	--	--	--
PYRENE	11 U	10 U	10 U	10 U	--	--	--	--
PYRIDINE	--	--	--	--	--	--	--	--
SAFROLE	--	--	--	--	--	--	--	--
SOLVENT YELLOW 2	--	--	--	--	--	--	--	--
VOLATILES (UG/L)								
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	--	--	--	5 U	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	5 UJ	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	5 U	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	--	--	--	5 U	--	--	--	--
1,1-DICHLOROETHENE	--	--	--	5 U	--	--	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	--	--	--	5 U	--	--	--	--
1,2-DICHLOROPROPANE	--	--	--	5 U	--	--	--	--
2-BUTANONE	--	--	--	10 U	--	--	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	10 U	--	--	--	--
3-CHLOROPROPENE	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	--	10 U	--	--	--	--
ACETONE	--	--	--	10 UJ	--	--	--	--
ACETONITRILE	--	--	--	--	--	--	--	--
ACROLEIN	--	--	--	--	--	--	--	--
ACRYLONITRILE	--	--	--	--	--	--	--	--
BENZENE	--	--	--	5 U	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	5 U	--	--	--	--
BROMOFORM	--	--	--	5 U	--	--	--	--
BROMOMETHANE	--	--	--	10 U	--	--	--	--
CARBON DISULFIDE	--	--	--	5 U	--	--	--	--
CARBON TETRACHLORIDE	--	--	--	5 U	--	--	--	--
CHLOROBENZENE	--	--	--	5 U	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	5 U	--	--	--	--
CHLOROETHANE	--	--	--	10 U	--	--	--	--
CHLOROFORM	--	--	--	5 U	--	--	--	--
CHLOROMETHANE	--	--	--	10 U	--	--	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	5 U	--	--	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--
DIBROMOMETHANE	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	--	--	5 U	--	--	--	--
METHACRYLONITRILE	--	--	--	--	--	--	--	--
METHYL IODIDE	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	5 U	--	--	--	--
PROPIONITRILE	--	--	--	--	--	--	--	--
STYRENE	--	--	--	5 U	--	--	--	--
TETRACHLOROETHENE	--	--	--	5 U	--	--	--	--
TOLUENE	--	--	--	5 U	--	--	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	5 U	--	--	--	--
TOTAL XYLENES	--	--	--	5 U	--	--	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	5 U	--	--	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	--	--
TRICHLOROETHENE	--	--	--	5 U	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	--	--
VINYL ACETATE	--	--	--	10 U	--	--	--	--
VINYL CHLORIDE	--	--	--	10 U	--	--	--	--
PCB CONGENERS (UG/L)								
AROCLOR-1016	1.1 U	1 U	1 U	1 U	--	--	--	--
AROCLOR-1221	1.1 U	1 U	1 U	1 U	--	--	--	--
AROCLOR-1232	1.1 U	1 U	1 U	1 U	--	--	--	--
AROCLOR-1242	1.1 U	1 U	1 U	1 U	--	--	--	--

Appendix A-2
Groundwater Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

GROUNDWATER

LOCATION	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044GW008**	**C044SB006**
SAMPLE ID	**044GW00802**	**044GW00803**	**044GW00804**	**044GW00805**	**044GW008B6**	**044GW008A6**	**044GW00806**	**044SB00601b_GW**
SAMPLE DATE	**1/18/1996**	**5/8/1996**	**6/12/1996**	**7/28/1997**	**7/21/1999**	**7/21/1999**	**7/21/1999**	**9/13/1995**
AROCLOR-1248	1.1 U	1 U	1 U	1 U	--	--	--	--
AROCLOR-1254	2.1 U	2 U	2 U	2 U	--	--	--	--
AROCLOR-1260	2.1 U	2 U	2 U	2 U	--	--	--	--
PESTICIDES/PCBS (UG/L)								
4,4'-DDD	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
4,4'-DDE	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
4,4'-DDT	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
ALDRIN	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
ALPHA-BHC	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
ALPHA-CHLORDANE	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
BETA-BHC	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
CHLORDANE	--	--	--	--	--	--	--	--
DELTA-BHC	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
DIELDRIN	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
ENDOSULFAN I	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
ENDOSULFAN II	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
ENDOSULFAN SULFATE	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
ENDRIN	0.085 U	0.08 U	0.08 U	0.08 UJ	--	--	--	--
ENDRIN ALDEHYDE	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
ENDRIN KETONE	0.085 U	0.08 U	0.08 U	0.08 U	--	--	--	--
GAMMA-BHC (LINDANE)	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
GAMMA-CHLORDANE	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
HEPTACHLOR	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
HEPTACHLOR EPOXIDE	0.042 U	0.04 U	0.04 U	0.04 U	--	--	--	--
ISODRIN	--	--	--	--	--	--	--	--
METHOXYCHLOR	0.40 U	0.38 U	0.38 U	0.38 U	--	--	--	--
TOXAPHENE	2.6 U	2.5 U	2.5 U	2.5 U	--	--	--	--

GROUNDWATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

APPENDIX A-3

SEDIMENT ANALYTICAL RESULTS SUMMARY

Appendix A-3
Sediment Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SEDIMENT

LOCATION	**C044M0009**	**C044M0010**	**C044M0011**	**C044M0012**	**C044M0013**	**C044M0014**	**C044M0015**	**C044M0016**	**C044M0017**	**C044M0018**	**C044M0019**
SAMPLE ID	**044M000901**	**044M001001**	**044M001101**	**044M001201**	**044M001301**	**044M001401**	**044M001501**	**044M001601**	**044M001701**	**044M001801**	**044M001901**
SAMPLE DATE	**4/17/1995**	**4/17/1995**	**4/17/1995**	**4/19/1995**	**4/19/1995**	**4/19/1995**	**4/19/1995**	**4/19/1995**	**4/19/1995**	**4/11/1995**	**4/11/1995**
METALS (MG/KG)											
ALUMINUM	6100	345	3500	10900	6460	5220	5900	7760	4870	--	--
ANTIMONY	0.65 J	0.53 J	0.25 UJ	1.2 J	0.53 J	0.23 UJ	0.35 UJ	0.43 UJ	0.97 J	--	--
ARSENIC	137	4.2	4	62.1	53.1	11.3	67.4	14.7	69.2	--	--
BARIUM	70.5	10.5 J	12 J	30.5 J	43.3 J	15.7 J	70.7 J	12.3 J	64 J	--	--
BERYLLIUM	0.45 J	0.22 U	0.20 U	0.65 J	0.38 U	0.32 U	0.40 U	0.41 U	0.47 U	--	--
CADMIUM	0.04 U	0.03 U	0.04 U	0.68	0.22	0.04	0.84	0.07 U	0.31	--	--
CALCIUM	1070	274 J	10300	23300 J	733 J	6850 J	833 J	1610 J	12600 J	--	--
CHROMIUM	37.9	27.9	8.5	42.1	21.4	10.2	23.2	12.5	22.8	--	--
COBALT	3.5 J	1.7 J	1.6 J	11.6	3 J	2 J	2.2 J	3 J	8.8 J	--	--
COPPER	51.1 J	21.1 J	7.2 J	75.3	24.3	11.9	33.9	32.5	51.3	--	--
IRON	37300	17200	5160	51600	38700	6730	93700	13100	37600	--	--
LEAD	53.1	41.2	11.2	13.5	43.7	14	35.1	43.4	63.6	--	--
MAGNESIUM	756	39.5 J	415 J	2090	791	614 J	1140	1510	1160 J	--	--
MANGANESE	104 J	70.3 J	62.8 J	96.1	45.9	36.9	0.06 U	72.4	85.9	--	--
MERCURY	0.14 U	0.11 U	0.11 U	0.17 J	0.36 J	0.67 J	0.28 J	0.47 J	1.6 J	--	--
NICKEL	9.6	12.8	5.9	23.7 J	5.4 J	4.1 J	3.8 J	4.2 J	26.7 J	--	--
POTASSIUM	1090 J	107 J	216 J	1040 J	2030 J	360 J	8240 J	739 J	1080 J	--	--
SELENIUM	5.3 J	2.1 J	0.57 UJ	5.2 J	4.6 J	0.83 J	9.3 J	1 UJ	7.3 J	--	--
SILVER	--	--	--	0.07 U	0.06 U	0.06 U	0.09 U	0.11 U	0.18 U	--	--
SODIUM	435 J	189 U	217 U	355 J	798 J	819 J	5860 J	3320 J	1130 J	--	--
THALLIUM	2.4	0.67 J	0.58 U	1.9	2.1	0.56 U	4.6	1 U	2.7 J	--	--
TIN	0.80 UJ	0.68 UJ	1.3 UJ	0.79 U	0.74 U	1.9 U	1.1 U	1.4 U	2.1 U	--	--
VANADIUM	21.2	8.3	8.1	24.4	23.1	12.6	33.5	22.1	26.7	--	--
ZINC	61.1	7.7	67.7	95.9 J	31.2 J	46.2 J	33.9 J	84.6 J	125 J	--	--
MISCELLANEOUS PARAMETERS											
TOTAL ORGANIC CARBON (MG/KG)	29400	59400	2860	10500	44100	2730	52600	10700	22500	14000	15200
SEMIVOLATILES (MG/KG)											
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	--	--	--	--
TOTAL PAHS	--	--	--	--	--	--	--	--	--	--	--

SEDIMENT Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-3
Sediment Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SEDIMENT

LOCATION	**C044M0020**	**C044M0021**	**C044MC001**	**C044MC002**	**C721MD001**	**C721MD002**	**C721MD003**	**C721MD004**	**C721MD005**	**C721MD006**	**C721MD007**
SAMPLE ID	**044M002001**	**044M002101**	**044MC00101**	**044MC00201**	**721MD00101**	**721MD00201**	**721MD00301**	**721MD00401**	**721MD00501**	**721MD00601**	**721MD00701**
SAMPLE DATE	**4/11/1995**	**4/11/1995**	**10/20/1999**	**10/20/1999**	**4/23/2003**	**4/23/2003**	**4/23/2003**	**4/23/2003**	**4/23/2003**	**4/23/2003**	**4/23/2003**
METALS (MG/KG)											
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	15.9	17.1	15	30.1	75.9	5.9	38.4
BARIUM	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	0.88	0.40 U	0.72	2	5.4	0.31 U	1.6 U
CADMIUM	--	--	0.27 J	0.69 J	--	--	--	--	--	--	--
CALCIUM	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--
COBALT	--	--	--	--	5.2	2.8	4.5	11.6	33.2	1.6	7.4
COPPER	--	--	44.9	12.9	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--
MERCURY	--	--	0.06 J	0.18 J	0.33 J	0.43 J	0.78 J	0.35 J	0.32 J	0.04 J	0.50 J
NICKEL	--	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	--	1.8	1.1	0.76 U	0.46 U	0.45 U	1.1 U	1.3 U	0.37 U	1.2 U
SILVER	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	0.45 UJ	0.64 U	0.39 UJ	2.2 U	1 U	0.31 UJ	1.1 UJ
TIN	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--
ZINC	--	--	--	--	118 J	50.7 J	132 J	202 J	311 J	65.7 J	398 J
MISCELLANEOUS PARAMETERS											
TOTAL ORGANIC CARBON (MG/KG)	12400	10200	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)											
2-METHYLNAPHTHALENE	--	--	--	--	0.89 U	0.03 J	0.057 J	0.24 J	0.72 J	0.074 J	0.71 J
BENZO(A)ANTHRACENE	--	--	--	--	0.31 J	0.13 J	0.31 J	0.22 J	0.34 J	0.048 J	0.44 J
CHRYSENE	--	--	--	--	0.46 J	0.16 J	0.32 J	0.29 J	0.52 J	0.083 J	0.56 J
FLUORANTHENE	--	--	--	--	0.57 J	0.29 J	0.61 J	0.58 J	1 J	0.16 J	0.99 J
NAPHTHALENE	--	--	--	--	0.89 U	0.50 U	0.75 U	0.13 J	0.39 J	0.61 U	0.37 J
PHENANTHRENE	--	--	--	--	0.15 J	0.074 J	0.14 J	0.29 J	0.83 J	0.093 J	0.66 J
PYRENE	--	--	--	--	0.76 J	0.31 J	0.48 J	0.44 J	0.82 J	0.12 J	0.85 J
TOTAL PAHS	--	--	--	--	2.25	0.994	1.917	2.19	4.62	--	4.58

SEDIMENT Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-3
Sediment Analytical Results Summary
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SEDIMENT

LOCATION	C721MD008	C721MD009	C721MD010	C721MD011	C721MD012	C721MD013	C721SBR01	C721SBR02	C721SBR03	C721SBR03	C721SBR03	C721SBR04
SAMPLE ID	721MD00801	721MD00901	721MD01001	721MD01101	721MD01201	721MD01301	721SBR0101	721SBR0201	721SBR0301-D	721SBR0301	721SBR0301-AVG	721SBR0401
SAMPLE DATE	4/23/2003	4/23/2003	4/23/2003	4/23/2003	4/23/2003	4/23/2003	11/21/2005	11/21/2005	11/21/2005	11/21/2005	11/21/2005	11/21/2005
METALS (MG/KG)												
ALUMINUM	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	28	21.6	42.6	12.6	3.5	3.8	5.4	11	12	11	11.5	43
BARIUM	--	--	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	0.96 U	1.2	2	0.46	0.29 U	0.18 U	--	--	--	--	--	--
CADMIUM	--	--	--	--	--	--	--	--	--	--	--	--
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--
COBALT	5.2	4.1	10.5	2.3	0.77	1	--	--	--	--	--	--
COPPER	--	--	--	--	--	--	--	--	--	--	--	--
IRON	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	0.46 J	0.071 J	1.1 J	0.27 J	0.36 J	0.044 J	--	--	--	--	--	--
NICKEL	--	--	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	0.86 U	0.45 U	2.4 U	0.29 U	0.26 U	0.25 U	--	--	--	--	--	--
SILVER	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.73 UJ	0.30 UJ	0.74 UJ	0.25 UJ	0.22 UJ	0.21 UJ	--	--	--	--	--	--
TIN	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	357 J	85.5 J	669 J	113 J	40.5 J	31.7 J	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS												
TOTAL ORGANIC CARBON (MG/KG)	--	--	--	--	--	--	--	--	--	--	--	--
SEMIVOLATILES (MG/KG)												
2-METHYLNAPHTHALENE	0.52 J	0.94	0.90 J	0.38 J	0.17 J	0.23 J	--	--	--	--	--	--
BENZO(A)ANTHRACENE	0.32 J	1.4	0.54 J	0.12 J	0.038 J	1.1	--	--	--	--	--	--
CHRYSENE	0.50 J	1.5	0.82 J	0.15 J	0.066 J	1.3	--	--	--	--	--	--
FLUORANTHENE	0.71 J	4.6	1.4 J	0.23 J	0.079 J	5.4	--	--	--	--	--	--
NAPHTHALENE	0.30 J	0.57 J	0.40 J	0.19 J	0.081 J	0.47	--	--	--	--	--	--
PHENANTHRENE	0.50 J	1.1	0.84 J	0.30 J	0.13 J	4.7	--	--	--	--	--	--
PYRENE	0.69 J	3.7	1.2 J	0.23 J	0.076 J	4.2	--	--	--	--	--	--
TOTAL PAHS	3.54	13.81	6.1	1.6	--	--	--	--	--	--	--	--

SEDIMENT Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

APPENDIX A-4

SURFACE WATER ANALYTICAL RESULTS SUMMARY (2003)

Appendix A-4
Surface Water Analytical Results Summary (2003)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

LOCATION	721WP001		721HP001		721WD001		721WD001		QC		QC	
SAMPLE ID	721WP00101		721HP00101		721WD00102		721WD00101		SW LAB BLANK		SW LAB BLANK	
SAMPLE_DATE	4/21/2003		4/21/2003		4/21/2003		4/22/2003		4/22/2003		4/22/2003	
Semivolatile Organics (ug/L)												
2-METHYLNAPHTHALENE	10	U	10	U	10	U	10	U	10	U	--	
BENZO(A)ANTHRACENE	10	U	10	U	10	U	10	U	10	U	--	
CHRYSENE	10	U	10	U	10	U	10	U	10	U	--	
FLUORANTHENE	10	U	10	U	10	U	10	U	10	U	--	
NAPHTHALENE	10	U	10	U	10	U	10	U	10	U	--	
PHENANTHRENE	10	U	10	U	10	U	10	U	10	U	--	
PYRENE	10	U	10	U	10	U	10	U	10	U	--	
Inorganics (ug/L)												
ARSENIC (AS)	2.5	U	3.6	J	2.5	U	2.5	U	2.5	U	--	
BERYLLIUM (BE)	0.3	U	0.3	U	0.33	J	0.32	J	0.3	U	--	
CALCIUM (CA)	161000		167000		125000		169000		52.7	U	--	
COBALT (CO)	1.1	U	1.1	J	1.1	U	1.1	U	1.1	U	--	
MAGNESIUM (MG)	411000		395000		382000		331000		42.2	B	--	
MERCURY (HG)	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	--	
POTASSIUM (K)	152000		152000		147000		126000		69.2	B	--	
SELENIUM (SE)	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U	--	
SODIUM (NA)	2650000	J	3040000	J	2680000	J	2340000	J	61	U	--	
THALLIUM (TL)	3.2	U	4.3	J	3.2	U	3.2	U	3.2	U	--	
ZINC (ZN)	5	U	5	U	5	U	5	U	15.4	B	--	
Miscellaneous Parameters												
CHLORIDE (mg/L)	6020		6310		6170		5280		1	U	--	
CONDUCTANCE (umhos)	17700		18200		18000		16000		--		--	
TDS (mg/L)	11300		11700		11500		10300		10	U	10	U
TOTAL SUSPENDED SOLIDS (mg/L)	22		72		4	U	20		4	U	4	U
SULFATE,TURBID (mg/L)	800		928		791		667		1	U	--	
SALINITY (g/L)	10.9		11.4		11.2		9.6		--		--	

APPENDIX A-5

SURFACE WATER ANALYTICAL RESULTS SUMMARY (1995 AND 1998)

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	C044W0009	C044W0010	C044W0011	C044W0012	C044W0013	C044W0014	C044W0014	C044W0014	C044W0015	C044W0016	C044W0016
SAMPLE ID	044W000901	044W001001	044W001101	044W001201	044W001301	044W001401b	044W001401a	044W001401a_LGCY	044W001501	044W001601a	044W001601b
SAMPLE DATE	7/11/1995	7/11/1995	7/11/1995	7/11/1995	7/11/1995	4/11/1995	4/19/1995	4/19/1995	7/11/1995	4/11/1995	4/19/1995
METALS (UG/L)											
ALUMINUM	175 J	3900	233	16400	363	160 UJ	--	--	12600	1230 J	--
ANTIMONY	1.9 U	1.9 U	2.4 J	5.2 J	2.7 J	1.9 U	--	--	1.9 U	1.9 U	--
ARSENIC	2.7 U	2.7 U	6.8 J	2.7 U	6.2 J	10.2 J	--	--	9.9 J	3.2 UJ	--
BARIUM	4.2 J	11.8 J	12.6 J	13.3 J	14.2 J	75.2 J	--	--	15.8 J	20.6 J	--
BERYLLIUM	0.10 U	1.4 J	0.10 U	5.2	0.10 U	0.20 U	--	--	3.7 J	0.20 U	--
CADMIUM	0.50 U	0.50 U	0.50 U	0.70 J	0.50 U	0.30 U	--	--	0.50 U	0.30 U	--
CALCIUM	120000	38700	48600	85400	56000	181000	--	--	114000	116000	--
CHROMIUM	1.6 J	2.9 J	1.8 J	8 J	1.6 J	2.6 J	--	--	10.4	52.4	--
COBALT	0.50 U	15.9 J	0.50 U	71	0.50 U	1.3 J	--	--	52.7	1 J	--
COPPER	4.9 J	25.3 J	6.8 J	92.5 J	7.3 J	4.2 U	--	--	45 J	8.6 J	--
IRON	362 J	1760 J	578 J	12500 J	626 J	1220 J	--	--	32100 J	1740 J	--
LEAD	3.8 J	6 J	3.8 J	4.4 J	4.5 J	3.9 U	--	--	9.2 J	5 U	--
MAGNESIUM	11500	1630 J	3980 J	4470 J	4620 J	336000	--	--	22400	344000	--
MANGANESE	18.8	148	143	687	120	2110	--	--	634	64.3	--
MERCURY	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--	--	0.20 U	0.20 U	--
NICKEL	4.3 J	31.6 J	4.1 J	107	3.6 J	2.5 J	--	--	92.5	27 J	--
POTASSIUM	5560	871 J	3150 J	710 J	3520 J	197000	--	--	8830	163000	--
SELENIUM	3.4 U	5.1	3.4 U	10.4	3.4 U	4.4 U	--	--	7.1	4.6 J	--
SILVER	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.50 UJ	--	--	0.60 U	0.50 UJ	--
SODIUM	12800	3200 J	16300	3910 J	18200	2620000	--	--	130000	2660000	--
THALLIUM	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	4.5 U	--	--	3.6 U	4.5 U	--
TIN	5 U	5 U	5 U	5 U	5 U	5.9 U	--	--	5 U	5.9 U	--
VANADIUM	0.62 J	0.86 J	3.1 J	0.71 J	3.1 J	1.5 J	--	--	6.9 J	4 J	--
ZINC	5.3 J	62	24.3	201	31.4	32.3	--	--	202	31	--
MISCELLANEOUS PARAMETERS											
DIBUTYLTIN (UG/L)	--	--	--	--	--	--	--	--	--	--	--
MONOBUTYLTIN (UG/L)	--	--	--	--	--	--	--	--	--	--	--
TETRABUTYLTIN (UG/L)	--	--	--	--	--	--	--	--	--	--	--
TRIBUTYLTIN (UG/L)	--	--	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)											
DIALLATE	--	--	--	--	--	--	20 U	--	--	--	20 U
DIMETHOATE	--	--	--	--	--	--	15 UJ	--	--	--	15 UJ
FAMPHUR	--	--	--	--	--	--	65 UJ	--	--	--	65 UJ
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	--	--	--	110 U	--	--	--	110 U
THIONAZIN	--	--	--	--	--	--	15 U	--	--	--	15 U
SEMIVOLATILES (UG/L)											
1,2,3,4-TETRACHLOROBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,2,3,5-TETRACHLOROBENZENE	--	--	--	--	--	--	15 U	--	--	--	15 U
1,2,4,5-TETRACHLOROBENZENE	--	--	--	--	--	--	15 U	--	--	--	15 U
1,2-DICHLOROBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,2-DIPHENYLHYDRAZINE	--	--	--	--	--	--	15 U	--	--	--	15 U
1,3,5-TRICHLOROBENZENE	--	--	--	--	--	--	5 U	--	--	--	5 U
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	45 U	--	--	--	45 U
1,3-DICHLOROBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,3-DINITROBENZENE	--	--	--	--	--	--	15 U	--	--	--	15 U
1,4-DICHLOROBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,4-NAPHTHOQUINONE	--	--	--	--	--	--	35 U	--	--	--	35 U
1-CHLORONAPHTHALENE	--	--	--	--	--	--	25 U	--	--	--	25 U
1-METHYLNAPHTHALENE	--	--	--	--	--	--	15 U	--	--	--	15 U
1-NAPHTHYLAMINE	--	--	--	--	--	--	35 U	--	--	--	35 U
2,3,4,6-TETRACHLOROPHENOL	--	--	--	--	--	--	35 U	--	--	--	35 U
2,4,5-TRICHLOROPHENOL	--	--	--	--	--	--	25 U	--	--	--	25 U
2,4,6-TRICHLOROPHENOL	--	--	--	--	--	--	25 U	--	--	--	25 U
2,4-DICHLOROPHENOL	--	--	--	--	--	--	15 U	--	--	--	15 U
2,4-DIMETHYLPHENOL	--	--	--	--	--	--	35 U	--	--	--	35 U
2,4-DINITROPHENOL	--	--	--	--	--	--	75 U	--	--	--	75 U
2,4-DINITROTOLUENE	--	--	--	--	--	--	10 U	--	--	--	10 U
2,6-DICHLOROPHENOL	--	--	--	--	--	--	25 U	--	--	--	25 U
2,6-DINITROTOLUENE	--	--	--	--	--	--	15 U	--	--	--	15 U
2-ACETYLAMINOFLUORENE	--	--	--	--	--	--	10 U	--	--	--	10 U
2-CHLORONAPHTHALENE	--	--	--	--	--	--	15 U	--	--	--	15 U
2-CHLOROPHENOL	--	--	--	--	--	--	15 U	--	--	--	15 U
2-METHYLANILINE HYDROCHLORIDE	--	--	--	--	--	--	25 U	--	--	--	25 U
2-METHYLNAPHTHALENE	--	--	--	--	--	--	10 U	--	--	--	10 U
2-METHYLPHENOL	--	--	--	--	--	--	20 U	--	--	--	20 U
2-NAPHTHYLAMINE	--	--	--	--	--	--	20 UJ	--	--	--	20 UJ
2-NITROANILINE	--	--	--	--	--	--	20 U	--	--	--	20 U

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	C044W0009	C044W0010	C044W0011	C044W0012	C044W0013	C044W0014	C044W0014	C044W0014	C044W0015	C044W0016	C044W0016
SAMPLE ID	044W000901	044W001001	044W001101	044W001201	044W001301	044W001401b	044W001401a	044W001401a_LGCY	044W001501	044W001601a	044W001601b
SAMPLE DATE	7/11/1995	7/11/1995	7/11/1995	7/11/1995	7/11/1995	4/11/1995	4/19/1995	4/19/1995	7/11/1995	4/11/1995	4/19/1995
2-NITROPHENOL	--	--	--	--	--	--	5 U	--	--	--	5 U
2-PICOLINE	--	--	--	--	--	--	45 U	--	--	--	45 U
3,3'-DICHLOROBENZIDINE	--	--	--	--	--	--	10 U	--	--	--	10 U
3,3'-DIMETHOXYBENZIDINE	--	--	--	--	--	--	20 U	--	--	--	20 U
3,3'-DIMETHYLBENZIDINE	--	--	--	--	--	--	100 U	--	--	--	100 U
3-METHYLCHOLANTHRENE	--	--	--	--	--	--	5 U	--	--	--	5 U
3-METHYLPHENOL	--	--	--	--	--	--	35 U	--	--	--	35 U
3-NITROANILINE	--	--	--	--	--	--	30 U	--	--	--	30 U
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	--	--	--	15 U	--	--	--	15 U
4,6-DINITRO-2-METHYLPHENOL	--	--	--	--	--	--	45 U	--	--	--	45 U
4-AMINOBIPHENYL	--	--	--	--	--	--	10 U	--	--	--	10 U
4-BROMOPHENYL PHENYL ETHER	--	--	--	--	--	--	15 U	--	--	--	15 U
4-CHLORO-3-METHYLPHENOL	--	--	--	--	--	--	10 U	--	--	--	10 U
4-CHLOROANILINE	--	--	--	--	--	--	5 U	--	--	--	5 U
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	--	10 U	--	--	--	10 U
4-METHYLPHENOL	--	--	--	--	--	--	35 U	--	--	--	35 U
4-NITROANILINE	--	--	--	--	--	--	35 U	--	--	--	35 U
4-NITROPHENOL	--	--	--	--	--	--	45 U	--	--	--	45 U
4-NITROQUINOLINE-1-OXIDE	--	--	--	--	--	--	--	--	--	--	--
5-NITRO-O-TOLUIDINE	--	--	--	--	--	--	30 U	--	--	--	30 U
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	--	--	--	10 U	--	--	--	10 U
ACENAPHTHENE	--	--	--	--	--	--	10 U	--	--	--	10 U
ACENAPHTHYLENE	--	--	--	--	--	--	10 U	--	--	--	10 U
ACETOPHENONE	--	--	--	--	--	--	20 U	--	--	--	20 U
ANILINE	--	--	--	--	--	--	15 U	--	--	--	15 U
ANTHRACENE	--	--	--	--	--	--	15 U	--	--	--	15 U
ARAMITE	--	--	--	--	--	--	20 U	--	--	--	20 U
BENZAL CHLORIDE	--	--	--	--	--	--	15 U	--	--	--	15 U
BENZIDINE	--	--	--	--	--	--	25 U	--	--	--	25 U
BENZO(A)ANTHRACENE	--	--	--	--	--	--	10 U	--	--	--	10 U
BENZO(A)PYRENE	--	--	--	--	--	--	5 U	--	--	--	5 U
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	10 U	--	--	--	10 U
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	10 U	--	--	--	10 U
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	20 U	--	--	--	20 U
BENZOIC ACID	--	--	--	--	--	--	95 UJ	--	--	--	95 UJ
BENZOTRICHLORIDE	--	--	--	--	--	--	5 U	--	--	--	5 U
BENZYL ALCOHOL	--	--	--	--	--	--	20 U	--	--	--	20 U
BENZYL CHLORIDE	--	--	--	--	--	--	5 U	--	--	--	5 U
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	15 U	--	--	--	15 U
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	20 U	--	--	--	20 U
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	--	--	--	15 U	--	--	--	15 U
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	10 U	--	--	--	10 U
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	10 U	--	--	--	10 U
CHLOROBENZILATE	--	--	--	--	--	--	10 U	--	--	--	10 U
CHRYSENE	--	--	--	--	--	--	15 U	--	--	--	15 U
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	--	--	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	--	--	--	10 U	--	--	--	10 U
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	10 U	--	--	--	10 U
DIBENZOFURAN	--	--	--	--	--	--	10 U	--	--	--	10 U
DIETHYL PHTHALATE	--	--	--	--	--	--	15 U	--	--	--	15 U
DIMETHYL PHTHALATE	--	--	--	--	--	--	10 U	--	--	--	10 U
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	1 J	--	--	--	15 U
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	20 U	--	--	--	20 U
DIPHENYLAMINE	--	--	--	--	--	--	30 U	--	--	--	30 U
ETHYL METHACRYLATE	--	--	--	--	--	--	15 U	10 UJ	--	--	10 U
ETHYL METHANE SULFONATE	--	--	--	--	--	--	20 U	--	--	--	20 U
FLUORANTHENE	--	--	--	--	--	--	20 U	--	--	--	20 U
FLUORENE	--	--	--	--	--	--	10 U	--	--	--	10 U
HEXACHLOROBENZENE	--	--	--	--	--	--	15 U	--	--	--	15 U
HEXACHLOROBUTADIENE	--	--	--	--	--	--	5 U	--	--	--	5 U
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	25 U	--	--	--	25 U
HEXACHLOROETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
HEXACHLOROPROPENE	--	--	--	--	--	--	20 U	--	--	--	20 U
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	10 U	--	--	--	10 U
ISOPHORONE	--	--	--	--	--	--	10 U	--	--	--	10 U
ISOSAFROLE	--	--	--	--	--	--	10 U	--	--	--	10 U
METHAPYRILENE	--	--	--	--	--	--	30 U	--	--	--	30 U
METHYL METHACRYLATE	--	--	--	--	--	--	20 U	--	--	--	--

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	C044W0009	C044W0010	C044W0011	C044W0012	C044W0013	C044W0014	C044W0014	C044W0014	C044W0015	C044W0016	C044W0016
SAMPLE ID	044W000901	044W001001	044W001101	044W001201	044W001301	044W001401b	044W001401a	044W001401a_LGCY	044W001501	044W001601a	044W001601b
SAMPLE DATE	7/11/1995	7/11/1995	7/11/1995	7/11/1995	7/11/1995	4/11/1995	4/19/1995	4/19/1995	7/11/1995	4/11/1995	4/19/1995
METHYL METHANE SULFONATE	--	--	--	--	--	--	20 U	--	--	--	20 U
NAPHTHALENE	--	--	--	--	--	--	5 U	--	--	--	5 U
NITROBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
N-NITROSODIETHYLAMINE	--	--	--	--	--	--	15 U	--	--	--	15 U
N-NITROSODIMETHYLAMINE	--	--	--	--	--	--	15 U	--	--	--	15 U
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	--	--	--	10 U	--	--	--	10 U
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	20 U	--	--	--	20 U
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	30 U	--	--	--	30 U
N-NITROSOMETHYLETHYLAMINE	--	--	--	--	--	--	20 U	--	--	--	20 U
N-NITROSOMORPHOLINE	--	--	--	--	--	--	10 U	--	--	--	10 U
N-NITROSOPIPERIDINE	--	--	--	--	--	--	10 U	--	--	--	10 U
N-NITROSOPYRROLIDINE	--	--	--	--	--	--	15 U	--	--	--	15 U
PARALDEHYDE	--	--	--	--	--	--	10 U	--	--	--	10 U
PENTACHLOROBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
PENTACHLOROETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
PENTACHLORONITROBENZENE	--	--	--	--	--	--	15 U	--	--	--	15 U
PENTACHLOROPHENOL	--	--	--	--	--	--	55 U	--	--	--	55 U
PHENACETIN	--	--	--	--	--	--	20 UJ	--	--	--	20 UJ
PHENANTHRENE	--	--	--	--	--	--	15 U	--	--	--	15 U
PHENOL	--	--	--	--	--	--	15 U	--	--	--	15 U
PRONAMIDE	--	--	--	--	--	--	15 UJ	--	--	--	15 UJ
PYRENE	--	--	--	--	--	--	10 U	--	--	--	10 U
PYRIDINE	--	--	--	--	--	--	20 U	--	--	--	20 U
SAFROLE	--	--	--	--	--	--	5 U	--	--	--	5 U
SOLVENT YELLOW 2	--	--	--	--	--	--	10 U	--	--	--	10 U
VOLATILES (UG/L)											
1,1,1,2-TETRACHLOROETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	--	--	--	15 U	--	--	--	15 U
1,1,1-TRICHLOROETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,1,2-TRICHLOROETHANE	--	--	--	--	--	--	5 UJ	--	--	--	5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	25 U	--	--	--	25 U
1,1-DICHLOROETHANE	--	--	--	--	--	--	5 U	--	--	--	5 U
1,1-DICHLOROETHENE	--	--	--	--	--	--	5 U	--	--	--	5 U
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	5 U	--	--	--	5 U
1,2,3-TRICHLOROPROPANE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	5 U	--	--	--	5 U
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,2-DIBROMOETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
1,2-DICHLOROETHANE	--	--	--	--	--	--	5 U	--	--	--	5 UJ
1,2-DICHLOROPROPANE	--	--	--	--	--	--	10 U	--	--	--	10 U
2-BUTANONE	--	--	--	--	--	--	20 U	--	--	--	20 UJ
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	10 UJ	--	--	--	--
2-HEXANONE	--	--	--	--	--	--	15 U	--	--	--	15 U
3-CHLOROPROPENE	--	--	--	--	--	--	15 U	--	--	--	15 U
4-METHYL-2-PENTANONE	--	--	--	--	--	--	10 U	--	--	--	10 U
ACETONE	--	--	--	--	--	--	15 U	--	--	--	15 UJ
ACETONITRILE	--	--	--	--	--	--	60 U	--	--	--	60 U
ACROLEIN	--	--	--	--	--	--	90 U	--	--	--	90 UJ
ACRYLONITRILE	--	--	--	--	--	--	95 U	--	--	--	95 U
BENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
BROMODICHLOROMETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
BROMOFORM	--	--	--	--	--	--	10 U	--	--	--	10 U
BROMOMETHANE	--	--	--	--	--	--	10 UJ	--	--	--	10 U
CARBON DISULFIDE	--	--	--	--	--	--	10 U	--	--	--	10 U
CARBON TETRACHLORIDE	--	--	--	--	--	--	10 U	--	--	--	10 U
CHLOROBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
CHLORODIBROMOMETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
CHLOROETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
CHLOROFORM	--	--	--	--	--	--	5 U	--	--	--	5 U
CHLOROMETHANE	--	--	--	--	--	--	15 UJ	--	--	--	15 U
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	15 U	--	--	--	15 UJ
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	5 U	--	--	--	5 UJ
DIBROMOMETHANE	--	--	--	--	--	--	10 U	--	--	--	10 U
ETHYLBENZENE	--	--	--	--	--	--	10 U	--	--	--	10 U
METHACRYLONITRILE	--	--	--	--	--	--	20 U	--	--	--	20 U
METHYL IODIDE	--	--	--	--	--	--	5 U	--	--	--	5 U
METHYLENE CHLORIDE	--	--	--	--	--	--	10 U	--	--	--	10 U

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	**C044W0009**	**C044W0010**	**C044W0011**	**C044W0012**	**C044W0013**	**C044W0014**	**C044W0014**	**C044W0014**	**C044W0015**	**C044W0016**	**C044W0016**
SAMPLE ID	**044W000901**	**044W001001**	**044W001101**	**044W001201**	**044W001301**	**044W001401b**	**044W001401a**	**044W001401a_LGCY**	**044W001501**	**044W001601a**	**044W001601b**
SAMPLE DATE	**7/11/1995**	**7/11/1995**	**7/11/1995**	**7/11/1995**	**7/11/1995**	**4/11/1995**	**4/19/1995**	**4/19/1995**	**7/11/1995**	**4/11/1995**	**4/19/1995**
PROPIONITRILE	--	--	--	--	--	--	220 U	--	--	--	--
STYRENE	--	--	--	--	--	--	5 U	--	--	--	5 U
TETRACHLOROETHENE	--	--	--	--	--	--	10 UJ	--	--	--	10 U
TOLUENE	--	--	--	--	--	--	5 U	--	--	--	5 U
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	10 U	--	--	--	10 U
TOTAL XYLENES	--	--	--	--	--	--	15 U	--	--	--	15 U
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	10 UJ	--	--	--	10 UJ
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--	--	--	10 U	--	--	--	--
TRICHLOROETHENE	--	--	--	--	--	--	5 U	--	--	--	5 U
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	10 U	--	--	--	10 UJ
VINYL ACETATE	--	--	--	--	--	--	10 U	--	--	--	10 U
VINYL CHLORIDE	--	--	--	--	--	--	10 U	--	--	--	10 U
PCB CONGENERS (UG/L)											
AROCLOR-1016	--	--	--	--	--	--	0.50 U	--	--	--	0.50 U
AROCLOR-1221	--	--	--	--	--	--	0.50 U	--	--	--	0.50 U
AROCLOR-1232	--	--	--	--	--	--	0.50 U	--	--	--	0.50 U
AROCLOR-1242	--	--	--	--	--	--	0.50 U	--	--	--	0.50 U
AROCLOR-1248	--	--	--	--	--	--	0.50 U	--	--	--	0.50 U
AROCLOR-1254	--	--	--	--	--	--	0.50 U	--	--	--	0.50 U
AROCLOR-1260	--	--	--	--	--	--	0.50 U	--	--	--	0.50 U
PESTICIDES/PCBS (UG/L)											
4,4'-DDD	--	--	--	--	--	--	0.10 U	--	--	--	0.10 U
4,4'-DDE	--	--	--	--	--	--	0.10 U	--	--	--	0.10 U
4,4'-DDT	--	--	--	--	--	--	0.10 U	--	--	--	0.10 U
ALDRIN	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
ALPHA-BHC	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
BETA-BHC	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
CHLORDANE	--	--	--	--	--	--	0.12 U	--	--	--	0.12 U
DELTA-BHC	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
DIELDRIN	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
ENDOSULFAN I	--	--	--	--	--	--	0.05 U	--	--	--	0.05 U
ENDOSULFAN II	--	--	--	--	--	--	0.10 U	--	--	--	0.10 U
ENDOSULFAN SULFATE	--	--	--	--	--	--	0.05 U	--	--	--	0.05 U
ENDRIN	--	--	--	--	--	--	0.05 U	--	--	--	0.05 U
ENDRIN ALDEHYDE	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
GAMMA-BHC (LINDANE)	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
HEPTACHLOR	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
HEPTACHLOR EPOXIDE	--	--	--	--	--	--	0.03 U	--	--	--	0.03 U
ISODRIN	--	--	--	--	--	--	15 U	--	--	--	15 U
METHOXYCHLOR	--	--	--	--	--	--	0.30 U	--	--	--	0.30 U
TOXAPHENE	--	--	--	--	--	--	1 U	--	--	--	1 U

SURFACE WATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is
an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	C044W0016	C044W0017	C044W0018	C044W0018	C044W0019	C044W0019	C044W0020	C044W0020	C044W0021	C044W0021	C044W0022
SAMPLE ID	044W001601b_LGCY	044W001701	044W001801_LGCY	044W001801	044W001901_LGCY	044W001901	044W002001	044W002001_LGCY	044W002101	044W002101_LGCY	044W002201a
SAMPLE DATE	4/19/1995	7/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995
METALS (UG/L)											
ALUMINUM	--	188 J	--	19.2 UJ	--	415 UJ	19.2 UJ	--	19.2 UJ	--	11900 J
ANTIMONY	--	2.8 J	--	1.9 U	--	1.9 U	1.9 U	--	1.9 U	--	1.9 U
ARSENIC	--	144	--	3.2 UJ	--	3.2 UJ	3.2 UJ	--	3.2 UJ	--	3.2 UJ
BARIUM	--	20.9 J	--	20.4 J	--	23.5 J	20.8 J	--	21.5 J	--	1.9 J
BERYLLIUM	--	0.10 U	--	0.20 U	--	0.20 U	0.20 U	--	0.20 U	--	2.9 J
CADMIUM	--	0.50 U	--	0.30 U	--	0.30 U	0.30 U	--	0.30 U	--	0.39 U
CALCIUM	--	262000	--	116000	--	121000	122000	--	126000	--	234000
CHROMIUM	--	2 J	--	2.3 J	--	3.1 J	3.1 J	--	2.1 J	--	2.9 J
COBALT	--	11.2 J	--	0.60 U	--	0.93 J	0.60 U	--	0.60 U	--	37.7 J
COPPER	--	5.8 J	--	3 U	--	4.9 J	3.7 U	--	4.4 U	--	27.5
IRON	--	85900 J	--	362 J	--	972 J	359 J	--	362 J	--	58500 J
LEAD	--	7.1 J	--	4.2 U	--	4.1 U	2.3 U	--	4.3 U	--	3.3 U
MAGNESIUM	--	12600	--	330000	--	343000	353000	--	373000	--	20100
MANGANESE	--	911	--	82.6	--	93.6	80.3	--	58.7	--	489
MERCURY	--	0.20 U	--	0.20 U	--	0.20 U	0.20 U	--	0.20 U	--	0.20 U
NICKEL	--	9.3 J	--	1.4 U	--	1.4 U	10.2 J	--	1.4 U	--	77.7
POTASSIUM	--	3020 J	--	195000	--	199000	163000	--	180000	--	6220
SELENIUM	--	7.5	--	4.4 U	--	4.4 U	4.4 U	--	4.4 U	--	10.2
SILVER	--	0.60 U	--	0.50 UJ	--	0.50 UJ	0.50 UJ	--	0.50 UJ	--	0.50 UJ
SODIUM	--	31200	--	2530000	--	2600000	2670000	--	2910000	--	23400
THALLIUM	--	3.6 U	--	4.5 U	--	4.5 U	4.5 U	--	4.5 U	--	5.6 U
TIN	--	5 U	--	5.9 U	--	5.9 U	5.9 U	--	5.9 U	--	5.9 U
VANADIUM	--	3.4 J	--	1.5 J	--	3.5 J	1.5 J	--	1.4 J	--	0.77 J
ZINC	--	16.2 J	--	15.2 J	--	15.1 J	13.2 J	--	18.8 J	--	197
MISCELLANEOUS PARAMETERS											
DIBUTYLTIN (UG/L)	--	--	--	0.30 U	--	0.30 U	0.115	--	0.30 U	--	--
MONOBUTYLTIN (UG/L)	--	--	--	0.30 U	--	0.30 U	0.173	--	0.30 U	--	--
TETRABUTYLTIN (UG/L)	--	--	--	0.30 U	--	0.30 U	0.30 U	--	0.30 U	--	--
TRIBUTYLTIN (UG/L)	--	--	--	0.30 U	--	0.30 U	0.30 U	--	0.30 U	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)											
DIALLATE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
DIMETHOATE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
FAMPHUR	--	--	--	--	--	--	--	--	--	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	--	--	110 U	--	110 U	110 U	--	110 U	--	--
THIONAZIN	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
SEMIVOLATILES (UG/L)											
1,2,3,4-TETRACHLOROBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,2,3,5-TETRACHLOROBENZENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
1,2,4,5-TETRACHLOROBENZENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
1,2-DICHLOROBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,2-DIPHENYLHYDRAZINE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
1,3,5-TRICHLOROBENZENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
1,3,5-TRINITROBENZENE	--	--	--	45 U	--	45 U	45 U	--	45 U	--	--
1,3-DICHLOROBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,3-DINITROBENZENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
1,4-DICHLOROBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,4-NAPHTHOQUINONE	--	--	--	35 U	--	35 U	35 U	--	35 U	--	--
1-CHLORONAPHTHALENE	--	--	--	25 U	--	25 U	25 U	--	25 U	--	--
1-METHYLNAPHTHALENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
1-NAPHTHYLAMINE	--	--	--	35 U	--	35 U	35 U	--	35 U	--	--
2,3,4,6-TETRACHLOROPHENOL	--	--	--	35 U	--	35 U	35 U	--	35 U	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	25 U	--	25 U	25 U	--	25 U	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	25 U	--	25 U	25 U	--	25 U	--	--
2,4-DICHLOROPHENOL	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
2,4-DIMETHYLPHENOL	--	--	--	35 U	--	35 U	35 U	--	35 U	--	--
2,4-DINITROPHENOL	--	--	--	75 U	--	75 U	75 U	--	75 U	--	--
2,4-DINITROTOLUENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
2,6-DICHLOROPHENOL	--	--	--	25 U	--	25 U	25 U	--	25 U	--	--
2,6-DINITROTOLUENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
2-ACETYLAMINOFLUORENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
2-CHLORONAPHTHALENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
2-CHLOROPHENOL	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
2-METHYLANILINE HYDROCHLORIDE	--	--	--	25 U	--	25 U	25 U	--	25 U	--	--
2-METHYLNAPHTHALENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
2-METHYLPHENOL	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
2-NAPHTHYLAMINE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
2-NITROANILINE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	C044W0016	C044W0017	C044W0018	C044W0018	C044W0019	C044W0019	C044W0020	C044W0020	C044W0021	C044W0021	C044W0022
SAMPLE ID	044W001601b_LGCY	044W001701	044W001801_LGCY	044W001801	044W001901_LGCY	044W001901	044W002001	044W002001_LGCY	044W002101	044W002101_LGCY	044W002201a
SAMPLE DATE	4/19/1995	7/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995
2-NITROPHENOL	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
2-PICOLINE	--	--	--	45 U	--	45 U	45 U	--	45 U	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
3,3'-DIMETHOXYBENZIDINE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
3,3'-DIMETHYLBENZIDINE	--	--	--	100 U	--	100 U	100 U	--	100 U	--	--
3-METHYLCHOLANTHRENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
3-METHYLPHENOL	--	--	--	35 U	--	35 U	35 U	--	35 U	--	--
3-NITROANILINE	--	--	--	30 U	--	30 U	30 U	--	30 U	--	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
4,6-DINITRO-2-METHYLPHENOL	--	--	--	45 U	--	45 U	45 U	--	45 U	--	--
4-AMINOBIPHENYL	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
4-CHLOROANILINE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
4-METHYLPHENOL	--	--	--	35 U	--	35 U	35 U	--	35 U	--	--
4-NITROANILINE	--	--	--	35 U	--	35 U	35 U	--	35 U	--	--
4-NITROPHENOL	--	--	--	45 U	--	45 U	45 U	--	45 U	--	--
4-NITROQUINOLINE-1-OXIDE	--	--	--	75 U	--	--	75 U	--	--	--	--
5-NITRO-O-TOLUIDINE	--	--	--	30 U	--	30 U	30 U	--	30 U	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
ACENAPHTHENE	--	--	--	10 U	--	10 UJ	10 U	--	10 U	--	--
ACENAPHTHYLENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
ACETOPHENONE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
ANILINE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
ANTHRACENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
ARAMITE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
BENZAL CHLORIDE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
BENZIDINE	--	--	--	25 U	--	25 U	25 U	--	25 U	--	--
BENZO(A)ANTHRACENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
BENZO(A)PYRENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
BENZO(B)FLUORANTHENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
BENZO(G,H,I)PERYLENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
BENZO(K)FLUORANTHENE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
BENZOIC ACID	--	--	--	95 U	--	95 U	95 U	--	95 U	--	--
BENZOTRICHLORIDE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
BENZYL ALCOHOL	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
BENZYL CHLORIDE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
BIS(2-CHLOROISOPROPYL)ETHER	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	10 U	--	10 UJ	10 U	--	10 UJ	--	--
BUTYL BENZYL PHTHALATE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CHLOROBENZILATE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CHRYSENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--	--	20 UJ	--	--	20 UJ	--	--
DIBENZ(A,J)ACRIDINE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
DIBENZOFURAN	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
DIETHYL PHTHALATE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
DIMETHYL PHTHALATE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
DI-N-BUTYL PHTHALATE	--	--	--	15 U	--	2 J	15 U	--	15 U	--	--
DI-N-OCTYL PHTHALATE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
DIPHENYLAMINE	--	--	--	30 U	--	30 U	30 U	--	30 U	--	--
ETHYL METHACRYLATE	15 U	--	15 U	10 U	15 U	10 U	10 U	15 U	10 U	15 U	--
ETHYL METHANE SULFONATE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
FLUORANTHENE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
FLUORENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
HEXACHLOROBENZENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
HEXACHLOROBUTADIENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	25 UJ	--	25 UJ	25 UJ	--	25 UJ	--	--
HEXACHLOROETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
HEXACHLOROPROPENE	--	--	--	20 UJ	--	20 U	20 UJ	--	20 U	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
ISOPHORONE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
ISOSAFROLE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
METHAPYRILENE	--	--	--	30 U	--	30 UJ	30 U	--	30 UJ	--	--
METHYL METHACRYLATE	--	--	--	20 U	--	20 U	--	--	--	--	--

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	C044W0016	C044W0017	C044W0018	C044W0018	C044W0019	C044W0019	C044W0020	C044W0020	C044W0021	C044W0021	C044W0022
SAMPLE ID	044W001601b_LGCY	044W001701	044W001801_LGCY	044W001801	044W001901_LGCY	044W001901	044W002001	044W002001_LGCY	044W002101	044W002101_LGCY	044W002201a
SAMPLE DATE	4/19/1995	7/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995	4/11/1995
METHYL METHANE SULFONATE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
NAPHTHALENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
NITROBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
N-NITROSODIETHYLAMINE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
N-NITROSODIMETHYLAMINE	--	--	--	15 U	--	15 UJ	15 U	--	15 UJ	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	20 U	--	20 UJ	20 U	--	20 U	--	--
N-NITROSODIPHENYLAMINE	--	--	--	30 U	--	30 U	30 U	--	30 U	--	--
N-NITROSOMETHYLETHYLAMINE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
N-NITROSOMORPHOLINE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
N-NITROSOPIPERIDINE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
N-NITROSOPYRROLIDINE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
PARALDEHYDE	--	--	--	10 U	--	10 UJ	10 U	--	10 UJ	--	--
PENTACHLOROBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
PENTACHLOROETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
PENTACHLORONITROBENZENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
PENTACHLOROPHENOL	--	--	--	55 U	--	55 U	55 U	--	55 U	--	--
PHENACETIN	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
PHENANTHRENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
PHENOL	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
PRONAMIDE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
PYRENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
PYRIDINE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
SAFROLE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
SOLVENT YELLOW 2	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
VOLATILES (UG/L)											
1,1,1,2-TETRACHLOROETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
1,1,1-TRICHLOROETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,1,2-TRICHLOROETHANE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	25 U	--	25 U	25 U	--	25 U	--	--
1,1-DICHLOROETHANE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
1,1-DICHLOROETHENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	10 UJ	--	10 UJ	10 U	--	10 U	--	--
1,2-DIBROMOETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
1,2-DICHLOROETHANE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
1,2-DICHLOROPROPANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
2-BUTANONE	--	--	--	20 UJ	--	20 UJ	20 UJ	--	20 UJ	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
3-CHLOROPROPENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
4-METHYL-2-PENTANONE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
ACETONE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
ACETONITRILE	--	--	--	60 U	--	60 U	60 U	--	60 U	--	--
ACROLEIN	--	--	--	90 U	--	1 J	90 U	--	90 U	--	--
ACRYLONITRILE	--	--	--	95 U	--	95 U	95 U	--	95 U	--	--
BENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
BROMODICHLOROMETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
BROMOFORM	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
BROMOMETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CARBON DISULFIDE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CARBON TETRACHLORIDE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CHLOROBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CHLORODIBROMOMETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CHLOROETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
CHLOROFORM	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
CHLOROMETHANE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
DIBROMOMETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
ETHYLBENZENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
METHACRYLONITRILE	--	--	--	20 U	--	20 U	20 U	--	20 U	--	--
METHYL IODIDE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
METHYLENE CHLORIDE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	**C044W0016**	**C044W0017**	**C044W0018**	**C044W0018**	**C044W0019**	**C044W0019**	**C044W0020**	**C044W0020**	**C044W0021**	**C044W0021**	**C044W0022**
SAMPLE ID	**044W001601b_LGCY**	**044W001701**	**044W001801_LGCY**	**044W001801**	**044W001901_LGCY**	**044W001901**	**044W002001**	**044W002001_LGCY**	**044W002101**	**044W002101_LGCY**	**044W002201a**
SAMPLE DATE	**4/19/1995**	**7/11/1995**	**4/11/1995**	**4/11/1995**	**4/11/1995**	**4/11/1995**	**4/11/1995**	**4/11/1995**	**4/11/1995**	**4/11/1995**	**4/11/1995**
PROPIONITRILE	--	--	--	220 UJ	--	220 UJ	--	--	--	--	--
STYRENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
TETRACHLOROETHENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
TOLUENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
TOTAL 1,2-DICHLOROETHENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
TOTAL XYLENES	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	10 U	--	10 U	--	--	--	--	--
TRICHLOROETHENE	--	--	--	5 U	--	5 U	5 U	--	5 U	--	--
TRICHLOROFLUOROMETHANE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
VINYL ACETATE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
VINYL CHLORIDE	--	--	--	10 U	--	10 U	10 U	--	10 U	--	--
PCB CONGENERS (UG/L)											
AROCLOR-1016	--	--	--	0.50 U	--	0.50 U	0.50 U	--	0.50 U	--	--
AROCLOR-1221	--	--	--	0.50 U	--	0.50 U	0.50 U	--	0.50 U	--	--
AROCLOR-1232	--	--	--	0.50 U	--	0.50 U	0.50 U	--	0.50 U	--	--
AROCLOR-1242	--	--	--	0.50 U	--	0.50 U	0.50 U	--	0.50 U	--	--
AROCLOR-1248	--	--	--	0.50 U	--	0.50 U	0.50 U	--	0.50 U	--	--
AROCLOR-1254	--	--	--	0.50 U	--	0.50 U	0.50 U	--	0.50 U	--	--
AROCLOR-1260	--	--	--	0.50 U	--	0.50 U	0.50 U	--	0.50 U	--	--
PESTICIDES/PCBS (UG/L)											
4,4'-DDD	--	--	--	0.10 U	--	0.10 U	0.10 U	--	0.10 U	--	--
4,4'-DDE	--	--	--	0.10 U	--	0.10 U	0.10 U	--	0.10 U	--	--
4,4'-DDT	--	--	--	0.10 U	--	0.10 U	0.10 U	--	0.10 U	--	--
ALDRIN	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
ALPHA-BHC	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
BETA-BHC	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
CHLORDANE	--	--	--	0.12 U	--	0.12 U	0.12 U	--	0.12 U	--	--
DELTA-BHC	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
DIELDRIN	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
ENDOSULFAN I	--	--	--	0.05 U	--	0.05 U	0.05 U	--	0.05 U	--	--
ENDOSULFAN II	--	--	--	0.10 U	--	0.10 U	0.10 U	--	0.10 U	--	--
ENDOSULFAN SULFATE	--	--	--	0.05 U	--	0.05 U	0.05 U	--	0.05 U	--	--
ENDRIN	--	--	--	0.05 U	--	0.05 U	0.05 U	--	0.05 U	--	--
ENDRIN ALDEHYDE	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
GAMMA-BHC (LINDANE)	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
HEPTACHLOR	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
HEPTACHLOR EPOXIDE	--	--	--	0.03 U	--	0.03 U	0.03 U	--	0.03 U	--	--
ISODRIN	--	--	--	15 U	--	15 U	15 U	--	15 U	--	--
METHOXYCHLOR	--	--	--	0.30 U	--	0.03 U	0.30 U	--	0.30 U	--	--
TOXAPHENE	--	--	--	1 U	--	1 U	1 U	--	1 U	--	--

SURFACE WATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	**C044W0022**	**C044W0022**	**C044WC001**	**C044WC002**
SAMPLE ID	**044W002201b_LGCY**	**044W002201b**	**044WC00101**	**044WC00201**
SAMPLE DATE	**4/19/1995**	**4/19/1995**	**10/20/1999**	**10/20/1999**
METALS (UG/L)				
ALUMINUM	--	--	--	--
ANTIMONY	--	--	--	--
ARSENIC	--	--	--	--
BARIUM	--	--	--	--
BERYLLIUM	--	--	--	--
CADMIUM	--	--	--	--
CALCIUM	--	--	--	--
CHROMIUM	--	--	--	--
COBALT	--	--	--	--
COPPER	--	--	1.6 J	4 J
IRON	--	--	--	--
LEAD	--	--	--	--
MAGNESIUM	--	--	--	--
MANGANESE	--	--	--	--
MERCURY	--	--	--	--
NICKEL	--	--	--	--
POTASSIUM	--	--	--	--
SELENIUM	--	--	--	--
SILVER	--	--	--	--
SODIUM	--	--	--	--
THALLIUM	--	--	--	--
TIN	--	--	--	--
VANADIUM	--	--	--	--
ZINC	--	--	--	--
MISCELLANEOUS PARAMETERS				
DIBUTYLTIN (UG/L)	--	--	--	--
MONOBUTYLTIN (UG/L)	--	--	--	--
TETRABUTYLTIN (UG/L)	--	--	--	--
TRIBUTYLTIN (UG/L)	--	--	--	--
ORGANOPHOSPHOROUS PESTICIDES (UG/L)				
DIALLATE	--	20 U	--	--
DIMETHOATE	--	15 UJ	--	--
FAMPHUR	--	65 UJ	--	--
O,O,O-TRIETHYL PHOSPHOROTHIOATE	--	110 U	--	--
THIONAZIN	--	15 U	--	--
SEMIVOLATILES (UG/L)				
1,2,3,4-TETRACHLOROBENZENE	--	10 U	--	--
1,2,3,5-TETRACHLOROBENZENE	--	15 U	--	--
1,2,4,5-TETRACHLOROBENZENE	--	15 U	--	--
1,2-DICHLOROBENZENE	--	10 U	--	--
1,2-DIPHENYLHYDRAZINE	--	15 U	--	--
1,3,5-TRICHLOROBENZENE	--	5 U	--	--
1,3,5-TRINITROBENZENE	--	45 U	--	--
1,3-DICHLOROBENZENE	--	10 U	--	--
1,3-DINITROBENZENE	--	15 U	--	--
1,4-DICHLOROBENZENE	--	10 U	--	--
1,4-NAPHTHOQUINONE	--	35 U	--	--
1-CHLORONAPHTHALENE	--	25 U	--	--
1-METHYLNAPHTHALENE	--	15 U	--	--
1-NAPHTHYLAMINE	--	35 U	--	--
2,3,4,6-TETRACHLOROPHENOL	--	35 U	--	--
2,4,5-TRICHLOROPHENOL	--	25 U	--	--
2,4,6-TRICHLOROPHENOL	--	25 U	--	--
2,4-DICHLOROPHENOL	--	15 U	--	--
2,4-DIMETHYLPHENOL	--	35 U	--	--
2,4-DINITROPHENOL	--	75 U	--	--
2,4-DINITROTOLUENE	--	10 U	--	--
2,6-DICHLOROPHENOL	--	25 U	--	--
2,6-DINITROTOLUENE	--	15 U	--	--
2-ACETYLAMINOFLUORENE	--	10 U	--	--
2-CHLORONAPHTHALENE	--	15 U	--	--
2-CHLOROPHENOL	--	15 U	--	--
2-METHYLANILINE HYDROCHLORIDE	--	25 U	--	--
2-METHYLNAPHTHALENE	--	10 U	--	--
2-METHYLPHENOL	--	20 U	--	--
2-NAPHTHYLAMINE	--	20 UJ	--	--
2-NITROANILINE	--	20 U	--	--

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	C044W0022	C044W0022	C044WC001	C044WC002
SAMPLE ID	044W002201b_LGCY	044W002201b	044WC00101	044WC00201
SAMPLE DATE	4/19/1995	4/19/1995	10/20/1999	10/20/1999
2-NITROPHENOL	--	5 U	--	--
2-PICOLINE	--	45 U	--	--
3,3'-DICHLOROBENZIDINE	--	10 U	--	--
3,3'-DIMETHOXYBENZIDINE	--	20 U	--	--
3,3'-DIMETHYLBENZIDINE	--	100 U	--	--
3-METHYLCHOLANTHRENE	--	5 U	--	--
3-METHYLPHENOL	--	35 U	--	--
3-NITROANILINE	--	30 U	--	--
4,4'-METHYLENE BIS(2-CHLOROANILINE)	--	15 U	--	--
4,6-DINITRO-2-METHYLPHENOL	--	45 U	--	--
4-AMINOBIPHENYL	--	10 U	--	--
4-BROMOPHENYL PHENYL ETHER	--	15 U	--	--
4-CHLORO-3-METHYLPHENOL	--	10 U	--	--
4-CHLOROANILINE	--	5 U	--	--
4-CHLOROPHENYL PHENYL ETHER	--	10 U	--	--
4-METHYLPHENOL	--	35 U	--	--
4-NITROANILINE	--	35 U	--	--
4-NITROPHENOL	--	45 U	--	--
4-NITROQUINOLINE-1-OXIDE	--	--	--	--
5-NITRO-O-TOLUIDINE	--	30 U	--	--
7,12-DIMETHYLBENZ(A)ANTHRACENE	--	10 U	--	--
ACENAPHTHENE	--	10 U	--	--
ACENAPHTHYLENE	--	10 U	--	--
ACETOPHENONE	--	20 U	--	--
ANILINE	--	15 U	--	--
ANTHRACENE	--	15 U	--	--
ARAMITE	--	20 U	--	--
BENZAL CHLORIDE	--	15 U	--	--
BENZIDINE	--	25 U	--	--
BENZO(A)ANTHRACENE	--	10 U	--	--
BENZO(A)PYRENE	--	5 U	--	--
BENZO(B)FLUORANTHENE	--	10 U	--	--
BENZO(G,H,I)PERYLENE	--	10 U	--	--
BENZO(K)FLUORANTHENE	--	20 U	--	--
BENZOIC ACID	--	95 UJ	--	--
BENZOTRICHLORIDE	--	5 U	--	--
BENZYL ALCOHOL	--	20 U	--	--
BENZYL CHLORIDE	--	5 U	--	--
BIS(2-CHLOROETHOXY)METHANE	--	15 U	--	--
BIS(2-CHLOROETHYL)ETHER	--	20 U	--	--
BIS(2-CHLOROISOPROPYL)ETHER	--	15 U	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	10 U	--	--
BUTYL BENZYL PHTHALATE	--	10 U	--	--
CHLOROBENZILATE	--	10 U	--	--
CHRYSENE	--	15 U	--	--
CYCLOPHOSPHAMIDE HYDRATE	--	--	--	--
DIBENZ(A,J)ACRIDINE	--	10 U	--	--
DIBENZO(A,H)ANTHRACENE	--	10 U	--	--
DIBENZOFURAN	--	10 U	--	--
DIETHYL PHTHALATE	--	15 U	--	--
DIMETHYL PHTHALATE	--	10 U	--	--
DI-N-BUTYL PHTHALATE	--	1 J	--	--
DI-N-OCTYL PHTHALATE	--	20 U	--	--
DIPHENYLAMINE	--	30 U	--	--
ETHYL METHACRYLATE	15 U	10 U	--	--
ETHYL METHANE SULFONATE	--	20 U	--	--
FLUORANTHENE	--	20 U	--	--
FLUORENE	--	10 U	--	--
HEXACHLOROBENZENE	--	15 U	--	--
HEXACHLOROBUTADIENE	--	5 U	--	--
HEXACHLOROCYCLOPENTADIENE	--	25 U	--	--
HEXACHLOROETHANE	--	10 U	--	--
HEXACHLOROPROPENE	--	20 U	--	--
INDENO(1,2,3-CD)PYRENE	--	10 U	--	--
ISOPHORONE	--	10 U	--	--
ISOSAFROLE	--	10 U	--	--
METHAPYRILENE	--	30 U	--	--
METHYL METHACRYLATE	--	--	--	--

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	**C044W0022**	**C044W0022**	**C044WC001**	**C044WC002**
SAMPLE ID	**044W002201b_LGCY**	**044W002201b**	**044WC00101**	**044WC00201**
SAMPLE DATE	**4/19/1995**	**4/19/1995**	**10/20/1999**	**10/20/1999**
METHYL METHANE SULFONATE	--	20 U	--	--
NAPHTHALENE	--	5 U	--	--
NITROBENZENE	--	10 U	--	--
N-NITROSODIETHYLAMINE	--	15 U	--	--
N-NITROSODIMETHYLAMINE	--	15 U	--	--
N-NITROSO-DI-N-BUTYLAMINE	--	10 U	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	20 U	--	--
N-NITROSODIPHENYLAMINE	--	30 U	--	--
N-NITROSOMETHYLETHYLAMINE	--	20 U	--	--
N-NITROSOMORPHOLINE	--	10 U	--	--
N-NITROSOPIPERIDINE	--	10 U	--	--
N-NITROSOPYRROLIDINE	--	15 U	--	--
PARALDEHYDE	--	10 U	--	--
PENTACHLOROBENZENE	--	10 U	--	--
PENTACHLOROETHANE	--	10 U	--	--
PENTACHLORONITROBENZENE	--	15 U	--	--
PENTACHLOROPHENOL	--	55 U	--	--
PHENACETIN	--	20 UJ	--	--
PHENANTHRENE	--	15 U	--	--
PHENOL	--	15 U	--	--
PRONAMIDE	--	15 UJ	--	--
PYRENE	--	10 U	--	--
PYRIDINE	--	20 U	--	--
SAFROLE	--	5 U	--	--
SOLVENT YELLOW 2	--	10 U	--	--
VOLATILES (UG/L)				
1,1,1,2-TETRACHLOROETHANE	--	10 U	--	--
1,1,1-TRICHLORO-2,2,2-TRIFLUOROMETHANE	--	15 U	--	--
1,1,1-TRICHLOROETHANE	--	10 U	--	--
1,1,2,2-TETRACHLOROETHANE	--	10 U	--	--
1,1,2-TRICHLOROETHANE	--	5 U	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	25 U	--	--
1,1-DICHLOROETHANE	--	5 U	--	--
1,1-DICHLOROETHENE	--	5 U	--	--
1,2,3-TRICHLOROBENZENE	--	5 U	--	--
1,2,3-TRICHLOROPROPANE	--	10 U	--	--
1,2,4-TRICHLOROBENZENE	--	5 U	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	10 U	--	--
1,2-DIBROMOETHANE	--	10 U	--	--
1,2-DICHLOROETHANE	--	5 UJ	--	--
1,2-DICHLOROPROPANE	--	10 U	--	--
2-BUTANONE	--	20 UJ	--	--
2-CHLOROETHYL VINYL ETHER	--	--	--	--
2-HEXANONE	--	15 U	--	--
3-CHLOROPROPENE	--	15 U	--	--
4-METHYL-2-PENTANONE	--	10 U	--	--
ACETONE	--	15 UJ	--	--
ACETONITRILE	--	60 U	--	--
ACROLEIN	--	90 UJ	--	--
ACRYLONITRILE	--	95 U	--	--
BENZENE	--	10 U	--	--
BROMODICHLOROMETHANE	--	10 U	--	--
BROMOFORM	--	10 U	--	--
BROMOMETHANE	--	10 U	--	--
CARBON DISULFIDE	--	10 U	--	--
CARBON TETRACHLORIDE	--	10 U	--	--
CHLOROBENZENE	--	10 U	--	--
CHLORODIBROMOMETHANE	--	10 U	--	--
CHLOROETHANE	--	10 U	--	--
CHLOROFORM	--	5 U	--	--
CHLOROMETHANE	--	15 U	--	--
CIS-1,3-DICHLOROPROPENE	--	15 UJ	--	--
CIS-1,4-DICHLORO-2-BUTENE	--	5 UJ	--	--
DIBROMOMETHANE	--	10 U	--	--
ETHYLBENZENE	--	10 U	--	--
METHACRYLONITRILE	--	20 U	--	--
METHYL IODIDE	--	5 U	--	--
METHYLENE CHLORIDE	--	10 U	--	--

Appendix A-5
Surface Water Analytical Results Summary (1995 and 1998)
AOC 721
Charleston Naval Complex
Charleston, South Carolina

SURFACE WATER

LOCATION	**C044W0022**	**C044W0022**	**C044WC001**	**C044WC002**
SAMPLE ID	**044W002201b_LGCY**	**044W002201b**	**044WC00101**	**044WC00201**
SAMPLE DATE	**4/19/1995**	**4/19/1995**	**10/20/1999**	**10/20/1999**
PROPIONITRILE	--	--	--	--
STYRENE	--	5 U	--	--
TETRACHLOROETHENE	--	10 U	--	--
TOLUENE	--	5 U	--	--
TOTAL 1,2-DICHLOROETHENE	--	10 U	--	--
TOTAL XYLENES	--	15 U	--	--
TRANS-1,3-DICHLOROPROPENE	--	10 UJ	--	--
TRANS-1,4-DICHLORO-2-BUTENE	--	--	--	--
TRICHLOROETHENE	--	5 U	--	--
TRICHLOROFLUOROMETHANE	--	10 UJ	--	--
VINYL ACETATE	--	10 U	--	--
VINYL CHLORIDE	--	10 U	--	--
PCB CONGENERS (UG/L)				
AROCLOR-1016	--	0.50 U	--	--
AROCLOR-1221	--	0.50 U	--	--
AROCLOR-1232	--	0.50 U	--	--
AROCLOR-1242	--	0.50 U	--	--
AROCLOR-1248	--	0.50 U	--	--
AROCLOR-1254	--	0.50 U	--	--
AROCLOR-1260	--	0.50 U	--	--
PESTICIDES/PCBS (UG/L)				
4,4'-DDD	--	0.10 U	--	--
4,4'-DDE	--	0.10 U	--	--
4,4'-DDT	--	0.10 U	--	--
ALDRIN	--	0.03 U	--	--
ALPHA-BHC	--	0.03 U	--	--
BETA-BHC	--	0.03 U	--	--
CHLORDANE	--	0.12 U	--	--
DELTA-BHC	--	0.03 U	--	--
DIELDRIN	--	0.03 U	--	--
ENDOSULFAN I	--	0.05 U	--	--
ENDOSULFAN II	--	0.10 U	--	--
ENDOSULFAN SULFATE	--	0.05 U	--	--
ENDRIN	--	0.05 U	--	--
ENDRIN ALDEHYDE	--	0.03 U	--	--
GAMMA-BHC (LINDANE)	--	0.03 U	--	--
HEPTACHLOR	--	0.03 U	--	--
HEPTACHLOR EPOXIDE	--	0.03 U	--	--
ISODRIN	--	15 U	--	--
METHOXYCHLOR	--	0.30 U	--	--
TOXAPHENE	--	1 U	--	--

SURFACE WATER Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

Blank (i.e., no qualifier) = the chemical was detected.

> = The chemical was detected.

J = The chemical was detected but the concentration reported is an estimated value.

U = The chemical was not detected.

< = The chemical was not detected.

R = The chemical was rejected.

APPENDIX B

DATA VALIDATION

B-1 SAMPLES COLLECTED DURING RFI INVESTIGATION (2003)

B-2 SAMPLES COLLECTED BY TETRA TECH (2008)

APPENDIX B-1

SAMPLES COLLECTED DURING RFI INVESTIGATION (2003)

APPENDIX B: DATA VALIDATION

1.0 INTRODUCTION

Section 4.1 of the *Zone A RFI Report* (EnSafe, 1998) defines the Data Quality Objectives (DQOs) used for the AOC 721 investigation. Analytical Level III data were deemed appropriate for the intended site characterization, risk assessment, and corrective measure determinations/design at AOC 721. Sixty-six samples were collected from AOC 721 and analyzed for Level III data during the RFI investigation (April through December 2003).

Appendix A includes the complete analytical data reports for the samples collected for the AOC 721 RFI investigation. Previous SWMU 44 analytical data reports, data validation reports and chain-of–custody forms are presented in the *CMS Work Plan/IM Completion Report, SWMU 44, Zone C* (CH2M-Jones, 2002) report.

It should be noted that in September 1993, USEPA replaced a 1987 guidance with an updated manual, *Data Quality Objectives Process for Superfund, Interim Final Guidance*, EPA/540/G-93/071 (USEPA, 1993) which stated, "This guidance replaces the earlier guidance EPA 540/G-87/003, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-7B and the five analytical levels introduced in that document." As a result, the five analytical data levels were reduced to two — screening data and definitive data.

Definitive data (formerly Level III) is defined as analytical data generated using rigorous analytical methods, such as approved USEPA reference methods. These data are analyte-specific, with confirmation of analyte identity and concentration. These approved methods produce tangible raw data (e.g., chromatograms, spectra, digital values, etc.) in paper printouts or computer-generated electronic files. Analytical or total measurement error (precision) must be determined for data to be definitive (USEPA, 1993). As a result, the data collected at AOC 721 were defined as definitive data per the most recent USEPA guidance but will still be referred to as Level III throughout the report to avoid confusion.

2.0 VALIDATION SUMMARY

This section presents the quality assurance/quality control (QA/QC) evaluation of the data produced from the analysis of environmental media samples collected in Zone C during the AOC 721 RFI for samples collected from April 2003 to December 2003. All previous SWMU 44 samples were evaluated in the *CMS Work Plan/IM Completion Report, SWMU 44, Zone C* (CH2M-Jones, 2002) report. This evaluation of AOC 721 data will verify that the appropriate QA/QC elements were followed and/or completed (e.g., method requirements, documentation, etc.) to identify and/or characterize any problems with the data set,

and ultimately to determine the usability of the analytical data for site characterization, risk assessment, and corrective measure determinations.

Examples of definitive data (formerly Level III) QA/QC elements are as follows:

- Sample documentation (verified time of sample receipt, extraction and holding times).
- Chain-of–custody.
- Initial and continuing calibration.
- Determination and documentation of detection limits.
- Analyte(s) identification.
- Analyte(s) quantification.
- QC blanks (trip, method, rinsate).
- Matrix spike recoveries.
- Performance evaluation (PE) samples (when specified).
- Analytical method precision.
- Total measurement error determination.

In accordance with the approved CSAP, sample analyses followed the guidance in the *USEPA Test Methods for Evaluating Solid Waste*, SW-846 (USEPA, 1992) and Title 40 of the Code of Federal Regulations (CFR) Part 264. Table B-1 summarizes the analytical methods and DQO laboratory deliverables.

TABLE B-1

AOC 721 ANALYTICAL PROGRAM

Full Scan/Appendix IX Analytical Methods	Data Quality Level	Method Reference
Semi-volatile Organic Compounds (SVOCs)	III	SW-846 8270C
Target Analyte List (TAL) Metals	III	SW-846 6010B/7470A/7471A
Iron $^{2+}$	II	HACH Method 8146 and Spectrophotometer
Iron $^{3+}$	II	HACH Method 8147 and Spectrophotometer

Notes:

HACH methods were conducted in the field and were not validated by a third-party validator.

The methods listed in Table B-1, excluding the HACH methods, are from:

- USEPA OSWER, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), Third Edition, Update III, November 1997.

- USEPA Environmental Monitoring and Support Laboratory, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983.
- *Title 40 CFR Part 264, Appendix IX* (*52 Federal Register 25947),* July 1987.

Third-party, independent, data validation of all analytical work, excluding the HACH methods, performed under the CSAP was conducted by Heartland Environmental Services, Inc. based on the QC criteria developed for USEPA Contract Laboratory Program (CLP). The third–party validation was to assess data quality reliability, usability, while documenting any mitigating factors such as noncompliance with methods, possible matrix interferences, and laboratory blank contamination.

3.0 ORGANIC EVALUATION CRITERIA

Section 4.2.1 of the *Zone A RFI Report* (EnSafe, 1998) discusses the organic evaluation criteria as they apply to the AOC 721 investigation. These criteria include holding times, instrument performance standards, surrogate spike recoveries, instrument calibration, matrix spikes/duplicates, laboratory control samples and laboratory duplicates, blank analysis, field-derived blank analyses, and internal performance standards.

4.0 DILUTED SAMPLES

There were no samples diluted due to high concentrations of contamination encountered during the AOC 721 RFI.

5.0 INORGANIC EVALUATION CRITERIA

Section 4.2.2 of the *Draft Zone A RFI Report* discusses the inorganic evaluation criteria as they apply to the AOC 721 investigation. These include holding times; instrument calibration; blank analysis; inductively coupled argon plasma (ICAP) interference check samples; laboratory control samples (LCS); spike sample analyses; laboratory duplicates; ICAP serial dilutions; and atomic absorption (AA) analysis, duplicate injections, and post digestion spikes.

6.0 AOC 721 DATA VALIDATION REPORTS

Samples were collected from April to December 2003. During the data validation review of AOC 721 soil, sediment, surface water and groundwater analyses, site–specific deficiencies and/or problems were noted in the SVOC, and metals methods. Although field blanks were site–specific, equipment, and distilled water blanks were not. The following sections present analytes detected in blank samples collected during the AOC 721 investigation.

6.1 Blank Evaluation

Southwest Laboratories of Oklahoma and Severn Trent Laboratories/Savannah reviewed their Standard Operating Procedures (SOP) and determined that several possibilities existed where inorganic contamination may be introduced into the samples. Sample containers can introduce either a positive or negative error in the measurement of trace metals by (a) contributing contaminants through leaching or surface desorption, and (b) depleting concentrations through adsorption. Other possibilities that contribute to potential contamination are dust in the laboratory equipment and impurities in reagents and on laboratory apparatus.

Memory interferences, better known as carryover, can also contribute to results in blanks. Carryover occurs when analytes in a previous sample contribute to the signals in a new sample. Since metals are analyzed using ICAP, carryover can result from sample deposition on the uptake tubing to the nebulizer, and from the build up of sample material in the plasma torch and spray chamber.

The laboratory utilizes several procedures to eliminate possible interferences during sample preparation and analysis. Trace metal grade acids for sample preparation, and a strict SOP for glassware cleaning helps eliminate cross contamination prior to sample analysis. During sample analysis, extended rinse times also help to eliminate cross-contamination, but excessively high concentrated samples can result in carryover of results in the following sample that is analyzed.

QC blanks with analyte detections with possible sample contamination are discussed previously.

Soil Boring Blanks

AOC 721 — Metals Method

1. Thallium and zinc in the laboratory blanks at concentrations of 0.42 and 6.6 micrograms per kilogram (µg/kg) respectively.
2. Selenium and thallium in field blank at concentrations of 4.3 and 3.2 micrograms per liter (µg/L) respectively.
3. Selenium and thallium in equipment blank at concentrations of 3.9 and 3.6 µg/L respectively.

The following samples had initial detections of selenium and/or thallium but were validated to non-detect because of blank contamination guidelines:

- 721SB00201 – selenium
- 721SB00301 – selenium and thallium
- 721SB00401 – selenium and thallium

- 721SB00501 – selenium
- 721SB03A01 – thallium
- 721SB06A01 – thallium
- 721SB06B01 – selenium and thallium
- 721SB06C01 – thallium
- 721SB06D01 – selenium
- 721SB06E01 – thallium
- 721SB06F01 – thallium
- 721SB06H01 – thallium

Groundwater Blanks

AOC 721 — Metals Method

April 2003 Data

1. Antimony and vanadium in the field blank at concentrations of 5.6 and 0.66 µg/L respectively.
2. Antimony and vanadium in the equipment blank at concentrations of 3.4 and 0.46 µg/L respectively.
3. Antimony and zinc in the laboratory blank at concentrations of 5.7 and 15.4 µg/L respectively.

The following samples had initial detections of antimony and vanadium but were validated to non-detect because of blank contamination guidelines:

- 044GW00607 – vanadium
- 044GW00708 – antimony

May 2003 Data

1. Antimony in laboratory blank at a concentration of 7.6 µg/L.

The following samples had initial detections of antimony but were validated to non-detect because of blank contamination guidelines:

- 044GW00508
- 044GW00608
- 044GW00509
- 044GW00609

- 044GW00709
- 044GW00710

Sediment Blanks

AOC 721 — Metals Method

1. Selenium, thallium, and zinc in laboratory blank at concentrations of 6.3, 0.43 and 1.7 milligrams per kilogram (mg/kg) respectively.
2. Beryllium, selenium, and thallium in equipment blank at concentrations of 0.41, 5.7, and 8.7 µg/L respectively.
3. Selenium and thallium in field blank at concentrations of 5.5 and 4.8 µg/L respectively.

The following samples had initial detections of beryllium, selenium, and/or thallium but were validated to non-detect because of blank contamination guidelines:

- 721MD00201 – beryllium, selenium, and thallium
- 721MD00401 – selenium and thallium
- 721MD00501 – selenium and thallium
- 721MD00601 – beryllium
- 721MD00701 – beryllium
- 721MD00801 – beryllium
- 721MD00901 – selenium
- 721MD01001 – selenium
- 721MD01201 – beryllium
- 721MD01301 – beryllium

Surface Water Blanks

AOC 721 — Metals Method

1. Magnesium, potassium, and zinc in laboratory blanks

There were no primary surface water samples affected by the blank contamination.

7.0 METHOD DETECTION LIMITS

The method detection limit (MDL) is the minimum concentration above zero that an analyte can be detected with 99 percent confidence. Tables B-2 through B-6 presents data from Southwest Laboratories and Severn Trent laboratories/Savannah MDL studies.

TABLE B-2
AOC 721
SOUTHWEST LABORATORY OF OKLAHOMA'S METHOD DETECTION LIMIT STUDY FOR SVOCS

		PQL's		MDL's	
Compound	**CAS Number**	**Water (µg/l)**	**Soil (µg/kg)**	**Water (µg/l)**	**Soil (µg/kg)**
Semivolatile **Test Code: MS500** **Method: SW846 8270, 823rd Edition, Nov. 1986, PQL Table II, Rev.0, Sept. 1986** **Matrix: Water–Soil** **Extract Volume: 1000 ml — 30g** **Initial Calibration: 20–50–100–120–160 ng, %RSD for CCC compounds=30%, SPCC=97RF > 0.05** **Continuing Calibration: 50 ng, %D = 25% for CCC Compounds, SPCC = RF > 0.05100**					
Phenol	108–95–2	10	330	4.0	99.0
bis(2–chloroethyl)ether	111–44–4	10	330	5.0	49.0
2–Chlorophenol	95–57–8	10	330	5.0	69.0
1,3–Dichlorobenzene	541–73–1	10	330	3.0	35.0
1,4–Dichlorobenzene	106–46–7	10	330	4.0	40.0
Benzyl alcohol	100–51–6	10	330	7.0	271.0
1,2–Dichlorobenzene	95–50–1	10	330	4.0	35.0
2–Methylphenol	95–48–7	10	330	6.0	126.0
bis(2–chloroisopropyl)ether	108–60–1	10	330	5.0	58.0
4–Methylphenol	106–44–5	10	330	5.0	130.0
N–Nitroso–di–n–propylamine	621–64–7	10	330	6.0	90.0
Hexachloroethane	67–72–1	10	330	3.0	40.0
Isophorone	78–59–1	10	330	5.0	68.0
Nitrobenzene	98–95–3	10	330	4.0	46.0
2–Nitrophenol	88–75–5	10	330	8.0	68.0
2,4–Dimethylphenol	105–67–9	10	330	6.0	182.0
bis(2–chloroethoxy)methane	111–91–1	10	330	4.0	64.0
2,4–Dichlorophenol	120–83–2	10	330	5.0	114.0
Benzoic acid	65–85–0	25	830	3.0	130.0
1,2,4–Trichlorobenzene	120–82–1	10	330	3.0	47.0
Naphthalene	91–20–3	10	330	3.0	36.0

Compound	CAS Number	PQL's Water (µg/l)	PQL's Soil (µg/kg)	MDL's Water (µg/l)	MDL's Soil (µg/kg)
Semivolatile **Test Code:** MS500 **Method:** SW846 8270, 823rd Edition, Nov. 1986, PQL Table II, Rev.0, Sept. 1986 **Matrix:** Water–Soil **Extract Volume:** 1000 ml — 30g **Initial Calibration:** 20–50–100–120–160 ng, %RSD for CCC compounds=30%, SPCC=97RF > 0.05 **Continuing Calibration:** 50 ng, %D = 25% for CCC Compounds, SPCC = RF > 0.05100					
4–Chloroaniline	106–47–8	10	330	6.0	186.0
Hexachlorobutadiene	87–68–3	10	330	3.0	47.0
4–Chloro–3–methylphenol	59–50–7	10	330	7.0	231.0
2–Methylnaphthalene	91–57–6	10	330	3.0	69.0
Hexachlorocyclopentadiene	77–47–4	10	330	1.0	86.0
2,4,6–Trichlorophenol	88–06–2	10	330	6.0	65.0
2,4,5–Trichlorophenol	95–95–4	25	830	7.0	109.0
2–Chloronaphthalene	91–58–7	10	330	4.0	56.0
2–Nitroaniline	88–74–4	25	830	6.0	128.0
Dimethylphthalate	131–11–3	10	330	6.0	115.0
Acenaphthylene	208–96–8	10	330	4.0	42.0
2,6–Dinitroltoluene	606–20–2	10	330	7.0	166.0
3–Nitroaniline	99–09–2	25	830	6.0	217.0
Acenaphthene	83–32–9	10	330	4.0	40.0
2,4–Dinitrophenol	51–28–5	25	830	6.0	384.0
4–Nitrophenol	100–02–7	25	830	6.0	374.0
Dibenzofuran	132–64–9	10	330	4.0	71.0
2,4–Dinitrotoluene	121–14–2	10	330	5.0	249.0
Diethylphthalate	84–66–2	10	330	5.0	142.0
Fluorene	86–73–7	10	330	5.0	60.0
4–Chlorophenyl–phenylther	7005–72–3	10	330	4.0	116.0
4–Nitroaniline	100–01–6	25	830	3.0	348.0
4,6–Dinitro–2–methylphenol	534–52–1	25	830	6.0	144.0
N–nitrosodiphenylamine	86–30–6	10	330	5.0	53.0
4–Bromophenyl–phenylether	101–55–3	10	330	6.0	44.0
Hexachlorobenzene	118–74–1	10	330	5.0	47.0

Compound	CAS Number	PQL's Water (µg/l)	PQL's Soil (µg/kg)	MDL's Water (µg/l)	MDL's Soil (µg/kg)
Semivolatile **Test Code: MS500** **Method: SW846 8270, 823rd Edition, Nov. 1986, PQL Table II, Rev.0, Sept. 1986** **Matrix: Water–Soil** **Extract Volume: 1000 ml — 30g** **Initial Calibration: 20–50–100–120–160 ng, %RSD for CCC compounds=30%, SPCC=97RF > 0.05** **Continuing Calibration: 50 ng, %D = 25% for CCC Compounds, SPCC = RF > 0.05100**					
Pentachlorophenol	87–86–5	25	830	6.0	119.0
Phenanthrene	85–01–8	10	330	5.0	28.0
Anthracene	120–12–7	10	330	5.0	27.0
Di–n–butylphthalate	84–74–2	10	330	4.0	113.0
Fluoranthene	206–44–0	10	330	4.0	152.0
Pyrene	129–00–0	10	330	3.0	202.0
Butylbenzylphthalate	85–68–7	10	330	4.0	63.0
Benzo(a)anthracene	56–55–3	10	330	1.0	23.0
3,3'–Dichlorobenzidine	91–94–1	10	330	3.0	234.0
Chrysene	218–1–9	10	330	1.0	23.0
bis(2–ethylhexyl)phthalate	117–81–7	10	330	5.0	71.0
Di–n–octylphthalate	117–84–0	10	330	5.0	191.0
Benzo(b)fluoranthene	205–99–2	10	330	2.0	176.0
Benzo(k)fluoranthene	207–08–9	10	330	4.0	195.0
Benzo(a)pyrene	50–32–8	10	330	1.0	23.0
Indeno(1,2,3–cd)pyrene	193–39–5	10	330	2.0	115.0
Dibenz(a,h)anthracene	53–70–3	10	330	2.0	116.0
Benzo(g,h,i)perylene	191–24–2	10	330	2.0	154.0

Notes:

CAS = Chemical Abstract Service
CCC = Calibration Check Compounds
%D = Percent difference
g = gram
MDL = Method Detection Limit
µg/l = micrograms per liter
µg/kg = micrograms per kilogram
ml = milliliter
ng = nanogram
PQL = Practical Quantitation Limit
RF = Response Factor
%RSD = Percent Relative Standard Deviation
SPCC = Spill Prevention, Control, and Countermeasures

TABLE B-3
AOC 721
SOUTHWEST LABORATORY OF OKLAHOMA'S METHOD DETECTION LIMIT STUDY FOR METALS BY LOW–LEVEL ICP METHOD

		PQL's		MDL's	
Compound	**CAS Number**	**Water (µg/l)**	**Soil (mg/kg)**	**Water (µg/l)**	**Soil (mg/kg)**
Metals reporting limits by Low Level ICP **Method:** **SW846 Third Edition, Nov. 1986, Method 6010A** **Matrix:** **Water—Soil** **Extract Volume:** **100ml — 1g** **Initial Calibration:** **0-500µg/l — varies** **Continuing Calibration:** **½ high std**					
Aluminum	7429–90–5	100.0	10	46.1	37.9
Antimony	7440–36–0	15.0	1.5	5.7	5.0
Arsenic	7440–38–2	10.0	1.0	2.7	2.8
Barium	7440–39–3	3.0	1.0	3.8	0.8
Beryllium	7440–41–7	1.0	0.3	0.4	0.9
Cadmium	7440–43–9	3.0	0.3	0.8	0.8
Calcium	7440–70–2	500.0	50.0	57.9	55.4
Chromium	7440–47–3	5.0	0.5	0.9	1.2
Cobalt	7440–48–4	5.0	1.0	1.6	1.6
Copper	7440–50–8	7.0	0.7	3.6	2.2
Iron	7439–89–6	100.0	10.0	38.7	24.4
Lead	7439–92–1	3.0	0.3	3.1	2.6
Magnesium	7439–95–4	250.0	50.0	114	45.5
Manganese	7439–96–5	3.0	0.4	0.5	0.6
Nickel	7440–02–0	5.0	1.0	4.5	2.3
Potassium	7440–09–7	1000.0	100.0	88.2	148.0
Selenium	7782–49–2	5.0	0.5	3.3	3.3
Scandium	440–20–2	NR	NR	NR	NR
Silver	7440–22–4	7.0	1.0	1.8	1.4
Sodium	7440–23–5	500.0	100.0	83.4	165.0
Thallium	7440–28–0	10.0	1.0	4.8	5.0
Tin	7440–31–5	50.0	5.0	17.0	16.2
Vanadium	7440—62—2	8.0	0.6	0.8	1.1
Zinc	744—66—6	20.0	2.0	8.3	4.2

Notes:
CAS = Chemical Abstract Service
G = gram
ICP = Inductively Coupled Plasma
MDL = Method Detection Limit
µg/l = micrograms per liter
mg/kg = milligrams per kilogram
ml = milliliter
NR = Not reported
PQL = Practical Quantitation Limit
STD = Standard

TABLE B-4
AOC 721
SOUTHWEST LABORATORY OF OKLAHOMA'S METHOD DETECTION LIMIT STUDY FOR MERCURY BY COLD VAPORS

		PQL's		MDL's	
Compound	**CAS Number**	**Water (µg/l)**	**Soil (mg/kg)**	**Water (µg/l)**	**Soil (mg/kg)**
Mercury by Cold Vapors **Test Code: MT310** **Method: SW846 Third Edition, Nov. 1986** **Matrix: Water—Soil** **Extract Volume: 100ml — 0.6g** **Initial Calibration: 0 — 10.0 µg/L** **Continuing Calibration: ½ HIGH STD**					
Mercury	7439—97—6	0.20	0.033	0.05	0.008

Notes:
CAS = Chemical Abstract Service
G = gram
MDL = Method Detection Limit
µg/l = micrograms per liter
mg/kg = milligrams per kilogram
ml = milliliter
PQL = Practical Quantitation Limit
STD = Standard

TABLE B-5
AOC 721
SOUTHWEST LABORATORY OF OKLAHOMA'S METHOD DETECTION LIMIT STUDY FOR MISCELLANEOUS INORGANICS

		PQL's		MDL's	
Compound	**Method**	**Water (mg/l)**	**Soil (mg/kg)**	**Water (mg/l)**	**Soil (mg/kg)**
Miscellaneous Inorganic Analyses **Test Code:** **Methods various** **Method:** **Matrix:** **Water–Soil** **Extract Volume:** **Initial Calibration:** **Continuing Calibration:**					
Chloride (IC)	EPA 300.0	0.2	1.0	-	-
Sulfate (IC)	EPA 300.0	0.2	1.0	-	-

Notes:
IC = Ion Chromatography
MDL = Method Detection Limit
mg/l = milligrams per liter
mg/kg = milligrams per kilogram
PQL = Practical Quantitation Limit

TABLE B-6
AOC 721
SEVERN TRENT LABORATORIES/SAVANNAH METHOD DETECTION LIMIT STUDY FOR METALS BY LOW–LEVEL ICP METHOD

		PQL's	MDL's
Compound	**CAS Number**	**Water (µg/l)**	**Water (µg/l)**
Metals reporting limits by Low Level ICP **Method:** **SW846 Third Edition, Nov. 1986, Method 6010A** **Matrix:** **Water** **Extract Volume: 100ml** **Initial Calibration:** **0—500µg/l — varies** **Continuing Calibration:** **½ high std**			
Arsenic	7440–38–2	10.0	3.6
Iron	7439–89–6	50.0	24

Notes:
CAS = Chemical Abstract Service
ICP = Inductively Coupled Plasma
MDL = Method Detection Limit
µg/l = micrograms per liter
ml = milliliter
PQL = Practical Quantitation Limit
STD = Standard

References

CH2M-Jones. 2002. CMS Work Plan/Interim Measure Completion Report, SWMU 44, Zone C. Charleston, South Carolina. May.

EnSafe Inc. 1998. Zone A RFI Report. Memphis, Tennessee. August.

USEPA Environmental Monitoring and Support Laboratory. 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020. March

USEPA. 1992. USEPA Test Methods for Evaluating Solid Waste, SW-846.

USEPA. 1993. Data Quality Objectives Process for Superfund, Interim Final Guidance, EPA/540/G-93/071. September.

USEPA OSWER. 1997. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, Update III. November.

Title 40 Code of Federal Regulations Part 264, Appendix IX (52 Federal Register 25947). July 1987.

APPENDIX B-2

SAMPLES COLLECTED BY TETRA TECH (2008)

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**C. PIKE**	**DATE:**	**JULY 15, 2008**
FROM:	**SONDRAYOVNNE JENNINGS-WHITE**	**COPIES:**	**DV FILE**
SUBJECT:	**INORGANIC DATA VALIDATION – TAL METALS** **CNC CHARLESTON – CTO 017** **SDG – SB2237**		
SAMPLES:	5/Aqueous/Metal		

044G00514	044G00614	044G00714
FD04290801	RB04290801	

Overview

The sample set for CNC CHARLESTON, CTO 017, and SDG: SB2237 contains five (5) aqueous environmental samples.

Each sample was analyzed for target analyte list metals. The samples were collected by Tetra Tech NUS on April 29, 2008 an Analytical Service. Metal analyses were conducted according to SW-846 Method 6010B and inductively coupled plasma (ICP) atomic emission spectrometer (AES) methodology.

Data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
• Initial and Continuing Calibration Results
• Laboratory Method/Preparation Blank Analyses
* • ICP Interference Check Sample Results
* • Matrix Spike Recoveries
* • Laboratory Control Sample Recoveries
• ICP Serial Dilution Results
* • Detection Limits
* • Analyte Quantitation

* - All quality control criteria were met for this parameter.

Laboratory Method/Preparation Blank Analyses

The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration (μg/L)	Action Level (μg/L)
Aluminum[1]	106.9	534.5
Antimony[1]	1.79	8.95
Barium [1]	0.38	1.9
Beryllium[1]	0.38	1.9
Cadmium[1]	0.46	2.3
Calcium[1]	55.77	278.85
Chromium[1]	4.54	22.7
Cobalt [1]	0.6	3.0
Iron[1]	61.78	308.9
Lead[1]	1.60	8.0
Magnesium[1]	48.74	243.7
Nickel[1]	1.09	9.5
Silver[1]	0.64	3.2
Sodium[1]	206.8	1034
Vanadium[1]	0.65	3.25
Zinc[1]	1.925	9.625

[1] Maximum concentration present in a laboratory method blank affecting all aqueous samples.

An action level of five times the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the blank action level reported for the above analytes were qualified “U” as a result of laboratory blank contamination. Aluminum, antimony, chromium, cobalt, lead, nickel, vanadium, and zinc were qualified due to laboratory blank contamination.

There was a noncompliance in the ICP serial dilution for nickel. The percent difference was greater than ten percent and the sample result was greater than fifty times the MDL. However, nickel has already been qualified due to blank contamination. No action was taken.

There were some negative percent recoveries (%R) in the spike duplicates; however, the original sample concentration is greater than 4X the amount of spike added to the matrix spike (MS), so no qualifications are necessary.

Executive Summary

Laboratory Performance: Several results were qualified due to laboratory blank contamination.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Review", October 2004, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (January 2006).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the DoD QSM Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Sondrayvonne Jennings-White

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

PROJ_NO: 00349

SDG: SB2237 MEDIA: WATER DATA FRACTION: M

nsample	044G00514	nsample	044G00614	nsample	044G00714
samp_date	4/29/2008	samp_date	4/29/2008	samp_date	4/29/2008
lab_id	SB2237-001	lab_id	SB2237-002	lab_id	SB2237-003
qc_type	NM	qc_type	NM	qc_type	NM
units	UG/L	units	UG/L	units	UG/L
Pct_Solids	0.0	Pct_Solids	0.0	Pct_Solids	0.0
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
ALUMINUM	258	U	A
ANTIMONY	7.5	U	
ARSENIC	8.5	U	
BARIUM	52.5		
BERYLLIUM	0.12	U	
CADMIUM	0.5	U	
CALCIUM	542000		
CHROMIUM	9.7	U	A
COBALT	2.3	U	A
COPPER	4	U	
IRON	400		
LEAD	7	U	
MAGNESIUM	498000		
MANGANESE	1010		
MERCURY	0.02	U	
NICKEL	5.7	U	A
POTASSIUM	149000		
SELENIUM	11	U	
SILVER	2.7	U	
SODIUM	4140000		
THALLIUM	10	U	
VANADIUM	3.4	U	A
ZINC	10.9	U	A

Parameter	Result	Val Qual	Qual Code
ALUMINUM	58.8	U	A
ANTIMONY	2.7	U	A
ARSENIC	4		
BARIUM	78.8		
BERYLLIUM	0.12	U	
CADMIUM	0.1	U	
CALCIUM	628000		
CHROMIUM	2.8	U	A
COBALT	5.3		
COPPER	8.9		
IRON	5880		
LEAD	4.4	U	A
MAGNESIUM	270000		
MANGANESE	4110		
MERCURY	0.02	U	
NICKEL	16.5	U	A
POTASSIUM	71100		
SELENIUM	2.2	U	
SILVER	0.54	U	
SODIUM	2280000		
THALLIUM	2	U	
VANADIUM	0.52	U	
ZINC	9.6	U	A

Parameter	Result	Val Qual	Qual Code
ALUMINUM	60.1	U	A
ANTIMONY	1.5	U	
ARSENIC	126		
BARIUM	86.5		
BERYLLIUM	0.12	U	
CADMIUM	0.1	U	
CALCIUM	173000		
CHROMIUM	1.4	U	A
COBALT	0.28	U	
COPPER	2.5		
IRON	14100		
LEAD	4	U	A
MAGNESIUM	43100		
MANGANESE	1040		
MERCURY	0.02	U	
NICKEL	2.5	U	A
POTASSIUM	20600		
SELENIUM	2.2	U	
SILVER	0.54	U	
SODIUM	270000		
THALLIUM	2	U	
VANADIUM	2.9	U	A
ZINC	7.8	U	A

PROJ_NO: 00349

SDG: SB2237 MEDIA: WATER DATA FRACTION: M

nsample	FD04290801	nsample	RB04290801
samp_date	4/29/2008	samp_date	4/29/2008
lab_id	SB2237-004	lab_id	SB2237-005
qc_type	NM	qc_type	NM
units	UG/L	units	UG/L
Pct_Solids	0.0	Pct_Solids	0.0
DUP_OF:	044G00714	DUP_OF:	

Parameter	Result	Val Qual	Qual Code
ALUMINUM	53.1	U	A
ANTIMONY	2.2	U	A
ARSENIC	118		
BARIUM	85.6		
BERYLLIUM	0.12	U	
CADMIUM	0.1	U	
CALCIUM	171000		
CHROMIUM	1	U	A
COBALT	0.28	U	
COPPER	2.9		
IRON	13300		
LEAD	4	U	A
MAGNESIUM	43100		
MANGANESE	1020		
MERCURY	0.02	U	
NICKEL	0.91	U	A
POTASSIUM	20400		
SELENIUM	2.2	U	
SILVER	0.54	U	
SODIUM	276000		
THALLIUM	2	U	
VANADIUM	2.2	U	A
ZINC	8.6	U	A

Parameter	Result	Val Qual	Qual Code
ALUMINUM	26.1		
ANTIMONY	1.5	U	
ARSENIC	1.7	U	
BARIUM	0.28	U	
BERYLLIUM	0.12	U	
CADMIUM	0.1	U	
CALCIUM	11.4		
CHROMIUM	0.38	U	
COBALT	0.28	U	
COPPER	1.2		
IRON	6	U	
LEAD	3		
MAGNESIUM	5.6	U	
MANGANESE	0.68	U	
MERCURY	0.02	U	
NICKEL	0.3	U	
POTASSIUM	78	U	
SELENIUM	2.2	U	
SILVER	0.54	U	
SODIUM	341		
THALLIUM	2	U	
VANADIUM	0.52	U	
ZINC	2.2		

APPENDIX B

RESULTS AS REPORTED BY THE LABORATORY

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** 044G00514

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-001

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted PQL	Adjusted IDL
7429-90-5	ALUMINUM, TOTAL	258	B		P	5	1500	70.00
7440-36-0	ANTIMONY, TOTAL	7.50	U		P	5	40	7.50
7440-38-2	ARSENIC, TOTAL	8.50	U		P	5	40	8.50
7440-39-3	BARIUM, TOTAL	52.5			P	1	5.0	0.28
7440-41-7	BERYLLIUM, TOTAL	0.12	U		P	1	5.0	0.12
7440-43-9	CADMIUM, TOTAL	0.50	U		P	5	50	0.50
7440-70-2	CALCIUM, TOTAL	542000			P	1	50	11.00
7440-47-3	CHROMIUM, TOTAL	9.7	B		P	5	75	1.90
7440-48-4	COBALT, TOTAL	2.3	B		P	5	150	1.40
7440-50-8	COPPER, TOTAL	4.00	U		P	5	120	4.00
7439-89-6	IRON, TOTAL	400	B		P	5	500	30.00
7439-92-1	LEAD, TOTAL	7.00	U		P	5	25	7.00
7439-95-4	MAGNESIUM, TOTAL	498000			P	1	50	5.60
7439-96-5	MANGANESE, TOTAL	1010			P	1	5.0	0.68
7439-97-6	MERCURY, TOTAL	0.02	U		CV	1	0.20	0.02
7440-02-0	NICKEL, TOTAL	5.7	B	E	P	5	200	1.50
7440-09-7	POTASSIUM, TOTAL	149000			P	1	1000	78.00
7782-49-2	SELENIUM, TOTAL	11.00	U		P	5	50	11.00
7440-22-4	SILVER, TOTAL	2.70	U	N	P	5	75	2.70
7440-23-5	SODIUM, TOTAL	4140000			P	5	5000	90.00
7440-28-0	THALLIUM, TOTAL	10.00	U		P	5	75	10.00
7440-62-2	VANADIUM, TOTAL	3.4	B		P	5	120	2.60
7440-66-6	ZINC, TOTAL	10.9	B	E	P	5	120	1.10

Bottle ID: A

Comments:

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** 044G00614

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-002

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted PQL	Adjusted IDL
7429-90-5	ALUMINUM, TOTAL	58.8	B		P	3	900	42.00
7440-36-0	ANTIMONY, TOTAL	2.7	B		P	1	8.0	1.50
7440-38-2	ARSENIC, TOTAL	4.0	B		P	1	8.0	1.70
7440-39-3	BARIUM, TOTAL	78.8			P	1	5.0	0.28
7440-41-7	BERYLLIUM, TOTAL	0.12	U		P	1	5.0	0.12
7440-43-9	CADMIUM, TOTAL	0.10	U		P	1	10	0.10
7440-70-2	CALCIUM, TOTAL	628000			P	1	50	11.00
7440-47-3	CHROMIUM, TOTAL	2.8	B		P	1	15	0.38
7440-48-4	COBALT, TOTAL	5.3	B		P	1	30	0.28
7440-50-8	COPPER, TOTAL	8.9	B		P	1	25	0.80
7439-89-6	IRON, TOTAL	5880			P	3	300	18.00
7439-92-1	LEAD, TOTAL	4.4	B		P	1	5.0	1.40
7439-95-4	MAGNESIUM, TOTAL	270000			P	1	50	5.60
7439-96-5	MANGANESE, TOTAL	4110			P	1	5.0	0.68
7439-97-6	MERCURY, TOTAL	0.02	U		CV	1	0.20	0.02
7440-02-0	NICKEL, TOTAL	16.5	B	E	P	1	40	0.30
7440-09-7	POTASSIUM, TOTAL	71100			P	1	1000	78.00
7782-49-2	SELENIUM, TOTAL	2.20	U		P	1	10	2.20
7440-22-4	SILVER, TOTAL	0.54	U	N	P	1	15	0.54
7440-23-5	SODIUM, TOTAL	2280000			P	3	3000	54.00
7440-28-0	THALLIUM, TOTAL	2.00	U		P	1	15	2.00
7440-62-2	VANADIUM, TOTAL	0.52	U		P	1	25	0.52
7440-66-6	ZINC, TOTAL	9.6	B	E	P	1	25	0.22

Bottle ID: A

Comments:

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** 044G00714

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-003

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted PQL	Adjusted IDL
7429-90-5	ALUMINUM, TOTAL	60.1	B		P	1	300	14.00
7440-36-0	ANTIMONY, TOTAL	1.50	U		P	1	8.0	1.50
7440-38-2	ARSENIC, TOTAL	126			P	1	8.0	1.70
7440-39-3	BARIUM, TOTAL	86.5			P	1	5.0	0.28
7440-41-7	BERYLLIUM, TOTAL	0.12	U		P	1	5.0	0.12
7440-43-9	CADMIUM, TOTAL	0.10	U		P	1	10	0.10
7440-70-2	CALCIUM, TOTAL	173000			P	1	50	11.00
7440-47-3	CHROMIUM, TOTAL	1.4	B		P	1	15	0.38
7440-48-4	COBALT, TOTAL	0.28	U		P	1	30	0.28
7440-50-8	COPPER, TOTAL	2.5	B		P	1	25	0.80
7439-89-6	IRON, TOTAL	14100			P	1	100	6.00
7439-92-1	LEAD, TOTAL	4.0	B		P	1	5.0	1.40
7439-95-4	MAGNESIUM, TOTAL	43100			P	1	50	5.60
7439-96-5	MANGANESE, TOTAL	1040			P	1	5.0	0.68
7439-97-6	MERCURY, TOTAL	0.02	U		CV	1	0.20	0.02
7440-02-0	NICKEL, TOTAL	2.5	B	E	P	1	40	0.30
7440-09-7	POTASSIUM, TOTAL	20600			P	1	1000	78.00
7782-49-2	SELENIUM, TOTAL	2.20	U		P	1	10	2.20
7440-22-4	SILVER, TOTAL	0.54	U	N	P	1	15	0.54
7440-23-5	SODIUM, TOTAL	270000			P	1	1000	18.00
7440-28-0	THALLIUM, TOTAL	2.00	U		P	1	15	2.00
7440-62-2	VANADIUM, TOTAL	2.9	B		P	1	25	0.52
7440-66-6	ZINC, TOTAL	7.8	B	E	P	1	25	0.22

Bottle ID: A

Comments:

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** FD04290801

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-004

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted PQL	Adjusted IDL
7429-90-5	ALUMINUM, TOTAL	53.1	B		P	1	300	14.00
7440-36-0	ANTIMONY, TOTAL	2.2	B		P	1	8.0	1.50
7440-38-2	ARSENIC, TOTAL	118			P	1	8.0	1.70
7440-39-3	BARIUM, TOTAL	85.6			P	1	5.0	0.28
7440-41-7	BERYLLIUM, TOTAL	0.12	U		P	1	5.0	0.12
7440-43-9	CADMIUM, TOTAL	0.10	U		P	1	10	0.10
7440-70-2	CALCIUM, TOTAL	171000			P	1	50	11.00
7440-47-3	CHROMIUM, TOTAL	1.0	B		P	1	15	0.38
7440-48-4	COBALT, TOTAL	0.28	U		P	1	30	0.28
7440-50-8	COPPER, TOTAL	2.9	B		P	1	25	0.80
7439-89-6	IRON, TOTAL	13300			P	1	100	6.00
7439-92-1	LEAD, TOTAL	4.0	B		P	1	5.0	1.40
7439-95-4	MAGNESIUM, TOTAL	43100			P	1	50	5.60
7439-96-5	MANGANESE, TOTAL	1020			P	1	5.0	0.68
7439-97-6	MERCURY, TOTAL	0.02	U		CV	1	0.20	0.02
7440-02-0	NICKEL, TOTAL	0.91	B	E	P	1	40	0.30
7440-09-7	POTASSIUM, TOTAL	20400			P	1	1000	78.00
7782-49-2	SELENIUM, TOTAL	2.20	U		P	1	10	2.20
7440-22-4	SILVER, TOTAL	0.54	U	N	P	1	15	0.54
7440-23-5	SODIUM, TOTAL	276000			P	1	1000	18.00
7440-28-0	THALLIUM, TOTAL	2.00	U		P	1	15	2.00
7440-62-2	VANADIUM, TOTAL	2.2	B		P	1	25	0.52
7440-66-6	ZINC, TOTAL	8.6	B	E	P	1	25	0.22

Bottle ID: A

Comments:

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** RB04290801

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-005

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted PQL	Adjusted IDL
7429-90-5	ALUMINUM, TOTAL	26.1	B		P	1	300	14.00
7440-36-0	ANTIMONY, TOTAL	1.50	U		P	1	8.0	1.50
7440-38-2	ARSENIC, TOTAL	1.70	U		P	1	8.0	1.70
7440-39-3	BARIUM, TOTAL	0.28	U		P	1	5.0	0.28
7440-41-7	BERYLLIUM, TOTAL	0.12	U		P	1	5.0	0.12
7440-43-9	CADMIUM, TOTAL	0.10	U		P	1	10	0.10
7440-70-2	CALCIUM, TOTAL	11.4	B		P	1	50	11.00
7440-47-3	CHROMIUM, TOTAL	0.38	U		P	1	15	0.38
7440-48-4	COBALT, TOTAL	0.28	U		P	1	30	0.28
7440-50-8	COPPER, TOTAL	1.2	B		P	1	25	0.80
7439-89-6	IRON, TOTAL	6.00	U		P	1	100	6.00
7439-92-1	LEAD, TOTAL	3.0	B		P	1	5.0	1.40
7439-95-4	MAGNESIUM, TOTAL	5.60	U		P	1	50	5.60
7439-96-5	MANGANESE, TOTAL	0.68	U		P	1	5.0	0.68
7439-97-6	MERCURY, TOTAL	0.02	U		CV	1	0.20	0.02
7440-02-0	NICKEL, TOTAL	0.30	U	E	P	1	40	0.30
7440-09-7	POTASSIUM, TOTAL	78.00	U		P	1	1000	78.00
7782-49-2	SELENIUM, TOTAL	2.20	U		P	1	10	2.20
7440-22-4	SILVER, TOTAL	0.54	U	N	P	1	15	0.54
7440-23-5	SODIUM, TOTAL	341	B		P	1	1000	18.00
7440-28-0	THALLIUM, TOTAL	2.00	U		P	1	15	2.00
7440-62-2	VANADIUM, TOTAL	0.52	U		P	1	25	0.52
7440-66-6	ZINC, TOTAL	2.2	B	E	P	1	25	0.22

Bottle ID: A

Comments:

APPENDIX C

SUPPORT DOCUMENTATION

HOLDTIME

SDG SB2237

SORT	UNITS	NSAMPLE	LAB_ID	QC_TYPE	SAMP_DATE	EXTR_DATE	ANAL_DATE	SMP_EXTR	EXTR_ANL	SMP_ANL
HG	UG/L	RB04290801	SB2237-005	NM	4/29/2008	5/7/2008	5/8/2008	8	1	9
HG	UG/L	FD04290801	SB2237-004	NM	4/29/2008	5/7/2008	5/8/2008	8	1	9
HG	UG/L	044G00714	SB2237-003	NM	4/29/2008	5/7/2008	5/8/2008	8	1	9
HG	UG/L	044G00614	SB2237-002	NM	4/29/2008	5/7/2008	5/8/2008	8	1	9
HG	UG/L	044G00514	SB2237-001	NM	4/29/2008	5/7/2008	5/8/2008	8	1	9
M	UG/L	RB04290801	SB2237-005	NM	4/29/2008	5/7/2008	5/11/2008	8	4	12
M	UG/L	RB04290801	SB2237-005	NM	4/29/2008	5/7/2008	5/10/2008	8	3	11
M	UG/L	FD04290801	SB2237-004	NM	4/29/2008	5/7/2008	5/11/2008	8	4	12
M	UG/L	FD04290801	SB2237-004	NM	4/29/2008	5/7/2008	5/10/2008	8	3	11
M	UG/L	044G00714	SB2237-003	NM	4/29/2008	5/7/2008	5/11/2008	8	4	12
M	UG/L	044G00714	SB2237-003	NM	4/29/2008	5/7/2008	5/10/2008	8	3	11
M	UG/L	044G00614	SB2237-002	NM	4/29/2008	5/7/2008	5/12/2008	8	5	13
M	UG/L	044G00614	SB2237-002	NM	4/29/2008	5/7/2008	5/10/2008	8	3	11
M	UG/L	044G00514	SB2237-001	NM	4/29/2008	5/7/2008	5/11/2008	8	4	12
M	UG/L	044G00514	SB2237-001	NM	4/29/2008	5/7/2008	5/10/2008	8	3	11

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICB

File: HYE08A May 08, 2008 9:43

Analyte	Result	C
MERCURY	-0.02	B

SAMPLE: CCB

File: HYE08A May 08, 2008 10:08

Analyte	Result	C
MERCURY	0.02	U

SAMPLE: CCB

File: HYE08A May 08, 2008 10:34

Analyte	Result	C
MERCURY	-0.03	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB

File: HYE08A May 08, 2008 10:51

Analyte	Result	C
MERCURY	-0.02	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICB
File: IYE07A May 07, 2008 14:48

Analyte	Result	C
ALUMINUM	14.00	U
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
MANGANESE	0.75	B
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	61.51	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	-0.22	B

SAMPLE: CCB
File: IYE07A May 07, 2008 15:17

Analyte	Result	C
ALUMINUM	14.00	U
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	42.60	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE07A May 07, 2008 16:14

Analyte	Result	C
ALUMINUM	14.00	U
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	57.44	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB

File: IYE07A May 07, 2008 17:12

Analyte	Result	C
ALUMINUM	14.00	U
ANTIMONY	1.79	B
ARSENIC	1.70	U
BARIUM	0.38	B
BERYLLIUM	0.13	B
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	-1.31	B
IRON	6.40	B
LEAD	1.40	U
MAGNESIUM	8.41	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	67.13	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICB
File: IYE09A May 09, 2008 17:16

Analyte	Result	C
ALUMINUM	14.00	U
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	18.00	U
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE09A May 09, 2008 17:45

Analyte	Result	C
ALUMINUM	14.00	U
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	-100.50	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-32.29	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE09A May 09, 2008 18:42

Analyte	Result	C
ALUMINUM	35.25	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	-0.35	B
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	6.64	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-42.64	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB
File: IYE09A May 09, 2008 19:39

Analyte	Result	C
ALUMINUM	20.77	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.61	B
COBALT	0.28	U
COPPER	0.80	U
IRON	10.84	B
LEAD	1.40	U
MAGNESIUM	7.96	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-31.35	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE09A May 09, 2008 20:36

Analyte	Result	C
ALUMINUM	37.61	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	-0.49	B
BERYLLIUM	0.12	U
CADMIUM	0.15	B
CALCIUM	17.48	B
CHROMIUM	0.55	B
COBALT	0.28	U
COPPER	0.80	U
IRON	16.04	B
LEAD	1.40	U
MAGNESIUM	15.85	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	-83.94	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-40.55	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE09A May 09, 2008 21:33

Analyte	Result	C
ALUMINUM	40.52	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.14	B
CADMIUM	0.15	B
CALCIUM	14.53	B
CHROMIUM	1.37	B
COBALT	0.28	U
COPPER	0.80	U
IRON	17.67	B
LEAD	1.40	U
MAGNESIUM	16.85	B
MANGANESE	0.68	U
NICKEL	0.39	B
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-37.79	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB
File: IYE09A May 09, 2008 22:30

Analyte	Result	C
ALUMINUM	69.41	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.16	B
CADMIUM	0.20	B
CALCIUM	30.41	B
CHROMIUM	2.00	B
COBALT	0.28	U
COPPER	0.80	U
IRON	30.86	B
LEAD	1.40	U
MAGNESIUM	26.61	B
MANGANESE	0.68	U
NICKEL	0.33	B
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-44.38	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE09A May 09, 2008 23:27

Analyte	Result	C
ALUMINUM	76.72	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.23	B
CADMIUM	0.29	B
CALCIUM	30.76	B
CHROMIUM	2.77	B
COBALT	0.35	B
COPPER	0.80	U
IRON	40.14	B
LEAD	1.60	B
MAGNESIUM	28.99	B
MANGANESE	0.68	U
NICKEL	0.46	B
POTASSIUM	-82.54	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-48.24	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.38	B

SAMPLE: CCB
File: IYE09A May 10, 2008 0:23

Analyte	Result	C
ALUMINUM	106.90	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	0.28	U
BERYLLIUM	0.38	B
CADMIUM	0.32	B
CALCIUM	55.77	
CHROMIUM	4.06	B
COBALT	0.40	B
COPPER	0.80	U
IRON	61.78	B
LEAD	1.40	U
MAGNESIUM	48.74	B
MANGANESE	0.68	U
NICKEL	0.62	B
POTASSIUM	-137.20	B
SELENIUM	2.20	U
SILVER	0.64	B
SODIUM	-59.85	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.37	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB
File: IYE09A May 10, 2008 1:20

Analyte	Result	C
ALUMINUM	18.12	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	-0.56	B
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	-0.44	B
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	-89.12	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	-66.23	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE09A May 10, 2008 2:18

Analyte	Result	C
ALUMINUM	30.12	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	-0.31	B
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.21	B
LEAD	1.40	U
MAGNESIUM	8.63	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	78.00	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	206.80	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE09A May 10, 2008 3:16

Analyte	Result	C
ALUMINUM	29.20	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	-0.38	B
BERYLLIUM	0.12	U
CADMIUM	0.10	U
CALCIUM	11.01	B
CHROMIUM	0.99	B
COBALT	0.28	U
COPPER	0.80	U
IRON	15.27	B
LEAD	1.43	B
MAGNESIUM	8.62	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	-87.77	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	72.52	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB

File: IYE09A May 10, 2008 4:03

Analyte	Result	C
ALUMINUM	32.78	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	-0.36	B
BERYLLIUM	0.12	U
CADMIUM	0.10	B
CALCIUM	17.74	B
CHROMIUM	1.11	B
COBALT	0.28	U
COPPER	0.80	U
IRON	20.95	B
LEAD	1.40	U
MAGNESIUM	12.05	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	-99.39	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	24.45	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB

File: IYE09A May 10, 2008 4:27

Analyte	Result	C
ALUMINUM	34.17	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
BARIUM	-0.32	B
BERYLLIUM	0.16	B
CADMIUM	0.14	B
CALCIUM	16.00	B
CHROMIUM	1.37	B
COBALT	0.28	U
COPPER	0.80	U
IRON	20.96	B
LEAD	1.40	U
MAGNESIUM	11.85	B
MANGANESE	0.68	U
NICKEL	0.30	U
POTASSIUM	-89.88	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	18.00	U
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.29	B

3A

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICB

File: IYE10A May 10, 2008 15:40

Analyte	Result	C
ALUMINUM	20.03	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
NICKEL	0.30	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	18.00	U
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB

File: IYE10A May 10, 2008 16:08

Analyte	Result	C
ALUMINUM	14.00	U
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
NICKEL	0.30	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	18.00	U
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB

File: IYE10A May 10, 2008 17:06

Analyte	Result	C
ALUMINUM	16.57	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.39	B
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	7.65	B
NICKEL	0.30	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	206.80	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB
File: IYE10A May 10, 2008 18:03

Analyte	Result	C
ALUMINUM	17.90	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.69	B
COBALT	0.28	U
COPPER	0.80	U
IRON	6.12	B
LEAD	1.40	U
MAGNESIUM	8.02	B
NICKEL	0.30	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	119.00	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE10A May 10, 2008 19:00

Analyte	Result	C
ALUMINUM	25.28	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	14.80	B
CHROMIUM	1.25	B
COBALT	0.28	U
COPPER	0.80	U
IRON	16.40	B
LEAD	1.40	U
MAGNESIUM	13.77	B
NICKEL	0.36	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	110.90	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	B

SAMPLE: CCB
File: IYE10A May 10, 2008 19:57

Analyte	Result	C
ALUMINUM	33.03	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.46	B
CALCIUM	20.18	B
CHROMIUM	1.60	B
COBALT	0.51	B
COPPER	0.80	U
IRON	23.74	B
LEAD	1.40	U
MAGNESIUM	17.74	B
NICKEL	0.41	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	55.92	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.71	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB
File: IYE10A May 10, 2008 20:53

Analyte	Result	C
ALUMINUM	74.85	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.27	B
CALCIUM	24.67	B
CHROMIUM	2.46	B
COBALT	0.28	U
COPPER	0.80	U
IRON	31.39	B
LEAD	1.40	U
MAGNESIUM	23.29	B
NICKEL	0.70	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	36.98	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.43	B

SAMPLE: CCB
File: IYE10A May 10, 2008 21:49

Analyte	Result	C
ALUMINUM	57.83	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.33	B
CALCIUM	28.43	B
CHROMIUM	2.83	B
COBALT	0.41	B
COPPER	0.80	U
IRON	42.22	B
LEAD	1.40	U
MAGNESIUM	25.87	B
NICKEL	0.77	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	36.28	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.52	B

SAMPLE: CCB
File: IYE10A May 10, 2008 22:47

Analyte	Result	C
ALUMINUM	71.54	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.45	B
CALCIUM	28.46	B
CHROMIUM	4.54	B
COBALT	0.60	B
COPPER	0.80	U
IRON	58.02	B
LEAD	1.40	U
MAGNESIUM	31.94	B
NICKEL	1.09	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	37.48	B
THALLIUM	2.00	U
VANADIUM	0.65	B
ZINC	0.73	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB
File: IYE10A May 10, 2008 23:43

Analyte	Result	C
ALUMINUM	19.12	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.38	U
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
NICKEL	0.30	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	21.82	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

SAMPLE: CCB
File: IYE10A May 11, 2008 0:41

Analyte	Result	C
ALUMINUM	37.73	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	0.66	B
COBALT	0.28	U
COPPER	0.80	U
IRON	6.00	U
LEAD	1.40	U
MAGNESIUM	5.60	U
NICKEL	0.30	U
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	51.42	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.23	B

SAMPLE: CCB
File: IYE10A May 11, 2008 1:38

Analyte	Result	C
ALUMINUM	25.35	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.10	U
CALCIUM	11.00	U
CHROMIUM	1.05	B
COBALT	0.36	B
COPPER	0.80	U
IRON	7.69	B
LEAD	1.40	U
MAGNESIUM	5.60	U
NICKEL	0.35	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	130.70	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.22	U

3A

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB
File: IYE10A May 11, 2008 2:35

Analyte	Result	C
ALUMINUM	20.36	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.13	B
CALCIUM	11.00	U
CHROMIUM	1.64	B
COBALT	0.28	U
COPPER	0.80	U
IRON	14.37	B
LEAD	1.40	U
MAGNESIUM	6.05	B
NICKEL	0.37	B
SELENIUM	2.20	U
SILVER OKAY	0.54	U
SODIUM	63.12	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.25	B

SAMPLE: CCB
File: IYE10A May 11, 2008 2:45

Analyte	Result	C
ALUMINUM	51.21	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.13	B
CALCIUM	11.80	B
CHROMIUM	2.55	B
COBALT	0.32	B
COPPER	0.80	U
IRON	24.01	B
LEAD	1.40	U
MAGNESIUM	11.10	B
NICKEL	0.54	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	63.40	B
THALLIUM	2.00	U
VANADIUM	0.52	U
ZINC	0.37	B

SAMPLE: CCB
File: IYE10A May 11, 2008 3:09

Analyte	Result	C
ALUMINUM	37.86	B
ANTIMONY	1.50	U
ARSENIC	1.70	U
CADMIUM	0.24	B
CALCIUM	14.55	B
CHROMIUM	3.10	B
COBALT	0.45	B
COPPER	0.80	U
IRON	27.00	B
LEAD	1.40	U
MAGNESIUM	8.60	B
NICKEL	0.48	B
SELENIUM	2.20	U
SILVER	0.54	U
SODIUM	39.16	B
THALLIUM	2.00	U
VANADIUM	0.60	B
ZINC	0.43	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICB
File: IYE12A May 12, 2008 17:33

Analyte	Result	C
ALUMINUM	14.00	U
CALCIUM	11.00	U
IRON	-7.02	B
MAGNESIUM	5.60	U
SODIUM	18.00	U

SAMPLE: CCB
File: IYE12A May 12, 2008 17:57

Analyte	Result	C
ALUMINUM	14.00	U
CALCIUM	11.00	U
IRON	-6.91	B
MAGNESIUM	5.60	U
SODIUM	18.00	U

SAMPLE: CCB
File: IYE12A May 12, 2008 18:54

Analyte	Result	C
ALUMINUM	29.10	B
CALCIUM	13.43	B
IRON	6.00	U
MAGNESIUM	10.74	B
SODIUM	111.80	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB

File: IYE12A May 12, 2008 19:50

Analyte	Result	C
ALUMINUM	33.30	B
CALCIUM	11.00	U
IRON	8.98	B
MAGNESIUM	15.82	B
SODIUM	29.02	B

SAMPLE: CCB

File: IYE12A May 12, 2008 20:47

Analyte	Result	C
ALUMINUM	34.96	B
CALCIUM	18.44	B
IRON	11.16	B
MAGNESIUM	16.43	B
SODIUM	33.88	B

SAMPLE: CCB

File: IYE12A May 12, 2008 21:44

Analyte	Result	C
ALUMINUM	42.10	B
CALCIUM	21.30	B
IRON	19.03	B
MAGNESIUM	18.30	B
SODIUM	52.20	B

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCB

File: IYE12A May 12, 2008 21:53

Analyte	Result	C
ALUMINUM	52.48	B
CALCIUM	20.59	B
IRON	21.58	B
MAGNESIUM	19.77	B
SODIUM	36.45	B

SAMPLE: CCB

File: IYE12A May 12, 2008 22:17

Analyte	Result	C
ALUMINUM	53.89	B
CALCIUM	20.56	B
IRON	31.22	B
MAGNESIUM	21.98	B
SODIUM	30.97	B

3P

PREPARATION BLANKS

Lab Name: Katahdin Analytical Services **Sample ID:** PBWYE07HGW1

Matrix: WATER **SDG Name:** SB2237

QC Batch ID: YE07HGW1

Concentration Units : ug/L

Analyte	RESULT	C
MERCURY	-0.023	B

3P

PREPARATION BLANKS

Lab Name: Katahdin Analytical Services **Sample ID:** PBWYE07ICW2

Matrix: WATER **SDG Name:** SB2237

QC Batch ID: YE07ICW2

Concentration Units : ug/L

Analyte	RESULT	C
ALUMINUM	14.000	U
ANTIMONY	1.500	U
ARSENIC	1.700	U
BARIUM	0.280	U
BERYLLIUM	0.120	U
CADMIUM	0.100	U
CALCIUM	11.000	U
CHROMIUM	0.380	U
COBALT	0.280	U
COPPER	0.800	U
IRON	6.000	U
LEAD	1.400	U
MAGNESIUM	5.600	U
MANGANESE	0.680	U
NICKEL	0.300	U
POTASSIUM	78.000	U
SELENIUM	2.200	U
SILVER	0.540	U
SODIUM	62.470	B
THALLIUM	2.000	U
VANADIUM	0.520	U
ZINC	1.925	B

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICV

File: HYE08A May 08, 2008 9:41

Analyte	True	Found	%R (1)
MERCURY	6.0	6.06	101.0

SAMPLE: CCV

File: HYE08A May 08, 2008 10:06

Analyte	True	Found	%R (1)
MERCURY	5.0	5.15	103.0

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: HYE08A May 08, 2008 10:32

Analyte	True	Found	%R (1)
MERCURY	5.0	5.34	106.8

SAMPLE: CCV

File: HYE08A May 08, 2008 10:49

Analyte	True	Found	%R (1)
MERCURY	5.0	5.39	107.8

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICV

File: IYE07A May 07, 2008 14:44

Analyte	True	Found	%R (1)
ALUMINUM	10000.0	10680.00	106.8
ANTIMONY	400.0	395.70	98.9
ARSENIC	400.0	393.10	98.3
BARIUM	400.0	401.50	100.4
BERYLLIUM	400.0	399.40	99.8
CADMIUM	400.0	397.70	99.4
CALCIUM	10000.0	10100.00	101.0
CHROMIUM	400.0	400.10	100.0
COBALT	400.0	401.80	100.4
COPPER	400.0	390.40	97.6
IRON	10000.0	10180.00	101.8
LEAD	400.0	401.40	100.3
MAGNESIUM	10000.0	10060.00	100.6
MANGANESE	400.0	403.50	100.9
NICKEL	400.0	401.50	100.4
POTASSIUM	13600.0	13800.00	101.5
SELENIUM	400.0	389.50	97.4
SILVER	400.0	398.90	99.7
SODIUM	10000.0	10290.00	102.9
THALLIUM	400.0	403.10	100.8
VANADIUM	400.0	401.50	100.4
ZINC	400.0	397.00	99.3

SAMPLE: CCV

File: IYE07A May 07, 2008 15:12

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12220.00	97.8
ANTIMONY	500.0	474.20	94.8
ARSENIC	500.0	474.90	95.0
BARIUM	500.0	488.10	97.6
BERYLLIUM	500.0	491.70	98.3
CADMIUM	500.0	476.80	95.4
CALCIUM	12500.0	12300.00	98.4
CHROMIUM	500.0	491.50	98.3
COBALT	500.0	481.80	96.4
COPPER	500.0	483.90	96.8
IRON	12500.0	12470.00	99.8
LEAD	500.0	481.00	96.2
MAGNESIUM	12500.0	12200.00	97.6
MANGANESE	500.0	495.00	99.0
NICKEL	500.0	480.30	96.1
POTASSIUM	12500.0	12060.00	96.5
SELENIUM	500.0	472.90	94.6
SILVER	500.0	483.70	96.7
SODIUM	12500.0	12410.00	99.3
THALLIUM	500.0	481.50	96.3
VANADIUM	500.0	486.80	97.4
ZINC	500.0	479.30	95.9

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE07A May 07, 2008 16:09

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12280.00	98.2
ANTIMONY	500.0	482.30	96.5
ARSENIC	500.0	482.50	96.5
BARIUM	500.0	491.80	98.4
BERYLLIUM	500.0	496.30	99.3
CADMIUM	500.0	486.20	97.2
CALCIUM	12500.0	12310.00	98.5
CHROMIUM	500.0	494.40	98.9
COBALT	500.0	490.70	98.1
COPPER	500.0	488.30	97.7
IRON	12500.0	12440.00	99.5
LEAD	500.0	490.10	98.0
MAGNESIUM	12500.0	12240.00	97.9
MANGANESE	500.0	496.80	99.4
NICKEL	500.0	491.50	98.3
POTASSIUM	12500.0	12170.00	97.4
SELENIUM	500.0	481.60	96.3
SILVER	500.0	488.90	97.8
SODIUM	12500.0	12410.00	99.3
THALLIUM	500.0	491.00	98.2
VANADIUM	500.0	493.70	98.7
ZINC	500.0	487.00	97.4

SAMPLE: CCV

File: IYE07A May 07, 2008 17:07

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12650.00	101.2
ANTIMONY	500.0	478.20	95.6
ARSENIC	500.0	470.90	94.2
BARIUM	500.0	506.20	101.2
BERYLLIUM	500.0	501.00	100.2
CADMIUM	500.0	464.30	92.9
CALCIUM	12500.0	12900.00	103.2
CHROMIUM	500.0	539.30	107.9
COBALT	500.0	481.80	96.4
COPPER	500.0	532.20	106.4
IRON	12500.0	13520.00	108.2
LEAD	500.0	469.30	93.9
MAGNESIUM	12500.0	12570.00	100.6
MANGANESE	500.0	527.30	105.5
NICKEL	500.0	461.10	92.2
POTASSIUM	12500.0	12280.00	98.2
SELENIUM	500.0	464.30	92.9
SILVER	500.0	510.10	102.0
SODIUM	12500.0	13240.00	105.9
THALLIUM	500.0	466.60	93.3
VANADIUM	500.0	507.50	101.5
ZINC	500.0	474.90	95.0

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICV

File: IYE09A May 09, 2008 17:11

Analyte	True	Found	%R (1)
ALUMINUM	10000.0	10710.00	107.1
ANTIMONY	400.0	387.10	96.8
ARSENIC	400.0	384.20	96.0
BARIUM	400.0	391.30	97.8
BERYLLIUM	400.0	392.40	98.1
CADMIUM	400.0	387.90	97.0
CALCIUM	10000.0	10080.00	100.8
CHROMIUM	400.0	392.70	98.2
COBALT	400.0	392.60	98.2
COPPER	400.0	387.90	97.0
IRON	10000.0	10210.00	102.1
LEAD	400.0	392.60	98.2
MAGNESIUM	10000.0	9816.00	98.2
MANGANESE	400.0	391.80	98.0
NICKEL	400.0	392.50	98.1
POTASSIUM	13600.0	13580.00	99.9
SELENIUM	400.0	378.80	94.7
SILVER	400.0	392.30	98.1
SODIUM	10000.0	10240.00	102.4
THALLIUM	400.0	395.80	99.0
VANADIUM	400.0	388.40	97.1
ZINC	400.0	387.40	96.8

SAMPLE: CCV

File: IYE09A May 09, 2008 17:40

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12390.00	99.1
ANTIMONY	500.0	475.70	95.1
ARSENIC	500.0	476.60	95.3
BARIUM	500.0	483.60	96.7
BERYLLIUM	500.0	488.20	97.6
CADMIUM	500.0	478.90	95.8
CALCIUM	12500.0	12450.00	99.6
CHROMIUM	500.0	484.00	96.8
COBALT	500.0	481.90	96.4
COPPER	500.0	479.50	95.9
IRON	12500.0	12500.00	100.0
LEAD	500.0	485.30	97.1
MAGNESIUM	12500.0	12040.00	96.3
MANGANESE	500.0	484.80	97.0
NICKEL	500.0	484.70	96.9
POTASSIUM	12500.0	12090.00	96.7
SELENIUM	500.0	477.60	95.5
SILVER	500.0	479.20	95.8
SODIUM	12500.0	12320.00	98.6
THALLIUM	500.0	485.30	97.1
VANADIUM	500.0	482.30	96.5
ZINC	500.0	481.90	96.4

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE09A May 09, 2008 18:37

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12240.00	97.9
ANTIMONY	500.0	483.30	96.7
ARSENIC	500.0	486.00	97.2
BARIUM	500.0	475.40	95.1
BERYLLIUM	500.0	466.90	93.4
CADMIUM	500.0	493.10	98.6
CALCIUM	12500.0	12200.00	97.6
CHROMIUM	500.0	466.00	93.2
COBALT	500.0	489.30	97.9
COPPER	500.0	462.40	92.5
IRON	12500.0	12010.00	96.1
LEAD	500.0	498.00	99.6
MAGNESIUM	12500.0	11810.00	94.5
MANGANESE	500.0	470.80	94.2
NICKEL	500.0	502.50	100.5
POTASSIUM	12500.0	12020.00	96.2
SELENIUM	500.0	493.30	98.7
SILVER	500.0	472.10	94.4
SODIUM	12500.0	11990.00	95.9
THALLIUM	500.0	497.70	99.5
VANADIUM	500.0	478.30	95.7
ZINC	500.0	488.30	97.7

SAMPLE: CCV

File: IYE09A May 09, 2008 19:34

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12540.00	100.3
ANTIMONY	500.0	479.90	96.0
ARSENIC	500.0	478.50	95.7
BARIUM	500.0	494.70	98.9
BERYLLIUM	500.0	496.70	99.3
CADMIUM	500.0	476.80	95.4
CALCIUM	12500.0	12570.00	100.6
CHROMIUM	500.0	495.40	99.1
COBALT	500.0	481.80	96.4
COPPER	500.0	491.50	98.3
IRON	12500.0	12690.00	101.5
LEAD	500.0	483.00	96.6
MAGNESIUM	12500.0	12170.00	97.4
MANGANESE	500.0	494.10	98.8
NICKEL	500.0	483.40	96.7
POTASSIUM	12500.0	12390.00	99.1
SELENIUM	500.0	481.90	96.4
SILVER	500.0	488.20	97.6
SODIUM	12500.0	12600.00	100.8
THALLIUM	500.0	482.50	96.5
VANADIUM	500.0	485.30	97.1
ZINC	500.0	481.00	96.2

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE09A May 09, 2008 20:31

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12400.00	99.2
ANTIMONY	500.0	481.40	96.3
ARSENIC	500.0	477.70	95.5
BARIUM	500.0	483.20	96.6
BERYLLIUM	500.0	487.50	97.5
CADMIUM	500.0	478.40	95.7
CALCIUM	12500.0	12450.00	99.6
CHROMIUM	500.0	486.00	97.2
COBALT	500.0	482.30	96.5
COPPER	500.0	478.50	95.7
IRON	12500.0	12480.00	99.8
LEAD	500.0	484.60	96.9
MAGNESIUM	12500.0	11960.00	95.7
MANGANESE	500.0	484.00	96.8
NICKEL	500.0	484.60	96.9
POTASSIUM	12500.0	12140.00	97.1
SELENIUM	500.0	480.60	96.1
SILVER	500.0	480.60	96.1
SODIUM	12500.0	12330.00	98.6
THALLIUM	500.0	484.40	96.9
VANADIUM	500.0	483.60	96.7
ZINC	500.0	481.00	96.2

SAMPLE: CCV

File: IYE09A May 09, 2008 21:28

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12360.00	98.9
ANTIMONY	500.0	481.30	96.3
ARSENIC	500.0	481.00	96.2
BARIUM	500.0	480.20	96.0
BERYLLIUM	500.0	482.00	96.4
CADMIUM	500.0	483.60	96.7
CALCIUM	12500.0	12420.00	99.4
CHROMIUM	500.0	481.40	96.3
COBALT	500.0	484.90	97.0
COPPER	500.0	475.50	95.1
IRON	12500.0	12330.00	98.6
LEAD	500.0	489.10	97.8
MAGNESIUM	12500.0	11950.00	95.6
MANGANESE	500.0	478.60	95.7
NICKEL	500.0	490.60	98.1
POTASSIUM	12500.0	12090.00	96.7
SELENIUM	500.0	486.10	97.2
SILVER	500.0	479.10	95.8
SODIUM	12500.0	12210.00	97.7
THALLIUM	500.0	488.70	97.7
VANADIUM	500.0	483.30	96.7
ZINC	500.0	484.70	96.9

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE09A May 09, 2008 22:25

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12550.00	100.4
ANTIMONY	500.0	486.40	97.3
ARSENIC	500.0	485.10	97.0
BARIUM	500.0	487.20	97.4
BERYLLIUM	500.0	490.30	98.1
CADMIUM	500.0	487.10	97.4
CALCIUM	12500.0	12640.00	101.1
CHROMIUM	500.0	490.90	98.2
COBALT	500.0	489.50	97.9
COPPER	500.0	484.00	96.8
IRON	12500.0	12540.00	100.3
LEAD	500.0	493.80	98.8
MAGNESIUM	12500.0	12140.00	97.1
MANGANESE	500.0	487.70	97.5
NICKEL	500.0	494.00	98.8
POTASSIUM	12500.0	12230.00	97.8
SELENIUM	500.0	488.20	97.6
SILVER	500.0	486.60	97.3
SODIUM	12500.0	12340.00	98.7
THALLIUM	500.0	492.00	98.4
VANADIUM	500.0	489.70	97.9
ZINC	500.0	489.30	97.9

SAMPLE: CCV

File: IYE09A May 09, 2008 23:22

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12180.00	97.4
ANTIMONY	500.0	487.50	97.5
ARSENIC	500.0	486.60	97.3
BARIUM	500.0	466.90	93.4
BERYLLIUM	500.0	475.10	95.0
CADMIUM	500.0	489.30	97.9
CALCIUM	12500.0	12270.00	98.2
CHROMIUM	500.0	501.10	100.2
COBALT	500.0	491.80	98.4
COPPER	500.0	491.30	98.3
IRON	12500.0	12180.00	97.4
LEAD	500.0	494.00	98.8
MAGNESIUM	12500.0	11700.00	93.6
MANGANESE	500.0	471.00	94.2
NICKEL	500.0	494.90	99.0
POTASSIUM	12500.0	11730.00	93.8
SELENIUM	500.0	489.50	97.9
SILVER	500.0	492.70	98.5
SODIUM	12500.0	11850.00	94.8
THALLIUM	500.0	494.30	98.9
VANADIUM	500.0	499.80	100.0
ZINC	500.0	492.60	98.5

(1) Control Limits: Mercury 80-120; Other Metals 90-110

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE09A May 10, 2008 0:18

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12490.00	99.9
ANTIMONY	500.0	478.30	95.7
ARSENIC	500.0	477.30	95.5
BARIUM	500.0	479.40	95.9
BERYLLIUM	500.0	486.30	97.3
CADMIUM	500.0	479.90	96.0
CALCIUM	12500.0	12600.00	100.8
CHROMIUM	500.0	485.70	97.1
COBALT	500.0	483.20	96.6
COPPER	500.0	476.20	95.2
IRON	12500.0	12480.00	99.8
LEAD	500.0	484.90	97.0
MAGNESIUM	12500.0	12050.00	96.4
MANGANESE	500.0	483.30	96.7
NICKEL	500.0	485.70	97.1
POTASSIUM	12500.0	12040.00	96.3
SELENIUM	500.0	480.00	96.0
SILVER	500.0	479.50	95.9
SODIUM	12500.0	12140.00	97.1
THALLIUM	500.0	484.60	96.9
VANADIUM	500.0	483.90	96.8
ZINC	500.0	483.60	96.7

SAMPLE: CCV

File: IYE09A May 10, 2008 1:16

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12590.00	100.7
ANTIMONY	500.0	480.00	96.0
ARSENIC	500.0	479.90	96.0
BARIUM	500.0	479.70	95.9
BERYLLIUM	500.0	487.80	97.6
CADMIUM	500.0	482.90	96.6
CALCIUM	12500.0	12700.00	101.6
CHROMIUM	500.0	488.70	97.7
COBALT	500.0	485.30	97.1
COPPER	500.0	478.00	95.6
IRON	12500.0	12610.00	100.9
LEAD	500.0	488.30	97.7
MAGNESIUM	12500.0	12090.00	96.7
MANGANESE	500.0	486.10	97.2
NICKEL	500.0	488.20	97.6
POTASSIUM	12500.0	12020.00	96.2
SELENIUM	500.0	482.80	96.6
SILVER	500.0	479.30	95.9
SODIUM	12500.0	12130.00	97.0
THALLIUM	500.0	487.30	97.5
VANADIUM	500.0	486.40	97.3
ZINC	500.0	485.20	97.0

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE09A May 10, 2008 2:14

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12610.00	100.9
ANTIMONY	500.0	481.80	96.4
ARSENIC	500.0	484.40	96.9
BARIUM	500.0	485.80	97.2
BERYLLIUM	500.0	494.50	98.9
CADMIUM	500.0	487.20	97.4
CALCIUM	12500.0	12790.00	102.3
CHROMIUM	500.0	493.10	98.6
COBALT	500.0	489.50	97.9
COPPER	500.0	477.40	95.5
IRON	12500.0	12710.00	101.7
LEAD	500.0	491.70	98.3
MAGNESIUM	12500.0	12130.00	97.0
MANGANESE	500.0	491.90	98.4
NICKEL	500.0	491.20	98.2
POTASSIUM	12500.0	12160.00	97.3
SELENIUM	500.0	483.90	96.8
SILVER	500.0	481.50	96.3
SODIUM	12500.0	12610.00	100.9
THALLIUM	500.0	486.60	97.3
VANADIUM	500.0	497.00	99.4
ZINC	500.0	492.50	98.5

SAMPLE: CCV

File: IYE09A May 10, 2008 3:11

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12500.00	100.0
ANTIMONY	500.0	477.00	95.4
ARSENIC	500.0	475.80	95.2
BARIUM	500.0	481.70	96.3
BERYLLIUM	500.0	492.80	98.6
CADMIUM	500.0	478.90	95.8
CALCIUM	12500.0	12700.00	101.6
CHROMIUM	500.0	490.90	98.2
COBALT	500.0	482.70	96.5
COPPER	500.0	478.00	95.6
IRON	12500.0	12650.00	101.2
LEAD	500.0	481.80	96.4
MAGNESIUM	12500.0	12010.00	96.1
MANGANESE	500.0	489.30	97.9
NICKEL	500.0	481.20	96.2
POTASSIUM	12500.0	12040.00	96.3
SELENIUM	500.0	477.40	95.5
SILVER	500.0	478.50	95.7
SODIUM	12500.0	12370.00	99.0
THALLIUM	500.0	478.10	95.6
VANADIUM	500.0	492.10	98.4
ZINC	500.0	484.80	97.0

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE09A May 10, 2008 3:58

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12450.00	99.6
ANTIMONY	500.0	479.30	95.9
ARSENIC	500.0	480.20	96.0
BARIUM	500.0	482.40	96.5
BERYLLIUM	500.0	488.20	97.6
CADMIUM	500.0	481.70	96.3
CALCIUM	12500.0	12580.00	100.6
CHROMIUM	500.0	488.50	97.7
COBALT	500.0	484.60	96.9
COPPER	500.0	477.10	95.4
IRON	12500.0	12550.00	100.4
LEAD	500.0	484.70	96.9
MAGNESIUM	12500.0	11960.00	95.7
MANGANESE	500.0	486.30	97.3
NICKEL	500.0	486.20	97.2
POTASSIUM	12500.0	12070.00	96.6
SELENIUM	500.0	480.60	96.1
SILVER	500.0	477.60	95.5
SODIUM	12500.0	12310.00	98.5
THALLIUM	500.0	483.00	96.6
VANADIUM	500.0	488.70	97.7
ZINC	500.0	486.10	97.2

SAMPLE: CCV

File: IYE09A May 10, 2008 4:22

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12440.00	99.5
ANTIMONY	500.0	476.30	95.3
ARSENIC	500.0	474.80	95.0
BARIUM	500.0	482.50	96.5
BERYLLIUM	500.0	490.30	98.1
CADMIUM	500.0	476.50	95.3
CALCIUM	12500.0	12590.00	100.7
CHROMIUM	500.0	491.80	98.4
COBALT	500.0	482.00	96.4
COPPER	500.0	479.50	95.9
IRON	12500.0	12580.00	100.6
LEAD	500.0	480.90	96.2
MAGNESIUM	12500.0	12010.00	96.1
MANGANESE	500.0	487.20	97.4
NICKEL	500.0	479.10	95.8
POTASSIUM	12500.0	12030.00	96.2
SELENIUM	500.0	476.40	95.3
SILVER	500.0	479.60	95.9
SODIUM	12500.0	12310.00	98.5
THALLIUM	500.0	476.60	95.3
VANADIUM	500.0	487.30	97.5
ZINC	500.0	482.80	96.6

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICV

File: IYE10A May 10, 2008 15:35

Analyte	True	Found	%R (1)
ALUMINUM	10000.0	10840.00	108.4
ANTIMONY	400.0	391.50	97.9
ARSENIC	400.0	389.20	97.3
CADMIUM	400.0	393.10	98.3
CALCIUM	10000.0	10190.00	101.9
CHROMIUM	400.0	399.20	99.8
COBALT	400.0	399.00	99.8
COPPER	400.0	394.80	98.7
IRON	10000.0	10290.00	102.9
LEAD	400.0	400.00	100.0
MAGNESIUM	10000.0	9928.00	99.3
NICKEL	400.0	400.80	100.2
SELENIUM	400.0	386.30	96.6
SILVER	400.0	400.60	100.2
SODIUM	10000.0	10340.00	103.4
THALLIUM	400.0	401.80	100.4
VANADIUM	400.0	397.20	99.3
ZINC	400.0	393.10	98.3

SAMPLE: CCV

File: IYE10A May 10, 2008 16:04

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12180.00	97.4
ANTIMONY	500.0	461.60	92.3
ARSENIC	500.0	465.00	93.0
CADMIUM	500.0	466.30	93.3
CALCIUM	12500.0	12300.00	98.4
CHROMIUM	500.0	478.60	95.7
COBALT	500.0	472.70	94.5
COPPER	500.0	477.90	95.6
IRON	12500.0	12500.00	100.0
LEAD	500.0	472.70	94.5
MAGNESIUM	12500.0	11900.00	95.2
NICKEL	500.0	484.10	96.8
SELENIUM	500.0	464.50	92.9
SILVER	500.0	476.80	95.4
SODIUM	12500.0	12320.00	98.6
THALLIUM	500.0	476.90	95.4
VANADIUM	500.0	470.60	94.1
ZINC	500.0	470.90	94.2

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE10A May 10, 2008 17:01

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12420.00	99.4
ANTIMONY	500.0	473.60	94.7
ARSENIC	500.0	476.10	95.2
CADMIUM	500.0	479.50	95.9
CALCIUM	12500.0	12560.00	100.5
CHROMIUM	500.0	494.70	98.9
COBALT	500.0	485.30	97.1
COPPER	500.0	480.50	96.1
IRON	12500.0	12750.00	102.0
LEAD	500.0	483.00	96.6
MAGNESIUM	12500.0	12240.00	97.9
NICKEL	500.0	494.00	98.8
SELENIUM	500.0	473.30	94.7
SILVER	500.0	478.40	95.7
SODIUM	12500.0	12890.00	103.1
THALLIUM	500.0	480.20	96.0
VANADIUM	500.0	478.90	95.8
ZINC	500.0	486.10	97.2

SAMPLE: CCV

File: IYE10A May 10, 2008 17:59

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12780.00	102.2
ANTIMONY	500.0	479.00	95.8
ARSENIC	500.0	488.90	97.8
CADMIUM	500.0	494.50	98.9
CALCIUM	12500.0	12870.00	103.0
CHROMIUM	500.0	500.80	100.2
COBALT	500.0	492.00	98.4
COPPER	500.0	480.90	96.2
IRON	12500.0	12850.00	102.8
LEAD	500.0	495.30	99.1
MAGNESIUM	12500.0	12470.00	99.8
NICKEL	500.0	490.90	98.2
SELENIUM	500.0	490.40	98.1
SILVER	500.0	489.90	98.0
SODIUM	12500.0	12790.00	102.3
THALLIUM	500.0	493.30	98.7
VANADIUM	500.0	502.30	100.5
ZINC	500.0	494.50	98.9

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE10A May 10, 2008 18:56

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13200.00	105.6
ANTIMONY	500.0	473.70	94.7
ARSENIC	500.0	484.60	96.9
CADMIUM	500.0	491.70	98.3
CALCIUM	12500.0	13240.00	105.9
CHROMIUM	500.0	508.70	101.7
COBALT	500.0	486.10	97.2
COPPER	500.0	486.60	97.3
IRON	12500.0	13080.00	104.6
LEAD	500.0	492.40	98.5
MAGNESIUM	12500.0	12890.00	103.1
NICKEL	500.0	481.80	96.4
SELENIUM	500.0	486.20	97.2
SILVER	500.0	501.70	100.3
SODIUM	12500.0	13120.00	105.0
THALLIUM	500.0	488.70	97.7
VANADIUM	500.0	516.00	103.2
ZINC	500.0	490.30	98.1

SAMPLE: CCV

File: IYE10A May 10, 2008 19:52

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12910.00	103.3
ANTIMONY	500.0	477.70	95.5
ARSENIC	500.0	487.90	97.6
CADMIUM	500.0	495.50	99.1
CALCIUM	12500.0	12910.00	103.3
CHROMIUM	500.0	500.80	100.2
COBALT	500.0	489.20	97.8
COPPER	500.0	481.80	96.4
IRON	12500.0	12790.00	102.3
LEAD	500.0	496.20	99.2
MAGNESIUM	12500.0	12580.00	100.6
NICKEL	500.0	483.40	96.7
SELENIUM	500.0	491.80	98.4
SILVER	500.0	495.90	99.2
SODIUM	12500.0	12780.00	102.2
THALLIUM	500.0	494.40	98.9
VANADIUM	500.0	507.90	101.6
ZINC	500.0	492.70	98.5

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE10A May 10, 2008 20:48

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12990.00	103.9
ANTIMONY	500.0	478.60	95.7
ARSENIC	500.0	489.90	98.0
CADMIUM	500.0	495.20	99.0
CALCIUM	12500.0	12960.00	103.7
CHROMIUM	500.0	500.50	100.1
COBALT	500.0	489.00	97.8
COPPER	500.0	482.00	96.4
IRON	12500.0	12830.00	102.6
LEAD	500.0	497.10	99.4
MAGNESIUM	12500.0	12690.00	101.5
NICKEL	500.0	483.50	96.7
SELENIUM	500.0	493.30	98.7
SILVER	500.0	495.10	99.0
SODIUM	12500.0	12850.00	102.8
THALLIUM	500.0	496.50	99.3
VANADIUM	500.0	503.60	100.7
ZINC	500.0	491.60	98.3

SAMPLE: CCV

File: IYE10A May 10, 2008 21:45

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12750.00	102.0
ANTIMONY	500.0	470.30	94.1
ARSENIC	500.0	482.40	96.5
CADMIUM	500.0	487.10	97.4
CALCIUM	12500.0	12730.00	101.8
CHROMIUM	500.0	492.80	98.6
COBALT	500.0	481.00	96.2
COPPER	500.0	477.10	95.4
IRON	12500.0	12670.00	101.4
LEAD	500.0	489.40	97.9
MAGNESIUM	12500.0	12520.00	100.2
NICKEL	500.0	476.10	95.2
SELENIUM	500.0	485.50	97.1
SILVER	500.0	490.60	98.1
SODIUM	12500.0	12740.00	101.9
THALLIUM	500.0	488.80	97.8
VANADIUM	500.0	495.40	99.1
ZINC	500.0	484.70	96.9

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE10A May 10, 2008 22:42

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12940.00	103.5
ANTIMONY	500.0	476.30	95.3
ARSENIC	500.0	489.60	97.9
CADMIUM	500.0	493.30	98.7
CALCIUM	12500.0	12910.00	103.3
CHROMIUM	500.0	505.00	101.0
COBALT	500.0	487.30	97.5
COPPER	500.0	485.60	97.1
IRON	12500.0	12850.00	102.8
LEAD	500.0	496.40	99.3
MAGNESIUM	12500.0	12700.00	101.6
NICKEL	500.0	484.00	96.8
SELENIUM	500.0	491.30	98.3
SILVER	500.0	499.90	100.0
SODIUM	12500.0	12910.00	103.3
THALLIUM	500.0	493.30	98.7
VANADIUM	500.0	503.10	100.6
ZINC	500.0	491.70	98.3

SAMPLE: CCV

File: IYE10A May 10, 2008 23:39

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12860.00	102.9
ANTIMONY	500.0	474.90	95.0
ARSENIC	500.0	488.10	97.6
CADMIUM	500.0	490.80	98.2
CALCIUM	12500.0	12860.00	102.9
CHROMIUM	500.0	502.70	100.5
COBALT	500.0	485.80	97.2
COPPER	500.0	481.20	96.2
IRON	12500.0	12850.00	102.8
LEAD	500.0	492.40	98.5
MAGNESIUM	12500.0	12670.00	101.4
NICKEL	500.0	484.20	96.8
SELENIUM	500.0	486.90	97.4
SILVER	500.0	492.60	98.5
SODIUM	12500.0	12870.00	103.0
THALLIUM	500.0	492.60	98.5
VANADIUM	500.0	496.40	99.3
ZINC	500.0	491.20	98.2

(1) Control Limits: Mercury 80-120; Other Metals 90-110

FORM II (Part 1) - IN

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE10A May 11, 2008 0:36

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13080.00	104.6
ANTIMONY	500.0	477.00	95.4
ARSENIC	500.0	495.30	99.1
CADMIUM	500.0	499.70	99.9
CALCIUM	12500.0	13160.00	105.3
CHROMIUM	500.0	508.00	101.6
COBALT	500.0	492.70	98.5
COPPER	500.0	488.60	97.7
IRON	12500.0	13140.00	105.1
LEAD	500.0	499.70	99.9
MAGNESIUM	12500.0	12900.00	103.2
NICKEL	500.0	494.10	98.8
SELENIUM	500.0	494.50	98.9
SILVER	500.0	504.30	100.9
SODIUM	12500.0	13140.00	105.1
THALLIUM	500.0	501.00	100.2
VANADIUM	500.0	507.90	101.6
ZINC	500.0	500.50	100.1

SAMPLE: CCV

File: IYE10A May 11, 2008 1:33

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13110.00	104.9
ANTIMONY	500.0	474.70	94.9
ARSENIC	500.0	493.40	98.7
CADMIUM	500.0	498.30	99.7
CALCIUM	12500.0	13150.00	105.2
CHROMIUM	500.0	503.80	100.8
COBALT	500.0	488.60	97.7
COPPER	500.0	485.10	97.0
IRON	12500.0	13010.00	104.1
LEAD	500.0	498.40	99.7
MAGNESIUM	12500.0	12960.00	103.7
NICKEL	500.0	485.80	97.2
SELENIUM	500.0	494.70	98.9
SILVER	500.0	504.40	100.9
SODIUM	12500.0	13270.00	106.2
THALLIUM	500.0	501.30	100.3
VANADIUM	500.0	509.70	101.9
ZINC	500.0	497.10	99.4

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE10A May 11, 2008 2:31

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13130.00	105.0
ANTIMONY	500.0	474.20	94.8
ARSENIC	500.0	494.30	98.9
CADMIUM	500.0	498.40	99.7
CALCIUM	12500.0	13120.00	105.0
CHROMIUM	500.0	505.60	101.1
COBALT	500.0	488.10	97.6
COPPER	500.0	486.10	97.2
IRON	12500.0	13020.00	104.2
LEAD	500.0	499.10	99.8
MAGNESIUM	12500.0	12960.00	103.7
NICKEL	500.0	486.20	97.2
SELENIUM	500.0	496.80	99.4
SILVER	500.0	503.50	100.7
SODIUM	12500.0	13200.00	105.6
THALLIUM	500.0	501.80	100.4
VANADIUM	500.0	505.70	101.1
ZINC	500.0	496.30	99.3

SAMPLE: CCV

File: IYE10A May 11, 2008 2:40

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13170.00	105.4
ANTIMONY	500.0	474.60	94.9
ARSENIC	500.0	495.70	99.1
CADMIUM	500.0	500.20	100.0
CALCIUM	12500.0	13200.00	105.6
CHROMIUM	500.0	510.20	102.0
COBALT	500.0	489.90	98.0
COPPER	500.0	490.00	98.0
IRON	12500.0	13120.00	105.0
LEAD	500.0	500.60	100.1
MAGNESIUM	12500.0	13050.00	104.4
NICKEL	500.0	487.40	97.5
SELENIUM	500.0	496.00	99.2
SILVER	500.0	509.30	101.9
SODIUM	12500.0	13290.00	106.3
THALLIUM	500.0	504.20	100.8
VANADIUM	500.0	510.80	102.2
ZINC	500.0	498.40	99.7

(1) Control Limits: Mercury 80-120; Other Metals 90-110

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE10A May 11, 2008 3:04

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13160.00	105.3
ANTIMONY	500.0	475.10	95.0
ARSENIC	500.0	493.50	98.7
CADMIUM	500.0	499.40	99.9
CALCIUM	12500.0	13170.00	105.4
CHROMIUM	500.0	508.70	101.7
COBALT	500.0	489.40	97.9
COPPER	500.0	488.80	97.8
IRON	12500.0	13080.00	104.6
LEAD	500.0	501.50	100.3
MAGNESIUM	12500.0	13020.00	104.2
NICKEL	500.0	487.00	97.4
SELENIUM	500.0	497.80	99.6
SILVER	500.0	507.40	101.5
SODIUM	12500.0	13220.00	105.8
THALLIUM	500.0	504.10	100.8
VANADIUM	500.0	508.60	101.7
ZINC	500.0	498.20	99.6

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICV

File: IYE12A May 12, 2008 17:29

Analyte	True	Found	%R (1)
ALUMINUM	10000.0	10720.00	107.2
CALCIUM	10000.0	10430.00	104.3
IRON	10000.0	10620.00	106.2
MAGNESIUM	10000.0	10210.00	102.1
SODIUM	10000.0	10590.00	105.9

SAMPLE: CCV

File: IYE12A May 12, 2008 17:53

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	12080.00	96.6
CALCIUM	12500.0	12140.00	97.1
IRON	12500.0	12340.00	98.7
MAGNESIUM	12500.0	11770.00	94.2
SODIUM	12500.0	12200.00	97.6

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE12A May 12, 2008 18:49

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	11890.00	95.1
CALCIUM	12500.0	11970.00	95.8
IRON	12500.0	12280.00	98.2
MAGNESIUM	12500.0	11670.00	93.4
SODIUM	12500.0	12380.00	99.0

SAMPLE: CCV

File: IYE12A May 12, 2008 19:46

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	11750.00	94.0
CALCIUM	12500.0	11880.00	95.0
IRON	12500.0	12190.00	97.5
MAGNESIUM	12500.0	11630.00	93.0
SODIUM	12500.0	12220.00	97.8

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE12A May 12, 2008 20:43

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13070.00	104.6
CALCIUM	12500.0	12940.00	103.5
IRON	12500.0	12810.00	102.5
MAGNESIUM	12500.0	12850.00	102.8
SODIUM	12500.0	13020.00	104.2

SAMPLE: CCV

File: IYE12A May 12, 2008 21:39

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13090.00	104.7
CALCIUM	12500.0	12900.00	103.2
IRON	12500.0	12780.00	102.2
MAGNESIUM	12500.0	13040.00	104.3
SODIUM	12500.0	13140.00	105.1

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CCV

File: IYE12A May 12, 2008 21:49

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13110.00	104.9
CALCIUM	12500.0	12950.00	103.6
IRON	12500.0	12770.00	102.2
MAGNESIUM	12500.0	12990.00	103.9
SODIUM	12500.0	12990.00	103.9

SAMPLE: CCV

File: IYE12A May 12, 2008 22:13

Analyte	True	Found	%R (1)
ALUMINUM	12500.0	13330.00	106.6
CALCIUM	12500.0	13140.00	105.1
IRON	12500.0	12900.00	103.2
MAGNESIUM	12500.0	13280.00	106.2
SODIUM	12500.0	13220.00	105.8

(1) Control Limits: Mercury 80-120; Other Metals 90-110

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: HYE08A May 08, 2008 09:45 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
MERCURY	0.2	0.18	90.0

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE07A May 07, 2008 14:58 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	316.80	105.6
ANTIMONY	8.0	6.68	83.5
ARSENIC	8.0	8.14	101.8
BARIUM	5.0	6.11	122.2
BERYLLIUM	5.0	5.04	100.8
CADMIUM	10.0	9.87	98.7
CALCIUM	50.0	56.76	113.5
CHROMIUM	15.0	15.49	103.3
COBALT	30.0	35.86	119.5
COPPER	25.0	24.93	99.7
IRON	100.0	104.30	104.3
LEAD	5.0	4.82	96.4
MAGNESIUM	50.0	59.45	118.9
MANGANESE	5.0	5.67	113.4
NICKEL	40.0	47.48	118.7
POTASSIUM	1000.0	1040.00	104.0
SELENIUM	10.0	10.21	102.1
SILVER	15.0	15.47	103.1
SODIUM	1000.0	1098.00	109.8
THALLIUM	15.0	15.04	100.3
VANADIUM	25.0	24.78	99.1
ZINC	25.0	24.53	98.1

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE07A May 07, 2008 16:53 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	317.20	105.7
ANTIMONY	8.0	7.10	88.8
ARSENIC	8.0	7.39	92.4
BARIUM	5.0	6.27	125.4
BERYLLIUM	5.0	5.16	103.2
CADMIUM	10.0	10.02	100.2
CALCIUM	50.0	57.25	114.5
CHROMIUM	15.0	15.51	103.4
COBALT	30.0	36.53	121.8
COPPER	25.0	25.09	100.4
IRON	100.0	107.20	107.2
LEAD	5.0	4.44	88.8
MAGNESIUM	50.0	60.09	120.2
MANGANESE	5.0	5.71	114.2
NICKEL	40.0	48.31	120.8
POTASSIUM	1000.0	1028.00	102.8
SELENIUM	10.0	10.86	108.6
SILVER	15.0	15.47	103.1
SODIUM	1000.0	1113.00	111.3
THALLIUM	15.0	15.75	105.0
VANADIUM	25.0	26.07	104.3
ZINC	25.0	24.87	99.5

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE09A May 09, 2008 17:26 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	334.30	111.4
ANTIMONY	8.0	6.48	81.0
ARSENIC	8.0	8.44	105.5
BARIUM	5.0	5.67	113.4
BERYLLIUM	5.0	5.11	102.2
CADMIUM	10.0	9.81	98.1
CALCIUM	50.0	54.19	108.4
CHROMIUM	15.0	15.00	100.0
COBALT	30.0	35.87	119.6
COPPER	25.0	25.16	100.6
IRON	100.0	110.90	110.9
LEAD	5.0	5.27	105.4
MAGNESIUM	50.0	50.19	100.4
MANGANESE	5.0	6.02	120.4
NICKEL	40.0	46.66	116.6
POTASSIUM	1000.0	965.30	96.5
SELENIUM	10.0	10.20	102.0
SILVER	15.0	14.82	98.8
SODIUM	1000.0	1034.00	103.4
THALLIUM	15.0	15.62	104.1
VANADIUM	25.0	24.45	97.8
ZINC	25.0	24.58	98.3

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE09A May 10, 2008 01:01 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	330.70	110.2
ANTIMONY	8.0	6.77	84.6
ARSENIC	8.0	8.10	101.3
BARIUM	5.0	5.54	110.8
BERYLLIUM	5.0	5.00	100.0
CADMIUM	10.0	9.86	98.6
CALCIUM	50.0	55.13	110.3
CHROMIUM	15.0	15.24	101.6
COBALT	30.0	35.90	119.7
COPPER	25.0	24.09	96.4
IRON	100.0	107.10	107.1
LEAD	5.0	5.49	109.8
MAGNESIUM	50.0	47.23	94.5
MANGANESE	5.0	5.17	103.4
NICKEL	40.0	47.39	118.5
POTASSIUM	1000.0	899.90	90.0
SELENIUM	10.0	10.89	108.9
SILVER	15.0	14.79	98.6
SODIUM	1000.0	987.00	98.7
THALLIUM	15.0	14.95	99.7
VANADIUM	25.0	24.71	98.8
ZINC	25.0	24.57	98.3

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE09A May 10, 2008 04:08 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	350.10	116.7
ANTIMONY	8.0	6.25	78.1
ARSENIC	8.0	8.21	102.6
BARIUM	5.0	5.51	110.2
BERYLLIUM	5.0	5.03	100.6
CADMIUM	10.0	9.92	99.2
CALCIUM	50.0	53.59	107.2
CHROMIUM	15.0	15.70	104.7
COBALT	30.0	36.08	120.3
COPPER	25.0	24.84	99.4
IRON	100.0	111.10	111.1
LEAD	5.0	5.09	101.8
MAGNESIUM	50.0	51.96	103.9
MANGANESE	5.0	5.77	115.4
NICKEL	40.0	47.47	118.7
POTASSIUM	1000.0	970.90	97.1
SELENIUM	10.0	9.41	94.1
SILVER	15.0	14.73	98.2
SODIUM	1000.0	1043.00	104.3
THALLIUM	15.0	15.78	105.2
VANADIUM	25.0	25.06	100.2
ZINC	25.0	25.01	100.0

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE10A May 10, 2008 15:49 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	318.20	106.1
ANTIMONY	8.0	6.47	80.9
ARSENIC	8.0	7.46	93.3
CADMIUM	10.0	9.69	96.9
CALCIUM	50.0	47.12	94.2
CHROMIUM	15.0	15.10	100.7
COBALT	30.0	35.77	119.2
COPPER	25.0	23.65	94.6
IRON	100.0	101.40	101.4
LEAD	5.0	4.90	98.0
MAGNESIUM	50.0	48.96	97.9
NICKEL	40.0	47.41	118.5
SELENIUM	10.0	11.63	116.3
SILVER	15.0	14.74	98.3
SODIUM	1000.0	1039.00	103.9
THALLIUM	15.0	14.12	94.1
VANADIUM	25.0	24.61	98.4
ZINC	25.0	24.42	97.7

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE10A May 10, 2008 17:44 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	338.00	112.7
ANTIMONY	8.0	5.66	70.8
ARSENIC	8.0	7.65	95.6
CADMIUM	10.0	9.94	99.4
CALCIUM	50.0	52.64	105.3
CHROMIUM	15.0	15.62	104.1
COBALT	30.0	35.96	119.9
COPPER	25.0	23.50	94.0
IRON	100.0	105.40	105.4
LEAD	5.0	5.43	108.6
MAGNESIUM	50.0	52.78	105.6
NICKEL	40.0	48.01	120.0
SELENIUM	10.0	9.47	94.7
SILVER	15.0	15.17	101.1
SODIUM	1000.0	1287.00	128.7
THALLIUM	15.0	15.29	101.9
VANADIUM	25.0	24.80	99.2
ZINC	25.0	25.21	100.8

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE10A May 10, 2008 19:38 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	353.20	117.7
ANTIMONY	8.0	5.41	67.6
ARSENIC	8.0	8.31	103.9
CADMIUM	10.0	10.32	103.2
CALCIUM	50.0	53.00	106.0
CHROMIUM	15.0	16.14	107.6
COBALT	30.0	37.10	123.7
COPPER	25.0	24.61	98.4
IRON	100.0	109.90	109.9
LEAD	5.0	5.40	108.0
MAGNESIUM	50.0	52.82	105.6
NICKEL	40.0	47.85	119.6
SELENIUM	10.0	10.79	107.9
SILVER	15.0	15.63	104.2
SODIUM	1000.0	1127.00	112.7
THALLIUM	15.0	15.61	104.1
VANADIUM	25.0	26.21	104.8
ZINC	25.0	25.65	102.6

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE10A May 10, 2008 22:27 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	355.80	118.6
ANTIMONY	8.0	5.46	68.3
ARSENIC	8.0	7.19	89.9
CADMIUM	10.0	10.18	101.8
CALCIUM	50.0	49.23	98.5
CHROMIUM	15.0	16.20	108.0
COBALT	30.0	36.62	122.1
COPPER	25.0	25.20	100.8
IRON	100.0	108.20	108.2
LEAD	5.0	5.84	116.8
MAGNESIUM	50.0	50.33	100.7
NICKEL	40.0	47.89	119.7
SELENIUM	10.0	9.89	98.9
SILVER	15.0	15.76	105.1
SODIUM	1000.0	1169.00	116.9
THALLIUM	15.0	15.35	102.3
VANADIUM	25.0	26.26	105.0
ZINC	25.0	25.47	101.9

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE10A May 11, 2008 02:50 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	351.80	117.3
ANTIMONY	8.0	6.47	80.9
ARSENIC	8.0	8.14	101.8
CADMIUM	10.0	10.32	103.2
CALCIUM	50.0	56.87	113.7
CHROMIUM	15.0	17.52	116.8
COBALT	30.0	36.78	122.6
COPPER	25.0	24.51	98.0
IRON	100.0	118.80	118.8
LEAD	5.0	5.48	109.6
MAGNESIUM	50.0	55.31	110.6
NICKEL	40.0	47.74	119.3
SELENIUM	10.0	11.42	114.2
SILVER	15.0	15.62	104.1
SODIUM	1000.0	1168.00	116.8
THALLIUM	15.0	15.98	106.5
VANADIUM	25.0	26.17	104.7
ZINC	25.0	25.83	103.3

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE12A May 12, 2008 17:38 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	322.30	107.4
CALCIUM	50.0	54.08	108.2
IRON	100.0	96.62	96.6
MAGNESIUM	50.0	49.07	98.1
SODIUM	1000.0	1022.00	102.2

2C

PQL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

SAMPLE: PQL

File: IYE12A May 12, 2008 21:58 Concentration Units: ug/L

Analyte	TRUE	FOUND	% R
ALUMINUM	300.0	372.80	124.3
CALCIUM	50.0	61.03	122.1
IRON	100.0	126.30	126.3
MAGNESIUM	50.0	58.49	117.0
SODIUM	1000.0	1128.00	112.8

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CRI

File: IYE07A May 07, 2008 14:53

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	59.01	98.3
ARSENIC	10.0	8.65	86.5
BERYLLIUM	5.0	4.80	96.0
CADMIUM	5.0	4.83	96.6
CHROMIUM	10.0	9.81	98.1
COBALT	50.0	48.89	97.8
COPPER	25.0	23.83	95.3
LEAD	10.0	9.83	98.3
MANGANESE	15.0	14.87	99.1
NICKEL	40.0	39.69	99.2
SELENIUM	35.0	30.85	88.1
SILVER	10.0	9.89	98.9
THALLIUM	25.0	25.31	101.2
VANADIUM	50.0	48.60	97.2
ZINC	60.0	57.13	95.2

SAMPLE: CRI

File: IYE07A May 07, 2008 16:48

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	58.26	97.1
ARSENIC	10.0	8.34	83.4
BERYLLIUM	5.0	4.96	99.2
CADMIUM	5.0	4.95	99.0
CHROMIUM	10.0	10.17	101.7
COBALT	50.0	49.85	99.7
COPPER	25.0	24.16	96.6
LEAD	10.0	10.11	101.1
MANGANESE	15.0	15.12	100.8
NICKEL	40.0	40.53	101.3
SELENIUM	35.0	33.31	95.2
SILVER	10.0	10.39	103.9
THALLIUM	25.0	25.72	102.9
VANADIUM	50.0	50.08	100.2
ZINC	60.0	57.89	96.5

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CRI

File: IYE09A May 09, 2008 17:21

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	57.20	95.3
ARSENIC	10.0	9.21	92.1
BERYLLIUM	5.0	4.83	96.6
CADMIUM	5.0	4.90	98.0
CHROMIUM	10.0	9.46	94.6
COBALT	50.0	49.58	99.2
COPPER	25.0	24.16	96.6
LEAD	10.0	10.31	103.1
MANGANESE	15.0	14.49	96.6
NICKEL	40.0	39.88	99.7
SELENIUM	35.0	33.74	96.4
SILVER	10.0	9.77	97.7
THALLIUM	25.0	25.40	101.6
VANADIUM	50.0	48.98	98.0
ZINC	60.0	58.17	97.0

SAMPLE: CRI

File: IYE09A May 09, 2008 19:20

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	58.08	96.8
ARSENIC	10.0	8.14	81.4
BERYLLIUM	5.0	4.97	99.4
CADMIUM	5.0	4.79	95.8
CHROMIUM	10.0	9.88	98.8
COBALT	50.0	49.08	98.2
COPPER	25.0	24.75	99.0
LEAD	10.0	10.65	106.5
MANGANESE	15.0	14.94	99.6
NICKEL	40.0	39.73	99.3
SELENIUM	35.0	33.15	94.7
SILVER	10.0	10.04	100.4
THALLIUM	25.0	24.59	98.4
VANADIUM	50.0	48.47	96.9
ZINC	60.0	57.56	95.9

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CRI

File: IYE09A May 09, 2008 21:14

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	57.13	95.2
ARSENIC	10.0	8.82	88.2
BERYLLIUM	5.0	4.67	93.4
CADMIUM	5.0	4.89	97.8
CHROMIUM	10.0	9.29	92.9
COBALT	50.0	48.83	97.7
COPPER	25.0	24.31	97.2
LEAD	10.0	10.88	108.8
MANGANESE	15.0	14.72	98.1
NICKEL	40.0	39.71	99.3
SELENIUM	35.0	32.19	92.0
SILVER	10.0	9.84	98.4
THALLIUM	25.0	24.96	99.8
VANADIUM	50.0	47.93	95.9
ZINC	60.0	57.43	95.7

SAMPLE: CRI

File: IYE09A May 09, 2008 23:08

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	58.11	96.9
ARSENIC	10.0	9.27	92.7
BERYLLIUM	5.0	4.90	98.0
CADMIUM	5.0	4.86	97.2
CHROMIUM	10.0	9.66	96.6
COBALT	50.0	49.07	98.1
COPPER	25.0	24.34	97.4
LEAD	10.0	10.39	103.9
MANGANESE	15.0	14.69	97.9
NICKEL	40.0	39.50	98.8
SELENIUM	35.0	32.81	93.7
SILVER	10.0	9.89	98.9
THALLIUM	25.0	24.48	97.9
VANADIUM	50.0	48.86	97.7
ZINC	60.0	57.95	96.6

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CRI

File: IYE09A May 10, 2008 00:56

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	57.15	95.3
ARSENIC	10.0	9.31	93.1
BERYLLIUM	5.0	4.92	98.4
CADMIUM	5.0	4.88	97.6
CHROMIUM	10.0	9.54	95.4
COBALT	50.0	48.78	97.6
COPPER	25.0	24.30	97.2
LEAD	10.0	10.23	102.3
MANGANESE	15.0	14.67	97.8
NICKEL	40.0	39.76	99.4
SELENIUM	35.0	32.39	92.5
SILVER	10.0	9.58	95.8
THALLIUM	25.0	25.16	100.6
VANADIUM	50.0	48.81	97.6
ZINC	60.0	57.95	96.6

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CRI

File: IYE10A May 10, 2008 15:45

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	55.29	92.2
ARSENIC	10.0	8.30	83.0
CADMIUM	5.0	4.70	94.0
CHROMIUM	10.0	9.95	99.5
COBALT	50.0	48.21	96.4
COPPER	25.0	22.98	91.9
LEAD	10.0	10.55	105.5
NICKEL	40.0	39.09	97.7
SELENIUM	35.0	30.99	88.5
SILVER	10.0	9.73	97.3
THALLIUM	25.0	24.01	96.0
VANADIUM	50.0	47.96	95.9
ZINC	60.0	56.07	93.5

SAMPLE: CRI

File: IYE10A May 10, 2008 17:39

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	55.43	92.4
ARSENIC	10.0	8.93	89.3
CADMIUM	5.0	4.88	97.6
CHROMIUM	10.0	10.29	102.9
COBALT	50.0	48.97	97.9
COPPER	25.0	23.23	92.9
LEAD	10.0	10.77	107.7
NICKEL	40.0	40.07	100.2
SELENIUM	35.0	31.27	89.3
SILVER	10.0	9.75	97.5
THALLIUM	25.0	24.31	97.2
VANADIUM	50.0	48.24	96.5
ZINC	60.0	58.51	97.5

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: CRI

File: IYE10A May 10, 2008 19:33

Analyte	TRUE	FOUND	% R
ANTIMONY	60.0	56.03	93.4
ARSENIC	10.0	8.94	89.4
CADMIUM	5.0	4.97	99.4
CHROMIUM	10.0	10.16	101.6
COBALT	50.0	49.41	98.8
COPPER	25.0	23.46	93.8
LEAD	10.0	11.16	111.6
NICKEL	40.0	39.25	98.1
SELENIUM	35.0	34.01	97.2
SILVER	10.0	10.14	101.4
THALLIUM	25.0	25.38	101.5
VANADIUM	50.0	50.49	101.0
ZINC	60.0	58.48	97.5

5A

SPIKE SAMPLE RECOVERY

Lab Name: Katahdin Analytical Services

Matrix: WATER

Percent Solids: 0.00

Client Field ID: 044G00614S

SDG Name: SB2237

Lab Sample ID: SB2237-002P

Concentration Units : ug/L

Analyte	Spiked Sample	C	Sample Result	C	Spike Added	%R	Q	Control Limits (%R) Low	High	M
ALUMINUM, TOTAL	2487.0000		58.8100	B	2000	121.4		75	125	P
ANTIMONY, TOTAL	511.7000		2.6960	B	500	101.8		75	125	P
ARSENIC, TOTAL	575.2000		4.0040	B	500	114.2		75	125	P
BARIUM, TOTAL	2374.0000		78.8100		2000	114.8		75	125	P
BERYLLIUM, TOTAL	55.6400		-0.0578	U	50	111.3		75	125	P
CADMIUM, TOTAL	241.2000		-0.0968	U	250	96.5		75	125	P
CALCIUM, TOTAL	614700.0000		627600.0000		2500	-516.0		75	125	P
CHROMIUM, TOTAL	227.5000		2.7990	B	200	112.4		75	125	P
COBALT, TOTAL	549.1000		5.3370	B	500	108.8		75	125	P
COPPER, TOTAL	301.6000		8.8870	B	250	117.1		75	125	P
IRON, TOTAL	7051.0000		5876.0000		1000	117.5		75	125	P
LEAD, TOTAL	460.7000		4.4420	B	500	91.3		75	125	P
MAGNESIUM, TOTAL	269500.0000		270500.0000		5000	-20.0		75	125	P
MANGANESE, TOTAL	4622.0000		4112.0000		500	102.0		75	125	P
NICKEL, TOTAL	555.1000		16.5200	B	500	107.7		75	125	P
POTASSIUM, TOTAL	82100.0000		71080.0000		10000	110.2		75	125	P
SELENIUM, TOTAL	517.9000		-2.7110	U	500	103.6		75	125	P
SILVER, TOTAL	64.1500		-0.0865	U	50	128.3	N	75	125	P
SODIUM, TOTAL	2250000.0000		2284000.0000		7500	-453.3		75	125	P
THALLIUM, TOTAL	439.3000		1.2340	U	500	87.9		75	125	P
VANADIUM, TOTAL	581.8000		0.1158	U	500	116.4		75	125	P
ZINC, TOTAL	571.1000		9.6000	B	500	112.3		75	125	P

Comments:

5A

SPIKE SAMPLE RECOVERY

Lab Name: Katahdin Analytical Services **Client Field ID:** 044G00614S

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-002S

Concentration Units : ug/L

Analyte	Spiked Sample	C	Sample Result	C	Spike Added	%R	Q	Control Limits (%R) Low	High	M
ALUMINUM, TOTAL	2452.0000		58.8100	B	2000	119.7		75	125	P
ANTIMONY, TOTAL	513.1000		2.6960	B	500	102.1		75	125	P
ARSENIC, TOTAL	576.8000		4.0040	B	500	114.6		75	125	P
BARIUM, TOTAL	2384.0000		78.8100		2000	115.3		75	125	P
BERYLLIUM, TOTAL	56.7600		-0.0578	U	50	113.5		75	125	P
CADMIUM, TOTAL	241.8000		-0.0968	U	250	96.7		75	125	P
CALCIUM, TOTAL	616700.0000		627600.0000		2500	-436.0		75	125	P
CHROMIUM, TOTAL	229.2000		2.7990	B	200	113.2		75	125	P
COBALT, TOTAL	551.6000		5.3370	B	500	109.3		75	125	P
COPPER, TOTAL	302.7000		8.8870	B	250	117.5		75	125	P
IRON, TOTAL	6960.0000		5876.0000		1000	108.4		75	125	P
LEAD, TOTAL	462.2000		4.4420	B	500	91.6		75	125	P
MAGNESIUM, TOTAL	267100.0000		270500.0000		5000	-68.0		75	125	P
MANGANESE, TOTAL	4608.0000		4112.0000		500	99.2		75	125	P
NICKEL, TOTAL	556.3000		16.5200	B	500	108.0		75	125	P
POTASSIUM, TOTAL	81100.0000		71080.0000		10000	100.2		75	125	P
SELENIUM, TOTAL	517.9000		-2.7110	U	500	103.6		75	125	P
SILVER, TOTAL	64.3700		-0.0865	U	50	128.7	N	75	125	P
SODIUM, TOTAL	2214000.0000		2284000.0000		7500	-933.3		75	125	P
THALLIUM, TOTAL	441.0000		1.2340	U	500	88.2		75	125	P
VANADIUM, TOTAL	586.2000		0.1158	U	500	117.2		75	125	P
ZINC, TOTAL	574.5000		9.6000	B	500	113.0		75	125	P

Comments:

5A

SPIKE SAMPLE RECOVERY

Lab Name: Katahdin Analytical Services **Client Field ID:** FD04290801S

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-004P

Concentration Units : ug/L

Analyte	Spiked Sample	C	Sample Result	C	Spike Added	%R	Q	Control Limits (%R) Low	High	M
MERCURY, TOTAL	0.9540		-0.0050	U	1	95.4		75	125	CV

Comments:

5A

SPIKE SAMPLE RECOVERY

Lab Name: Katahdin Analytical Services | **Client Field ID:** FD04290801S

Matrix: WATER | **SDG Name:** SB2237

Percent Solids: 0.00 | **Lab Sample ID:** SB2237-004S

Concentration Units : ug/L

Analyte	Spiked Sample	C	Sample Result	C	Spike Added	%R	Q	Control Limits (%R) Low	High	M
MERCURY, TOTAL	0.9850		-0.0050	U	1	98.5		75	125	CV

Comments:

5D

SPIKE DUPLICATES

Lab Name: Katahdin Analytical Services **Client Field ID:** 044G00614

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-002

Concentration Units : ug/L

Analyte	Control Limits	Spike Result	C	Spike Dup. Result	C	RPD	Q	M
ALUMINUM, TOTAL	900	2452.0000		2487.0000		1.4		P
ANTIMONY, TOTAL		513.1000		511.7000		0.3		P
ARSENIC, TOTAL		576.8000		575.2000		0.3		P
BARIUM, TOTAL		2384.0000		2374.0000		0.4		P
BERYLLIUM, TOTAL		56.7600		55.6400		2.0		P
CADMIUM, TOTAL		241.8000		241.2000		0.2		P
CALCIUM, TOTAL		616700.0000		614700.0000		0.3		P
CHROMIUM, TOTAL		229.2000		227.5000		0.7		P
COBALT, TOTAL		551.6000		549.1000		0.5		P
COPPER, TOTAL		302.7000		301.6000		0.4		P
IRON, TOTAL		6960.0000		7051.0000		1.3		P
LEAD, TOTAL		462.2000		460.7000		0.3		P
MAGNESIUM, TOTAL		267100.0000		269500.0000		0.9		P
MANGANESE, TOTAL		4608.0000		4622.0000		0.3		P
NICKEL, TOTAL		556.3000		555.1000		0.2		P
POTASSIUM, TOTAL		81100.0000		82100.0000		1.2		P
SELENIUM, TOTAL		517.9000		517.9000		0.0		P
SILVER, TOTAL	15	64.3700		64.1500		0.3		P
SODIUM, TOTAL		2214000.0000		2250000.0000		1.6		P
THALLIUM, TOTAL		441.0000		439.3000		0.4		P
VANADIUM, TOTAL		586.2000		581.8000		0.8		P
ZINC, TOTAL		574.5000		571.1000		0.6		P

Comments:

5D

SPIKE DUPLICATES

Lab Name: Katahdin Analytical Services **Client Field ID:** FD04290801

Matrix: WATER **SDG Name:** SB2237

Percent Solids: 0.00 **Lab Sample ID:** SB2237-004

Concentration Units : ug/L

Analyte	Control Limits	Spike Result	C	Spike Dup. Result	C	RPD	Q	M
MERCURY, TOTAL	0.2	0.9850		0.9540		3.2		CV

Comments:

LABORATORY CONTROL SAMPLES

Lab Name: Katahdin Analytical Services **Sample ID:** LCSWYE07HGW1

Matrix: WATER **SDG Name:** SB2237

QC Batch ID: YE07HGW1

Concentration Units : ug/L

Analyte	TRUE	FOUND	% R	LIMITS (%)	
MERCURY	5.0	5.24	104.8	80	120

LABORATORY CONTROL SAMPLES

Lab Name: Katahdin Analytical Services **Sample ID:** LCSWYE07ICW2

Matrix: WATER **SDG Name:** SB2237

QC Batch ID: YE07ICW2

Concentration Units : ug/L

Analyte	TRUE	FOUND	% R	LIMITS (%)	
ALUMINUM	2000.0	2328.00	116.4	80	120
ANTIMONY	500.0	472.80	94.6	80	120
ARSENIC	500.0	509.90	102.0	80	120
BARIUM	2000.0	2385.00	119.2	80	120
BERYLLIUM	50.0	58.95	117.9	80	120
CADMIUM	250.0	253.70	101.5	80	120
CALCIUM	2500.0	2715.00	108.6	80	120
CHROMIUM	200.0	237.60	118.8	80	120
COBALT	500.0	590.80	118.2	80	120
COPPER	250.0	293.80	117.5	80	120
IRON	1000.0	1177.00	117.7	80	120
LEAD	500.0	505.10	101.0	80	120
MAGNESIUM	5000.0	5354.00	107.1	80	120
MANGANESE	500.0	598.10	119.6	80	120
NICKEL	500.0	584.70	116.9	80	120
POTASSIUM	10000.0	10900.00	109.0	80	120
SELENIUM	500.0	468.00	93.6	80	120
SILVER	50.0	58.06	116.1	80	120
SODIUM	7500.0	8244.00	109.9	80	120
THALLIUM	500.0	521.70	104.3	80	120
VANADIUM	500.0	589.10	117.8	80	120
ZINC	500.0	578.80	115.8	80	120

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE07A May 07, 2008 15:03

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	526100	105.2
ANTIMONY	0	1	
ARSENIC	0	2	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	1	
CALCIUM	500000	478200	95.6
CHROMIUM	0	2	
COBALT	0	-3	
COPPER	0	0	
IRON	200000	188900	94.5
LEAD	0	5	
MAGNESIUM	500000	511000	102.2
MANGANESE	4	-3	
NICKEL	0	1	
POTASSIUM	0	34	
SELENIUM	0	-3	
SILVER	0	-3	
SODIUM	0	123	
THALLIUM	0	0	
VANADIUM	0	0	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE07A May 07, 2008 15:08

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	534900	107.0
ANTIMONY	600	598	99.7
ARSENIC	100	101	101.0
BARIUM	500	499	99.8
BERYLLIUM	500	487	97.4
CADMIUM	1000	919	91.9
CALCIUM	500000	474600	94.9
CHROMIUM	500	481	96.2
COBALT	500	455	91.0
COPPER	500	522	104.4
IRON	200000	189000	94.5
LEAD	50	50	100.0
MAGNESIUM	500000	509900	102.0
MANGANESE	504	474	94.0
NICKEL	1000	894	89.4
POTASSIUM	20000	20730	103.6
SELENIUM	50	53	106.0
SILVER	200	209	104.5
SODIUM	20000	20970	104.8
THALLIUM	100	90	90.0
VANADIUM	500	489	97.8
ZINC	1000	912	91.2

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE07A May 07, 2008 16:57

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	530500	106.1
ANTIMONY	0	4	
ARSENIC	0	6	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	-1	
CALCIUM	500000	497800	99.6
CHROMIUM	0	3	
COBALT	0	-3	
COPPER	0	-1	
IRON	200000	199000	99.5
LEAD	0	6	
MAGNESIUM	500000	519100	103.8
MANGANESE	4	-3	
NICKEL	0	1	
POTASSIUM	0	-126	
SELENIUM	0	-3	
SILVER	0	-7	
SODIUM	0	127	
THALLIUM	0	2	
VANADIUM	0	0	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE07A May 07, 2008 17:02

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	545200	109.0
ANTIMONY	600	601	100.2
ARSENIC	100	105	105.0
BARIUM	500	515	103.0
BERYLLIUM	500	493	98.6
CADMIUM	1000	889	88.9
CALCIUM	500000	501200	100.2
CHROMIUM	500	513	102.6
COBALT	500	451	90.2
COPPER	500	561	112.2
IRON	200000	204400	102.2
LEAD	50	49	98.0
MAGNESIUM	500000	525100	105.0
MANGANESE	504	504	100.0
NICKEL	1000	857	85.7
POTASSIUM	20000	20840	104.2
SELENIUM	50	53	106.0
SILVER	200	214	107.0
SODIUM	20000	22060	110.3
THALLIUM	100	85	85.0
VANADIUM	500	502	100.4
ZINC	1000	898	89.8

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE09A May 09, 2008 17:30

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	539600	107.9
ANTIMONY	0	3	
ARSENIC	0	3	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	0	
CALCIUM	500000	490200	98.0
CHROMIUM	0	3	
COBALT	0	-2	
COPPER	0	1	
IRON	200000	192600	96.3
LEAD	0	1	
MAGNESIUM	500000	492400	98.5
MANGANESE	4	-4	
NICKEL	0	1	
POTASSIUM	0	-92	
SELENIUM	0	-2	
SILVER	0	-3	
SODIUM	0	43	
THALLIUM	0	1	
VANADIUM	0	0	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE09A May 09, 2008 17:35

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	548500	109.7
ANTIMONY	600	601	100.2
ARSENIC	100	102	102.0
BARIUM	500	501	100.2
BERYLLIUM	500	499	99.8
CADMIUM	1000	923	92.3
CALCIUM	500000	501900	100.4
CHROMIUM	500	486	97.2
COBALT	500	448	89.6
COPPER	500	518	103.6
IRON	200000	196300	98.2
LEAD	50	46	92.0
MAGNESIUM	500000	501600	100.3
MANGANESE	504	474	94.0
NICKEL	1000	894	89.4
POTASSIUM	20000	20830	104.2
SELENIUM	50	51	102.0
SILVER	200	212	106.0
SODIUM	20000	21300	106.5
THALLIUM	100	87	87.0
VANADIUM	500	490	98.0
ZINC	1000	921	92.1

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services SDG Name: SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE09A May 09, 2008 19:24

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	544300	108.9
ANTIMONY	0	2	
ARSENIC	0	1	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	0	
CALCIUM	500000	491700	98.3
CHROMIUM	0	3	
COBALT	0	-2	
COPPER	0	1	
IRON	200000	194200	97.1
LEAD	0	1	
MAGNESIUM	500000	494900	99.0
MANGANESE	4	-3	
NICKEL	0	1	
POTASSIUM	0	-58	
SELENIUM	0	-2	
SILVER	0	-4	
SODIUM	0	16	
THALLIUM	0	0	
VANADIUM	0	0	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE09A May 09, 2008 19:29

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	545500	109.1
ANTIMONY	600	603	100.5
ARSENIC	100	102	102.0
BARIUM	500	508	101.6
BERYLLIUM	500	497	99.4
CADMIUM	1000	920	92.0
CALCIUM	500000	494700	98.9
CHROMIUM	500	485	97.0
COBALT	500	447	89.4
COPPER	500	518	103.6
IRON	200000	195300	97.7
LEAD	50	47	94.0
MAGNESIUM	500000	494600	98.9
MANGANESE	504	474	94.0
NICKEL	1000	896	89.6
POTASSIUM	20000	21150	105.8
SELENIUM	50	51	102.0
SILVER	200	212	106.0
SODIUM	20000	21450	107.3
THALLIUM	100	87	87.0
VANADIUM	500	488	97.6
ZINC	1000	918	91.8

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE09A May 09, 2008 21:18

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	532500	106.5
ANTIMONY	0	3	
ARSENIC	0	0	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	0	
CALCIUM	500000	490700	98.1
CHROMIUM	0	3	
COBALT	0	-2	
COPPER	0	1	
IRON	200000	189200	94.6
LEAD	0	1	
MAGNESIUM	500000	486100	97.2
MANGANESE	4	-3	
NICKEL	0	0	
POTASSIUM	0	-92	
SELENIUM	0	-3	
SILVER	0	-2	
SODIUM	0	7	
THALLIUM	0	1	
VANADIUM	0	0	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE09A May 09, 2008 21:23

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	548900	109.8
ANTIMONY	600	613	102.2
ARSENIC	100	102	102.0
BARIUM	500	497	99.4
BERYLLIUM	500	488	97.6
CADMIUM	1000	949	94.9
CALCIUM	500000	497400	99.5
CHROMIUM	500	482	96.4
COBALT	500	457	91.4
COPPER	500	511	102.2
IRON	200000	192600	96.3
LEAD	50	46	92.0
MAGNESIUM	500000	493100	98.6
MANGANESE	504	472	93.7
NICKEL	1000	922	92.2
POTASSIUM	20000	20750	103.8
SELENIUM	50	53	106.0
SILVER	200	211	105.5
SODIUM	20000	20880	104.4
THALLIUM	100	89	89.0
VANADIUM	500	498	99.6
ZINC	1000	939	93.9

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE09A May 09, 2008 23:12

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	537400	107.5
ANTIMONY	0	1	
ARSENIC	0	2	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	0	
CALCIUM	500000	489900	98.0
CHROMIUM	0	3	
COBALT	0	-2	
COPPER	0	0	
IRON	200000	191400	95.7
LEAD	0	1	
MAGNESIUM	500000	495400	99.1
MANGANESE	4	-4	
NICKEL	0	1	
POTASSIUM	0	-103	
SELENIUM	0	-2	
SILVER	0	-3	
SODIUM	0	-5	
THALLIUM	0	1	
VANADIUM	0	0	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE09A May 09, 2008 23:17

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	548800	109.8
ANTIMONY	600	607	101.2
ARSENIC	100	101	101.0
BARIUM	500	496	99.2
BERYLLIUM	500	493	98.6
CADMIUM	1000	938	93.8
CALCIUM	500000	502200	100.4
CHROMIUM	500	486	97.2
COBALT	500	453	90.6
COPPER	500	516	103.2
IRON	200000	194300	97.2
LEAD	50	47	94.0
MAGNESIUM	500000	491900	98.4
MANGANESE	504	472	93.7
NICKEL	1000	910	91.0
POTASSIUM	20000	20680	103.4
SELENIUM	50	51	102.0
SILVER	200	211	105.5
SODIUM	20000	20870	104.4
THALLIUM	100	88	88.0
VANADIUM	500	496	99.2
ZINC	1000	936	93.6

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE09A May 10, 2008 01:06

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	541300	108.3
ANTIMONY	0	3	
ARSENIC	0	2	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	0	
CALCIUM	500000	490300	98.1
CHROMIUM	0	3	
COBALT	0	-3	
COPPER	0	0	
IRON	200000	191700	95.9
LEAD	0	1	
MAGNESIUM	500000	486300	97.3
MANGANESE	4	-3	
NICKEL	0	1	
POTASSIUM	0	-132	
SELENIUM	0	-4	
SILVER	0	-3	
SODIUM	0	23	
THALLIUM	0	0	
VANADIUM	0	-1	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE09A May 10, 2008 01:11

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	546000	109.2
ANTIMONY	600	605	100.8
ARSENIC	100	101	101.0
BARIUM	500	493	98.6
BERYLLIUM	500	493	98.6
CADMIUM	1000	932	93.2
CALCIUM	500000	498500	99.7
CHROMIUM	500	481	96.2
COBALT	500	450	90.0
COPPER	500	508	101.6
IRON	200000	194400	97.2
LEAD	50	45	90.0
MAGNESIUM	500000	494500	98.9
MANGANESE	504	470	93.3
NICKEL	1000	903	90.3
POTASSIUM	20000	20490	102.5
SELENIUM	50	53	106.0
SILVER	200	209	104.5
SODIUM	20000	20680	103.4
THALLIUM	100	88	88.0
VANADIUM	500	494	98.8
ZINC	1000	928	92.8

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE09A May 10, 2008 04:12

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	535700	107.1
ANTIMONY	0	3	
ARSENIC	0	1	
BARIUM	0	0	
BERYLLIUM	0	0	
CADMIUM	0	0	
CALCIUM	500000	493100	98.6
CHROMIUM	0	4	
COBALT	0	-2	
COPPER	0	1	
IRON	200000	192500	96.3
LEAD	0	1	
MAGNESIUM	500000	486700	97.3
MANGANESE	4	-3	
NICKEL	0	1	
POTASSIUM	0	-87	
SELENIUM	0	-1	
SILVER	0	-3	
SODIUM	0	122	
THALLIUM	0	0	
VANADIUM	0	0	
ZINC	5	10	

SAMPLE: ICSAB

File: IYE09A May 10, 2008 04:17

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	546600	109.3
ANTIMONY	600	603	100.5
ARSENIC	100	102	102.0
BARIUM	500	495	99.0
BERYLLIUM	500	491	98.2
CADMIUM	1000	927	92.7
CALCIUM	500000	499500	99.9
CHROMIUM	500	487	97.4
COBALT	500	449	89.8
COPPER	500	509	101.8
IRON	200000	194700	97.4
LEAD	50	45	90.0
MAGNESIUM	500000	484500	96.9
MANGANESE	504	472	93.7
NICKEL	1000	897	89.7
POTASSIUM	20000	20570	102.8
SELENIUM	50	53	106.0
SILVER	200	209	104.5
SODIUM	20000	20850	104.3
THALLIUM	100	87	87.0
VANADIUM	500	495	99.0
ZINC	1000	928	92.8

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE10A May 10, 2008 15:54

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	531400	106.3
ANTIMONY	0	2	
ARSENIC	0	5	
CADMIUM	0	0	
CALCIUM	500000	483700	96.7
CHROMIUM	0	2	
COBALT	0	-2	
COPPER	0	0	
IRON	200000	190100	95.0
LEAD	0	2	
MAGNESIUM	500000	481700	96.3
NICKEL	0	1	
SELENIUM	0	2	
SILVER	0	-4	
SODIUM	0	60	
THALLIUM	0	0	
VANADIUM	0	1	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE10A May 10, 2008 15:59

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	531900	106.4
ANTIMONY	600	592	98.7
ARSENIC	100	103	103.0
CADMIUM	1000	914	91.4
CALCIUM	500000	488600	97.7
CHROMIUM	500	480	96.0
COBALT	500	446	89.2
COPPER	500	513	102.6
IRON	200000	191500	95.8
LEAD	50	45	90.0
MAGNESIUM	500000	484800	97.0
NICKEL	1000	899	89.9
SELENIUM	50	55	110.0
SILVER	200	206	103.0
SODIUM	20000	20750	103.8
THALLIUM	100	86	86.0
VANADIUM	500	486	97.2
ZINC	1000	913	91.3

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE10A May 10, 2008 17:49

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	539100	107.8
ANTIMONY	0	2	
ARSENIC	0	6	
CADMIUM	0	0	
CALCIUM	500000	495100	99.0
CHROMIUM	0	2	
COBALT	0	-2	
COPPER	0	1	
IRON	200000	194000	97.0
LEAD	0	3	
MAGNESIUM	500000	487200	97.4
NICKEL	0	1	
SELENIUM	0	1	
SILVER	0	-3	
SODIUM	0	309	
THALLIUM	0	1	
VANADIUM	0	1	
ZINC	5	9	

SAMPLE: ICSAB

File: IYE10A May 10, 2008 17:54

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	542100	108.4
ANTIMONY	600	593	98.8
ARSENIC	100	106	106.0
CADMIUM	1000	936	93.6
CALCIUM	500000	493100	98.6
CHROMIUM	500	484	96.8
COBALT	500	450	90.0
COPPER	500	504	100.8
IRON	200000	194500	97.3
LEAD	50	46	92.0
MAGNESIUM	500000	488600	97.7
NICKEL	1000	895	89.5
SELENIUM	50	52	104.0
SILVER	200	208	104.0
SODIUM	20000	21450	107.3
THALLIUM	100	87	87.0
VANADIUM	500	493	98.6
ZINC	1000	931	93.1

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE10A May 10, 2008 19:42

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	564700	112.9
ANTIMONY	0	3	
ARSENIC	0	4	
CADMIUM	0	0	
CALCIUM	500000	508600	101.7
CHROMIUM	0	3	
COBALT	0	-3	
COPPER	0	1	
IRON	200000	196700	98.4
LEAD	0	4	
MAGNESIUM	500000	511000	102.2
NICKEL	0	1	
SELENIUM	0	-1	
SILVER	0	0	
SODIUM	0	145	
THALLIUM	0	0	
VANADIUM	0	1	
ZINC	5	10	

SAMPLE: ICSAB

File: IYE10A May 10, 2008 19:47

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	556000	111.2
ANTIMONY	600	607	101.2
ARSENIC	100	106	106.0
CADMIUM	1000	969	96.9
CALCIUM	500000	505400	101.1
CHROMIUM	500	494	98.8
COBALT	500	460	92.0
COPPER	500	512	102.4
IRON	200000	196500	98.3
LEAD	50	49	98.0
MAGNESIUM	500000	501900	100.4
NICKEL	1000	903	90.3
SELENIUM	50	56	112.0
SILVER	200	217	108.5
SODIUM	20000	21770	108.9
THALLIUM	100	90	90.0
VANADIUM	500	518	103.6
ZINC	1000	953	95.3

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE10A May 10, 2008 22:32

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	562700	112.5
ANTIMONY	0	0	
ARSENIC	0	4	
CADMIUM	0	0	
CALCIUM	500000	508100	101.6
CHROMIUM	0	2	
COBALT	0	-2	
COPPER	0	0	
IRON	200000	197100	98.6
LEAD	0	4	
MAGNESIUM	500000	509500	101.9
NICKEL	0	1	
SELENIUM	0	2	
SILVER	0	-1	
SODIUM	0	129	
THALLIUM	0	1	
VANADIUM	0	0	
ZINC	5	10	

SAMPLE: ICSAB

File: IYE10A May 10, 2008 22:37

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	558600	111.7
ANTIMONY	600	596	99.3
ARSENIC	100	106	106.0
CADMIUM	1000	951	95.1
CALCIUM	500000	510300	102.1
CHROMIUM	500	491	98.2
COBALT	500	451	90.2
COPPER	500	511	102.2
IRON	200000	196400	98.2
LEAD	50	48	96.0
MAGNESIUM	500000	507100	101.4
NICKEL	1000	888	88.8
SELENIUM	50	57	114.0
SILVER	200	218	109.0
SODIUM	20000	21960	109.8
THALLIUM	100	89	89.0
VANADIUM	500	509	101.8
ZINC	1000	938	93.8

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE10A May 11, 2008 02:54

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	572900	114.6
ANTIMONY	0	2	
ARSENIC	0	4	
CADMIUM	0	0	
CALCIUM	500000	518400	103.7
CHROMIUM	0	3	
COBALT	0	-2	
COPPER	0	1	
IRON	200000	199800	99.9
LEAD	0	6	
MAGNESIUM	500000	520400	104.1
NICKEL	0	1	
SELENIUM	0	-1	
SILVER	0	0	
SODIUM	0	115	
THALLIUM	0	2	
VANADIUM	0	1	
ZINC	5	10	

SAMPLE: ICSAB

File: IYE10A May 11, 2008 02:59

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	571400	114.3
ANTIMONY	600	600	100.0
ARSENIC	100	106	106.0
CADMIUM	1000	961	96.1
CALCIUM	500000	513100	102.6
CHROMIUM	500	500	100.0
COBALT	500	455	91.0
COPPER	500	518	103.6
IRON	200000	198600	99.3
LEAD	50	48	96.0
MAGNESIUM	500000	517500	103.5
NICKEL	1000	893	89.3
SELENIUM	50	58	116.0
SILVER	200	221	110.5
SODIUM	20000	22190	110.9
THALLIUM	100	89	89.0
VANADIUM	500	513	102.6
ZINC	1000	951	95.1

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE12A May 12, 2008 17:43

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	529500	105.9
CALCIUM	500000	476400	95.3
IRON	200000	187800	93.9
MAGNESIUM	500000	475400	95.1
SODIUM	0	39	

SAMPLE: ICSAB

File: IYE12A May 12, 2008 17:48

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	528900	105.8
CALCIUM	500000	482200	96.4
IRON	200000	190200	95.1
MAGNESIUM	500000	487300	97.5
SODIUM	20000	21700	108.5

ICP INTERFERENCE CHECK SAMPLE

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Concentration Units: ug/L

SAMPLE: ICSA

File: IYE12A May 12, 2008 22:03

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	569300	113.9
CALCIUM	500000	513900	102.8
IRON	200000	196100	98.0
MAGNESIUM	500000	540800	108.2
SODIUM	0	86	

SAMPLE: ICSAB

File: IYE12A May 12, 2008 22:08

Analyte	TRUE	FOUND	% R
ALUMINUM	500000	581900	116.4
CALCIUM	500000	515700	103.1
IRON	200000	198600	99.3
MAGNESIUM	500000	546400	109.3
SODIUM	20000	22980	114.9

ICP SERIAL DILUTION

Lab Name: Katahdin Analytical Services **Client Field ID:** 044G00614L

Matrix: WATER **SDG Name:** SB2237

Lab Sample ID: SB2237-002L

Concentration Units: ug/L

Analyte	Sample Result	C	Dilution Result	C	% Difference	Q	M	MDLx5
ALUMINUM, TOTAL	19.60	B	152.53	B	678.2 ✓		P	14.0 = 700
ANTIMONY, TOTAL NO	2.70	B	10.21	B	278.1 ✓		P	1.5 = 75
ARSENIC, TOTAL NO	4.00	B	3.96	U	100.0 ✓		P	1.7 = 85
BARIUM, TOTAL	78.81		78.99		0.2		P	
BERYLLIUM, TOTAL	-0.06	U	0.25	U			P	
CADMIUM, TOTAL	-0.10	U	-0.18	U			P	
CALCIUM, TOTAL	627600.00		672100.00		7.1		P	
CHROMIUM, TOTAL NO	2.80	B	5.15	B	83.9 ✓		P	.38 = 40
COBALT, TOTAL NO	5.34	B	6.08	B	13.9 ✓		P	.28 = 14
COPPER, TOTAL	8.89	B	9.87	B	11.0 ✓		P	.80 = 40
IRON, TOTAL	1958.67		1975.67		0.9		P	
LEAD, TOTAL NO	4.44	B	9.11	B	105.2 ✓		P	1.4 = 70
MAGNESIUM, TOTAL	270500.00		280800.00		3.8		P	
MANGANESE, TOTAL	4112.00		4352.00		5.8		P	
NICKEL, TOTAL	16.52	B	18.76	B	13.6 ✓	E	P	.30 = 15
POTASSIUM, TOTAL	71080.00		70340.00		1.0		P	
SELENIUM, TOTAL	-2.71	U	-9.19	U			P	
SILVER, TOTAL	-0.09	U	0.55	U			P	
SODIUM, TOTAL	761333.33		786666.67		3.3		P	
THALLIUM, TOTAL	1.23	U	6.56	U			P	
VANADIUM, TOTAL	0.12	U	2.30	U			P	
ZINC, TOTAL	9.60	B	12.16	B	NO 26.7 ✓	E	P	.22 = 11

* DMS 5108

MEQUALIFY J

ONLY QUALIFY NICKEL ALREADY QUALIFIED DUE TO METHOD ~~BLK~~ PREPARATION BLANK CONTAMINATION

FORM IX - IN

ICP SERIAL DILUTION

Lab Name: Katahdin Analytical Services

Matrix: WATER

Client Field ID: FD04290801L

SDG Name: SB2237

Lab Sample ID: SB2237-004L

Concentration Units: ug/L

Analyte	Sample Result	C	Dilution Result	C	% Difference	Q	M
MERCURY, TOTAL	-0.01	U	-0.10	U			CV

INSTRUMENT DETECTION LIMITS

Lab Name: Katahdin Analytical Services **Instrument Code:** I

Instrument Name: THERMO ICAP 6500 **Date:** 2/20/2008

Concentration Units: ug/L

Analyte	CRDL	IDL	M
ALUMINUM	300	14.00	P
ANTIMONY	8.0	1.50	P
ARSENIC	8.0	1.70	P
BARIUM	5.0	0.28	P
BERYLLIUM	5.0	0.12	P
CADMIUM	10	0.10	P
CALCIUM	50	11.00	P
CHROMIUM	15	0.38	P
COBALT	30	0.28	P
COPPER	25	0.80	P
IRON	100	6.00	P
LEAD	5.0	1.40	P
MAGNESIUM	50	5.60	P
MANGANESE	5.0	0.68	P
NICKEL	40	0.30	P
POTASSIUM	1000	78.00	P
SELENIUM	10	2.20	P
SILVER	15	0.54	P
SODIUM	1000	18.00	P
THALLIUM	15	2.00	P
VANADIUM	25	0.52	P
ZINC	25	0.22	P

INSTRUMENT DETECTION LIMITS

Lab Name: Katahdin Analytical Services **Instrument Code:** H

Instrument Name: CETAC M6100 **Date:** 8/1/2007

Concentration Units: ug/L

Analyte	CRDL	IDL	M
MERCURY	0.20	0.02	CV

ICP INTERELEMENT CORRECTION FACTORS

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument Name: THERMO ICAP 6500 **Date:** 9/19/2007

Instrument ID: I

Analyte	Wavelength (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	Co	Cr	Cu	Mo	Ni	Ti	V
ALUMINUM	396.15	0.0	0.0002310	0.0	0.0	0.0	0.0	0.0	0.0492690	0.0	0.0	0.0
ANTIMONY	206.88	0.0000070	0.0	0.0000320	0.0	0.0	0.0135440	0.0	-0.0050900	-0.0006530	0.0	-0.0012130
ARSENIC	189.04	-0.0000020	0.0	-0.0002190	0.0	0.0	0.0004750	0.0	0.0014020	0.0	0.0	0.0
BARIUM	455.40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BERYLLIUM	313.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0003030	0.0005500
BORON	208.96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0308360	0.0	0.0	0.0
CADMIUM	226.50	0.0	0.0	0.0000780	0.0	-0.0000220	0.0	0.0	0.0	-0.0000800	-0.0000120	0.0
CALCIUM	315.89	0.0	0.0	0.0	0.0	0.0012890	-0.0004940	0.0	0.0	0.0	0.0	0.0
CHROMIUM	267.72	0.0	0.0	-0.0000070	0.0	0.0	0.0	0.0	-0.0000210	0.0	0.0	0.0000720
COBALT	228.62	0.0	0.0	0.0000160	0.0	0.0	-0.0000800	0.0	0.0000180	0.0000830	0.0019920	0.0
COPPER	327.40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0006350	0.0002980
IRON	259.94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0005620	0.0	0.0	0.0
LEAD	220.35	-0.0000820	0.0	0.0000350	0.0	-0.0000490	0.0	0.0000790	-0.0014420	0.0001840	-0.0000270	0.0
MAGNESIUM	285.21	0.0	0.0	-0.0000030	0.0	0.0	0.0006030	0.0	0.0	0.0	0.0	0.0
MANGANESE	257.61	0.0	0.0	0.0	0.0000260	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOLYBDENUM	202.03	0.0	0.0	0.0	0.0	0.0	0.0001080	0.0	0.0	0.0	0.0	-0.0001440
NICKEL	231.60	0.0	0.0	-0.0000400	0.0	0.0003390	0.0	0.0	0.0015690	0.0	0.0	0.0
SELENIUM	196.09	-0.0000020	0.0	-0.0000790	0.0	-0.0001540	0.0	0.0	0.0	0.0	0.0	-0.0000210
SILVER	328.07	0.0	0.0	-0.0001320	0.0	0.0	0.0	0.0	0.0	0.0	-0.0001650	0.0
THALLIUM	190.86	0.0	0.0	-0.0000020	0.0	0.0018720	0.0	-0.0000030	-0.0000300	0.0	-0.0015350	0.0005220
TITANIUM	334.90	0.0	0.0	0.0	0.0	0.0	0.0001290	0.0	0.0008550	0.0	0.0	0.0
VANADIUM	292.40	0.0	0.0	0.0000160	0.0	0.0	-0.0028800	0.0	-0.0077010	0.0	0.0004950	0.0
ZINC	206.20	0.0	0.0	0.0	0.0	0.0	-0.0005230	0.0	0.0	0.0	0.0	0.0

FORM XI - IN

Sample Data Summary A0000095

ICP LINEAR RANGES

Lab Name: Katahdin Analytical Services **Instrument Code:** I

Instrument Name: THERMO ICAP 6500 **Date:** 10/4/2007

Concentration Units: ug/L

Analyte	Integration Time (sec)	Linear Range	M
ALUMINUM	5.00	1000000	P
ANTIMONY	60.00	20000	P
ARSENIC	60.00	20000	P
BARIUM	5.00	20000	P
BERYLLIUM	5.00	20000	P
CADMIUM	60.00	20000	P
CALCIUM	5.00	1000000	P
CHROMIUM	10.00	20000	P
COBALT	60.00	20000	P
COPPER	10.00	20000	P
IRON	5.00	400000	P
LEAD	60.00	20000	P
MAGNESIUM	5.00	500000	P
MANGANESE	5.00	20000	P
NICKEL	10.00	20000	P
POTASSIUM	5.00	1000000	P
SELENIUM	60.00	20000	P
SILVER	10.00	2000	P
SODIUM	5.00	500000	P
THALLIUM	60.00	20000	P
VANADIUM	10.00	20000	P
ZINC	60.00	20000	P

PREPARATION LOG

Lab Name: Katahdin Analytical Services **QC Batch ID:** YE07HGW1

Matrix: WATER **SDG Name:** SB2237

Method: CV **Prep Date:** 05/07/2008

Client ID	Lab Sample ID	Initial (L)	Final (L)
LCSWYE07HGW1	LCSWYE07HGW1	0.025	0.025
PBWYE07HGW1	PBWYE07HGW1	0.025	0.025
044G00514	SB2237-001	0.025	0.025
044G00614	SB2237-002	0.025	0.025
044G00714	SB2237-003	0.025	0.025
FD04290801	SB2237-004	0.025	0.025
FD04290801P	SB2237-004P	0.025	0.025
FD04290801S	SB2237-004S	0.025	0.025
RB04290801	SB2237-005	0.025	0.025

PREPARATION LOG

Lab Name: Katahdin Analytical Services **QC Batch ID:** YE07ICW2

Matrix: WATER **SDG Name:** SB2237

Method: P **Prep Date:** 05/07/2008

Client ID	Lab Sample ID	Initial (L)	Final (L)
LCSWYE07ICW2	LCSWYE07ICW2	0.05	0.05
PBWYE07ICW2	PBWYE07ICW2	0.05	0.05
044G00514	SB2237-001	0.05	0.05
044G00614	SB2237-002	0.05	0.05
044G00614P	SB2237-002P	0.05	0.05
044G00614S	SB2237-002S	0.05	0.05
044G00714	SB2237-003	0.05	0.05
FD04290801	SB2237-004	0.05	0.05
RB04290801	SB2237-005	0.05	0.05

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: CETAC M6100 **File Name:** HYE08A

Date: 5/8/2008 **Method:** CV

Lab Sample ID	Client ID	D.F.	Time	Elements
Calibration Blank		1	9:27	Hg
Standard #1 (0.2 pp		1	9:29	Hg
Standard #2 (0.5 pp		1	9:31	Hg
Standard #3 (1.0 pp		1	9:33	Hg
Standard #4 (5.0 pp		1	9:35	Hg
Standard #5 (10.0 p		1	9:37	Hg
ICV		1	9:41	HG
ICB		1	9:43	HG
PQL		1	9:45	HG
LCSWYE07HGW1		1	9:47	HG
PBWYE07HGW1		1	9:49	HG
ZZZZZZ		1	9:51	
ZZZZZZ		1	9:53	
ZZZZZZ		1	9:55	
ZZZZZZ		1	9:58	
ZZZZZZ		1	10:00	
ZZZZZZ		1	10:02	
ZZZZZZ		1	10:04	
CCV		1	10:06	HG
CCB		1	10:08	HG
ZZZZZZ		1	10:10	
ZZZZZZ		1	10:12	
ZZZZZZ		1	10:15	
ZZZZZZ		1	10:17	
ZZZZZZ		1	10:19	
SB2237-001	044G00514	1	10:21	HG
SB2237-002	044G00614	1	10:23	HG
SB2237-003	044G00714	1	10:25	HG
SB2237-004	FD04290801	1	10:27	HG
SB2237-004P	FD04290801P	1	10:30	HG
CCV		1	10:32	HG
CCB		1	10:34	HG
SB2237-004S	FD04290801S	1	10:36	HG
SB2237-005	RB04290801	1	10:38	HG
ZZZZZZ		1	10:40	
ZZZZZZ		1	10:42	
ZZZZZZ		1	10:44	
SB2237-004L	FD04290801L	5	10:47	HG
CCV		1	10:49	HG
CCB		1	10:51	HG

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE07A

Date: 5/7/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements																			
Blank		1	14:34	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
Std 1		1	14:39	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICV		1	14:44	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICB		1	14:48	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CRI		1	14:53	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
PQL		1	14:58	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSA		1	15:03	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSAB		1	15:08	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCV		1	15:12	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	15:17	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ZZZZZZ		1	15:22																						
ZZZZZZ		1	15:26																						
ZZZZZZ		1	15:31																						
ZZZZZZ		1	15:36																						
LCSWYE07ICW2		1	15:41		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
PBWYE07ICW2		1	15:46	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ZZZZZZ		5	15:50																						
ZZZZZZ		1	15:55																						
ZZZZZZ		1	16:00																						
ZZZZZZ		1	16:05																						
CCV		1	16:09	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	16:14	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ZZZZZZ		1	16:19																						
ZZZZZZ		1	16:24																						
ZZZZZZ		1	16:29																						
ZZZZZZ		1	16:33																						
ZZZZZZ		1	16:38																						
ZZZZZZ		1	16:43																						
CRI		1	16:48	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
PQL		1	16:53	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSA		1	16:57	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSAB		1	17:02	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCV		1	17:07	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	17:12	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE09A

Date: 5/9/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements
Blank		1	17:02	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
Std 1		1	17:07	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ICV		1	17:11	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ICB		1	17:16	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
CRI		1	17:21	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
PQL		1	17:26	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ICSA		1	17:30	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ICSAB		1	17:35	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
CCV		1	17:40	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
CCB		1	17:45	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ZZZZZZ		1	17:49	
ZZZZZZ		1	17:54	
ZZZZZZ		1	17:59	
ZZZZZZ		1	18:04	
ZZZZZZ		1	18:08	
ZZZZZZ		1	18:13	
ZZZZZZ		1	18:18	
ZZZZZZ		1	18:23	
ZZZZZZ		1	18:27	
ZZZZZZ		1	18:32	
CCV		1	18:37	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
CCB		1	18:42	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ZZZZZZ		1	18:46	
ZZZZZZ		1	18:51	
ZZZZZZ		1	18:56	
ZZZZZZ		1	19:01	
ZZZZZZ		1	19:05	
ZZZZZZ		1	19:10	
ZZZZZZ		1	19:15	
CRI		1	19:20	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ICSA		1	19:24	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ICSAB		1	19:29	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
CCV		1	19:34	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
CCB		1	19:39	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ZZZZZZ		1	19:44	
ZZZZZZ		1	19:48	
ZZZZZZ		1	19:53	
ZZZZZZ		1	19:58	
ZZZZZZ		5	20:03	
ZZZZZZ		1	20:07	
ZZZZZZ		1	20:12	
ZZZZZZ		1	20:17	
ZZZZZZ		1	20:22	
ZZZZZZ		1	20:26	
CCV		1	20:31	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
CCB		1	20:36	AL SB AS BA BE CD CA CR CO CU FE PB MG MN NI K SE AG NA TL V ZN
ZZZZZZ		1	20:40	
ZZZZZZ		5	20:45	
ZZZZZZ		1	20:50	
ZZZZZZ		1	20:55	

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE09A

Date: 5/9/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements											
ZZZZZZ		1	20:59												
ZZZZZZ		1	21:04												
ZZZZZZ		1	21:09												
CRI		1	21:14	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ICSA		1	21:18	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ICSAB		1	21:23	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
CCV		1	21:28	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
CCB		1	21:33	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ZZZZZZ		1	21:38												
ZZZZZZ		1	21:42												
ZZZZZZ		1	21:47												
ZZZZZZ		1	21:52												
ZZZZZZ		1	21:57												
ZZZZZZ		1	22:02												
ZZZZZZ		1	22:06												
ZZZZZZ		1	22:11												
ZZZZZZ		1	22:16												
ZZZZZZ		1	22:21												
CCV		1	22:25	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
CCB		1	22:30	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ZZZZZZ		1	22:35												
ZZZZZZ		1	22:40												
ZZZZZZ		1	22:44												
ZZZZZZ		2	22:49												
ZZZZZZ		2	22:54												
ZZZZZZ		1	22:58												
ZZZZZZ		1	23:03												
CRI		1	23:08	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ICSA		1	23:12	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ICSAB		1	23:17	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
CCV		1	23:22	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
CCB		1	23:27	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ZZZZZZ		5	23:32												
ZZZZZZ		1	23:36												
ZZZZZZ		1	23:41												
ZZZZZZ		1	23:46												
ZZZZZZ		1	23:50												
ZZZZZZ		1	23:55												
ZZZZZZ		1	0:00												
ZZZZZZ		1	0:04												
ZZZZZZ		1	0:09												
ZZZZZZ		1	0:14												
CCV		1	0:18	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
CCB		1	0:23	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN
ZZZZZZ		1	0:28												
ZZZZZZ		1	0:32												
ZZZZZZ		1	0:37												
ZZZZZZ		1	0:42												
ZZZZZZ		5	0:46												
ZZZZZZ		5	0:51												
CRI		1	0:56	AL	SB	AS	BA	BE	CD CA CR CO CU FE PB MG MN	NI	K	SE	AG NA	TL	V ZN

FORM XIV - IN

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE09A

Date: 5/10/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements																			
PQL		1	1:01	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSA		1	1:06	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSAB		1	1:11	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCV		1	1:16	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	1:20	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
SB2237-001	044G00514	1	1:25				BA	BE		CA						MG	MN		K						
SB2237-002	044G00614	1	1:30		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG		TL	V	ZN
SB2237-002L	044G00614L	5	1:35		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG		TL	V	ZN
SB2237-002P	044G00614P	1	1:40		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG		TL	V	ZN
SB2237-002S	044G00614S	1	1:45		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG		TL	V	ZN
SB2237-003	044G00714	1	1:50		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
SB2237-004	FD04290801	1	1:55		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
SB2237-005	RB04290801	1	1:59		SB	AS	BA	BE	CD	CA	CR	CO	CU		PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ZZZZZZ		1	2:04																						
ZZZZZZ		5	2:09																						
CCV		1	2:14	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	2:18	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ZZZZZZ		5	2:23																						
ZZZZZZ		1	2:28																						
ZZZZZZ		1	2:33																						
ZZZZZZ		1	2:38																						
ZZZZZZ		1	2:42																						
ZZZZZZ		1	2:47																						
ZZZZZZ		1	2:52																						
ZZZZZZ		1	2:57																						
ZZZZZZ		1	3:02																						
ZZZZZZ		1	3:06																						
CCV		1	3:11	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	3:16	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ZZZZZZ		1	3:20																						
ZZZZZZ		5	3:25																						
ZZZZZZ		1	3:30																						
ZZZZZZ		1	3:35																						
ZZZZZZ		1	3:39																						
ZZZZZZ		1	3:44																						
ZZZZZZ		1	3:49																						
ZZZZZZ		1	3:54																						
CCV		1	3:58	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	4:03	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
PQL		1	4:08	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSA		1	4:12	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
ICSAB		1	4:17	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCV		1	4:22	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN
CCB		1	4:27	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	NI	K	SE	AG	NA	TL	V	ZN

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE10A

Date: 5/10/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements							
Blank		1	15:26	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
Std 1		1	15:31	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ICV		1	15:35	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ICB		1	15:40	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
CRI		1	15:45	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
PQL		1	15:49	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ICSA		1	15:54	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ICSAB		1	15:59	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
CCV		1	16:04	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
CCB		1	16:08	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
LCSWYE07ICW2		1	16:13	AL	FE						
ZZZZZZ		2	16:18								
ZZZZZZ		5	16:23								
ZZZZZZ		5	16:28								
ZZZZZZ		10	16:32								
ZZZZZZ		50	16:37								
ZZZZZZ		10	16:42								
ZZZZZZ		10	16:47								
ZZZZZZ		10	16:52								
ZZZZZZ		10	16:56								
CCV		1	17:01	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
CCB		1	17:06	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ZZZZZZ		50	17:11								
ZZZZZZ		10	17:15								
ZZZZZZ		10	17:20								
ZZZZZZ		10	17:25								
ZZZZZZ		10	17:30								
ZZZZZZ		10	17:35								
CRI		1	17:39	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
PQL		1	17:44	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ICSA		1	17:49	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ICSAB		1	17:54	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
CCV		1	17:59	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
CCB		1	18:03	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ZZZZZZ		5	18:08								
ZZZZZZ		5	18:13								
ZZZZZZ		5	18:18								
ZZZZZZ		1	18:23								
ZZZZZZ		1	18:27								
ZZZZZZ		1	18:32								
ZZZZZZ		1	18:37								
ZZZZZZ		1	18:42								
ZZZZZZ		1	18:46								
ZZZZZZ		1	18:51								
CCV		1	18:56	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
CCB		1	19:00	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V	ZN
ZZZZZZ		1	19:05								
ZZZZZZ		1	19:10								
ZZZZZZ		1	19:14								
ZZZZZZ		1	19:19								

FORM XIV - IN

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE10A

Date: 5/10/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements								
ZZZZZZ		1	19:24									
ZZZZZZ		1	19:28									
CRI		1	19:33	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
PQL		1	19:38	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ICSA		1	19:42	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ICSAB		1	19:47	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
CCV		1	19:52	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
CCB		1	19:57	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ZZZZZZ		1	20:02									
ZZZZZZ		1	20:06									
ZZZZZZ		1	20:11									
ZZZZZZ		5	20:16									
ZZZZZZ		1	20:20									
ZZZZZZ		1	20:25									
ZZZZZZ		1	20:30									
ZZZZZZ		1	20:34									
ZZZZZZ		1	20:39									
ZZZZZZ		1	20:44									
CCV		1	20:48	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
CCB		1	20:53	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ZZZZZZ		1	20:58									
ZZZZZZ		1	21:03									
ZZZZZZ		1	21:07									
ZZZZZZ		2	21:12									
ZZZZZZ		1	21:17									
ZZZZZZ		1	21:21									
ZZZZZZ		1	21:26									
ZZZZZZ		2	21:31									
ZZZZZZ		1	21:35									
ZZZZZZ		1	21:40									
CCV		1	21:45	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
CCB		1	21:49	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ZZZZZZ		1	21:54									
ZZZZZZ		1	21:59									
ZZZZZZ		5	22:04									
ZZZZZZ		1	22:08									
ZZZZZZ		1	22:13									
ZZZZZZ		1	22:18									
ZZZZZZ		1	22:23									
PQL		1	22:27	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ICSA		1	22:32	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ICSAB		1	22:37	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
CCV		1	22:42	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
CCB		1	22:47	AL SB AS	CD CA CR CO CU FE PB MG	NI	SE	AG NA	TL	V ZN		
ZZZZZZ		1	22:51									
ZZZZZZ		1	22:56									
ZZZZZZ		1	23:01									
ZZZZZZ		1	23:05									
ZZZZZZ		1	23:10									
ZZZZZZ		1	23:15									
ZZZZZZ		1	23:20									

FORM XIV - IN

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE10A

Date: 5/10/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements											
ZZZZZZ		1	23:24												
ZZZZZZ		1	23:29												
ZZZZZZ		1	23:34												
CCV		1	23:39	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCB		1	23:43	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
ZZZZZZ		1	23:48																		
ZZZZZZ		1	23:53																		
ZZZZZZ		1	23:58																		
ZZZZZZ		1	0:02																		
ZZZZZZ		1	0:07																		
ZZZZZZ		1	0:12																		
ZZZZZZ		1	0:17																		
ZZZZZZ		1	0:22																		
ZZZZZZ		1	0:26																		
ZZZZZZ		1	0:31																		
CCV		1	0:36	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCB		1	0:41	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
ZZZZZZ		5	0:45																		
ZZZZZZ		1	0:50																		
ZZZZZZ		1	0:55																		
ZZZZZZ		1	1:00																		
SB2237-001	044G00514	5	1:04	AL	SB	AS	CD		CR	CO	CU	FE	PB		NI	SE	AG	NA	TL	V	ZN
ZZZZZZ		3	1:09																		
ZZZZZZ		15	1:14																		
ZZZZZZ		3	1:19																		
ZZZZZZ		3	1:24																		
SB2237-003	044G00714	1	1:29	AL								FE									
CCV		1	1:33	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCB		1	1:38	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
SB2237-004	FD04290801	1	1:43	AL								FE									
SB2237-005	RB04290801	1	1:48	AL								FE									
ZZZZZZ		1	1:53																		
ZZZZZZ		1	1:57																		
ZZZZZZ		1	2:02																		
ZZZZZZ		1	2:07																		
ZZZZZZ		2	2:12																		
ZZZZZZ		1	2:16																		
ZZZZZZ		1	2:21																		
ZZZZZZ		1	2:26																		
CCV		1	2:31	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCB		1	2:35	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCV		1	2:40	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCB		1	2:45	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
PQL		1	2:50	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
ICSA		1	2:54	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
ICSAB		1	2:59	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCV		1	3:04	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN
CCB		1	3:09	AL	SB	AS	CD	CA	CR	CO	CU	FE	PB	MG	NI	SE	AG	NA	TL	V	ZN

FORM XIV - IN

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE12A

Date: 5/12/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements			
Blank		1	17:19 AL	CA	FE	MG	NA
Std 1		1	17:24 AL	CA	FE	MG	NA
ICV		1	17:29 AL	CA	FE	MG	NA
ICB		1	17:33 AL	CA	FE	MG	NA
PQL		1	17:38 AL	CA	FE	MG	NA
ICSA		1	17:43 AL	CA	FE	MG	NA
ICSAB		1	17:48 AL	CA	FE	MG	NA
CCV		1	17:53 AL	CA	FE	MG	NA
CCB		1	17:57 AL	CA	FE	MG	NA
ZZZZZZ		1	18:02				
ZZZZZZ		1	18:07				
ZZZZZZ		1	18:11				
ZZZZZZ		2	18:16				
ZZZZZZ		2	18:21				
ZZZZZZ		5	18:25				
SB2237-002	044G00614	3	18:30 AL		FE		NA
SB2237-002L	044G00614L	15	18:35 AL		FE		NA
SB2237-002S	044G00614S	3	18:39 AL		FE		NA
SB2237-002P	044G00614P	3	18:44 AL		FE		NA
CCV		1	18:49 AL	CA	FE	MG	NA
CCB		1	18:54 AL	CA	FE	MG	NA
ZZZZZZ		1	18:58				
ZZZZZZ		1	19:03				
ZZZZZZ		1	19:08				
ZZZZZZ		1	19:13				
ZZZZZZ		1	19:17				
ZZZZZZ		1	19:22				
ZZZZZZ		1	19:27				
ZZZZZZ		1	19:32				
ZZZZZZ		5	19:36				
ZZZZZZ		1	19:41				
CCV		1	19:46 AL	CA	FE	MG	NA
CCB		1	19:50 AL	CA	FE	MG	NA
ZZZZZZ		1	19:55				
ZZZZZZ		1	20:00				
ZZZZZZ		1	20:05				
ZZZZZZ		1	20:09				
ZZZZZZ		1	20:14				
ZZZZZZ		1	20:19				
ZZZZZZ		1	20:24				
ZZZZZZ		1	20:28				
ZZZZZZ		1	20:33				
ZZZZZZ		1	20:38				
CCV		1	20:43 AL	CA	FE	MG	NA
CCB		1	20:47 AL	CA	FE	MG	NA
ZZZZZZ		1	20:52				
ZZZZZZ		1	20:57				
ZZZZZZ		1	21:01				
ZZZZZZ		1	21:06				
ZZZZZZ		1	21:11				

FORM XIV - IN

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SB2237

Instrument ID: THERMO ICAP 6500 **File Name:** IYE12A

Date: 5/12/2008 **Method:** P

Lab Sample ID	Client ID	D.F.	Time	Elements											
ZZZZZZ		1	21:16												
ZZZZZZ		1	21:20												
ZZZZZZ		5	21:25												
ZZZZZZ		1	21:30												
ZZZZZZ		1	21:35												
CCV		1	21:39	AL		CA		FE		MG		NA			
CCB		1	21:44	AL		CA		FE		MG		NA			
CCV		1	21:49	AL		CA		FE		MG		NA			
CCB		1	21:53	AL		CA		FE		MG		NA			
PQL		1	21:58	AL		CA		FE		MG		NA			
ICSA		1	22:03	AL		CA		FE		MG		NA			
ICSAB		1	22:08	AL		CA		FE		MG		NA			
CCV		1	22:13	AL		CA		FE		MG		NA			
CCB		1	22:17	AL		CA		FE		MG		NA			

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CTO 17 CNC CHARLESTON
SB2237

Sample Receipt

The following samples were received on May 2, 2008 and were logged in under Katahdin Analytical Services work order number SB2237 for a hardcopy due date of May 28, 2008.

KATAHDIN Sample No.	TTNUS Sample Identification
SB2237-1	044G00514
SB2237-2	044G00614
SB2237-3	044G00714
SB2237-4	FD04290801
SB2237-5	RB04290801

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

We certify that the test results provided in this report meet all the requirements of the NELAC standards unless otherwise noted in this narrative or in the Report of Analysis.

Sample analyses have been performed by the methods as noted herein.

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact your Katahdin Analytical Services Project Manager, **Andrea J. Colby**. This narrative is an integral part of the Report of Analysis.

Metals Analysis

The samples of Katahdin Work Order SB2237 were prepared and analyzed for metals in accordance with the "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846. 2nd edition, 1982 (revised 1984), 3rd edition, 1986, and Updates I, II, IIA, III, IIIA and IIIB 1996, 1998 & 2004, Office of Solid Waste and Emergency Response, U.S. EPA.

Inductively-Coupled Plasma Atomic Emission Spectroscopic Analysis (ICP)

Aqueous-matrix Katahdin Sample Numbers SB2237-(1-5) were digested for ICP analysis on 05/07/08 (QC Batch YE07ICW2) in accordance with USEPA Method 3010A. Katahdin Sample Number SB2237-2 was prepared with duplicate matrix-spiked aliquots.

ICP analyses of Katahdin Work Order SB2237 sample digestates were performed using a Thermo iCAP 6500 ICP spectrometer in accordance with USEPA Method 6010B. All samples were

analyzed within holding times and all analytical run QC criteria were met, with the following comments or exceptions:

Some of the results for run QC samples (ICV, ICB, CCV, CCB, ICSA, and ICSAB) included in the accompanying data package may have exceeded acceptance limits for some elements. Please note that all client samples and batch QC samples associated with out-of-control results for run QC samples were subsequently reanalyzed for the analytes in question.

Analysis of Mercury by Cold Vapor Atomic Absorption (CVAA)

Aqueous-matrix Katahdin Sample Numbers SB2237-(1-5) were digested for mercury analysis on 05/07/08 (QC Batch YE07HGW1) in accordance with USEPA Method 7470A. Katahdin Sample Number SB2237-4 was prepared with duplicate matrix-spiked aliquots.

Mercury analyses of Katahdin Work Order SB2237 sample digestates were performed using a Cetac M6100 automated mercury analyzer in accordance with USEPA Method 7470A. All samples were analyzed within holding times and all analytical run QC criteria were met.

Matrix QC Summary

The measured recovery of silver in the matrix-spiked aliquots of Katahdin Sample Number SB2237-2 is outside the laboratory's acceptance criteria (75% - 125% recovery of the added element, if the native concentration is less than four times the amount added).

The measured recovery of mercury in the matrix-spiked aliquots of Katahdin Sample Number SB2237-4 is within the laboratory's acceptance criteria (75% - 125% recovery of the added element, if the native concentration is less than four times the amount added).

The matrix-spike duplicate analyses of Katahdin Sample Numbers SB2237-(2 and 4) are within the laboratory's acceptance limit (<20% relative difference between duplicate matrix-spiked aliquots) for all analytes.

The serial dilution analysis of Katahdin Sample Number SB2237-2 is outside the laboratory's acceptance limit (<10% relative percent difference, if the concentration in the original sample is greater than 50 times the IDL) for nickel and zinc. The measured nickel and zinc concentrations of this sample are below the PQL.

The serial dilution analysis of Katahdin Sample Number SB2237-4 is within the laboratory's acceptance limit (<10% relative percent difference, if the concentration in the original sample is greater than 50 times the IDL) for mercury.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Operations Manager or the Quality Assurance Officer as verified by the following signature.

Leslie Dimond
5.27.08

Leslie Dimond
Quality Assurance Officer

Katahdin Analytical Services, Inc. **Sample Receipt Condition Report**

Client: Tetra Tech	KAS PM: ADC	Sampled By: Client
Project:	KIMS Entry By: DJ	Delivered By: FEDEX
KAS Work Order#: SB2237	KIMS Review By: ADC	Received By: DJ
SDG #:	Cooler: 1 of 1	Date/Time Rec.: 5/28 1000

Receipt Criteria	Y	N	EX*	NA	Comments and/or Resolution
1. Custody seals present / intact?	X				
2. Chain of Custody present in cooler?	X				
3. Chain of Custody signed by client?	X				
4. Chain of Custody matches samples?	X				
5. Temperature Blanks present?	X				Temp (°C): 0.9
6. Samples received at < 6 °C w/o freezing? (ice) or ice packs present? (Y) or N	X				Cooler temp. (°C): (if no temp blank)
7. Volatiles free of headspace?					
Aqueous: No bubble larger than a pea				X	
Soil/Sediment:					
Received in airtight container?				X	
Received in methanol?				X	
Methanol covering soil?				X	
8. Trip Blank present in cooler?				X	
9. Proper sample containers and volume?	X				
10. Samples within hold time upon receipt?	X				
11. Aqueous samples properly preserved?					
Metals, COD, NH3, TKN, O/G, phenol, TPO4, N+N, TOC, DRO, TPH – pH <2	X				
Sulfide - >9				X	
Cyanide – pH >12				X	
12. Corrective Action Report Filed?				✓	

* Log-In Notes to Exceptions: document any problems with samples or discrepancies or pH adjustments

Katahdin ANALYTICAL SERVICES
600 Technology Way
Scarborough, ME 04074
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

COC. 042908-1

PLEASE BEAR DOWN AND PRINT LEGIBLY IN PEN

Client: TETRA TECH
Contact: CHRIS PIKE
Phone #: (412) 921-8861
Fax #: ( )
Address: 661 ANDERSEN DR. FOSTER PLAZA 7
City: Pittsburgh
State: PA
Zip Code: 15220
Purchase Order #:
Proj. Name / No.: CTO 017 AOC 721
Katahdin Quote #:
Bill (if different than above):
Address:
Sampler (Print / Sign): Gary Gunter / GARY GUNTER
Copies To:

LAB USE ONLY
WORK ORDER #: 352237
KATAHDIN PROJECT NUMBER

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT
AIRBILL NO:
TEMP°C ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	TAL METALS HNO3 (Filt. ☐Y ☒N)	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N
	044G00514	4/29/08/1101	GW	1	1									
	044G00614	4/29/08/1347	GW	1	1									
	044G00714	4/29/08/1705	GW	1	1									
	FD04290801	4/29/08/ -	GW	1	1									
	RB04290801	4/29/08/1445	DI	1	1									
	TEMP BLANK	- / -	DI	1										
		/												
		/												
		/												
		/												
		/												
		/												
		/												
		/												
		/												
		/												

COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
Gary Gunter	4/30/08/1400	FED. EXPRESS			
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
		5/08/11			0000006

THE TERMS AND CONDITIONS ON THE REVERSE SIDE HEREOF SHALL GOVERN

ORIGINAL

Katahdin
ANALYTICAL SERVICES

Katahdin Analytical Services

Login Chain of Custody Report (lno1)

May. 05, 2008
09:13 AM

Login Number: SB2237

Account: TETRAT001 Web
Tetra Tech NUS, Inc.

Project: TETRAT721001

Login Information

ANALYSIS INSTRUCTIONS	:
CHECK NO.	:
CLIENT PO#	: 1020744
COOLER TEMPERATURE	: 0.9
DELIVERY SERVICES	: FEDEX
EDD FORMAT	: KAS087QC-TXT
PM	: AJC
PROJECT NAME	: CTO 17 CNC Charleston
QC LEVEL	: IV
REGULATORY LIST	: NFESC
REPORT INSTRUCTIONS	: Rpt to IDL. Data summary needs all forms. Send Tobrena rpt & EDD on 2 CDs, no hc. Send Chris 1 CD w/ PDF & EDD.
SDG ID	:
SDG STATUS	:

Primary Report Address:

Tobrena Skeen
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh,PA 15220

Primary Invoice Address:

Accounts Payable
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh,PA 15220

Report CC Addresses:

Chris Pike
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh,PA 15220

Invoice CC Addresses:

Laboratory Sample ID	Client Sample Number	Collect Date/Time	Receive Date	PR	Verbal Date	Due Date	Mailed
SB2237-1	044G00514	29-APR-08 11:01	02-MAY-08			28-MAY-08	

Matrix		Product	Hold Date (shortest)	Bottle Type	Bottle Count	Comments
Aqueous	P	TAL-METALS-SW846			1	

SW3010-PREP	SW6010-ALUMINUM	SW6010-ANTIMONY
SW6010-ARSENIC	SW6010-BARIUM	SW6010-BERYLLIUM
SW6010-CADMIUM	SW6010-CALCIUM	SW6010-CHROMIUM
SW6010-COBALT	SW6010-COPPER	SW6010-IRON
SW6010-LEAD	SW6010-MAGNESIUM	SW6010-MANGANESE
SW6010-NICKEL	SW6010-POTASSIUM	SW6010-SELENIUM
SW6010-SILVER	SW6010-SODIUM	SW6010-THALLIUM
SW6010-VANADIUM	SW6010-ZINC	SW7470-MERCURY

SB2237-2	044G00614	29-APR-08 13:47	02-MAY-08			28-MAY-08	

Matrix		Product	Hold Date (shortest)	Bottle Type	Bottle Count	Comments
Aqueous	P	TAL-METALS-SW846			1	

SW3010-PREP	SW6010-ALUMINUM	SW6010-ANTIMONY
SW6010-ARSENIC	SW6010-BARIUM	SW6010-BERYLLIUM
SW6010-CADMIUM	SW6010-CALCIUM	SW6010-CHROMIUM
SW6010-COBALT	SW6010-COPPER	SW6010-IRON
SW6010-LEAD	SW6010-MAGNESIUM	SW6010-MANGANESE
SW6010-NICKEL	SW6010-POTASSIUM	SW6010-SELENIUM
SW6010-SILVER	SW6010-SODIUM	SW6010-THALLIUM
SW6010-VANADIUM	SW6010-ZINC	SW7470-MERCURY

Katahdin
ANALYTICAL SERVICES

Katahdin Analytical Services

Login Chain of Custody Report (lno1)

May. 05, 2008
09:13 AM

Login Number: SB2237

Account: TETRAT001 Web
Tetra Tech NUS, Inc.

Project: TETRAT721001

Laboratory Sample ID	Client Sample Number	Collect Date/Time	Receive Date	PR	Verbal Date	Due Date	Mailed
SB2237-3	044G00714	29-APR-08 17:05	02-MAY-08			28-MAY-08	

Matrix		Product	Hold Date (shortest)	Bottle Type	Bottle Count	Comments
Aqueous	P	TAL-METALS-SW846			1	

SW3010-PREP	SW6010-ALUMINUM	SW6010-ANTIMONY
SW6010-ARSENIC	SW6010-BARIUM	SW6010-BERYLLIUM
SW6010-CADMIUM	SW6010-CALCIUM	SW6010-CHROMIUM
SW6010-COBALT	SW6010-COPPER	SW6010-IRON
SW6010-LEAD	SW6010-MAGNESIUM	SW6010-MANGANESE
SW6010-NICKEL	SW6010-POTASSIUM	SW6010-SELENIUM
SW6010-SILVER	SW6010-SODIUM	SW6010-THALLIUM
SW6010-VANADIUM	SW6010-ZINC	SW7470-MERCURY

SB2237-4	FD04290801	29-APR-08 00:00	02-MAY-08	28-MAY-08	

Matrix		Product	Hold Date (shortest)	Bottle Type	Bottle Count	Comments
Aqueous	P	TAL-METALS-SW846			1	

SW3010-PREP	SW6010-ALUMINUM	SW6010-ANTIMONY
SW6010-ARSENIC	SW6010-BARIUM	SW6010-BERYLLIUM
SW6010-CADMIUM	SW6010-CALCIUM	SW6010-CHROMIUM
SW6010-COBALT	SW6010-COPPER	SW6010-IRON
SW6010-LEAD	SW6010-MAGNESIUM	SW6010-MANGANESE
SW6010-NICKEL	SW6010-POTASSIUM	SW6010-SELENIUM
SW6010-SILVER	SW6010-SODIUM	SW6010-THALLIUM
SW6010-VANADIUM	SW6010-ZINC	SW7470-MERCURY

SB2237-5	RB04290801	29-APR-08 14:45	02-MAY-08	28-MAY-08	

Matrix		Product	Hold Date (shortest)	Bottle Type	Bottle Count	Comments
Aqueous	P	TAL-METALS-SW846			1	

SW3010-PREP	SW6010-ALUMINUM	SW6010-ANTIMONY
SW6010-ARSENIC	SW6010-BARIUM	SW6010-BERYLLIUM
SW6010-CADMIUM	SW6010-CALCIUM	SW6010-CHROMIUM
SW6010-COBALT	SW6010-COPPER	SW6010-IRON
SW6010-LEAD	SW6010-MAGNESIUM	SW6010-MANGANESE
SW6010-NICKEL	SW6010-POTASSIUM	SW6010-SELENIUM
SW6010-SILVER	SW6010-SODIUM	SW6010-THALLIUM
SW6010-VANADIUM	SW6010-ZINC	SW7470-MERCURY

Total Samples: *5* ***Total Analyses:*** *5*

0000008

RAW RESULTS VERIFICATION

SB2237-002

Acquire Date: 10-May-2008 1:30 am

Sample Type: Unknown

Elem	Avg	Units	Stddev	%RSD	Intensity
Ag3280_	-.0865	ug/L	0.1983	229.3547	-21.62
Al3961_	11.78	ug/L	12.0096	101.9586	57.12
As1891_	4.004	ug/L	0.8722	21.7859	-0.55
B_2089_	812.0	ug/L	0.1465	0.0180	885.73
Ba4554_	78.81	ug/L	0.7628	0.9680	2,866.07
Be3130_	-.0578	ug/L	0.0292	50.5528	-4.76
Ca3158_	627600.	ug/L	1,714.5600	0.2732	449,600.03
Cd2265_	-.0968	ug/L	0.0340	35.1632	2.41
Co2286_	5.337	ug/L	0.1580	2.9605	19.51
Cr2677_	2.799	ug/L	0.0557	1.9883	42.56
Cu3273_	8.887	ug/L	0.5528	6.2204	77.79
Fe2599_	5982.	ug/L	9.7200	0.1625	5,767.10
K_7664_	71080.	ug/L	298.8829	0.4205	32,643.92
Mg2852	270500.	ug/L	703.0846	0.2600	473,663.05
Mn2576	4112.	ug/L	10.0430	0.2443	22,042.20
Mo2020	6.320	ug/L	0.2255	3.5677	16.32
Na5895_	F 2053000.	ug/L	32,012.8772	1.5592	3,096,269.69
Ni2316_	16.52	ug/L	0.0838	0.5073	23.28
Pb2203_	4.442	ug/L	0.0515	1.1600	2.33
Sb2068_	2.696	ug/L	0.7852	29.1245	1.01
Se1960_	-2.711	ug/L	2.7968	103.1571	0.82
Si2516_	14710.	ug/L	24.0505	0.1635	3,653.81
Sn1899_	2.236	ug/L	0.6656	29.7676	1.96
Sr4215_	2844.	ug/L	17.1833	0.6041	118,583.22
Ti3349_	2.734	ug/L	0.4867	17.8001	55.83
Tl1908_	1.234	ug/L	0.0401	3.2489	-3.59
V_2924_	.1158	ug/L	0.1440	124.3354	0.06
Y_2243_	6536.2	Cts/S	0.6555	0.0100	6,536.16
Y_3600_	13102.	Cts/S	44.0968	0.3366	13,101.78
Y_3600_	171230.	Cts/S	387.8213	0.2265	171,231.44
Zn2062_	9.600	ug/L	0.1621	1.6887	30.33

Katahdin Analytical Services 4000268

APPENDIX C

SUPPORTING INFORMATION FOR HUMAN HEALTH RISK ASSESSMENT

C-1 RAGS Part D Tables
C-2 ProUCL Printouts
C-3 Sample Calculations

APPENDIX C-1

RAGS-PART D TABLES

RAGS Part D Table 1

Selection of Exposure Pathways

TABLE 1

SELECTION OF EXPOSURE PATHWAYS
AOC 721 - REMEDIAL INVESTIGATION
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Adolescent trespassers may contact surface soil while at the site.
		Air	AOC 721	Typical Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust during normal work activities.
				Trespassers	Adolescent	Inhalation	Quant	Adolescent trespassers may be exposed to fugitive dust while at the site.
Current/Future	Groundwater	Groundwater	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not expected to have contact with groundwater.
				Trespassers	Adolescent	Ingestion Dermal	None None	Adolescent trespassers are not expected to be exposed to groundwater.
		Air	AOC 721	Typical Industrial Worker	Adult	Inhalation	None	No VOCs selected as COPCs.
				Trespassers	Adolescent	Inhalation	None	No VOCs selected as COPCs.
Current/Future	Surface Water	Surface Water	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not expected to be exposed to surface water.
				Trespassers	Adolescent	Ingestion Dermal	None None	Adolescent trespassers are not expected to be exposed to surface water because surface water at the site is limited to a drainage ditch and a small pond.
Current/Future	Sediment	Sediment	AOC 721	Typical Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not expected to be exposed to sediment.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Adolescent trespassers may be exposed to sediment while at the site.
Future	Surface Soil	Surface Soil	AOC 721	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	Child recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	Adult recreational users may contact surface soil while at the site.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
		Air	AOC 721	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust during excavation activities.
				Recreational Users	Child	Inhalation	Quant	Child recreational users may be exposed to fugitive dust while at the site.
					Adult	Inhalation	Quant	Adult recreational users may be exposed to fugitive dust while at the site.
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

TABLE 1

SELECTION OF EXPOSURE PATHWAYS
AOC 721 - REMEDIAL INVESTIGATION
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	AOC 721	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with groundwater during excavation activities.
				Recreational Users	Child	Ingestion Dermal	None None	Child recreational users are not expected to be exposed to groundwater.
					Adult	Ingestion Dermal	None None	Adult recreational users are not expected to be exposed to groundwater.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
		Air	AOC 721	Construction Workers	Adult	Inhalation	None	No VOCs selected as COPCs.
				Recreational Users	Child	Ingestion Dermal	None None	No VOCs selected as COPCs.
					Adult	Ingestion Dermal	None None	No VOCs selected as COPCs.
				Residents	Child	Inhalation	None	No VOCs selected as COPCs.
					Adult	Inhalation	None	
Future	Surface Water	Surface Water	AOC 721	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not expected to be exposed to surface water.
				Recreational Users	Child	Ingestion Dermal	None None	Child and adult recreational users are not expected to be exposed to surface water because surface water at the site is limited to a drainage ditch and a small pond.
					Adult	Ingestion Dermal	None None	
				Residents	Child	Ingestion Dermal	None None	Child and adult residents are not expected to be exposed to surface water because surface water at the site is limited to a drainage ditch and a small pond.
					Adult	Ingestion	None None	
Future	Sediment	Sediment	AOC 721	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not expected to be exposed to sediment.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	Child and adult recreational users may be exposed to sediment at AOC 721.
					Adult	Ingestion Dermal	Quant Quant	
				Residents	Child	Ingestion Dermal	Quant Quant	Child and adult residents may be exposed to sediment at AOC 721. If they are exposed to sediment then exposures are expected to be similar to those of the child and adult recreational users.
					Adult	Ingestion Dermal	Quant Quant	

Notes:
Quant - Quantitative. Qual - Qualitative Evaluation only.

RAGS Part D Table 2

Occurrence, Distribution and Selection Of Chemicals of Potential Concern

LIST OF TABLES
RAGS PART D TABLE 2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Table No.

2.1 Surface Soil - Direct Contact
2.2 Surface Soil - Migration From Soil to Groundwater
2.3 Groundwater - Direct Contact
2.4 Sediment - Direct Contact
2.5 Surface Water - Direct Contact

TABLE 2.1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN- SURFACE SOIL- DIRECT CONTACT
AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection [1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	AOC 721 Background Surface Soil Maximum[4]	Screening Toxicity Value[5]	COPC Flag	Rationale For Contaminant Deletion or Selection [6]
Inorganics (mg/kg)												
7429-90-5	ALUMINUM	1/1	4870	4870	C044M0017	044M001701		4870	9850	7700 N	No	BSL, BKG
7440-36-0	ANTIMONY	1/1	0.97 J	0.97 J	C044M0017	044M001701		0.97	1.4	3.1 N	No	BSL, BKG
7440-38-2	ARSENIC	9/9	21.2	**92.7**	C721SB002	721SB00201		92.7	92	0.39 C	Yes	ASL
7440-39-3	BARIUM	1/1	64 J	64 J	C044M0017	044M001701		64	193	1500 N	No	BSL, BKG
7440-43-9	CADMIUM	1/1	0.31	0.31	C044M0017	044M001701		0.31	0.65	7 N	No	BSL, BKG
7440-70-2	CALCIUM	1/1	12600 J	12600 J	C044M0017	044M001701		12600	85600	NA	No	EN, BKG
7440-47-3	CHROMIUM	1/1	22.8	**22.8**	C044M0017	044M001701		22.8	32	0.29 C[7]	No	BKG
7440-48-4	COBALT	1/1	8.8 J	**8.8 J**	C044M0017	044M001701		8.8	2.9	2.3 N	Yes	ASL
7440-50-8	COPPER	1/1	51.3	51.3	C044M0017	044M001701		51.3	109	310 N	No	BSL, BKG
7439-89-6	IRON	1/1	37600	**37600**	C044M0017	044M001701		37600	12000	5500 N	Yes	ASL
7439-92-1	LEAD	1/1	63.6	63.6	C044M0017	044M001701		63.6	588	400	No	BSL, BKG
7439-95-4	MAGNESIUM	1/1	1160 J	1160 J	C044M0017	044M001701		1160	2390	NA	No	EN, BKG
7439-96-5	MANGANESE	1/1	85.9	85.9	C044M0017	044M001701		85.9	101	180 N	No	BSL, BKG
7439-97-6	MERCURY	5/5	0.13	**1.6 J**	C044M0017	044M001701		1.6	0.75	2.3 N[8]	No	BSL
7440-02-0	NICKEL	1/1	26.7 J	26.7 J	C044M0017	044M001701		26.7	28	150 N	No	BSL, BKG
7440-09-7	POTASSIUM	1/1	1080 J	**1080 J**	C044M0017	044M001701		1080	836	NA	No	EN
7782-49-2	SELENIUM	1/5	7.3 J	**7.3 J**	C044M0017	044M001701	1.9 - 2.4	7.3	1.3	39 N	No	BSL
7440-23-5	SODIUM	1/1	1130 J	**1130 J**	C044M0017	044M001701		1130	729	NA	No	EN
7440-28-0	THALLIUM	1/7	2.7 J	**2.7 J**	C044M0017	044M001701	0.3 - 1.2	2.7	ND	0.078 N	Yes	ASL
7440-62-2	VANADIUM	1/1	26.7	**26.7**	C044M0017	044M001701		26.7	25	39 N	No	BSL
7440-66-6	ZINC	1/1	125 J	125 J	C044M0017	044M001701		125	779	2300 N	No	BSL, BKG
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	1/1	22500	22500	C044M0017	044M001701		22500	NA	NA	No	NTX

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.

2 - Values presented are sample-specific quantitation limits.

3 - The maximum detected concentration is used for screening purposes.

4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.

5 - USEPA Regional Screening Level for residential soil. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).

6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.

7 - Value is for hexavalent chromium.

8 - Value is for mercuric chloride (and other mercury salts).

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:

COPC = Chemical of Potential Concern
C = Carcinogenic
N = Noncarcinogenic
NA = Not Applicable/Not Available

Rationale Codes:

For selection as a COPC:
ASL = Above Screening Level and site background

For elimination as a COPC:
BKG = Below site background concentration
BSL = Below COPC screening Level
NTX = No toxicity criteria
EN = Essential Nutrient

TABLE 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN- SURFACE SOIL-MIGRATION TO GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection [1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	AOC 721 Background Surface Soil Maximum[4]	Screening Toxicity Value[5]	COPC Flag	Rationale for Contaminant Deletion or Selection [6]
Inorganics (mg/kg)												
7429-90-5	ALUMINUM	1/1	4870	4870	C044M0017	044M001701		4870	9850	23000	No	BSL, BKG
7440-36-0	ANTIMONY	1/1	0.97 J	**0.97 J**	C044M0017	044M001701		0.97	1.4	0.27	No	BKG
7440-38-2	ARSENIC	9/9	21.2	**92.7**	C721SB002	721SB00201		92.7	92	0.0013	Yes	ASL
7440-39-3	BARIUM	1/1	64 J	64 J	C044M0017	044M001701		64	193	120	No	BSL, BKG
7440-43-9	CADMIUM	1/1	0.31	0.31	C044M0017	044M001701		0.31	0.65	0.52	No	BSL, BKG
7440-70-2	CALCIUM	1/1	12600 J	12600 J	C044M0017	044M001701		12600	85600	NA	No	EN, BKG
7440-47-3	CHROMIUM	1/1	22.8	**22.8**	C044M0017	044M001701		22.8	32	0.00059 [7]	No	BKG
7440-48-4	COBALT	1/1	8.8 J	**8.8 J**	C044M0017	044M001701		8.8	2.9	0.21	Yes	ASL
7440-50-8	COPPER	1/1	51.3	**51.3**	C044M0017	044M001701		51.3	109	22	No	BKG
7439-89-6	IRON	1/1	37600	**37600**	C044M0017	044M001701		37600	12000	270	Yes	ASL
7439-92-1	LEAD	1/1	63.6	**63.6**	C044M0017	044M001701		63.6	588	14 [8]	No	BKG
7439-95-4	MAGNESIUM	1/1	1160 J	1160 J	C044M0017	044M001701		1160	2390	NA	No	EN, BKG
7439-96-5	MANGANESE	1/1	85.9	**85.9**	C044M0017	044M001701		85.9	101	21	No	BKG
7439-97-6	MERCURY	5/5	0.13	**1.6 J**	C044M0017	044M001701		1.6	0.75	0.033	Yes	ASL
7440-02-0	NICKEL	1/1	26.7 J	**26.7 J**	C044M0017	044M001701		26.7	28	20	No	BKG
7440-09-7	POTASSIUM	1/1	1080 J	**1080 J**	C044M0017	044M001701		1080	836	NA	No	EN
7782-49-2	SELENIUM	1/5	7.3 J	**7.3 J**	C044M0017	044M001701	1.9 - 2.4	7.3	1.3	0.4	Yes	ASL
7440-23-5	SODIUM	1/1	1130 J	**1130 J**	C044M0017	044M001701		1130	729	NA	No	EN
7440-28-0	THALLIUM	1/7	2.7 J	**2.7 J**	C044M0017	044M001701	0.3 - 1.2	2.7	ND	0.011	Yes	ASL
7440-62-2	VANADIUM	1/1	26.7	**26.7**	C044M0017	044M001701		26.7	25	78	No	BSL
7440-66-6	ZINC	1/1	125 J	125 J	C044M0017	044M001701		125	779	290	No	BSL, BKG
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	1/1	22500	22500	C044M0017	044M001701		22500	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, Risk-based soil screening level (SSL) for migration to groundwater, May 2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.
7 - Value is for hexavalent chromium.
8 - The MCL-based SSL is presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:
COPC= Chemical of Potential Concern
C = Carcinogenic
N = Noncarcinogenic
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background

For elimination as a COPC:
BKG= Below site background concentration
BSL = Below COPC screening Level
NTX = No toxicity criteria
EN = Essential Nutrient

TABLE 2.3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN-GROUNDWATER
AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection [1]	Minimum Detected Concentration [1]	Maximum Detected Concentration [1]	Location of Maximum Concentration	Sample Containing Maximum Concentration	Range of Nondetects [2]	Concentration Used for Screening [3]	AOC 721 Background Maximum [4]	Screening Toxicity Value [5]	USEPA MCL [6]	COPC Flag	Rationale for Contaminant Deletion or Selection [7]
Semivolatile Organics (ug/L)													
98-86-2	ACETOPHENONE	1/1	1 J	1 J	C044GW006	044GW00601a		1	NA	150 N	NA	No	BSL
65-85-0	BENZOIC ACID	2/13	2 J	7 J	C044GW005	044GW00503	50 - 95	7	NA	5800 N	NA	No	BSL
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	2/13	1 J	**8 J**	C044GW006	044GW00601a	10 - 25	8	NA	0.071 C	6	Yes	ASL
84-74-2	DI-N-BUTYL PHTHALATE	1/13	1 J	1 J	C044GW005	044GW00503	10 - 15	1	NA	67 N	NA	No	BSL
84-66-2	DIETHYL PHTHALATE	1/13	1 J	1 J	C044GW005	044GW00503	10 - 15	1	NA	1100 N	NA	No	BSL
Pesticides/PCBs (ug/L)													
76-44-8	HEPTACHLOR	1/10	0.079	**0.079**	C044GW007	044GW00702	0.03 - 0.04	0.079	NA	0.0018 C	0.4	Yes	ASL
Inorganics (ug/L)													
7429-90-5	ALUMINUM	5/18	28.3 J	**2110 J**	C044GW007	044GW00701	8 - 258	2110	620	1600 N	50 to 200 [8]	Yes	ASL
7440-36-0	ANTIMONY	5/38	2.6 J	**54.1**	C044GW007	044GW00702	1.5 - 14.4	54.1	ND	0.6 N	6	Yes	ASL
7440-38-2	ARSENIC	29/45	2.1 J	**206**	C044GW007	044GW00711	2.5 - 8.5	206	6	0.045 C	10	Yes	ASL
7440-39-3	BARIUM	21/27	22.2	**98.1**	C044GW007	044GW00707	8.5 - 35.4	98.1	16	290 N	2000	No	BSL
7440-41-7	BERYLLIUM	8/32	0.11 J	**0.91 J**	C044GW005	044GW00505	0.1 - 1.3	0.91	0.36	1.6 N	4	No	BSL
7440-70-2	CALCIUM	27/27	81400	**628000**	C044GW006	044G00614		628000	152000	NA	NA	No	EN
7440-47-3	CHROMIUM	9/29	1.1 J	**4.5 J**	C044GW007	044GW00701	0.5 - 9.7	4.5	2	0.031 C [9]	100	Yes	ASL
7440-48-4	COBALT	5/30	0.95 J	**5.3**	C044GW006	044G00614	0.28 - 5.2	5.3	2	0.47 N	NA	Yes	ASL
7440-50-8	COPPER	6/27	2.5	**8.9**	C044GW006	044G00614	0.6 - 5.4	8.9	ND	62 N	1300	No	BSL
7439-89-6	IRON	39/43	28 J	**14100**	C044GW007	044G00714	24.2 - 518	14100	4660	1100 N	300 [8]	Yes	ASL
7439-92-1	LEAD	3/29	2.2 J	**4.9 J**	C044GW007	044GW00701	0.9 - 7	4.9	4	NA	15	No	BSL
7439-95-4	MAGNESIUM	27/27	18700	**658000 J**	C044GW005	044GW00504		658000	9250	NA	NA	No	EN
7439-96-5	MANGANESE	27/27	173	**4110**	C044GW006	044G00614		4110	789	32 N	50 [0]	Yes	ASL
7439-97-6	MERCURY	1/32	0.14 J	**0.14 J**	C044GW005	044GW00502	0.02 - 0.2	0.14	ND	0.43 N [10]	2	No	BSL
7440-02-0	NICKEL	9/27	0.96 J	**10.5 J**	C044GW006	044GW00602	0.8 - 16.5	10.5	5	30 N	NA	No	BSL
7440-09-7	POTASSIUM	27/27	11800	**282000 J**	C044GW005	044GW00501		282000	6400	NA	NA	No	EN
7782-49-2	SELENIUM	2/30	4.3 J	**5.7 J**	C044GW007	044GW00708	2.2 - 11	5.7	ND	7.8 N	50	No	BSL
7440-22-4	SILVER	2/27	1 J	**2.3**	C044GW007	044GW00703	0.5 - 2.7	2.3	ND	7.1 N	100 [8]	No	BSL
7440-23-5	SODIUM	27/27	108000	6590000	C044GW005	044GW00504		6590000	NA	NA	NA	No	EN
7440-28-0	THALLIUM	3/32	3.1 J	**6 J**	C044GW006	044GW00605	2 - 10	6	ND	0.016 N	2	Yes	ASL
7440-31-5	TIN	2/24	2.6 J	**3.1 J**	C044GW006	044GW00603	2.6 - 29.5	3.1	ND	930 N	NA	No	BSL
7440-62-2	VANADIUM	21/36	0.94 J	**26 J**	C044GW006	044GW00604	0.5 - 9.6	26	2	7.8 N	NA	Yes	ASL
7440-66-6	ZINC	4/30	13	**24.7 J**	C044GW007	044GW00701	2.9 - 17.7	24.7	15	470 N	5000 [8]	No	BSL
Miscellaneous Parameters (ug/L)													
16887-00-6	CHLORIDE	10/10	362000	11500000	C044GW005	044GW00504		11500000	NA	NA	NA	NA	NTX
14808-79-8	SULFATE	8/10	20200	1640000	C044GW006	044GW00602	14400 - 15800	1640000	NA	NA	NA	NA	NTX
--	TOTAL DISSOLVED SOLIDS	26/26	699000	20500000	C044GW005	044GW00504		20500000	NA	NA	NA	NA	NTX
--	TOTAL ORGANIC CARBON	16/16	6200	41000	C044GW005	044GW00510		41000	NA	NA	NA	NA	NTX

Footnotes:
1- Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.
5 - USEPA Regional Screening Level for tapwater. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).
6 - 2012 Edition of the Drinking Water Standards and Health Advisories (USEPA, April 2012).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.
8 - Secondary MCL.
9 - Value is for hexavalent chromium.
10 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:
COPC = Chemical of Potential Concern
C = Carcinogenic
MCL = Maximum Contaminant Level
N = Noncarcinogenic
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background

For elimination as a COPC:
BKG= Below site background concentration
BSL = Below COPC screening Level
NTX = No toxicity criteria
EN = Essential Nutrient

TABLE 2.4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection [1]	Minimum Concentration [1]	Maximum Concentration [1]	Location of Maximum Detect	Sample of Maximum Detect	Range of Nondetects [2]	Concentration Used for Screening?[3]	AOC 721 Background Maximum[4]	Screening Toxicity Value [5]	COPC Flag	Rationale For Contaminant Deletion or Selection [6]
Volatile Organics (mg/kg)												
120-82-1	1,2,4-TRICHLOROBENZENE	1/3	0.084 J	0.084 J	C044SS005	044SS00501	0.4 - 0.49	0.084	NA	6.2 N[7]	No	BSL
Semivolatile Organics (mg/kg)												
91-57-6	2-METHYLNAPHTHALENE	13/17	0.03 J	**1.3**	C044SS005	044SS00501	0.49 - 0.89	1.3	ND	23 N	No	BSL
--	BENZO(A)PYRENE EQUIVALENTS	2/3	0.28	**0.44**	C044SS005	044SS00501	0.49 - 0.49	0.44	0.50	0.015 C	No	BKG
56-55-3	BENZO(A)ANTHRACENE	15/16	0.051 J	**1.4**	C721MD009	721MD00901	0.49 - 0.49	1.4	0.23	0.15 C	Yes	ASL
50-32-8	BENZO(A)PYRENE	2/3	0.049 J	**0.18 J**	C044SS005	044SS00501	0.49 - 0.49	0.18	0.38	0.015 C	No	BKG
205-99-2	BENZO(B)FLUORANTHENE	2/3	0.067 J	**0.25 J**	C044SS005	044SS00501	0.49 - 0.49	0.25	0.42	0.15 C	No	BKG
191-24-2	BENZO(G,H,I)PERYLENE	1/3	0.099 J	0.099 J	C044SS005	044SS00501	0.4 - 0.49	0.099	0.2	170 N[8]	No	BSL, BKG
207-08-9	BENZO(K)FLUORANTHENE	2/3	0.067 J	0.15 J	C044SS005	044SS00501	0.49 - 0.49	0.15	0.33	1.5 C	No	BSL, BKG
218-01-9	CHRYSENE	18/19	0.097 J	**1.5**	C721MD009	721MD00901	0.49 - 0.49	1.5	0.12	15 C	No	BSL
132-64-9	DIBENZOFURAN	2/3	0.085 J	0.3 J	C044SS005	044SS00501	0.49 - 0.49	0.3	NA	7.8 N	No	BSL
206-44-0	FLUORANTHENE	15/16	0.077 J	**4.6**	C721MD009	721MD00901	0.49 - 0.49	4.6	0.38	230 N	No	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	1/3	0.074 J	0.074 J	C044SS005	044SS00501	0.4 - 0.49	0.074	0.19	0.15 C	No	BSL, BKG
91-20-3	NAPHTHALENE	15/19	0.13 J	**0.96**	C721SB001	721SB00101	0.49 - 0.89	0.96	ND	3.6 C	No	BSL
85-01-8	PHENANTHRENE	18/19	0.074 J	**1.1**	C721SB001	721SB00101	0.49 - 0.49	1.1	ND	170 N[8]	No	BSL
129-00-0	PYRENE	19/20	0.063 J	**3.7**	C721MD009	721MD00901	0.49 - 0.49	3.7	0.51	170 N	No	BSL
Inorganics (mg/kg)												
7429-90-5	ALUMINUM	10/10	394	**36600**	C044SB025	044SB02501		36600	27000	7700 N	Yes	ASL
7440-36-0	ANTIMONY	3/10	0.48 J	**0.71 J**	C044SS005	044SS00501	0.21 - 0.55	0.71	ND	3.1 N	No	BSL
7440-38-2	ARSENIC	33/34	2.8 J	**89.5**	C721SB06G	721SB06G01	0.39 - 0.39	89.5	15	0.39 C	Yes	ASL
7440-39-3	BARIUM	10/10	1.4	**70.7 J**	C044M0015	044M001501		70.7	30	1500 N	No	BSL
7440-41-7	BERYLLIUM	16/25	0.16 J	**5.4**	C721MD005	721MD00501	0.05 - 1.6	5.4	1.5	16 N	No	BSL
7440-43-9	CADMIUM	6/12	0.1 J	**0.9**	C044SB007	044SB00701	0.04 - 0.22	0.9	ND	7 N	No	BSL
7440-70-2	CALCIUM	10/10	268	128000 J	C044SB007	044SB00701		128000	140000	NA	No	EN, BKG
7440-47-3	CHROMIUM	10/10	1 J	**54.3**	C044SB025	044SB02501		54.3	56	0.29 C[9]	No	BKG
7440-48-4	COBALT	23/25	2.2 J	**33.2**	C721MD005	721MD00501	0.15 - 1.7	33.2	8.4	2.3 N	Yes	ASL
7440-50-8	COPPER	12/12	0.59 J	**46.5**	C044SB027	044SB02701		46.5	16	310 N	No	BSL
7439-89-6	IRON	10/10	568	**93700**	C044M0015	044M001501		93700	33000	5500 N	Yes	ASL
7439-92-1	LEAD	10/10	0.84	**82.7 J**	C044SB007	044SB00701		82.7	21	400	No	BSL
7439-95-4	MAGNESIUM	10/10	326 J	6410 J	C044SB027	044SB02703		6410	7100	NA	No	EN, BKG
7439-96-5	MANGANESE	9/10	5.7	**408**	C044SB025	044SB02501	0.06 - 0.06	408	240	180 N	Yes	ASL
7439-97-6	MERCURY	19/22	0.06	**1.1 J**	C721MD010	721MD01001	0.02 - 0.21	1.1	0.11	2.3 N[10]	No	BSL
7440-02-0	NICKEL	12/12	0.32 J	**36.9**	C044SB025	044SB02501		36.9	15	150 N	No	BSL
7440-09-7	POTASSIUM	10/10	145 J	**8240 J**	C0440015	044M001501		8240	4200	NA	No	EN
7782-49-2	SELENIUM	9/23	0.52 J	**9.3 J**	C044M0015	044M001501	0.29 - 2.4	9.3	ND	39 N	No	BSL
7440-23-5	SODIUM	9/10	367 J	13100	C044SB027	044SB02703	882 - 882	13100	14000	NA	No	EN, BKG
7440-28-0	THALLIUM	3/32	3.2	**4.6**	C044M0015	044M001501	0.25 - 4	4.6	ND	0.078 N	Yes	ASL
7440-31-5	TIN	1/10	1.3 J	1.3 J	C044SB007	044SB00701	0.97 - 14.5	1.3	NA	4700 N	No	BSL
7440-62-2	VANADIUM	10/10	0.89 J	**68.5**	C044SB027	044SB02701		68.5	61	39 N	Yes	ASL
7440-66-6	ZINC	25/25	1.4 J	**669 J**	C721MD010	721MD01001		669	64	2300 N	No	BSL

TABLE 2.4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CAS Number	Chemical	Frequency of Detection (1)	Minimum Concentration (1)	Maximum Concentration (1)	Location of Maximum Detect	Sample of Maximum Detect	Range of Nondetects (2)	Concentration Used for Screening?(3)	AOC 721 Background Maximum(4)	Screening Toxicity Value (5)	COPC Flag	Rationale For Contaminant Deletion or Selection (6)
Miscellaneous Parameters (mg/kg)												
--	TOTAL ORGANIC CARBON	3/3	10700	52600	C044M0015	044M001501		52600	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a comparison of maximum concentrations was conducted. The maximum background is shaded if the site maximum exceeds the background maximum.
5 - USEPA Regional Screening Level for residential soil. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than the background maximum concentration.
7 - Ten percent of the noncarcinogenic value is less than the carcinogenic value; therefore, the noncarcinogenic value is presented.
8 - Value is for pyrene.
9 - Value is for hexavalent chromium.
10 - Value is for mercuric chloride and other mercury salts.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria or background (if available).

Definitions:
C = Carcinogen
N = Noncarcinogen
COPC = Chemical of Potential Concern
NA = Not Applicable/Not Available
ND = Not Detected

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.
For elimination as a COPC:
BKG = Below Background concentration
BSL = Below COPC Screening Level
EN = Essential nutrient
NTX = No toxicity Criteria

TABLE 2.5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN-SURFACE WATER
AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CAS Number	Parameter	Frequency of Detection (1)	Minimum Detected Concentration (1)	Maximum Detected Concentration(1)	Mean	Concentration Used for Screening(2)	Screening Toxicity Value (3)	COPC Flag	Rationale For Contaminant Deletion or Selection (4)
Inorganic Elements (µg/l)									
7440-38-2	**Arsenic**	1/3	3.6	**3.6**	3.6	3.6	**0.045 C**	**Yes**	ASL
7440-41-7	Beryllium	2/3	0.32	0.33	0.33	0.33	1.6 N	No	BSL
7440-70-2	Calcium	3/3	125000	169000	152,667	169000	NA	No	EN
7440-48-4	**Cobalt**	1/3	1.1	**1.1**	1.1	1.1	**0.47 N**	**Yes**	ASL
7439-95-4	Magnesium	3/3	331000	403000	372,000	403000	NA	No	EN
7440-09-7	Potassium	3/3	126000	152000	141,667	152000	NA	No	EN
7440-23-5	Sodium	3/3	2340000	2845000	2,621,667	2845000	NA	No	EN
7440-28-0	**Thallium**	1/3	4.3	**4.3**	4.3	4.3	**0.016 N**	**Yes**	ASL
Miscellaneous Compounds									
16887-00-6	Chloride (mg/l)	3/3	5280	6170	5,872	6170	NA	No	NTX
--	Conductance (umhos)	3/3	16000	18000	17,317	18000	NA	No	NTX
--	Salinity (g/l)	3/3	9.6	11.2	10.7	11.2	NA	No	NTX
--	Sulfate, turbid (mg/l)	3/3	667	864	774	864	NA	No	NTX
--	TDS (mg/l)	3/3	10300	11500	11,100	11500	NA	No	NTX
--	TSS (mg/l)	2/3	20	47	33.5	47	NA	No	NTX

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected and as one sample when determining the frequency of detection and average results.
2 - The maximum detected concentration is used for screening purposes.
3 - The USEPA Regional Screening level for tapwater is presented. The noncarcinogenic values (denoted with a "N" flag) are divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA, May 2012).
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.

Shaded criterion indicates that the maximum concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
Bolded maximum concentrations indicate that the maximum concentration exceeds one or more screening criteria.

Definitions:
C = Carcinogen
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level
For elimination as a COPC:
BSL = Below COPC Screening Level
EN = Essential nutrient
NTX = No toxicity Criteria

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

LIST OF TABLES
RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.	Reasonable Maximum Exposures
3.1	Surface Soil
3.2	Groundwater
3.3	Sediment

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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
AOC 721	ARSENIC	mg/kg	59.5	NA	92.7	92.7	mg/kg	Maximum Detected Concentration	<10 samples
	COBALT	mg/kg	NA[1]	NA	8.8 J	8.8	mg/kg	Maximum Detected Concentration	<10 samples
	IRON	mg/kg	NA[1]	NA	37600	37600	mg/kg	Maximum Detected Concentration	<10 samples
	THALLIUM	mg/kg	0.64	NA	2.7	2.7	mg/kg	Maximum Detected Concentration	<10 samples

1 - Only one sample.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
AOC 721	BIS(2-ETHYLHEXYL)PHTHALATE	ug/L	NA	NA	8 J	8	ug/L	Maximum Detected Concentration	(1)
	HEPTACHLOR	ug/L	0.025	NA	0.079	0.079	ug/L	Maximum Detected Concentration	(1)
	ALUMINUM	ug/L	194	NA	2110 J	2110	ug/L	Maximum Detected Concentration	(1)
	ANTIMONY	ug/L	5.0	NA	54.1	54.1	ug/L	Maximum Detected Concentration	(1)
	ARSENIC	ug/L	34.0	NA	206	206	ug/L	Maximum Detected Concentration	(1)
	CHROMIUM VI	ug/L	1.3	NA	4.5 J	4.5	ug/L	Maximum Detected Concentration	(1)
	COBALT	ug/L	1.4	NA	5.3	5.3	ug/L	Maximum Detected Concentration	(1)
	IRON	ug/L	2640	NA	14100	14100	ug/L	Maximum Detected Concentration	(1)
	MANGANESE	ug/L	914	NA	4110	4110	ug/L	Maximum Detected Concentration	(1)
	THALLIUM	ug/L	1.9	NA	6 J	6	ug/L	Maximum Detected Concentration	(1)
	VANADIUM	ug/L	3.0	NA	26 J	26	ug/L	Maximum Detected Concentration	(1)

1 - The maximum detected concentration is used as the exposure point concentration for groundwater.

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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
AOC 721	BENZO(A)ANTHRACENE	mg/kg	0.31	0.66	1	0.66	mg/kg	95% KM (Chebyshev) UCL	Pro UCL
	ALUMINUM	mg/kg	11275	22011	36600	22011	mg/kg	95% Approximate Gamma UCL	Pro UCL
	ARSENIC	mg/kg	25.6	42.5	89.5	42.5	mg/kg	95% KM (Chebyshev) UCL	Pro UCL
	COBALT	mg/kg	7.17	13.2	33.2	13.2	mg/kg	95% KM (Chebyshev) UCL	Pro UCL
	IRON	mg/kg	22,700	48,305	93700	48305	mg/kg	95% Approximate Gamma UCL	Pro UCL
	MANGANESE	mg/kg	134	212	408	212	mg/kg	95% KM(t) UCL	Pro UCL
	THALLIUM	mg/kg	0.79	NA	4.6	4.6	mg/kg	Maximum	<4 detections
	VANADIUM	mg/kg	29	42.6	69	42.6	mg/kg	95% Student's-t UCL	Pro UCL

RAGS Part D Table 4

Values Used For Daily Intake Calculations

LIST OF TABLES
RAGS PART D TABLE 4
VALUES USED FOR DAILY INTAKE CALCULATIONS

Table No.	Reasonable Maximum Exposures
4.1.RME	Construction Workers Exposed to Surface Soil
4.2.RME	Construction Workers Exposed to Air Emissions from Surface Soil
4.3.RME	Construction Workers Exposed to Groundwater
4.4.RME	Industrial Workers Exposed to Surface Soil
4.5.RME	Industrial Workers Exposed to Air Emissions from Surface Soil
4.6.RME	Trespassers Exposed to Surface Soil
4.7.RME	Trespassers Exposed to Air Emissions from Surface Soil
4.8.RME	Trespassers Exposed to Sediment
4.9.RME	Child Recreational Users Exposed to Surface Soil
4.10.RME	Child Recreational Users Exposed to Air Emissions from Surface Soil
4.11.RME	Child Recreational Users Exposed to Sediment
4.12.RME	Adult Recreational Users Exposed to Surface Soil
4.13.RME	Adult Recreational Users Exposed to Air Emissions from Surface Soil
4.14.RME	Adult Recreational Users Exposed to Sediment
4.15.RME	Child Residents Exposed to Surface Soil
4.16.RME	Child Residents Exposed to Air Emissions from Surface Soil
4.17.RME	Child Residents Exposed to Groundwater
4.18.RME	Child Residents Exposed to Sediment
4.19.RME	Adult Residents Exposed to Surface Soil
4.20.RME	Adult Residents Exposed to Air Emissions from Surface Soil
4.21.RME	Adult Residents Exposed to Groundwater
4.22.RME	Adult Residents Exposed to Sediment

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS- SOILS
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	330	mg/day	(1), USEPA, 2002b	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	150	days/year	(2)	
				ED	Exposure Duration	1	years	(1)(3)	
				BW	Body Weight	70	kg	(1), USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	(1), USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	(1), USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	150	days/year	(2)	
				ED	Exposure Duration	1	years	(1)(3)	
				BW	Body Weight	70	kg	(1), USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment.

2 - Assumes construction activities take place 150 days/year.

3 - Assumed that construction activities take place over 1/2 year.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.77E-08 Cancer Dermal Intake = 8.30E-08

Noncancer Ingestion Intake = 1.94E-06 Noncancer Dermal Intake = 5.81E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - SOILS TO AIR

FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface 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 Workers	Adult	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	150	days/year	(1)	AT x 24 hours/day
				ED	Exposure Duration	1	years	(1)	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.27E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	

Notes:

1 - Professional judgment.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.96E-03 Noncancer Inhalation Intake = 1.37E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - GROUNDWATER

CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	AOC 721	CGW	Chemical Concentration in Groundwater	Maximum or 95% UCL	ug/L	USEPA, 2002b	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	L/cm3	--	
				IR-GW	Ingestion Rate of Groundwater	0.04	L/day	(1)	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	90	days/year	(2)	BW x AT
				ED	Exposure Duration	1	years	(1)(2)	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	AOC 721	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t^*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	90	days/year	(2)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)(2)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1997	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

1 - Professional judgment assuming 4 hours being onsite.

2 - Assumed that construction activities take place over 1/2 year. However, exposures to groundwater are assumed to occur 3 months (90 days) a year.

3 - Assumed that construction workers are exposed to groundwater for 4 hours per day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA Region I, 1999. Risk Updates, Number 5.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Dermal Intake = 1.66E-01 Noncancer Dermal Intake = 1.16E+01

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL

CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2004	BW x AT
				EF	Exposure Frequency	250	days/year	USEPA, 2004	
				ED	Exposure Duration	25	years	USEPA, 1997	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	250	days/year	USEPA, 2004	
				ED	Exposure Duration	25	years	USEPA, 1997	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.49E-07 Cancer Dermal Intake = 2.31E-06

Noncancer Ingestion Intake = 9.78E-07 Noncancer Dermal Intake = 6.46E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL TO AIR

FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface 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	Industrial Workers	Adult	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	250	days/year	USEPA, 2002a	AT x 24 hours/day
				ED	Exposure Duration	25	years	USEPA, 2002a	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.63E+09	m3/kg	USEPA, 2012	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	76.40181	g/m2-s per kg/m3	USEPA, 2012	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA, 2012	
				Um	Mean annual wind speed	3.89	m/sec	USEPA, 2012	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2012	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2012	

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2012: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Charleston, South Carolina.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 8.15E-02 Noncancer Inhalation Intake = 2.28E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SOILS

CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1997	BW x AT
				EF	Exposure Frequency	40	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	45	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3850	cm2	(3)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	40	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	45	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	

Notes:

For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

1 - Professional judgement.

2 - Older child from age 7 to 18.

3 - Assumes head, hands, forearms, lower legs, and feet are exposed.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.48E-08 Cancer Dermal Intake = 4.02E-07

Noncancer Ingestion Intake = 2.44E-07 Noncancer Dermal Intake = 2.81E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SOILS TO AIR

FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface 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	Trespassers	Adolescent	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	1.5	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	40	days/year	(2)	AT x 24 hours/day
				ED	Exposure Duration	10	years	(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.63E+09	m3/kg	USEPA, 2012	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	76.40181	g/m2-s per kg/m3	USEPA, 2012	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA, 2012	
				Um	Mean annual wind speed	3.89	m/sec	USEPA, 2012	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2012	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2012	

Notes:

For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

1 - Professional judgment.

2 - Assume one day a week in warm weather months for RME and one day every other week for CTE.

3 - Older child from age 6 to 17.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2012: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Charleston, South Carolina.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 9.78E-04 Noncancer Inhalation Intake = 6.85E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.8.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SEDIMENT
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	Trespassers	Adolescent	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	(1)	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CSx IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	36	days/year	(2)	
				ED	Exposure Duration	10	years	(1)	
				BW	Body Weight	45	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	3,850	cm2	(3)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	(1)	
				EF	Exposure Frequency	36	days/year	(2)	
				ED	Exposure Duration	10	years	(1)	
				BW	Body Weight	45	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	

Notes:

1 - Professional judgement.

2 - Assumes swimming 3 days per week during warm summer months.

3 - Assumes that the lower arms, hands, lower legs, and feet are exposed.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 1.57E-08 Cancer Dermal Intake = 3.62E-07

Noncancer Ingestion Intake = 1.10E-07 Noncancer Dermal Intake = 2.53E-06

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.9.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS

CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	--	BW x AT
				EF	Exposure Frequency	100	days/year	USEPA, 2004	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	(2), USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Recreational User	Child	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	100	days/year	USEPA, 2004	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	(2), USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children were evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, Residentsial children were evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

2 - Professional judgement.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 3.13E-07 Cancer Dermal Intake (Age 0 - 6) = 8.77E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.04E-07 Cancer Dermal Intake (Age 0 - 2) = 2.92E-07

Cancer Ingestion Intake (Age 2 - 6) = 2.09E-07 Cancer Dermal Intake (Age 2 - 6) = 5.84E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 3.65E-06 Noncancer Dermal Intake = 1.02E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS TO AIR

FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface 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	Recreational User	Child	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	1.5	hours/day	(1)	CA x ET x EF x ED / AT x 24 hours/day
				EF	Exposure Frequency	100	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.63E+09	m3/kg	USEPA, 2012	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	76.40181	g/m2-s per kg/m3	USEPA, 2012	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA, 2012	
				Um	Mean annual wind speed	3.89	m/sec	USEPA, 2012	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2012	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2012	

Notes:

1 - Professional judgment.

2 - Assume four days a week in warm weather months for RME and two days a week for CTE.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2012: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Charleston, South Carolina.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 1.47E-03 Noncancer Inhalation Intake = 1.71E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 4.89E-04

Cancer Inhalation Intake (Age 2 - 6) = 9.78E-04

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SEDIMENT
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	Recreational User	Child	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	--	BW x AT
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Recreational User	Child	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Assumes swimming 3 days per week during warm summer months.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

3 - 95th Percentile value for a child playing in wet soil, Exhibit 3-3, USEPA 2004.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 5.64E-08 Cancer Dermal Intake (Age 0 - 6) = 3.16E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.88E-08 Cancer Dermal Intake (Age 0 - 2) = 1.05E-07

Cancer Ingestion Intake (Age 2 - 6) = 3.76E-08 Cancer Dermal Intake (Age 2 - 6) = 2.10E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 6.58E-07 Noncancer Dermal Intake = 3.68E-06

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from Ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	(1), USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	--	BW x AT
				EF	Exposure Frequency	100	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1987	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Recreational User	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	(1), USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	(1), USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	100	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1987	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Professional judgement.

2 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 1.34E-07 Cancer Dermal Intake (Age 6 - 30) = 2.29E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 5.59E-08 Cancer Dermal Intake (Age 6 - 16) = 9.56E-07

Cancer Ingestion Intake Age 16 - 30) = 7.83E-08 Cancer Dermal Intake (Age 16 - 30) = 1.34E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 3.91E-07 Noncancer Dermal Intake = 6.69E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.13.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS TO AIR

FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface 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	Recreational User	Adult	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	1.5	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	100	days/year	(1)	AT x 24 hours/day
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.63E+09	m3/kg	USEPA, 2012	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	76.40181	g/m2-s per kg/m3	USEPA, 2012	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA, 2012	
				Um	Mean annual wind speed	3.89	m/sec	USEPA, 2012	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2012	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2012	

Notes:

1 - Professional judgment. Assume four days a week in warm weather months for RME and two days a week for CTE.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2012: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Charleston, South Carolina.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 5.87E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.71E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 2.45E-03

Cancer Inhalation Intake (Age 16 - 30) = 3.42E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.14.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SEDIMENT

CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	Recreational User	Adult	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CSx IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	--	BW x AT
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Recreational User	Adult	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Assumes swimming 3 days per week during warm summer months.

2 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 2.42E-08 Cancer Dermal Intake (Age 6 - 30) = 1.93E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.01E-08 Cancer Dermal Intake (Age 6 - 16) = 8.03E-08

Cancer Ingestion Intake (Age 16 - 30) = 1.41E-08 Cancer Dermal Intake (Age 16 - 30) = 1.12E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 7.05E-08 Noncancer Dermal Intake = 5.62E-07

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.15.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SOILS
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	--	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 2004	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.10E-06 Cancer Dermal Intake (Age 0 - 6) = 3.07E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.65E-07 Cancer Dermal Intake (Age 0 - 2) = 1.02E-06

Cancer Ingestion Intake (Age 2 - 6) = 7.31E-07 Cancer Dermal Intake (Age 2 - 6) = 2.05E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 3.58E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from Ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.16.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface 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	Resident	Child	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	CA x ET x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 2004	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.63E+09	m3/kg	USEPA, 2012	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	76.40181	g/m2-s per kg/m3	USEPA, 2012	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA, 2012	
				Um	Mean annual wind speed	3.89	m/sec	USEPA, 2012	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2012	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2012	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2012: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Charleston, South Carolina.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 8.22E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.92E+00

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 2.74E-02

Cancer Inhalation Intake (Age 2 - 6) = 5.48E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.17.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - GROUNDWATER
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Child	AOC 721	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	1	L/day	USEPA, 1997	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 2004	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Residents	Child	AOC 721	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t^*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	1	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	6,600	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 2004	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

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

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 5.48E-06 Cancer Dermal Intake Time (Age 0 - 6) = 3.62E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.83E-06 Cancer Dermal Intake (Age 0 - 2) = 1.21E+01

Cancer Ingestion Intake (Age 2 - 6) = 3.65E-06 Cancer Dermal Intake (Age 2 - 6) = 2.41E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 6.39E-05 Noncancer Dermal Intake = 4.22E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.18.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SEDIMENT
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	Resident	Child	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	--	BW x AT
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Assumes swimming 3 days per week during warm summer months.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 5.64E-08 Cancer Dermal Intake (Age 0 - 6) = 3.16E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.88E-08 Cancer Dermal Intake (Age 0 - 2) = 1.05E-07

Cancer Ingestion Intake (Age 2 - 6) = 3.76E-08 Cancer Dermal Intake (Age 2 - 6) = 2.10E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 6.58E-07 Noncancer Dermal Intake = 3.68E-06

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.19.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	--	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	AOC 721	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, Residentsial adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 4.70E-07 Cancer Dermal Intake (Age 6 - 30) = 1.87E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.96E-07 Cancer Dermal Intake (Age 6 - 16) = 7.81E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.74E-07 Cancer Dermal Intake (Age 16 - 30) = 1.09E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.37E-06 Noncancer Dermal Intake = 5.47E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.20.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface 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	Resident	Adult	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	350	days/year	USEPA, 2002a	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	$CA = (1/PEF + 1/VF) \times Cs$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.63E+09	m3/kg	USEPA, 2012	$PEF = \frac{Q / C \times 3600}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	76.40181	g/m2-s per kg/m3	USEPA, 2012	$F(x) = 0.18 * (8x^3 + 12x) * \exp(-x^2)$
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA, 2012	
				Um	Mean annual wind speed	3.89	m/sec	USEPA, 2012	$x = 0.886 * Ut / Um$
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2012	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2012	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2012: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Charleston, South Carolina.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 3.29E-01

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.37E-01

Cancer Inhalation Intake (Age 16 - 30) = 1.92E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.21.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - GROUNDWATER
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	AOC 721	CGW	Chemical Concentration in Groundwater	95% UCL or Max	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	2	L/day	USEPA, 1997	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 2004	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Residents	Adult	AOC 721	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	DAevent x EV x EF x ED x SA
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	BW x AT
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	For inorganics
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				t^*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	
				tevent	Duration of event	0.58	hr/event	(1)	For organics if tevent <= t^*
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				SA	Skin Surface Available for Contact	18,000	cm2	USEPA, 2004	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 2004	For organics if tevent > t^*
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, Residentsial adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 9.39E-06 Cancer Dermal Intake (Age 6 - 30) = 8.45E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 3.91E-06 Cancer Dermal Intake (Age 6 - 16) = 3.52E+01

Cancer Ingestion Intake (Age 16 - 30) = 5.48E-06 Cancer Dermal Intake (Age 16 - 30) = 4.93E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.74E-05 Noncancer Dermal Intake = 2.47E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.22.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SEDIMENT
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	Residents	Adult	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1997	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CSx IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	--	BW x AT
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Residents	Adult	AOC 721	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	36	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Assumes swimming 3 days per week during warm summer months.

2 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 2.42E-08 Cancer Dermal Intake (Age 6 - 30) = 1.93E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.01E-08 Cancer Dermal Intake (Age 6 - 16) = 8.03E-08

Cancer Ingestion Intake (Age 16 - 30) = 1.41E-08 Cancer Dermal Intake (Age 16 - 30) = 1.12E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 7.05E-08 Noncancer Dermal Intake = 5.62E-07

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from Ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

RAGS Part D Table 5

Non-Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 5
NON-CANCER TOXICITY DATA

Table No.

5.1 Non-Cancer Toxicity Data - Oral/Dermal
5.2 Non-Cancer Toxicity Data - Inhalation

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s) [3]	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
SVOCs										
BENZO(A)ANTHRACENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BIS(2-ETHYLHEXYL)PHTHALATE	Subchronic	1.0E-01	mg/kg/day	1	1.0E-01	mg/kg/day	Liver	100/1	ATSDR	9/2002
	Chronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day	Liver	1000/1	IRIS	8/6/2012
Pesticides/PCBs										
HEPTACHLOR	Subchronic	1.0E-04	mg/kg/day	1	1.0E-04	mg/kg/day	Liver	300/1	IRIS	8/6/2012
	Chronic	5.0E-04	mg/kg/day	1	5.0E-04	mg/kg/day	Liver	300/1	IRIS	8/6/2012
Inorganics										
ALUMINUM	Subchronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	CNS	30/1	ATSDR	9/2008
	Chronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	CNS	100	PPRTV	10/23/2006
ANTIMONY	Subchronic	4.0E-04	mg/kg/day	0.15	6.0E-05	mg/kg/day	Blood	1000/1	PPRTV	7/29/2008
	Chronic	4.0E-04	mg/kg/day	0.15	6.0E-05	mg/kg/day	Blood	1000/1	IRIS	8/6/2012
ARSENIC	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	8/6/2012
CHROMIUM[3]	Subchronic	2.0E-02	mg/kg/day	0.025	5.0E-04	mg/kg/day	None Specified	100/3	HEAST	9/1997
	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	None Specified	300/3	IRIS	8/6/2012
COBALT	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Thyroid	300/1	PPRTV	8/25/2008
	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	3000/1	PPRTV	8/25/2008
IRON	Subchronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
	Chronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
MANGANESE[4]	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	CNS	1	IRIS	8/6/2012
THALLIUM	Subchronic	4.0E-05	mg/kg/day	1	0.0E+00	mg/kg/day	Skin	1000/1	PPRTV	10/8/2010
	Chronic	1.0E-05	mg/kg/day	1	0.0E+00	mg/kg/day	Skin	3000/1	PPRTV	10/8/2010
VANADIUM	Chronic	5.0E-03	mg/kg/day	1	5.0E-03	mg/kg/day	Kidney	300	USEPA	5/2012

Notes:
1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.
3 - Value is for hexavalent chromium.
4 - Adjusted IRIS value in accordance with IRIS.

Definitions:
ATSDR = Agency for Toxic Substances and Disease Registry
CNS = Central nervous system
CVS = Cardiovascular system
IRIS = Integrated Risk Information System
NA = Not Available
USEPA = Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012.
PPRTV = Provisional Peer Reviewed Toxicity Values

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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)
SVOCs									
BENZO(A)ANTHRACENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
BIS(2-ETHYLHEXYL)PHTHALATE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs									
HEPTACHLOR	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics									
ALUMINUM	Chronic	5.0E-03	mg/m^3	1.4E-03	(mg/kg/day)	CNS	300	PPRTV	10/23/2006
ANTIMONY	NA	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	Chronic	1.5E-05	mg/m^3	4.3E-06	(mg/kg/day)	NA	NA	Cal EPA	9/2009
CHROMIUM[2]	Chronic	1.0E-04	mg/m^3	2.9E-05	(mg/kg/day)	Respiratory	300/1	IRIS	8/6/2012
COBALT	Subchronic	2.0E-05	mg/m^3	5.7E-06	(mg/kg/day)	Respiratory	100/1	PPRTV	8/25/2008
	Chronic	6.0E-06	mg/m^3	1.7E-06	(mg/kg/day)	Respiratory	300/1	PPRTV	8/25/2008
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	Chronic	5.0E-05	mg/m^3	1.4E-05	(mg/kg/day)	CNS	1000/1	IRIS	8/6/2012
THALLIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA
VANADIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - Extrapolated RfD = RfC *$20m^3$/day / 70 kg

2 - Value is for hexavalent chromium.

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

CNS = Central nervous system

NA = Not Applicable

PPRTV = Provisional Peer Reviewed Toxicity Values

RAGS Part D Table 6

Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 6
CANCER TOXICITY DATA

Table No.

6.1 Cancer Toxicity Data - Oral/Dermal
6.2 Cancer Toxicity Data - Inhalation

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
SVOCs								
BENZO(A)ANTHRACENE	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	ECAO	1993
BIS(2-ETHYLHEXYL)PHTHALATE	1.4E-02	$(mg/kg/day)^{-1}$	1	1.4E-02	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	8/6/2012
Pesticides/PCBs								
HEPTACHLOR	4.5E+00	$(mg/kg/day)^{-1}$	1	4.5E+00	$(mg/kg/day)^{-1}$	B2 (Probable human carcinogen)	IRIS	8/6/2012
Inorganics								
ALUMINUM	NA	NA	NA	NA	NA	NA	NA	NA
ANTIMONY	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / Known/likely human carcinogen	IRIS	8/6/2012
CHROMIUM[3][4]	5.0E-01	$(mg/kg/day)^{-1}$	0.025	2.0E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	NJDEP	4/8/2009
COBALT	NA	NA	NA	NA	NA	NA	NA	NA
IRON	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	NA	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	8/6/2012
THALLIUM	NA	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	8/6/2012
VANADIUM	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral Absorption Efficiency for Dermal.
3 - Value is for hexavalent chromium.
4 - Hexavalent chromium is considered to act via the mutagenic mode of action and was evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

ECAO = Environmental Criteria and Assessment Office (EPA, 1993).
IRIS = Integrated Risk Information System.
NA = Not Available.
NJDEP = New Jersey Department of Environmental Protection, Derivation of Ingestion-Based Soil Remediation Criterion for Cr+6 Based on the NTP Chronic Bioassay Data for Sodium Dichromate Dihydrate, April 8, 2009.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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) (MM/DD/YYYY)
SVOCs							
BENZO(A)ANTHRACENE	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
BIS(2-ETHYLHEXYL)PHTHALATE	2.4E-06	$(ug/m^3)^{-1}$	8.4E-03	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Pesticides/PCBs							
HEPTACHLOR	1.3E-03	$(ug/m^3)^{-1}$	4.6E+00	$(mg/kg/day)^{-1}$	B2 (Probable human carcinogen)	IRIS	8/6/2012
Inorganics							
ALUMINUM	NA	NA	NA	NA	NA	NA	NA
ANTIMONY	NA	NA	NA	NA	NA	NA	NA
ARSENIC	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/6/2012
CHROMIUM[2][3]	8.4E-02	$(ug/m^3)^{-1}$	2.9E+02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/6/2012
COBALT	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
IRON	NA	NA	NA	NA	NA	NA	NA
MANGANESE	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	8/6/2012
THALLIUM	NA	NA	NA	NA	NA	NA	NA
VANADIUM	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Value is for hexavalent chromium.

3 - Hexavalent chromium is considered to act via the mutagenic mode of action and was evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

IRIS = Integrated Risk Information System.

NA = Not Available.

PPRTV = Provisional Peer Reviewed Toxicity Values

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	REASONABLE MAXIMUM EXPOSURES
7.1.RME	Construction Workers
7.2.RME	Industrial Workers
7.3.RME	Trespassers
7.4.RME	Child Recreational Users
7.5.RME	Adult Recreational Users
7.6.RME	Child Residents
7.7.RME	Adult Residents

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/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	
Surface Soil	Surface Soil	AOC 721	Ingestion	ARSENIC	92.7	mg/kg	2.6E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.8E-06	1.8E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.6
				COBALT	8.80	mg/kg	2.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.006
				IRON	37,600	mg/kg	1.0E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.1
				THALLIUM	2.70	mg/kg	7.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-06	(mg/kg/day)	4.0E-05	(mg/kg/day)	0.1
			Exp. Route Total								3.8E-06					0.8
			Dermal	ARSENIC	92.7	mg/kg	2.3E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.5E-07	1.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				COBALT	8.80	mg/kg	7.3E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
				IRON	37,600	mg/kg	3.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0003
				THALLIUM	2.70	mg/kg	2.2E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-08	(mg/kg/day)	4.0E-05	(mg/kg/day)	0.0004
			Exp. Route Total								3.5E-07					0.05
		Exposure Point Total									4.2E-06					0.9
	Exposure Medium Total										4.2E-06					0.9
	Air	AOC 721	Inhalation	ARSENIC	7.3E-5	mg/m^3	1.4E-07	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	6.1E-07	1.0E-05	(mg/m^3)	1.5E-05	(mg/m^3)	0.7
				COBALT	6.9E-6	mg/m^3	1.4E-08	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.2E-07	9.5E-07	(mg/m^3)	2.0E-05	(mg/m^3)	0.05
				IRON	0.030	mg/m^3	5.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.1E-03	(mg/m^3)	NA	(mg/m^3)	--
				THALLIUM	2.1E-6	mg/m^3	4.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.4E-07					0.7
		Exposure Point Total									7.4E-07					0.7
	Exposure Medium Total										7.4E-07					0.7
Medium Total											4.9E-06					1.6
Groundwater	Groundwater	AOC 721	Ingestion	BIS(2-ETHYLHEXYL)PHTHALA	8.00	ug/L	1.6E-08	(mg/kg/day)	1.4E-02	$(mg/kg/day)^{-1}$	2.3E-10	1.1E-06	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.00001
				HEPTACHLOR	0.079	ug/L	1.6E-10	(mg/kg/day)	4.5E+00	$(mg/kg/day)^{-1}$	7.2E-10	1.1E-08	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.0001
				ALUMINUM	2,110	ug/L	4.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				ANTIMONY	54.1	ug/L	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.6E-06	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.02
				ARSENIC	206	ug/L	4.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.2E-07	2.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.10
				CHROMIUM VI	4.50	ug/L	9.1E-09	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.5E-09	6.3E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				COBALT	5.30	ug/L	1.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				IRON	14,100	ug/L	2.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.003
				MANGANESE	4,110	ug/L	8.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
				THALLIUM	6.00	ug/L	1.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-07	(mg/kg/day)	4.0E-05	(mg/kg/day)	0.02
				VANADIUM	26.0	ug/L	5.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0007
			Exp. Route Total								6.3E-07					0.2
			Dermal	BIS(2-ETHYLHEXYL)PHTHALA	8.00	ug/L	6.0E-07	(mg/kg/day)	1.4E-02	$(mg/kg/day)^{-1}$	8.4E-09	4.2E-05	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.0004
				HEPTACHLOR	0.079	ug/L	1.8E-09	(mg/kg/day)	4.5E+00	$(mg/kg/day)^{-1}$	8.2E-09	1.3E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.001
				ALUMINUM	2,110	ug/L	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.8E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00010
				ANTIMONY	54.1	ug/L	3.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	6.0E-05	(mg/kg/day)	0.04
				ARSENIC	206	ug/L	1.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-07	9.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				CHROMIUM VI	4.50	ug/L	6.0E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.2E-07	4.2E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0008
				COBALT	5.30	ug/L	1.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
				IRON	14,100	ug/L	9.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0009
				MANGANESE	4,110	ug/L	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.2
				THALLIUM	6.00	ug/L	4.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-07	(mg/kg/day)	4.0E-05	(mg/kg/day)	0.007
				VANADIUM	26.0	ug/L	1.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0002
			Exp. Route Total								3.4E-07					0.3
		Exposure Point Total									9.7E-07					0.4
	Exposure Medium Total										9.7E-07					0.4
Medium Total											9.7E-07					0.4
										Total of Receptor Risks Across All Media	5.9E-06				Total of Receptor Hazards Across All Media	2.1

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/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	
Surface Soil	Surface Soil	AOC 721	Ingestion	ARSENIC	92.7	mg/kg	3.2E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.9E-05	9.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				COBALT	8.80	mg/kg	3.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				IRON	37,600	mg/kg	1.3E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.05
				THALLIUM	2.70	mg/kg	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-06	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.3
			Exp. Route Total								4.9E-05					0.6
			Dermal	ARSENIC	92.7	mg/kg	6.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.6E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				COBALT	8.80	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				IRON	37,600	mg/kg	8.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0003
				THALLIUM	2.70	mg/kg	6.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.002
			Exp. Route Total								9.6E-06					0.06
		Exposure Point Total									5.8E-05					0.7
	Exposure Medium Total										5.8E-05					0.7
	Air	AOC 721	Inhalation	ARSENIC	9.6E-9	mg/m^3	7.8E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.4E-09	2.2E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0001
				COBALT	9.1E-10	mg/m^3	7.5E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	6.7E-10	2.1E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00003
				IRON	3.9E-6	mg/m^3	3.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				THALLIUM	2.8E-10	mg/m^3	2.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.4E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.0E-09					0.0002
		Exposure Point Total									4.0E-09					0.0002
	Exposure Medium Total										4.0E-09					0.0002
Medium Total											5.8E-05					0.7
										Total of Receptor Risks Across All Media	5.8E-05				Total of Receptor Hazards Across All Media	0.7

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	AOC 721	Ingestion	ARSENIC	92.7	mg/kg	3.2E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.8E-06	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				COBALT	8.80	mg/kg	3.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				IRON	37,600	mg/kg	1.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				THALLIUM	2.70	mg/kg	9.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-07	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.07
			Exp. Route Total								4.8E-06					0.2
			Dermal	ARSENIC	92.7	mg/kg	1.1E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-06	7.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				COBALT	8.80	mg/kg	3.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00008
				IRON	37,600	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0002
				THALLIUM	2.70	mg/kg	1.1E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.6E-09	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.0008
			Exp. Route Total								1.7E-06					0.03
		Exposure Point Total									6.5E-06					0.2
	Exposure Medium Total										6.5E-06					0.2
	Air	AOC 721	Inhalation	ARSENIC	9.6E-9	mg/m^3	9.4E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.1E-11	6.6E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000004
				COBALT	9.1E-10	mg/m^3	8.9E-13	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	8.0E-12	6.3E-12	(mg/m^3)	6.0E-06	(mg/m^3)	0.000001
				IRON	3.9E-6	mg/m^3	3.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				THALLIUM	2.8E-10	mg/m^3	2.7E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.9E-11					0.000005
		Exposure Point Total									4.9E-11					0.000005
	Exposure Medium Total										4.9E-11					0.000005
Medium Total											6.5E-06					0.2
Sediment	Sediment	AOC 721	Ingestion	BENZO(A)ANTHRACENE	0.660	mg/kg	3.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	7.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	3.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				ARSENIC	42.5	mg/kg	6.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.0E-06	4.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				COBALT	13.2	mg/kg	2.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				IRON	48,305	mg/kg	7.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.008
				MANGANESE	212	mg/kg	3.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0010
				THALLIUM	4.60	mg/kg	7.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-07	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.05
				VANADIUM	42.6	mg/kg	6.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0009
			Exp. Route Total								1.0E-06					0.08
			Dermal	BENZO(A)ANTHRACENE	0.660	mg/kg	9.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.8E-08	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	8.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00006
				ARSENIC	42.5	mg/kg	4.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.9E-07	3.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				COBALT	13.2	mg/kg	4.8E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				IRON	48,305	mg/kg	1.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0002
				MANGANESE	212	mg/kg	7.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0006
				THALLIUM	4.60	mg/kg	1.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.001
				VANADIUM	42.6	mg/kg	1.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00002
			Exp. Route Total								7.6E-07					0.01
		Exposure Point Total									1.8E-06					0.10
	Exposure Medium Total										1.8E-06					0.10
Medium Total											1.8E-06					0.10
										Total of Receptor Risks Across All Media	8.3E-06				Total of Receptor Hazards Across All Media	0.3

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
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 Soil	Surface Soil	AOC 721	Ingestion	ARSENIC	92.7	mg/kg	2.9E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.4E-05	3.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.1
				COBALT	8.80	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				IRON	37,600	mg/kg	1.2E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.2
				THALLIUM	2.70	mg/kg	8.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-06	(mg/kg/day)	1.0E-05	(mg/kg/day)	1.0
			Exp. Route Total								4.4E-05					2.4
			Dermal	ARSENIC	92.7	mg/kg	2.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.7E-06	2.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				COBALT	8.80	mg/kg	7.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				IRON	37,600	mg/kg	3.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0005
				THALLIUM	2.70	mg/kg	2.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.003
			Exp. Route Total								3.7E-06					0.10
		Exposure Point Total									4.7E-05					2.5
	Exposure Medium Total										4.7E-05					2.5
	Air	AOC 721	Inhalation	ARSENIC	9.6E-9	mg/m^3	1.4E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	6.1E-11	1.6E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00001
				COBALT	9.1E-10	mg/m^3	1.3E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.2E-11	1.6E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000003
				IRON	3.9E-6	mg/m^3	5.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				THALLIUM	2.8E-10	mg/m^3	4.1E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.3E-11					0.00001
		Exposure Point Total									7.3E-11					0.00001
	Exposure Medium Total										7.3E-11					0.00001
Medium Total											4.7E-05					2.5
Sediment	Sediment	AOC 721	Ingestion	BENZO(A)ANTHRACENE	0.660	mg/kg	2.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	1.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.01
				ARSENIC	42.5	mg/kg	2.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.6E-06	2.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				COBALT	13.2	mg/kg	7.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				IRON	48,305	mg/kg	2.7E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.05
				MANGANESE	212	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.006
				THALLIUM	4.60	mg/kg	2.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-06	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.3
				VANADIUM	42.6	mg/kg	2.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.006
			Exp. Route Total								3.7E-06					0.5
			Dermal	BENZO(A)ANTHRACENE	0.660	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-07	3.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	6.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00008
				ARSENIC	42.5	mg/kg	4.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.0E-07	4.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				COBALT	13.2	mg/kg	4.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				IRON	48,305	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0003
				MANGANESE	212	mg/kg	6.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.8E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0008
				THALLIUM	4.60	mg/kg	1.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.002
				VANADIUM	42.6	mg/kg	1.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								7.1E-07					0.02
		Exposure Point Total									4.4E-06					0.5
	Exposure Medium Total										4.4E-06					0.5
Medium Total											4.4E-06					0.5
										Total of Receptor Risks Across All Media	5.2E-05				Total of Receptor Hazards Across All Media	3.0

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
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	AOC 721	Ingestion	ARSENIC	92.7	mg/kg	1.2E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.9E-05	3.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				COBALT	8.80	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				IRON	37,600	mg/kg	5.0E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.02
				THALLIUM	2.70	mg/kg	3.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.1
			Exp. Route Total								1.9E-05					0.3
			Dermal	ARSENIC	92.7	mg/kg	6.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.6E-06	1.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				COBALT	8.80	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				IRON	37,600	mg/kg	8.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0004
				THALLIUM	2.70	mg/kg	6.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.002
			Exp. Route Total								9.6E-06					0.06
		Exposure Point Total									2.8E-05					0.3
	Exposure Medium Total										2.8E-05					0.3
	Air	AOC 721	Inhalation	ARSENIC	9.6E-9	mg/m^3	5.7E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.4E-10	1.6E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00001
				COBALT	9.1E-10	mg/m^3	5.4E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	4.8E-11	1.6E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000003
				IRON	3.9E-6	mg/m^3	2.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				THALLIUM	2.8E-10	mg/m^3	1.6E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.9E-10					0.00001
		Exposure Point Total									2.9E-10					0.00001
	Exposure Medium Total										2.9E-10					0.00001
Medium Total											2.8E-05					0.3
Sediment	Sediment	AOC 721	Ingestion	BENZO(A)ANTHRACENE	0.660	mg/kg	2.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	4.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	5.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				ARSENIC	42.5	mg/kg	1.0E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-06	3.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.010
				COBALT	13.2	mg/kg	3.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				IRON	48,305	mg/kg	1.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				MANGANESE	212	mg/kg	5.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0006
				THALLIUM	4.60	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-07	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.03
				VANADIUM	42.6	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0006
			Exp. Route Total								1.6E-06					0.05
			Dermal	BENZO(A)ANTHRACENE	0.660	mg/kg	3.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-08	4.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	4.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00001
				ARSENIC	42.5	mg/kg	2.5E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.7E-07	7.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				COBALT	13.2	mg/kg	2.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00002
				IRON	48,305	mg/kg	9.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.00004
				MANGANESE	212	mg/kg	4.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0001
				THALLIUM	4.60	mg/kg	8.9E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-09	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.0003
				VANADIUM	42.6	mg/kg	8.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-08	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.000005
			Exp. Route Total								3.9E-07					0.003
		Exposure Point Total									2.0E-06					0.06
	Exposure Medium Total										2.0E-06					0.06
Medium Total											2.0E-06					0.06
										Total of Receptor Risks Across All Media	3.0E-05				Total of Receptor Hazards Across All Media	0.4

Notes:
† - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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 Soil	Surface Soil	AOC 721	Ingestion	ARSENIC	92.7	mg/kg	1.0E-04	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-04	1.2E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	4.0
				COBALT	8.80	mg/kg	9.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				IRON	37,600	mg/kg	4.1E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.8E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.7
				THALLIUM	2.70	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.5E-05	(mg/kg/day)	1.0E-05	(mg/kg/day)	3.5
			Exp. Route Total								1.5E-04					8.5
			Dermal	ARSENIC	92.7	mg/kg	8.5E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-05	1.0E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				COBALT	8.80	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				IRON	37,600	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.3E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				THALLIUM	2.70	mg/kg	8.3E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	9.7E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.010
			Exp. Route Total								1.3E-05					0.3
		Exposure Point Total									1.7E-04					8.8
	Exposure Medium Total										1.7E-04					8.8
	Air	AOC 721	Inhalation	ARSENIC	9.6E-9	mg/m^3	7.9E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.4E-09	9.2E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
				COBALT	9.1E-10	mg/m^3	7.5E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	6.8E-10	8.8E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.0001
				IRON	3.9E-6	mg/m^3	3.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	3.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				THALLIUM	2.8E-10	mg/m^3	2.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.7E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.1E-09					0.0008
		Exposure Point Total									4.1E-09					0.0008
	Exposure Medium Total										4.1E-09					0.0008
Medium Total											1.7E-04					8.8
Groundwater	Groundwater	AOC 721	Ingestion	BIS(2-ETHYLHEXYL)PHTHALA	8.00	ug/L	4.4E-05	(mg/kg/day)	1.4E-02	$(mg/kg/day)^{-1}$	6.1E-07	5.1E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.03
				HEPTACHLOR	0.079	ug/L	4.3E-07	(mg/kg/day)	4.5E+00	$(mg/kg/day)^{-1}$	1.9E-06	5.1E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.01
				ALUMINUM	2,110	ug/L	1.2E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.3E-01	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.1
				ANTIMONY	54.1	ug/L	3.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.5E-03	(mg/kg/day)	4.0E-04	(mg/kg/day)	8.6
				ARSENIC	206	ug/L	1.1E-03	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-03	1.3E-02	(mg/kg/day)	3.0E-04	(mg/kg/day)	44
				CHROMIUM VI	4.50	ug/L	1.3E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.6E-05	2.9E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.10
				COBALT	5.30	ug/L	2.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.1
				IRON	14,100	ug/L	7.7E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	9.0E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	1.3
				MANGANESE	4,110	ug/L	2.3E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.6E-01	(mg/kg/day)	2.4E-02	(mg/kg/day)	11
				THALLIUM	6.00	ug/L	3.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.8E-04	(mg/kg/day)	1.0E-05	(mg/kg/day)	38
				VANADIUM	26.0	ug/L	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.7E-03	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.3
			Exp. Route Total								1.8E-03					105
			Dermal	BIS(2-ETHYLHEXYL)PHTHALA	8.00	ug/L	6.5E-05	(mg/kg/day)	1.4E-02	$(mg/kg/day)^{-1}$	9.1E-07	7.6E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
				HEPTACHLOR	0.079	ug/L	2.0E-07	(mg/kg/day)	4.5E+00	$(mg/kg/day)^{-1}$	9.0E-07	2.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
				ALUMINUM	2,110	ug/L	7.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	8.9E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0009
				ANTIMONY	54.1	ug/L	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.3E-05	(mg/kg/day)	6.0E-05	(mg/kg/day)	0.4
				ARSENIC	206	ug/L	7.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-05	8.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				CHROMIUM VI	4.50	ug/L	1.7E-06	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	3.5E-05	3.8E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.05
				COBALT	5.30	ug/L	7.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	8.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				IRON	14,100	ug/L	5.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	5.9E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.008
				MANGANESE	4,110	ug/L	1.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.7E-03	(mg/kg/day)	9.6E-04	(mg/kg/day)	1.8
				THALLIUM	6.00	ug/L	2.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.5E-06	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.3
				VANADIUM	26.0	ug/L	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.1E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.002
			Exp. Route Total								4.8E-05					2.8
		Exposure Point Total									1.8E-03					108
	Exposure Medium Total										1.8E-03					108
Medium Total											1.8E-03					108

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	AOC 721	Ingestion	BENZO(A)ANTHRACENE	0.660	mg/kg	2.0E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.4E-07	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.01
				ARSENIC	42.5	mg/kg	2.4E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.6E-06	2.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				COBALT	13.2	mg/kg	7.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				IRON	48,305	mg/kg	2.7E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.05
				MANGANESE	212	mg/kg	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.006
				THALLIUM	4.60	mg/kg	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.0E-06	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.3
				VANADIUM	42.6	mg/kg	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.006
			Exp. Route Total								3.7E-06					0.5
			Dermal	BENZO(A)ANTHRACENE	0.660	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.1E-07	3.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	6.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.1E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00008
				ARSENIC	42.5	mg/kg	4.0E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	6.0E-07	4.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				COBALT	13.2	mg/kg	4.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				IRON	48,305	mg/kg	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0003
				MANGANESE	212	mg/kg	6.7E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.8E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0008
				THALLIUM	4.60	mg/kg	1.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.002
				VANADIUM	42.6	mg/kg	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								7.1E-07					0.02
		Exposure Point Total									4.4E-06					0.5
	Exposure Medium Total										4.4E-06					0.5
Medium Total											4.4E-06					0.5
										Total of Receptor Risks Across All Media	2.0E-03				Total of Receptor Hazards Across All Media	117

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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 Soil	Surface Soil	AOC 721	Ingestion	ARSENIC	92.7	mg/kg	4.4E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.5E-05	1.3E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				COBALT	8.80	mg/kg	4.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				IRON	37,600	mg/kg	1.8E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.07
				THALLIUM	2.70	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-06	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.4
			Exp. Route Total								6.5E-05					0.9
			Dermal	ARSENIC	92.7	mg/kg	5.2E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.8E-06	1.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				COBALT	8.80	mg/kg	1.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				IRON	37,600	mg/kg	7.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0003
				THALLIUM	2.70	mg/kg	5.1E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-08	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.001
			Exp. Route Total								7.8E-06					0.05
		Exposure Point Total									7.3E-05					1.0
	Exposure Medium Total										7.3E-05					1.0
	Air	AOC 721	Inhalation	ARSENIC	9.6E-9	mg/m^3	3.2E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.4E-08	9.2E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
				COBALT	9.1E-10	mg/m^3	3.0E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.7E-09	8.8E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.0001
				IRON	3.9E-6	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				THALLIUM	2.8E-10	mg/m^3	9.2E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-08					0.0008
		Exposure Point Total									1.6E-08					0.0008
	Exposure Medium Total										1.6E-08					0.0008
Medium Total											7.3E-05					1.0
Groundwater	Groundwater	AOC 721	Ingestion	BIS(2-ETHYLHEXYL)PHTHALA	8.00	ug/L	7.5E-05	(mg/kg/day)	1.4E-02	$(mg/kg/day)^{-1}$	1.1E-06	2.2E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.01
				HEPTACHLOR	0.079	ug/L	7.4E-07	(mg/kg/day)	4.5E+00	$(mg/kg/day)^{-1}$	3.3E-06	2.2E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.004
				ALUMINUM	2,110	ug/L	2.0E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.06
				ANTIMONY	54.1	ug/L	5.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-03	(mg/kg/day)	4.0E-04	(mg/kg/day)	3.7
				ARSENIC	206	ug/L	1.9E-03	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.9E-03	5.6E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	19
				CHROMIUM VI	4.50	ug/L	7.7E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.9E-05	1.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
				COBALT	5.30	ug/L	5.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				IRON	14,100	ug/L	1.3E-01	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.6
				MANGANESE	4,110	ug/L	3.9E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-01	(mg/kg/day)	2.4E-02	(mg/kg/day)	4.7
				THALLIUM	6.00	ug/L	5.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-04	(mg/kg/day)	1.0E-05	(mg/kg/day)	16
				VANADIUM	26.0	ug/L	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.1E-04	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.1
			Exp. Route Total								2.9E-03					45
			Dermal	BIS(2-ETHYLHEXYL)PHTHALA	8.00	ug/L	1.2E-04	(mg/kg/day)	1.4E-02	$(mg/kg/day)^{-1}$	1.6E-06	3.4E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.02
				HEPTACHLOR	0.079	ug/L	3.5E-07	(mg/kg/day)	4.5E+00	$(mg/kg/day)^{-1}$	1.6E-06	1.0E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.002
				ALUMINUM	2,110	ug/L	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				ANTIMONY	54.1	ug/L	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-06	(mg/kg/day)	6.0E-05	(mg/kg/day)	0.1
				ARSENIC	206	ug/L	1.0E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-05	2.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.10
				CHROMIUM VI	4.50	ug/L	8.1E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.6E-05	1.3E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
				COBALT	5.30	ug/L	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				IRON	14,100	ug/L	6.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.003
				MANGANESE	4,110	ug/L	2.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.9E-04	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.6
				THALLIUM	6.00	ug/L	2.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.6E-07	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.09
				VANADIUM	26.0	ug/L	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0007
			Exp. Route Total								3.5E-05					1.0
		Exposure Point Total									3.0E-03					46
	Exposure Medium Total										3.0E-03					46
Medium Total											3.0E-03					46

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	AOC 721	Ingestion	BENZO(A)ANTHRACENE	0.660	mg/kg	2.9E-08	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	2.1E-08	4.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	5.3E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				ARSENIC	42.5	mg/kg	1.0E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.5E-06	3.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.010
				COBALT	13.2	mg/kg	3.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				IRON	48,305	mg/kg	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				MANGANESE	212	mg/kg	5.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0006
				THALLIUM	4.60	mg/kg	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-07	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.03
				VANADIUM	42.6	mg/kg	1.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.0E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0006
			Exp. Route Total								1.6E-06					0.05
			Dermal	BENZO(A)ANTHRACENE	0.660	mg/kg	3.0E-08	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	2.2E-08	4.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				ALUMINUM	22,011	mg/kg	4.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00001
				ARSENIC	42.5	mg/kg	2.5E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.7E-07	7.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				COBALT	13.2	mg/kg	2.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.4E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00002
				IRON	48,305	mg/kg	9.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-05	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.00004
				MANGANESE	212	mg/kg	4.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0001
				THALLIUM	4.60	mg/kg	8.9E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-09	(mg/kg/day)	1.0E-05	(mg/kg/day)	0.0003
				VANADIUM	42.6	mg/kg	8.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-08	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.000005
			Exp. Route Total								3.9E-07					0.003
		Exposure Point Total									2.0E-06					0.06
	Exposure Medium Total										2.0E-06					0.06
Medium Total											2.0E-06					0.06
										Total of Receptor Risks Across All Media	3.1E-03				Total of Receptor Hazards Across All Media	47

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers
9.2.RME	Industrial Workers
9.3.RME	Trespassers
9.4.RME	Child Recreational Users
9.5.RME	Adult Recreational Users
9.6.RME	Lifelong Recreational Users
9.7.RME	Child Residents
9.8.RME	Adult Residents
9.9.RME	Lifelong Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/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	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	4E-06	--	3E-07	--	4E-06	Skin, CVS	0.6	--	0.05	0.7
			COBALT	- -	--	- -	--	- -	Thyroid	0.006	--	0.00002	0.006
			IRON	- -	--	- -	--	- -	GS	0.1	--	0.0003	0.1
			THALLIUM	- -	--	- -	--	- -	Skin	0.1	--	0.0004	0.1
			Chemical Total	4E-06	--	3E-07	--	4E-06		0.8	--	0.05	0.9
		Exposure Point Total						4E-06					0.9
	Exposure Medium Total							4E-06					0.9
	Air	AOC 721	ARSENIC	--	6E-07	--	--	6E-07	NA	--	0.7	--	0.7
			COBALT	--	1E-07	--	--	1E-07	Respiratory	--	0.05	--	0.05
			IRON	--	- -	--	--	- -	NA	--	--	--	--
			THALLIUM	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	7E-07	--	--	7E-07		- -	0.7	- -	0.7
		Exposure Point Total						7E-07					0.7
	Exposure Medium Total							7E-07					0.7
Medium Total								5E-06					2
Groundwater	Groundwater	AOC 721	BIS(2-ETHYLHEXYL)PHTHAL	2E-10	--	8E-09	--	9E-09	Liver	0.00001	--	0.0004	0.0004
			HEPTACHLOR	7E-10	--	8E-09	--	9E-09	Liver	0.0001	--	0.001	0.001
			ALUMINUM	- -	--	- -	--	- -	CNS	0.0003	--	0.00010	0.0004
			ANTIMONY	- -	--	- -	--	- -	Blood	0.02	--	0.04	0.06
			ARSENIC	6E-07	--	2E-07	--	8E-07	Skin, CVS	0.10	--	0.03	0.1
			CHROMIUM VI	5E-09	--	1E-07	--	1E-07	None Specified	0.00003	--	0.0008	0.0009
			COBALT	- -	--	- -	--	- -	Thyroid	0.0002	--	0.00003	0.0003
			IRON	- -	--	- -	--	- -	GS	0.003	--	0.0009	0.004
			MANGANESE	- -	--	- -	--	- -	CNS	0.02	--	0.2	0.2
			THALLIUM	- -	--	- -	--	- -	Skin	0.02	--	0.007	0.03
			VANADIUM	- -	--	- -	--	- -	Kidney	0.0007	--	0.0002	0.0010
			Chemical Total	6E-07	--	3E-07	--	1E-06		0.2	--	0.3	0.4
		Exposure Point Total						1E-06					0.4
	Exposure Medium Total							1E-06					0.4
Medium Total								1E-06					0.4
Receptor Total							Receptor Risk Total	6E-06				Receptor HI Total	2

Total Blood HI	0.06
Total CNS HI	0.2
Total CVS HI	0.8
Total GS HI	0.1
Total Kidney HI	0.0010
Total Liver HI	0.002
Total Respiratory HI	0.05
Total Skin HI	0.9
Total Thyroid HI	0.006
Total NA HI	0.7

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/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	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	5E-05	--	1E-05	--	6E-05	Skin, CVS	0.3	--	0.06	0.4
			COBALT	- -	--	- -	--	- -	Thyroid	0.03	--	0.0002	0.03
			IRON	- -	--	- -	--	- -	GS	0.05	--	0.0003	0.05
			THALLIUM	- -	--	- -	--	- -	Skin	0.3	--	0.002	0.3
			Chemical Total	5E-05	--	1E-05	--	6E-05		0.6	--	0.06	0.7
		Exposure Point Total						6E-05					0.7
	Exposure Medium Total							6E-05					0.7
	Air	AOC 721	ARSENIC	--	3E-09	--	--	3E-09	NA	--	0.0001	--	0.0001
			COBALT	--	7E-10	--	--	7E-10	Respiratory	--	0.00003	--	0.00003
			IRON	--	- -	--	--	- -	NA	--	--	--	--
			THALLIUM	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0002	- -	0.0002
		Exposure Point Total						4E-09					0.0002
	Exposure Medium Total							4E-09					0.0002
Medium Total								6E-05					0.7
Receptor Total							Receptor Risk Total	6E-05				Receptor HI Total	0.7

Total CVS HI	0.4
Total GS HI	0.05
Total Respiratory HI	0.00003
Total Skin HI	0.6
Total Thyroid HI	0.03
Total NA HI	0.0001

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	5E-06	--	2E-06	--	7E-06	Skin, CVS	0.08	--	0.03	0.1
			COBALT	- -	--	- -	--	- -	Thyroid	0.007	--	0.00008	0.007
			IRON	- -	--	- -	--	- -	GS	0.01	--	0.0002	0.01
			THALLIUM	- -	--	- -	--	- -	Skin	0.07	--	0.0008	0.07
			Chemical Total	5E-06	--	2E-06	--	7E-06		0.2	--	0.03	0.2
		Exposure Point Total						7E-06					0.2
	Exposure Medium Total							7E-06					0.2
	Air	AOC 721	ARSENIC	--	4E-11	--	--	4E-11	NA	--	0.000004	--	0.000004
			COBALT	--	8E-12	--	--	8E-12	Respiratory	--	0.000001	--	0.000001
			IRON	--	- -	--	--	- -	NA	--	--	--	--
			THALLIUM	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	5E-11	--	--	5E-11		- -	0.000005	- -	0.000005
		Exposure Point Total						5E-11					0.000005
	Exposure Medium Total							5E-11					0.000005
Medium Total								7E-06					0.2
Sediment	Sediment	AOC 721	BENZO(A)ANTHRACENE	2E-08	--	7E-08	--	9E-08	NA	--	--	--	--
			ALUMINUM	- -	--	- -	--	- -	CNS	0.002	--	0.00006	0.002
			ARSENIC	1E-06	--	7E-07	--	2E-06	Skin, CVS	0.02	--	0.01	0.03
			COBALT	- -	--	- -	--	- -	Thyroid	0.005	--	0.0001	0.005
			IRON	- -	--	- -	--	- -	GS	0.008	--	0.0002	0.008
			MANGANESE	- -	--	- -	--	- -	CNS	0.0010	--	0.0006	0.002
			THALLIUM	- -	--	- -	--	- -	Skin	0.05	--	0.001	0.05
			VANADIUM	- -	--	- -	--	- -	Kidney	0.0009	--	0.00002	0.0010
			Chemical Total	1E-06	--	8E-07	--	2E-06		0.08	--	0.01	0.10
		Exposure Point Total						2E-06					0.10
	Exposure Medium Total							2E-06					0.10
Medium Total								2E-06					0.10
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	0.3

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total CNS HI	0.004
Total CVS HI	0.1
Total GS HI	0.02
Total Kidney HI	0.0010
Total Respiratory HI	0.000001
Total Skin HI	0.2
Total Thyroid HI	0.01
Total NA HI	0.000004

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	4E-05	--	4E-06	--	5E-05	Skin, CVS	1	--	0.09	1
			COBALT	- -	--	- -	--	- -	Thyroid	0.1	--	0.0003	0.1
			IRON	- -	--	- -	--	- -	GS	0.2	--	0.0005	0.2
			THALLIUM	- -	--	- -	--	- -	Skin	1.0	--	0.003	1.0
			Chemical Total	4E-05	--	4E-06	--	5E-05		2	--	0.10	3
		Exposure Point Total						5E-05					3
	Exposure Medium Total							5E-05					3
	Air	AOC 721	ARSENIC	--	6E-11	--	--	6E-11	NA	--	0.00001	--	0.00001
			COBALT	--	1E-11	--	--	1E-11	Respiratory	--	0.000003	--	0.000003
			IRON	--	- -	--	--	- -	NA	--	--	--	--
			THALLIUM	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	7E-11	--	--	7E-11		- -	0.00001	- -	0.00001
		Exposure Point Total						7E-11					0.00001
	Exposure Medium Total							7E-11					0.00001
Medium Total								5E-05					3
Sediment	Sediment	AOC 721	BENZO(A)ANTHRACENE	1E-07	--	1E-07	--	3E-07	NA	--	--	--	--
			ALUMINUM	- -	--	- -	--	- -	CNS	0.01	--	0.00008	0.01
			ARSENIC	4E-06	--	6E-07	--	4E-06	Skin, CVS	0.09	--	0.02	0.1
			COBALT	- -	--	- -	--	- -	Thyroid	0.03	--	0.0002	0.03
			IRON	- -	--	- -	--	- -	GS	0.05	--	0.0003	0.05
			MANGANESE	- -	--	- -	--	- -	CNS	0.006	--	0.0008	0.007
			THALLIUM	- -	--	- -	--	- -	Skin	0.3	--	0.002	0.3
			VANADIUM	- -	--	- -	--	- -	Kidney	0.006	--	0.00003	0.006
			Chemical Total	4E-06	--	7E-07	--	4E-06		0.5	--	0.02	0.5
		Exposure Point Total						4E-06					0.5
	Exposure Medium Total							4E-06					0.5
Medium Total								4E-06					0.5
Receptor Total							Receptor Risk Total	5E-05				Receptor HI Total	3

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total CNS HI	0.02
Total CVS HI	1
Total GS HI	0.2
Total Kidney HI	0.006
Total Respiratory HI	0.000003
Total Skin HI	3
Total Thyroid HI	0.1
Total NA HI	0.00001

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	2E-05	--	1E-05	--	3E-05	Skin, CVS	0.1	--	0.06	0.2
			COBALT	- -	--	- -	--	- -	Thyroid	0.01	--	0.0002	0.01
			IRON	- -	--	- -	--	- -	GS	0.02	--	0.0004	0.02
			THALLIUM	- -	--	- -	--	- -	Skin	0.1	--	0.002	0.1
			Chemical Total	2E-05	--	1E-05	--	3E-05		0.3	--	0.06	0.3
		Exposure Point Total						3E-05					0.3
	Exposure Medium Total							3E-05					0.3
	Air	AOC 721	ARSENIC	--	2E-10	--	--	2E-10	NA	--	0.00001	--	0.00001
			COBALT	--	5E-11	--	--	5E-11	Respiratory	--	0.000003	--	0.000003
			IRON	--	- -	--	--	- -	NA	--	--	--	--
			THALLIUM	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00001	- -	0.00001
		Exposure Point Total						3E-10					0.00001
	Exposure Medium Total							3E-10					0.00001
Medium Total								3E-05					0.3
Sediment	Sediment	AOC 721	BENZO(A)ANTHRACENE	2E-08	--	2E-08	--	4E-08	NA	--	--	--	--
			ALUMINUM	- -	--	- -	--	- -	CNS	0.002	--	0.00001	0.002
			ARSENIC	2E-06	--	4E-07	--	2E-06	Skin, CVS	0.010	--	0.002	0.01
			COBALT	- -	--	- -	--	- -	Thyroid	0.003	--	0.00002	0.003
			IRON	- -	--	- -	--	- -	GS	0.005	--	0.00004	0.005
			MANGANESE	- -	--	- -	--	- -	CNS	0.0006	--	0.0001	0.0007
			THALLIUM	- -	--	- -	--	- -	Skin	0.03	--	0.0003	0.03
			VANADIUM	- -	--	- -	--	- -	Kidney	0.0006	--	0.000005	0.0006
			Chemical Total	2E-06	--	4E-07	--	2E-06		0.05	--	0.003	0.06
		Exposure Point Total						2E-06					0.06
	Exposure Medium Total							2E-06					0.06
Medium Total								2E-06					0.06
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	0.4

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total CNS HI	0.002
Total CVS HI	0.2
Total GS HI	0.03
Total Kidney HI	0.0006
Total Respiratory HI	0.000003
Total Skin HI	0.3
Total Thyroid HI	0.01
Total NA HI	0.00001

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifelong

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	6E-05	--	1E-05	--	8E-05					
			COBALT	- -	--	- -	--	- -					
			IRON	- -	--	- -	--	- -					
			THALLIUM	- -	--	- -	--	- -					
			Chemical Total	6E-05	--	1E-05	--	8E-05					
		Exposure Point Total						8E-05					
	Exposure Medium Total							8E-05					
	Air	AOC 721	ARSENIC	--	3E-10	--	--	3E-10					
			COBALT	--	6E-11	--	--	6E-11					
			IRON	--	- -	--	--	- -					
			THALLIUM	--	- -	--	--	- -					
			Chemical Total	--	4E-10	--	--	4E-10					
		Exposure Point Total						4E-10					
	Exposure Medium Total							4E-10					
Medium Total								8E-05					
Sediment	Sediment	AOC 721	BENZO(A)ANTHRACENE	2E-07	--	1E-07	--	3E-07					
			ALUMINUM	- -	--	- -	--	- -					
			ARSENIC	5E-06	--	1E-06	--	6E-06					
			COBALT	- -	--	- -	--	- -					
			IRON	- -	--	- -	--	- -					
			MANGANESE	- -	--	- -	--	- -					
			THALLIUM	- -	--	- -	--	- -					
			VANADIUM	- -	--	- -	--	- -					
			Chemical Total	5E-06	--	1E-06	--	6E-06					
		Exposure Point Total						6E-06					
	Exposure Medium Total							6E-06					
Medium Total								6E-06					
Receptor Total							Receptor Risk Total	8E-05					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	2E-04	--	1E-05	--	2E-04	Skin, CVS	4	--	0.3	4
			COBALT	- -	--	- -	--	- -	Thyroid	0.4	--	0.001	0.4
			IRON	- -	--	- -	--	- -	GS	0.7	--	0.002	0.7
			THALLIUM	- -	--	- -	--	- -	Skin	3	--	0.010	3
			Chemical Total	2E-04	--	1E-05	--	2E-04		8	--	0.3	9
		Exposure Point Total						2E-04					9
	Exposure Medium Total							2E-04					9
	Air	AOC 721	ARSENIC	--	3E-09	--	--	3E-09	NA	--	0.0006	--	0.0006
			COBALT	--	7E-10	--	--	7E-10	Respiratory	--	0.0001	--	0.0001
			IRON	--	- -	--	--	- -	NA	--	--	--	--
			THALLIUM	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0008	- -	0.0008
		Exposure Point Total						4E-09					0.0008
	Exposure Medium Total							4E-09					0.0008
Medium Total								2E-04					9
Groundwater	Groundwater	AOC 721	BIS(2-ETHYLHEXYL)PHTHAL	6E-07	--	9E-07	--	2E-06	Liver	0.03	--	0.04	0.06
			HEPTACHLOR	2E-06	--	9E-07	--	3E-06	Liver	0.01	--	0.005	0.01
			ALUMINUM	- -	--	- -	--	- -	CNS	0.1	--	0.0009	0.1
			ANTIMONY	- -	--	- -	--	- -	Blood	9	--	0.4	9
			ARSENIC	2E-03	--	1E-05	--	2E-03	Skin, CVS	44	--	0.3	44
			CHROMIUM VI	7E-05	--	3E-05	--	1E-04	None Specified	0.10	--	0.05	0.1
			COBALT	- -	--	- -	--	- -	Thyroid	1	--	0.003	1
			IRON	- -	--	- -	--	- -	GS	1	--	0.008	1
			MANGANESE	- -	--	- -	--	- -	CNS	11	--	2	13
			THALLIUM	- -	--	- -	--	- -	Skin	38	--	0.3	39
			VANADIUM	- -	--	- -	--	- -	Kidney	0.3	--	0.002	0.3
			Chemical Total	2E-03	--	5E-05	--	2E-03		105	--	3	108
		Exposure Point Total						2E-03					108
	Exposure Medium Total							2E-03					108
Medium Total								2E-03					108
Sediment	Sediment	AOC 721	BENZO(A)ANTHRACENE	1E-07	--	1E-07	--	3E-07	NA	--	--	--	--
			ALUMINUM	- -	--	- -	--	- -	CNS	0.01	--	0.00008	0.01
			ARSENIC	4E-06	--	6E-07	--	4E-06	Skin, CVS	0.09	--	0.02	0.1
			COBALT	- -	--	- -	--	- -	Thyroid	0.03	--	0.0002	0.03
			IRON	- -	--	- -	--	- -	GS	0.05	--	0.0003	0.05
			MANGANESE	- -	--	- -	--	- -	CNS	0.006	--	0.0008	0.007
			THALLIUM	- -	--	- -	--	- -	Skin	0.3	--	0.002	0.3
			VANADIUM	- -	--	- -	--	- -	Kidney	0.006	--	0.00003	0.006
			Chemical Total	4E-06	--	7E-07	--	4E-06		0.5	--	0.02	0.5
		Exposure Point Total						4E-06					0.5
	Exposure Medium Total							4E-06					0.5
Medium Total								4E-06					0.5
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	117

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	9
Total CNS HI	13
Total CVS HI	49
Total GS HI	2
Total Kidney HI	0.3
Total Liver HI	0.08
Total Respiratory HI	0.0001
Total Skin HI	91
Total Thyroid HI	2
Total NA HI	0.0006

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	7E-05	--	8E-06	--	7E-05	Skin, CVS	0.4	--	0.05	0.5
			COBALT	- -	--	- -	--	- -	Thyroid	0.04	--	0.0002	0.04
			IRON	- -	--	- -	--	- -	GS	0.07	--	0.0003	0.07
			THALLIUM	- -	--	- -	--	- -	Skin	0.4	--	0.001	0.4
			Chemical Total	7E-05	--	8E-06	--	7E-05		0.9	--	0.05	1.0
		Exposure Point Total						7E-05					1.0
	Exposure Medium Total							7E-05					1.0
	Air	AOC 721	ARSENIC	--	1E-08	--	--	1E-08	NA	--	0.0006	--	0.0006
			COBALT	--	3E-09	--	--	3E-09	Respiratory	--	0.0001	--	0.0001
			IRON	--	- -	--	--	- -	NA	--	--	--	--
			THALLIUM	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0008	- -	0.0008
		Exposure Point Total						2E-08					0.0008
	Exposure Medium Total							2E-08					0.0008
Medium Total								7E-05					1.0
Groundwater	Groundwater	AOC 721	BIS(2-ETHYLHEXYL)PHTHALA	1E-06	--	2E-06	--	3E-06	Liver	0.01	--	0.02	0.03
			HEPTACHLOR	3E-06	--	2E-06	--	5E-06	Liver	0.004	--	0.002	0.006
			ALUMINUM	- -	--	- -	--	- -	CNS	0.06	--	0.0003	0.06
			ANTIMONY	- -	--	- -	--	- -	Blood	4	--	0.1	4
			ARSENIC	3E-03	--	2E-05	--	3E-03	Skin, CVS	19	--	0.10	19
			CHROMIUM VI	4E-05	--	2E-05	--	5E-05	None Specified	0.04	--	0.02	0.06
			COBALT	- -	--	- -	--	- -	Thyroid	0.5	--	0.001	0.5
			IRON	- -	--	- -	--	- -	GS	0.6	--	0.003	0.6
			MANGANESE	- -	--	- -	--	- -	CNS	5	--	0.6	5
			THALLIUM	- -	--	- -	--	- -	Skin	16	--	0.09	17
			VANADIUM	- -	--	- -	--	- -	Kidney	0.1	--	0.0007	0.1
			Chemical Total	3E-03	--	3E-05	--	3E-03		45	--	1.0	46
		Exposure Point Total						3E-03					46
	Exposure Medium Total							3E-03					46
Medium Total								3E-03					46
Sediment	Sediment	AOC 721	BENZO(A)ANTHRACENE	2E-08	--	2E-08	--	4E-08	NA	--	--	--	--
			ALUMINUM	- -	--	- -	--	- -	CNS	0.002	--	0.00001	0.002
			ARSENIC	2E-06	--	4E-07	--	2E-06	Skin, CVS	0.010	--	0.002	0.01
			COBALT	- -	--	- -	--	- -	Thyroid	0.003	--	0.00002	0.003
			IRON	- -	--	- -	--	- -	GS	0.005	--	0.00004	0.005
			MANGANESE	- -	--	- -	--	- -	CNS	0.0006	--	0.0001	0.0007
			THALLIUM	- -	--	- -	--	- -	Skin	0.03	--	0.0003	0.03
			VANADIUM	- -	--	- -	--	- -	Kidney	0.0006	--	0.000005	0.0006
			Chemical Total	2E-06	--	4E-07	--	2E-06		0.05	--	0.003	0.06
		Exposure Point Total						2E-06					0.06
	Exposure Medium Total							2E-06					0.06
Medium Total								2E-06					0.06
Receptor Total							Receptor Risk Total	3E-03				Receptor HI Total	47

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	4
Total CNS HI	5
Total CVS HI	19
Total GS HI	0.6
Total Kidney HI	0.1
Total Liver HI	0.03
Total Respiratory HI	0.0001
Total Skin HI	36
Total Thyroid HI	0.5
Total NA HI	0.0006

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	AOC 721	ARSENIC	2E-04	--	2E-05	--	2E-04					
			COBALT	- -	--	- -	--	- -					
			IRON	- -	--	- -	--	- -					
			THALLIUM	- -	--	- -	--	- -					
			Chemical Total	2E-04	--	2E-05	--	2E-04					
		Exposure Point Total						2E-04					
	Exposure Medium Total							2E-04					
	Air	AOC 721	ARSENIC	--	2E-08	--	--	2E-08					
			COBALT	--	3E-09	--	--	3E-09					
			IRON	--	- -	--	--	- -					
			THALLIUM	--	- -	--	--	- -					
			Chemical Total	--	2E-08	--	--	2E-08					
		Exposure Point Total						2E-08					
	Exposure Medium Total							2E-08					
Medium Total								2E-04					
Groundwater	Groundwater	AOC 721	BIS(2-ETHYLHEXYL)PHTHALA	2E-06	--	3E-06	--	4E-06					
			HEPTACHLOR	5E-06	--	2E-06	--	8E-06					
			ALUMINUM	- -	--	- -	--	- -					
			ANTIMONY	- -	--	- -	--	- -					
			ARSENIC	5E-03	--	3E-05	--	5E-03					
			CHROMIUM VI	1E-04	--	5E-05	--	2E-04					
			COBALT	- -	--	- -	--	- -					
			IRON	- -	--	- -	--	- -					
			MANGANESE	- -	--	- -	--	- -					
			THALLIUM	- -	--	- -	--	- -					
			VANADIUM	- -	--	- -	--	- -					
			Chemical Total	5E-03	--	8E-05	--	5E-03					
		Exposure Point Total						5E-03					
	Exposure Medium Total							5E-03					
Medium Total								5E-03					
Sediment	Sediment	AOC 721	BENZO(A)ANTHRACENE	2E-07	--	1E-07	--	3E-07					
			ALUMINUM	- -	--	- -	--	- -					
			ARSENIC	5E-06	--	1E-06	--	6E-06					
			COBALT	- -	--	- -	--	- -					
			IRON	- -	--	- -	--	- -					
			MANGANESE	- -	--	- -	--	- -					
			THALLIUM	- -	--	- -	--	- -					
			VANADIUM	- -	--	- -	--	- -					
			Chemical Total	5E-06	--	1E-06	--	6E-06					
		Exposure Point Total						6E-06					
	Exposure Medium Total							6E-06					
Medium Total								6E-06					
Receptor Total							Receptor Risk Total	5E-03					

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
AOC 721 CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

APPENDIX C-2

ProUCL PRINTOUTS

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Data	16	Number of Detected Data	15
Number of Distinct Detected Data	14	Number of Non-Detect Data	1
Number of Missing Values	19	Percent Non-Detects	6.25%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.051	Minimum Detected	-2.976
Maximum Detected	1.4	Maximum Detected	0.336
Mean of Detected	0.312	Mean of Detected	-1.53
SD of Detected	0.333	SD of Detected	0.854
Minimum Non-Detect	0.49	Minimum Non-Detect	-0.713
Maximum Non-Detect	0.49	Maximum Non-Detect	-0.713

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.674	Shapiro Wilk Test Statistic	0.967
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.308	Mean	-1.522
SD	0.322	SD	0.826
95% DL/2 (t) UCL	0.449	95% H-Stat (DL/2) UCL	0.517
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.541
		SD in Log Scale	0.826
		Mean in Original Scale	0.304
		SD in Original Scale	0.323
		95% t UCL	0.445
		95% Percentile Bootstrap UCL	0.437
		95% BCA Bootstrap UCL	0.512
		95% H-UCL	0.508
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.259	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.248		
nu star	37.77		

A-D Test Statistic	0.476	**Nonparametric Statistics**	
5% A-D Critical Value	0.754	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.754	Mean	0.305
5% K-S Critical Value	0.225	SD	0.314
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0816
		95% KM (t) UCL	0.448
Assuming Gamma Distribution		95% KM (z) UCL	0.44
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.448
Minimum	0.051	95% KM (bootstrap t) UCL	0.59
Maximum	1.4	95% KM (BCA) UCL	0.453
Mean	0.309	95% KM (Percentile Bootstrap) UCL	0.439
Median	0.243	95% KM (Chebyshev) UCL	0.661
SD	0.322	97.5% KM (Chebyshev) UCL	0.815
k star	1.348	99% KM (Chebyshev) UCL	1.117
Theta star	0.229		
Nu star	43.14	**Potential UCLs to Use**	
AppChi2	29.08	95% KM (Chebyshev) UCL	0.661
95% Gamma Approximate UCL (Use when n >= 40)	0.458		
95% Adjusted Gamma UCL (Use when n < 40)	0.48		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics

Number of Valid Data	32	Number of Detected Data	31
Number of Distinct Detected Data	30	Number of Non-Detect Data	1
Number of Missing Values	16	Percent Non-Detects	3.13%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	2.8	Minimum Detected	1.03
Maximum Detected	89.5	Maximum Detected	4.494
Mean of Detected	26.4	Mean of Detected	2.977
SD of Detected	21.84	SD of Detected	0.8
Minimum Non-Detect	0.39	Minimum Non-Detect	-0.942
Maximum Non-Detect	0.39	Maximum Non-Detect	-0.942

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.808	Shapiro Wilk Test Statistic	0.976
5% Shapiro Wilk Critical Value	0.929	5% Shapiro Wilk Critical Value	0.929
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	25.58	Mean	2.833

SD	21.98	SD	1.133
95% DL/2 (t) UCL	32.17	95% H-Stat (DL/2) UCL	54.74
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	25.24	Mean in Log Scale	2.914
SD	22.17	SD in Log Scale	0.863
95% MLE (t) UCL	31.89	Mean in Original Scale	25.66
95% MLE (Tiku) UCL	31.63	SD in Original Scale	21.89
		95% t UCL	32.22
		95% Percentile Bootstrap UCL	32.51
		95% BCA Bootstrap UCL	33.13
		95% H UCL	38.08
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.68	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	15.72		
nu star	104.1		
A-D Test Statistic	0.552	**Nonparametric Statistics**	
5% A-D Critical Value	0.76	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.76	Mean	25.66
5% K-S Critical Value	0.16	SD	21.54
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	3.87
		95% KM (t) UCL	32.22
Assuming Gamma Distribution		95% KM (z) UCL	32.03
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	32.17
Minimum	0.000001	95% KM (bootstrap t) UCL	34.13
Maximum	89.5	95% KM (BCA) UCL	32.44
Mean	25.58	95% KM (Percentile Bootstrap) UCL	32.06
Median	18.6	95% KM (Chebyshev) UCL	42.53
SD	21.98	97.5% KM (Chebyshev) UCL	49.83
k star	0.707	99% KM (Chebyshev) UCL	64.17
Theta star	36.17		
Nu star	45.26	**Potential UCLs to Use**	
AppChi2	30.82	95% KM (Chebyshev) UCL	42.53
95% Gamma Approximate UCL (Use when n >= 40)	37.55		
95% Adjusted Gamma UCL (Use when n < 40)	38.34		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics

Number of Valid Data	25	Number of Detected Data	23
Number of Distinct Detected Data	22	Number of Non-Detect Data	2
Number of Missing Values	19	Percent Non-Detects	8.00%

ProUCL Output - Sediment

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.2	Minimum Detected	0.788
Maximum Detected	33.2	Maximum Detected	3.503
Mean of Detected	7.748	Mean of Detected	1.792
SD of Detected	6.916	SD of Detected	0.69
Minimum Non-Detect	0.15	Minimum Non-Detect	-1.897
Maximum Non-Detect	1.7	Maximum Non-Detect	0.531
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	23
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	8.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.71	Shapiro Wilk Test Statistic	0.964
5% Shapiro Wilk Critical Value	0.914	5% Shapiro Wilk Critical Value	0.914
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	7.165	Mean	1.538
SD	6.923	SD	1.153
95% DL/2 (t) UCL	9.534	95% H-Stat (DL/2) UCL	17.06
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	6.932	Mean in Log Scale	1.662
SD	7.119	SD in Log Scale	0.799
95% MLE (t) UCL	9.368	Mean in Original Scale	7.223
95% MLE (Tiku) UCL	9.248	SD in Original Scale	6.866
		95% t UCL	9.572
		95% Percentile Bootstrap UCL	9.555
		95% BCA Bootstrap UCL	10.62
		95% H UCL	10.47
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.861	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4.163		
nu star	85.6		
A-D Test Statistic	0.59	Nonparametric Statistics	
5% A-D Critical Value	0.754	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.754	Mean	7.304
5% K-S Critical Value	0.184	SD	6.66
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.362
		95% KM (t) UCL	9.634
Assuming Gamma Distribution		95% KM (z) UCL	9.544
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	9.624
Minimum	0.000001	95% KM (bootstrap t) UCL	11.61
Maximum	33.2	95% KM (BCA) UCL	9.736
Mean	7.128	95% KM (Percentile Bootstrap) UCL	9.628
Median	5.2	95% KM (Chebyshev) UCL	13.24

SD	6.96	97.5% KM (Chebyshev) UCL	15.81
k star	0.426	99% KM (Chebyshev) UCL	20.86
Theta star	16.73		
Nu star	21.3	**Potential UCLs to Use**	
AppChi2	11.82	95% KM (Chebyshev) UCL	13.24
95% Gamma Approximate UCL (Use when n >= 40)	12.85		
95% Adjusted Gamma UCL (Use when n < 40)	13.4		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	10	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	1
Number of Missing Values	6	Percent Non-Detects	10.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	5.7	Minimum Detected	1.74
Maximum Detected	408	Maximum Detected	6.011
Mean of Detected	149.4	Mean of Detected	4.48
SD of Detected	130.7	SD of Detected	1.325
Minimum Non-Detect	0.06	Minimum Non-Detect	-2.813
Maximum Non-Detect	0.06	Maximum Non-Detect	-2.813

Warning: There are only 9 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.917	Shapiro Wilk Test Statistic	0.913
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	134.5	Mean	3.682
SD	132	SD	2.818
95% DL/2 (t) UCL	211	95% H-Stat (DL/2) UCL	2217717
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	127.2	Mean in Log Scale	4.171

SD	136.1	SD in Log Scale	1.587
95% MLE (t) UCL	206	Mean in Original Scale	134.9
95% MLE (Tiku) UCL	204.5	SD in Original Scale	131.6
		95% t UCL	211.1
		95% Percentile Bootstrap UCL	201.9
		95% BCA Bootstrap UCL	213.4
		95% H UCL	2352
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.798	**Data appear Normal at 5% Significance Level**	
Theta Star	187.2		
nu star	14.37		
A-D Test Statistic	0.165	**Nonparametric Statistics**	
5% A-D Critical Value	0.742	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.742	Mean	135.1
5% K-S Critical Value	0.286	SD	124.6
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	41.8
		95% KM (t) UCL	211.7
Assuming Gamma Distribution		95% KM (z) UCL	203.8
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	210.6
Minimum	0.000001	95% KM (bootstrap t) UCL	246
Maximum	408	95% KM (BCA) UCL	208.9
Mean	134.5	95% KM (Percentile Bootstrap) UCL	206.4
Median	98.65	95% KM (Chebyshev) UCL	317.3
SD	132	97.5% KM (Chebyshev) UCL	396.1
k star	0.281	99% KM (Chebyshev) UCL	551
Theta star	479.4		
Nu star	5.61	**Potential UCLs to Use**	
AppChi2	1.444	95% KM (t) UCL	211.7
95% Gamma Approximate UCL (Use when n >= 40)	522.5	95% KM (Percentile Bootstrap) UCL	206.4
95% Adjusted Gamma UCL (Use when n < 40)	679.3		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Thallium

General Statistics

Number of Valid Data	32	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	29
Number of Missing Values	8	Percent Non-Detects	90.63%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	3.2	Minimum Detected	1.163
Maximum Detected	4.6	Maximum Detected	1.526
Mean of Detected	3.833	Mean of Detected	1.333
SD of Detected	0.709	SD of Detected	0.183

Minimum Non-Detect	0.25	Minimum Non-Detect	-1.386
Maximum Non-Detect	4	Maximum Non-Detect	1.386
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	31
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	96.88%

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.973	Shapiro Wilk Test Statistic	0.987
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.793	Mean	-0.797
SD	1.1	SD	0.962
95% DL/2 (t) UCL	1.122	95% H-Stat (DL/2) UCL	1.082
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.526
		SD in Log Scale	0.282
		Mean in Original Scale	1.777
		SD in Original Scale	0.709
		95% t UCL	1.989
		95% Percentile Bootstrap UCL	1.993
		95% BCA Bootstrap UCL	2.065
		95% H-UCL	1.928
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data appear Normal at 5% Significance Level**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	3.26
5% K-S Critical Value	N/A	SD	0.257
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0558
		95% KM (t) UCL	3.355
Assuming Gamma Distribution		95% KM (z) UCL	3.352
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.582

Minimum	N/A	95% KM (bootstrap t) UCL	3.322
Maximum	N/A	95% KM (BCA) UCL	4.6
Mean	N/A	95% KM (Percentile Bootstrap) UCL	4.6
Median	N/A	95% KM (Chebyshev) UCL	3.504
SD	N/A	97.5% KM (Chebyshev) UCL	3.609
k star	N/A	99% KM (Chebyshev) UCL	3.816
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	3.355
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	4.6
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10
Number of Missing Values	6		

Raw Statistics		**Log-transformed Statistics**	
Minimum	394	Minimum of Log Data	5.976
Maximum	36600	Maximum of Log Data	10.51
Mean	11275	Mean of log Data	8.827
Geometric Mean	6819	SD of log Data	1.247
Median	7025		
SD	10912		
Std. Error of Mean	3451		
Coefficient of Variation	0.968		
Skewness	1.623		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.824	Shapiro Wilk Test Statistic	0.901
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	17601	95% H-UCL	67254
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	37202
95% Adjusted-CLT UCL (Chen-1995)	18844	97.5% Chebyshev (MVUE) UCL	47585
95% Modified-t UCL (Johnson-1978)	17896	99% Chebyshev (MVUE) UCL	67979
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.859	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	13128		
MLE of Mean	11275		
MLE of Standard Deviation	12166		
nu star	17.18		
Approximate Chi Square Value (.05)	8.799	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	16951
Adjusted Chi Square Value	7.779	95% Jackknife UCL	17601
		95% Standard Bootstrap UCL	16593
Anderson-Darling Test Statistic	0.299	95% Bootstrap-t UCL	22671
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	38206
Kolmogorov-Smirnov Test Statistic	0.185	95% Percentile Bootstrap UCL	17029
Kolmogorov-Smirnov 5% Critical Value	0.273	95% BCA Bootstrap UCL	18143

Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	26317
		97.5% Chebyshev(Mean, Sd) UCL	32825
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	45610
95% Approximate Gamma UCL (Use when n >= 40)	22011		
95% Adjusted Gamma UCL (Use when n < 40)	24900		
Potential UCL to Use		Use 95% Approximate Gamma UCL	22011

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10
Number of Missing Values	6		

Raw Statistics		**Log-transformed Statistics**	
Minimum	568	Minimum of Log Data	6.342
Maximum	93700	Maximum of Log Data	11.45
Mean	22675	Mean of log Data	9.383
Geometric Mean	11889	SD of log Data	1.392
Median	11950		
SD	27076		
Std. Error of Mean	8562		
Coefficient of Variation	1.194		
Skewness	2.34		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.719	Shapiro Wilk Test Statistic	0.928
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	38370	95% H-UCL	196387
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	81164
95% Adjusted-CLT UCL (Chen-1995)	43527	97.5% Chebyshev (MVUE) UCL	104687
95% Modified-t UCL (Johnson-1978)	39426	99% Chebyshev (MVUE) UCL	150895
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.7	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	32389		
MLE of Mean	22675		
MLE of Standard Deviation	27100		
nu star	14		
Approximate Chi Square Value (.05)	6.572	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	36758
Adjusted Chi Square Value	5.711	95% Jackknife UCL	38370

		95% Standard Bootstrap UCL	35543
Anderson-Darling Test Statistic	0.283	95% Bootstrap-t UCL	54895
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	90731
Kolmogorov-Smirnov Test Statistic	0.145	95% Percentile Bootstrap UCL	37302
Kolmogorov-Smirnov 5% Critical Value	0.275	95% BCA Bootstrap UCL	42946
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	59996
		97.5% Chebyshev(Mean, Sd) UCL	76145
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	107866
95% Approximate Gamma UCL (Use when n >= 40)	48305		
95% Adjusted Gamma UCL (Use when n < 40)	55589		
Potential UCL to Use		Use 95% Approximate Gamma UCL	48305

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10
Number of Missing Values	6		

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.89	Minimum of Log Data	-0.117
Maximum	68.5	Maximum of Log Data	4.227
Mean	29.2	Mean of log Data	2.921
Geometric Mean	18.56	SD of log Data	1.267
Median	22		
SD	23.18		
Std. Error of Mean	7.331		
Coefficient of Variation	0.794		
Skewness	0.916		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.88	Shapiro Wilk Test Statistic	0.847
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	42.64	95% H-UCL	195.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	104.3
95% Adjusted-CLT UCL (Chen-1995)	43.53	97.5% Chebyshev (MVUE) UCL	133.6
95% Modified-t UCL (Johnson-1978)	42.99	99% Chebyshev (MVUE) UCL	191.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.937	**Data appear Normal at 5% Significance Level**	
Theta Star	31.16		
MLE of Mean	29.2		

MLE of Standard Deviation	30.16		
nu star	18.74		
Approximate Chi Square Value (.05)	9.929	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	41.26
Adjusted Chi Square Value	8.835	95% Jackknife UCL	42.64
		95% Standard Bootstrap UCL	40.43
Anderson-Darling Test Statistic	0.317	95% Bootstrap-t UCL	50.47
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	60.67
Kolmogorov-Smirnov Test Statistic	0.162	95% Percentile Bootstrap UCL	41.85
Kolmogorov-Smirnov 5% Critical Value	0.272	95% BCA Bootstrap UCL	43.09
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	61.15
		97.5% Chebyshev(Mean, Sd) UCL	74.98
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	102.1
95% Approximate Gamma UCL (Use when n >= 40)	55.11		
95% Adjusted Gamma UCL (Use when n < 40)	61.94		
Potential UCL to Use		Use 95% Student's-t UCL	42.64

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

APPENDIX C-3

SAMPLE CALCULATIONS

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface soil at AOC 721.

EQUATION:

$$IEX = \frac{Cs \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cs	=	92.7	mg/kg	Chemical: Arsenic
IR	=	330	mg/day	
EF	=	150	days/year	
ED	=	1	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	365	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{92.7 \text{ mg/kg} \times 330 \text{ mg/day} \times 150 \text{ days/year} \times 1 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 2.57E-06 mg/kg/day

ILCR = 2.57E-06 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 3.8E-06

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{92.7 \text{ mg/kg} \times 330 \text{ mg/day} \times 150 \text{ days/year} \times 1 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{70 \text{ kg} \times 365 \text{ days}}$$

IEXnc = 1.80E-04 mg/kg/day

HQ = 1.80E-04 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 6.0E-01

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, JULY 2004		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface soil at AOC 721.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EV \times EF \times ED}{BW \times AT}$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2-event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	92.7	mg/kg	Chemical: Arsenic
CF	=	1.0E-06	kg/mg	
SA	=	3300	cm^2/day	
AF	=	0.3	mg/cm^2-event	
ABS	=	0.03		
EV	=	1	event/day	
EF	=	150	days/year	
ED	=	1	years	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	365	days	
CSFd	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDd	=	3.0E-04	(mg/kg/day)	

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, JULY 2004		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{92.7 \text{ mg/kg} \times 1.0E\text{-}06 \text{ kg/mg} \times 3300 \text{ cm2/day} \times 0.3 \text{ mg/cm2-event} \times 0.03 \times 1 \text{ event/day} \times 150 \text{ days/year} \times 1 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

DEXc = 2.31E-07 mg/kg/day

ILCR = 2.31E-07 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 3.5E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$DEXnc = \frac{92.7 \text{ mg/kg} \times 1.0E\text{-}06 \text{ kg/mg} \times 3300 \text{ cm2/day} \times 0.3 \text{ mg/cm2-event} \times 0.03 \times 1 \text{ event/day} \times 150 \text{ days/year} \times 1 \text{ years}}{70 \text{ kg} \times 365 \text{ days}}$$

DEXnc = 1.62E-05 mg/kg/day

HQ = 1.62E-05 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 5.4E-02

CALCULATION WORKSHEET

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of surface soil.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$$

Where:

EC	=	exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (hours)
IUR	=	inhalation unit risk ($(ug/m3)^{-1}$)
RfC	=	inhalation reference concentration (mg/m3)

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFCi (mg/m3)

ASSUMPTIONS:

Cs	=	92.7	mg/kg	Chemical: Arsenic
PEF	=	1.27E+06	m3/kg	
Ca	=	7.30E-05	mg/m3	
ET	=	8	hours/day	
EF	=	150	days/year	
ED	=	1	years	
ATc	=	25,550	days	
ATnc	=	365	days	
IUR	=	4.3E-03	$(ug/m3)^{-1}$	
RfC	=	1.5E-05	(mg/m3)	

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 8/17/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{7.30E\text{-}05\ mg/m3 \times 8\ hours/day \times 150\ days/year \times 1\ years}{25550\ days \times 24\ hours/day}$$

IEXc = 1.43E-07 mg/m3

ILCR = 1.43E-07 mg/m3 x 4.30E-03 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

ILCR = 6.1E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{7.30E\text{-}05\ mg/m3 \times 8\ hours/day \times 150\ days/year \times 1\ years}{365\ days \times 24\ hours/day}$$

IEXnc = 1.00E-05 mg/m3

HQ = 1.00E-05 mg/m3 / 1.50E-05 (mg/m3) = Hazard Quotient

HQ **6.7E-01**

CLIENT:	JOB NUMBER:
CHARLESTON NAVAL COMPLEX	112G00349

SUBJECT:
CALCULATION OF PARTICULATE EMISSION FACTOR FOR CONSTRUCTION WORKERS

BASED ON:
Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, December 2002)

BY:	CHECKED BY:	DATE:
L. CIOFANI		9/6/2012

Equation 5-5
Derivation of the Particulate Emission Factor
Construction Scenario - Construction Worker

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times \Sigma VKT} \right]$$

Parameter/Definition (units)	Default
PEF_{sc}/subchronic road particulate emission factor (m^3/kg)	site-specific
Q/C_{sr}/ inverse of the ratio of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/m^2-s per kg/m^3)	23.02* (Equation 5-6)
F_D/dispersion correction factor (unitless)	0.185 (Appendix E)
T/total time over which construction occurs (s)	site-specific
A_R/surface area of contaminated road segment (m^2) L_R/length of road segment (ft) W_R/width of road segment (ft)	274.213 ($A_R = L_R \times W_R \times 0.092903 m^2/ft^2$)
W/mean vehicle weight (tons)	site-specific
p/number of days with at least 0.01 inches of precipitation (days/year)	site-specific (Exhibit 5-2)
ΣVKT/sum of fleet vehicle kilometers traveled during the exposure duration (km)	site-specific

* Assumes a 0.5 acre site

Calculation of PEF for Construction Workers

Q/C	23.02	(g/m^2-s per kg/m^3)	
Fd	0.185	dispersion correction factor (unitless)	
T	4.32E+06	sec	3600 sec/hr x 8hr/day x 150 days/yr
A_R	274.213	m^2	
W	8	tons	
p	110	day/year	
VKT	202.5	km	30 vehicles x 0.045 km/day x 150 days

PEF = 1.27E+06 m^3/kg

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT CURRENT/FUTURE ADULT RECREATIONAL USERS		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of sediment at AOC 721.

EQUATION:

$$IEX = \frac{Cs \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cs	=	42.5	mg/kg	Chemical: Arsenic
IR	=	100	mg/day	
EF	=	36	days/year	
ED	=	24	years	
FI	=	0.5		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	8760	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT CURRENT/FUTURE ADULT RECREATIONAL USERS		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{42.5 \text{ mg/kg} \times 100 \text{ mg/day} \times 36 \text{ days/year} \times 24 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 1.03E-06 mg/kg/day

ILCR = 1.03E-06 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 1.5E-06

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{42.5 \text{ mg/kg} \times 100 \text{ mg/day} \times 36 \text{ days/year} \times 24 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 8760 \text{ days}}$$

IEXnc = 2.99E-06 mg/kg/day

HQ = 2.99E-06 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 1.0E-02

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT CURRENT/FUTURE ADULT RECREATIONAL USERS		
BASED ON: U.S. EPA, JULY 2004		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with sediment at AOC 721.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EV \times EF \times ED}{BW \times AT}$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in sediment (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2-event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	42.5	mg/kg	Chemical: Arsenic
CF	=	1.0E-06	kg/mg	
SA	=	5700	cm^2/day	
AF	=	0.07	mg/cm^2-event	
ABS	=	0.03		
EV	=	1	event/day	
EF	=	36	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	8760	days	
CSFd	=	1.5E+00	(mg/kg/day)$^{-1}$	
RfDd	=	3.0E-04	(mg/kg/day)	

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT CURRENT/FUTURE ADULT RECREATIONAL USERS		
BASED ON: U.S. EPA, JULY 2004		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{42.5 \text{ mg/kg} \times 1.0E\text{-}06 \text{ kg/mg} \times 5700 \text{ cm2/day} \times 0.07 \text{ mg/cm2-event} \times 0.03 \times 1 \text{ event/day} \times 36 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

DEXc = 2.46E-07 mg/kg/day

ILCR = 2.46E-07 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 3.7E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$DEXnc = \frac{42.5 \text{ mg/kg} \times 1.0E\text{-}06 \text{ kg/mg} \times 5700 \text{ cm2/day} \times 0.07 \text{ mg/cm2-event} \times 0.03 \times 1 \text{ event/day} \times 36 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 8760 \text{ days}}$$

DEXnc = 7.17E-07 mg/kg/day

HQ = 7.17E-07 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 2.4E-03

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from ingestion of groundwater at AOC 721.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IR \times EF \times ED}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cgw	=	206	ug/L	Chemical: Arsenic
IR	=	2	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	8760	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{206 \text{ ug/L} \times 0.001 \text{ mg/ug} \times 2 \text{ L/day} \times 350 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 1.94E-03 mg/kg/day

ILCR = 1.94E-03 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 2.9E-03

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{206 \text{ ug/L} \times 0.001 \text{ mg/ug} \times 2 \text{ L/day} \times 350 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 8760 \text{ days}}$$

IEXnc = 5.64E-03 mg/kg/day

$$HQ = \frac{5.64\text{E-03 mg/kg/day}}{3.00\text{E-04 (mg/kg/day)}} = \text{Hazard Quotient}$$

HQ = 1.9E+01

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with groundwater at AOC 721.

EQUATION:

$$DAD = \frac{DAevent \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

DAD	=	dermally absorbed dose (mg/kg/day)
DAevent	=	absorbed dose per event (mg/cm^2/event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
A	=	skin surface available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = DAD (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = DAD (mg/kg/day) / RFDd (mg/kg/day)

EQUATIONS for DAevent:

For Inorganics:

DAevent = Kp x Cw x CF x tevent

For Organics:

$$If\ tevent \le t^*,\ then: DAevent = 2 \times FA \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$If\ tevent > t^*,\ then: DAevent = FA \times Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

Where:

Kp	=	permeability coefficient from water (cm/hr)
Cgw	=	concentration of chemical in groundwater (mg/L)
tevent	=	duration of event (hr/event)
CF	=	conversion factor (0.001 L/cm^3)
t*	=	time it takes to reach steady-state (hr/event)
τ	=	lag time (hr/event)
B	=	Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

Cgw	=	0.206	mg/L	Chemical: Arsenic
Kp	=	1.00E-03	cm/hr	
tevent	=	0.58	hr/event	
CF	=	0.001	L/cm^3	

DAevent = 0.001 cm/hr x 0.034 mg/L x 0.001 L/cm3 x 0.58 hr/event

DAevent = 1.19E-07 mg/cm^2-event

RISK CALCULATIONS

ASSUMPTIONS:

A	=	18000	cm^2/day
EV	=	1	event/day
ED	=	24	years
EF	=	350	days/year
BW	=	70	kg
ATc	=	25550	days
ATnc	=	8760	days
CSFd	=	1.5E+00	(mg/kg/day)$^{-1}$
RfDd	=	3.0E-04	(mg/kg/day)

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{0.00000011948 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 350 \text{ days/year} \times 18000 \text{ cm2/day}}{70 \text{ kg} \times 25550 \text{ days}}$$

DADc = 1.01E-05 mg/kg/day

DADc = 1.01E-05 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 1.5E-05

EXAMPLE NONCARCINOGENIC CALCULATION

$$DADnc = \frac{0.00000011948 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 350 \text{ days/year} \times 18000 \text{ cm2/day}}{70 \text{ kg} \times 8760 \text{ days}}$$

DADnc = 2.95E-05 mg/kg/day

HQ = 2.95E-05 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 9.8E-02

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from ingestion of groundwater.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IF \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cgw	=	4.5	ug/L	Chemical: Chromium VI
IR	=	1	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
ATc	=	25550	days	
CSFo	=	5.0E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{4.5\ ug/L \times 0.001\ mg/ug \times 1\ L/day \times 350\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

IEXc = 8.22E-05 mg/kg/day

$$IEXc = \frac{4.5\ ug/L \times 0.001\ mg/ug \times 1\ L/day \times 350\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

IEXc = 4.93E-05 mg/kg/day

ILCR = (8.22E-05 mg/kg/day + 4.93E-05 mg/kg/day) x 5.00E-01 (mg/kg/day)-1

ILCR = 6.6E-05

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from ingestion of groundwater.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IF \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cgw	=	4.5	ug/L	Chemical: Chromium VI
IR	=	2	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
BW	=	70	kg	
ATc	=	25550	days	
CSFo	=	5.0E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{4.5\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 10\ years}{70\ kg \times 25550\ days} \times 3$$

IEXc = 5.28E-05 mg/kg/day

$$IEXc = \frac{4.5\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 14\ years}{70\ kg \times 25550\ days} \times 1$$

IEXc = 2.47E-05 mg/kg/day

ILCR = (5.28E-05 mg/kg/day + 2.47E-05 mg/kg/day) x 5.00E-01 (mg/kg/day)-1

ILCR = 3.9E-05

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT FOR MUTAGENIC CHEMICALS - CHILD RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from incidental ingestion of sediment.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in sediment (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.66	mg/kg	Chemical: Benzo(a)antrhacene
IR	=	200	mg/day	
EF	=	36	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
FI	=	0.5		
CF	=	1.0E-06	kg/mg	
BW	=	15	kg	
ATc	=	25,550	days	
CSFo	=	7.3E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT FOR MUTAGENIC CHEMICALS - CHILD RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{0.66 \text{ mg/kg} \times 200 \text{ mg/day} \times 36 \text{ days/year} \times 2 \text{ years} \times 1.0E\text{-}06 \text{ kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 10$$

IEXc = 1.24E-07 mg/kg/day

$$IEXc = \frac{0.66 \text{ mg/kg} \times 200 \text{ mg/day} \times 36 \text{ days/year} \times 4 \text{ years} \times 1.0E\text{-}06 \text{ kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 3$$

IEXc = 7.44E-08 mg/kg/day

ILCR = (1.24E-07 mg/kg/day + 7.44E-08 mg/kg/day) x 7.30E-01 (mg/kg/day)-1

ILCR = 1.4E-07

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT FOR MUTAGENIC CHEMICALS - CHILD RECREATIONAL USERS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from dermal contact with sediment.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in sediment (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	0.66	mg/kg	Chemical: Benzo(a)anthracene
CF	=	1.0E-06	kg/mg	
SA	=	2,800	cm^2/day	
AF	=	0.2	mg/cm^2	
ABS	=	0.13		
EF	=	36	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
ATc	=	25,550	days	
CSFd	=	7.3E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: CHARLESTON NAVAL COMPLEX		JOB NUMBER: 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT FOR MUTAGENIC CHEMICALS - CHILD RECREATIONAL USERS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: L. CIOFANI	CHECKED BY:	DATE: 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{0.66\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 36\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

DEXc = 9.03E-08 mg/kg/day

$$DEXc = \frac{0.66\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 36\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

DEXc = 5.42E-08 mg/kg/day

ILCR = (9.03E-08 mg/kg/day + 5.42E-08 mg/kg/day) x 7.30E-01 (mg/kg/day)-1

ILCR = 1.1E-07

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT FOR MUTAGENIC CHEMICALS - ADULT RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from incidental ingestion of sediment.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in sediment (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.66	mg/kg	Chemical: Benzo(a)anthracene
IR	=	100	mg/day	
EF	=	36	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
FI	=	0.5		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
ATc	=	25,550	days	
CSFo	=	7.3E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT FOR MUTAGENIC CHEMICALS - ADULT RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{0.66 \text{ mg/kg} \times 100 \text{ mg/day} \times 36 \text{ days/year} \times 10 \text{ years} \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 3$$

IEXc = 1.99E-08 mg/kg/day

$$IEXc = \frac{0.66 \text{ mg/kg} \times 100 \text{ mg/day} \times 36 \text{ days/year} \times 14 \text{ years} \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 1$$

IEXc = 9.30E-09 mg/kg/day

ILCR = (1.99E-08 mg/kg/day + 9.30E-09 mg/kg/day) x 7.30E-01 (mg/kg/day)-1

ILCR = 2.1E-08

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT FOR MUTAGENIC CHEMICALS - ADULT RECREATIONAL USERS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from dermal contact with sediment.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in sediment (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	0.66	mg/kg	Chemical: Benzo(a)anthracene
CF	=	1.0E-06	kg/mg	
SA	=	5,700	cm^2/day	
AF	=	0.07	mg/cm^2	
ABS	=	0.13		
EF	=	36	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
BW	=	70	kg	
ATc	=	25,550	days	
CSFd	=	7.3E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: CHARLESTON NAVAL COMPLEX		**JOB NUMBER:** 112G00349
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT FOR MUTAGENIC CHEMICALS - ADULT RECREATIONAL USERS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: L. CIOFANI	**CHECKED BY:**	**DATE:** 9/6/2012

EXAMPLE CARCINOGENIC CALCULATION

$$\text{DEXc} = \frac{0.66\ \text{mg/kg} \times 1.0\text{E-06 kg/mg} \times 5700\ \text{cm2/day} \times 0.07\ \text{mg/cm2} \times 0.13 \times 36\ \text{days/year} \times 10\ \text{years}}{70\ \text{kg} \times 25550\ \text{days}} \times 3$$

DEXc = 2.07E-08 mg/kg/day

$$\text{DEXc} = \frac{0.66\ \text{mg/kg} \times 1.0\text{E-06 kg/mg} \times 5700\ \text{cm2/day} \times 0.07\ \text{mg/cm2} \times 0.13 \times 36\ \text{days/year} \times 14\ \text{years}}{70\ \text{kg} \times 25550\ \text{days}} \times 1$$

DEXc = 9.65E-09 mg/kg/day

ILCR = (2.07E-08 mg/kg/day + 9.65E-09 mg/kg/day) x 7.30E-01 (mg/kg/day)-1

ILCR = 2.2E-08

APPENDIX D

ERA SUPPORTING INFORMATION

APPENDIX D

WILDLIFE TOXICITY REFERENCE VALUES
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

PARAMETER	Mammal		Bird	
	NOAEL	LOAEL	NOAEL	LOAEL
INORGANICS				
Arsenic	1.04	4.55	2.24	4.51
Cadmium	0.8	6.9	1.5	6.3
Chromium	2.40	58.17	2.66	15.63
Copper	5.6	82.7	4.05	34.87
Lead	4.7	186.4	1.63	44.63
Mercury	0.032	0.16	0.0064	0.064
Nickel	1.70	14.77	6.71	18.57
Selenium	0.143	0.661	0.29	0.819
Silver	6.02	118.6	2.02	60.47
Zinc	75.4	298	66.1	171.44

Notes:

The sources of these NOAELS and LOAELS are presented in the table titled "Sources and Endpoints for NOAELS and LOAELS for Terrestrial Wildlife" in this appendix.

The NOAELS and LOAELS in the source table were divided by 10 if a subchronic study was the basis for the value. Also, if only a NOAEL was available, the value was multiplied by 10 to estimate the LOAEL. If only a LOAEL was available, the value was divided by 10 to estimate the NOAEL.

APPENDIX D

SOURCES AND ENDPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Parameters	Concentration (mg/kg-day)	Endpoint	Effect	Chronic/ Subchronic	Species	Primary Reference	Source of Reference
Inorganics							
Arsenic	2.24	NOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Arsenic	4.51	LOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Arsenic	1.04	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Arsenic	4.55	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Cadmium	1.47	NOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Cadmium	6.35	LOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Cadmium	0.77	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Cadmium	6.9	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Chromium(III)	2.66	NOAEL	reproduction & growth	chronic	birds	USEPA, 2008	
Chromium(III)	15.63	LOAEL	reproduction & growth	chronic	birds	USEPA, 2008	
Chromium(III)	2.4	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2008	
Chromium(III)	58.17	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2008	
Chromium(VI)	5.66	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2008	
Chromium(VI)	38.37	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2008	
Copper	4.05	NOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Copper	34.87	LOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Copper	5.6	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Copper	82.7	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Lead	1.63	NOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Lead	44.6	LOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Lead	4.7	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Lead	186.4	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Mercury	0.064	LOAEL	reproductive	chronic	mallard duck	Heinz, 1979	Sample et.al., 1996
Mercury	0.032	NOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Mercury	0.16	LOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Nickel	6.71	NOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Nickel	18.57	LOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Nickel	1.7	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Nickel	14.77	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Selenium	0.29	NOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Selenium	0.819	LOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Selenium	0.143	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Selenium	0.661	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Zinc	75.4	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Zinc	297.58	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Zinc	66.1	NOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Zinc	171.44	LOAEL	reproduction & growth	chronic	birds	USEPA, 2007	

Notes:

NOAEL = No Observed Adverse Effects Level

LOAEL = Lowest Observed Adverse Effects Level

The LOAELs used for several metals were calculated as the geometric mean of growth and reproduction data from the Ecological Soil Screening Levels (U.S. EPA, 2005, 2006, 2007).

References for the NOAELS and LOAELs are presented in this Appendix and Titled "TRV Source and Endpoint References".

APPENDIX D

TRV SOURCE AND ENDPOINT REFERENCES

Heinz, G. H. 1979. "Methyl Mercury: Reproductive and Behavioral Effects on Three Generations of Mallard Ducks." *J. Wildl. Mgmt.* 43: 394-401.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. June. ES/ER/TM-86/R3.

USEPA, 2005. Ecological Soil Screening Level for Arsenic, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-62. March.

USEPA, 2005. Ecological Soil Screening Level for Cadmium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-65. March.

USEPA, 2005. Ecological Soil Screening Level for Lead, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-70. March.

USEPA, 2007. Ecological Soil Screening Level for Copper, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-68. February.

USEPA, 2007. Ecological Soil Screening Level for Nickel, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-76. March.

USEPA, 2007. Ecological Soil Screening Level for Selenium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-72. November.

USEPA, 2007. Ecological Soil Screening Level for Zinc, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-73. November.

USEPA, 2008. Ecological Soil Screening Level for Chromium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-66. April.

Verschuuren, H. G., R. Kroes, E. M. Den Tonkelaar, J. M. Berkvens, P. W. Helleman, A. G. Rauws, P. L. Schuller, and G. J. Van Esch. 1976. "Toxicity of Methyl Mercury Chloride in Rats. II. Reproduction Study." *Toxicol.* 6: 97-106.

APPENDIX D

BIOACCUMULATION FACTORS AND BIOTA SEDIMENT ACCUMULATION FACTORS

This attachment presents the bioaccumulation factors (BAFs) and biota sediment accumulation factors (BSAFs) that were used in the food chain models. Note that dry weight BAFs/BSAFs were used for this ERA. The following sources of BAFs/BSAFs were used in the ecological risk assessment for most of the chemicals:

- Soil Invertebrate BAFs: EPA Guidance for Developing Ecological Soil Screening Levels, Attachment 4-1 (USEPA, 2007).

- Soil Invertebrate BAFs: Development and Validation of Bioaccumulation Models for Earthworms (Sample et al., 1998).

- Sediment Invertebrate BSAFs: Biota Sediment Accumulation Factors for Invertebrates: Review and recommendations for the Oak Ridge Reservation. (ORNL, 1998).

The Appendix D Table titled "Dry Weight BAFs/BSAFs for Earthworms and Sediment Invertebrates" presents the BAFs that were used in the food-chain models for the individual chemicals that were retained for food chain modeling at Site 1. A default value of 1.0 was used for the BAF/BSAF if chemical-specific data was not available.

The EPA Guidance for Developing Ecological Soil Screening Levels (Eco SSLs) (USEPA, 2007) was the source of the BAFs for some of the chemicals. The majority of these BAFs are actually regression or BAF equations that are used to calculate the tissue concentration from the soil concentration. For mercury and nickel, the source of the BAF was Sample et al. (1998). The mercury BAF is a regression equation from Table 4, and the nickel BAF was from Table 11.

Sediment invertebrate BSAFs for metals were from ORNL (1998) Table 2. The 90th percentile was used for the conservative scenario and the median BSAF was used for the less conservative scenario.

References:

ORNL (Oak Ridge National Laboratory). 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and recommendations for the Oak Ridge Reservation. BJC/OR-112. August.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W., Suter II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory. June. ES/ER/TM-220.

USEPA, 2007. Guidance for Developing Ecological Soil Screening Levels Attachment 4-1. Office of Solid Waste and Emergency and Response. OSWER Directive 92857-55. February.

APPENDIX D

DRY WEIGHT BAFs/BSAFs EARTHWORMS AND SEDIMENT INVERTEBRATES
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

	Earthworm BAFs[1,2]		Sediment Invertebrate BSAFs[3]	
Chemicals	Conservative[4]	Average[4]	Conservative[4]	Average[4]
Inorganics				
Arsenic	Eco-SSL	Eco-SSL	6.90E-01	1.43E-01
Cadmium	Eco-SSL	Eco-SSL	7.99E+00	6.00E-01
Chromium	Eco-SSL	Eco-SSL	4.68E-01	1.00E-01
Copper	Eco-SSL	Eco-SSL	5.25E+00	1.56E+00
Lead	Eco-SSL	Eco-SSL	6.07E-01	7.10E-02
Mercury	Regression	Regression	2.87E+00	1.14E+00
Nickel	4.73E+00	1.06E+00	2.32E+00	4.86E-01
Selenium	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00
Zinc	Eco-SSL	Eco-SSL	7.53E+00	1.94E+00

Notes:
BAF - Bioaccumulation Factor
Eco-SSL - USEPA Ecological Screening Level

1 - Where "Eco-SSL" is given, values were calculated using BAF regression equations from USEPA (2007), Attachment 4-1, Tables 4a (inorganics).
2 - Sample et al. (February, 1998) for mercury (Table 4) and nickel (Table 11).
3 - ORNL (August, 1998) for all chemicals; conservative value is 90th percentile; average value is median value
4 - Conservative and average refers to the exposure scenarios for which the uptake factors are used.

Default value of 1 is assigned to parameters without uptake factors
References and rationale for the BAFs/BASFs are provided in this Appendix titled "Bioaccumulation Factors and Biota Sediment Accumulation Factors".

APPENDIX D

FOOD CHAIN MODEL: REPRESENTATIVE RECEPTOR PROFILES

Receptor profiles are presented below for the short-tailed shrew, American robin, Carolina wren, star-nosed mole, mink, and green heron. Values for body weight and food consumption were taken preferentially from the Wildlife Exposure Factors Handbook (USEPA, 1993).

The food ingestion rates in g/g (of body weight) per day on a wet weight basis were converted to dry weight for the ERA. The estimated portion of diets comprised of soil or sediment are in dry weight. Tables following this text explain the derivation of the exposure factors.

Short-Tailed Shrew (*Blarina brevicauda*)

Shrews inhabit a wide variety of habitats and are common in areas with abundant vegetative cover. They need cool, moist habitats because of their high metabolic and water-loss rates. The short-tailed shrew is primarily carnivorous, eating insects such as earthworms, slugs, and snails.

The adult body weight for the short-tailed shrew in various habitats ranged from 0.015 to 0.01921 kg with an average of 0.0161 kg. The listed food ingestion rates for shrews are 0.49 and 0.62 g/g-day (wet-weight). The water ingestion rate was listed as 0.223 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in the attached table. The food ingestion rates were then multiplied by 0.16, which is the percent solids of worms (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested, assuming 3 percent for the conservative food chain model and 1.5 percent for the average food chain model; 3 percent is the 90th percentile value and 1.5 percent is the 50th percentile value (USEPA, 2007).

American Robin (*Turdus migratorius*)

American robins' habitats include parks, lawns, moist forests, swamps, open woodlands, and orchards. Robins forage on the ground in open areas, along habitat edges, or the edges of streams. They also forage in shrubs and within the lower branches of trees. In the months preceding and during the breeding season, robins feed primarily on invertebrates and on some fruits. During the rest of the year their diet consists primarily of fruits.

The adult body weight for the American robin in New York woodlands and forests and in Pennsylvania ranged from 0.0773 to 0.0862 kg with an average of 0.0804 kg. Food ingestion rates for robins were 1.52 g/g-day in Kansas and 0.89 g/g-day in California, with an average of 1.205 g/g-day. Studies calculating ingestion rates for the robin (USEPA, 1993) were based on a diet comprised of berries. Based on these studies, the food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in the attached table. The food ingestion rates were then multiplied by 0.23, which is the percent solids of fruit (Sample et al., 1997) to

convert the ingestion rate from a wet-weight value to a dry-weight value. However, because it is assumed that 100 percent of the robin's diet are worms for the food chain models, the ingestion rate for the robin was calculated using field metabolism scaling as presented on the attached table (Nagy et al., 1999). These are the values that were used in the food chain model for this site.

The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 16.4 percent for conservative food chain model and 6.4 percent for the average food chain model) from USEPA (2007). The 16.4 percent and 6.4 percent values are from the American woodcock since it is assumed that both the woodcock and robin are consuming 100% worms, and no incidental soil ingestion rate was available for the robin.

Star-nosed Mole (*Condylura cristata*)

Star-nosed mole habitats include low wet ground near bodies of water, swamps, and wet meadows. The diet of this mole is aquatic invertebrates and terrestrial invertebrates (especially earthworms).

The body weight for adult star-nosed moles ranged from 0.034 to 0.078 kg with an average of 0.0560 kg (Burt and Grossenheider, 1980). Because it is assumed for the food chain models that 100 percent of the mole's diet is worms, the ingestion rate for the mole was calculated using field metabolism scaling as presented on the attached table (Nagy et al., 1999).

The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 3 percent for conservative food chain model and 0.9 percent for the average food chain model). The 3 percent and 0.9 percent values are based on the short-tailed shrew (USEPA, 2007) since it is assumed that both the shrew and mole are consuming 100 percent worms, and no incidental soil ingestion rate was available for the mole.

Carolina Wren (Thryothorus ludoivicianus)

Habitats for the Carolina wren include bushy woodlands and suburban areas.

The body weight for adult Carolina wrens ranged from 0.0142 to 0.0211 kg with an average of 0.0176 kg (Terres, 1980). Because it is assumed for the food chain models that 100 percent of the wren's diet is worms, the ingestion rate for the wren was calculated using field metabolism scaling as presented on the attached table (Nagy et al., 1999).

The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 16.4 percent for conservative food chain model and 6.4 percent for the average food chain model). The 16.4 percent and 6.4 percent values are based on the American woodcock (USEPA, 2007) since it is assumed that both the woodcock and wren are consuming 100 percent worms, and no incidental soil ingestion rate was available for the wren.

Mink (Mustela vison)

The mink is the most abundant and widespread carnivorous mammal in North America. Mink are found in freshwater and brackish coastal marshes, wetlands, swamps, and along the edges of rivers, streams, lakes, lakes, and ditches (USEPA, 1993). They are never found far from water (Lowery, 1974). Mink tend to use brushy or wooded cover adjacent to water where prey is abundant. Mink den in cavities in tree roots, brush piles, rock piles, logjams, or bank burrows of other animals, particularly muskrats. Mink are largely nocturnal but may move or feed during crepuscular (twilight) periods or during cloudy daylight conditions (USEPA, 1993). Mink are carnivorous opportunistic predators, taking whatever prey is abundant. They feed on fish, crustaceans, and amphibians in aquatic habitats. Mammals are the most important prey in nearby terrestrial habitats where mink prey especially on mice, rats, and rabbits, and also birds, reptiles, and insects (Lowery, 1974; USEPA, 1993).

Mean body weight values for adult wild mink (non-farm raised) were 1.040 kg (male, summer), 1.233 kg (male, fall), 0.550 kg (female, summer), and 0.586 kg (female, fall) in studies summarized in USEPA's Wildlife Exposure Factors Handbook (1993). Because female mink are especially sensitive to some chemicals, mink body weight and food ingestion values in the ERA were based on female data. Therefore, the body weight was 0.550 kg in the conservative scenario and 0.568 kg (average female summer and fall) in the average scenario.

Food ingestion rates for mink ranged from 0.12 to 0.22 g/g body weight/day (USEPA, 1993). The food ingestion in the conservative scenario (0.0678 kg/day) was derived by multiplying the maximum food ingestion rate (0.22 g/g body weight/day) by the maximum body weight (1.233 kg), then multiplying by 0.25 to convert the ingestion rate from a wet-weight value to a dry-weight value, based on a 75-percent moisture content in fish (Sample, et al., 1997). Food ingestion in the average scenario (0.0227 kg/day) was derived by multiplying the female food ingestion rate (0.16 g/g body weight/day) by the average female body weight (0.568 kg), then multiplying by 0.25 to convert the ingestion rate from a wet-weight value to a dry-weight value.

The two incidental sediment ingestion rates in Table 8-5 of the ERA (0.0064 kg/day and 0.0021 kg/day) were calculated by multiplying the two food ingestion rates (0.0678 kg/day and 0.0227 kg/day) by incidentally ingested sediment (9.4 percent of diet). The 9.4 percent value is based on the incidental soil/sediment ingestion rate of the raccoon (Beyer, et al., 1994), which also forages on aquatic organisms, because sediment ingestion data were not available for the mink.

Green Heron (*Butorides virescens*)

The green heron is a common bird in wetland thickets throughout the eastern United States. It is typically a bird of swampy thickets where it forages in both fresh and salt water, especially along forested margins of ponds, lakes, rivers, streams, marshes, and swamps. It prefers thick vegetation but will feed in the open when food is available. Small fish are the primary prey, but green herons also consume insects and a variety of

aquatic invertebrates. Breeding populations in coastal South Carolina are non-migratory (Davis and Kushlan, 1994).

Data for the green heron were not included in the Wildlife Exposure Factors Handbook (USEPA, 1993). The mean adult body weight of 34 green herons in Florida was 212 g (Dunning, 1993). Minimum and maximum body weights were not provided, but the standard deviation was 5.92 g (Dunning, 1993). A body weight value of 0.200 kg was used for the conservative scenario. This value is the mean minus two standard deviations from Dunning's data. The body weight for the average scenario was the mean (0.212 kg) from Dunning's data.

Food ingestion rates for the green heron were not available. Nagy (2001) provided allometric equations for several orders of birds but not for Ciconiiformes (herons). Dry weight food ingestion in the conservative scenario (0.031 kg/day) was derived using the Nagy (2001) equation for "marine birds" based on a 0.224 kg bird. The 0.224 kg body weight value is the mean plus two standard deviations from Dunning's (1993) green heron data (see previous paragraph); this value would approximate the 98th percentile, and thus, represents a conservative approach. Dry weight food ingestion in the average scenario (0.030 kg/day) was derived using the Nagy (2001) equation for marine birds based on a 0.212 kg bird, which is the mean body weight value from Dunning's (1993) green heron data.

Sediment ingestion data for piscivorous birds were not available in the literature. A sediment ingestion rate of 5 percent for piscivorous birds was used in the food chain modeling. Unlike shorebirds, herons do not probe the sediment. Green herons and other wading birds typically capture prey with a darting stroke, grasping or spearing with the bill (Davis and Kushlan, 1994). Similarly, piscivorous birds such as the belted kingfisher and osprey capture prey primarily from the water column rather than by probing on or near the sediment substrate. Therefore, an assumed value of 5 percent for incidental sediment ingestion is probably a very conservative estimate for the green heron as well as for other piscivorous birds. The two sediment ingestion rates in Table 8-5 of the ERA (0.0016 kg/day and 0.0015 kg/day) were calculated by multiplying the two food ingestion rates (0.031 kg/day and 0.030 kg/day) by 0.05, assuming that incidentally ingested sediment is 5 percent of the diet.

References:

Beyer, N., E. Connor, and S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. Journal of Wildlife Management 58(2) pp. 375-382.

Burt, W.H. and R.P. Grossenheider. 1980. A Field Guide to Mammals of North America North of Mexico. Houghton Mifflin, Boston, Massachusetts.

Davis, W.E., Jr. and J.A. Kushlan. 1994. Green heron (Butorides virescens). In The Birds of North America, No. 129 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Dunning, J.B. Jr. 1993. CRC Handbook of Avian Body Masses, CRC Press, Boca Raton, FL.

Lowery, G.H. 1974. The Mammals of Louisiana and its Adjacent Waters. Louisiana State University Press, Baton Rouge, Louisiana.

Nagy, K.A., I.A. Girard, and T.K. Brown. 1999. Energetics of Free-Ranging Mammals, Reptiles, and Birds. Annu. Rev. Nutr. 19. pp. 247-277.

Nagy, K.A.. 2001. Food requirements of wild animals: Predictive equations for free-living mammals, reptiles, and birds. Nutrition Abstracts and Reviews, Series B-71, 21R-31R.

Sample, B.E., M.S. Aplin, R.A. Efroymson, G.W., Suter II, and C.J.E. Welsh. 1997. Methods and Tools for Estimation of the Exposure of Terrestrial Wildlife to Contaminants. Oak Ridge National Laboratory. October. ORNL/TM-13391.

Terres, J.K., 1980. The Audubon Society Encyclopedia of North American Birds. New York: Knopf.

USEPA (U.S. Environmental Protection Agency), 1993. Wildlife Exposure Factors Handbook. U.S. Environmental Protection Agency. Office of Research and Development. Washington, D.C. December 1993. EPA/600/R-93/187a.

USEPA (U.S. Environmental Protection Agency), 2007. Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs, revised April, in USEPA 2005, Guidance for developing Ecological Soil Screening Levels. OSWER Directive 9285.7-55, Office of Solid Waste and Emergency Response. February.

APPENDIX D

DRY WEIGHT DERIVATION OF BODY WEIGHT, FOOD INTAKE, AND WATER INTAKE FACTORS FOR TERRESTRIAL FOOD CHAIN MODELS

Data from US EPA (1993) except where noted				Derivation of Factors for Modeling		
Species/Factor	Age/Sex/ Cond./Seas.	Value	Study Average	Calculation of Values		Notes
American Robin						
Body Weight (g)	A B	77.3	77.3	Minimum Value	0.0773 kg	
				Maximum Value	0.0862 kg	
	A M nonbreeding	86.2		Overall Study Average	0.0804 kg	
	A F nonbreeding	83.6	84.9			
	A M breeding	77.4				
	A F breeding	80.6	79			
Food Ingestion Rate (g/g-day)	B B free-living	0.89		*Based on Metabolic Scaling*		
				Conservative value:	0.01247 kg/day	Used maximum body weight in below equation
	- B free-living	1.52				
				Average value	0.01188 kg/day	Used average body weight in below equation
						Food ingestion rates were calculated from Nagy et al., (1999) for insectivores as follows:
	Overall Study Average		1.21			$FI = (9.7*BW(g)^{0.705})/18kJ/g/1000$
Water Ingestion Rate (g/g-day)	A B	0.14		Conservative value:	0.0121 L/day	Ingestion rate * Maximum Body weight
				Average value	0.0113 L/day	Ingestion rate * Average Body weight
Short-Tailed Shrew						
Body Weight (g)	A B	15	15	Minimum Value	0.0150 kg	
				Maximum Value	0.01921 kg	
	M summer	19.21	17.27	Overall Study Average	0.01613 kg	
	F summer	17.4				
	M fall	16.87				
	M fall	15.58				
Food Ingestion Rate (g/g-day)	A B	0.49		Conservative value:	0.0016 kg/day	Maximum ingestion rate * Average Body weight * 0.16[1]
	A B	0.62		Average value	0.00143 kg/day	Average ingestion rate * Average Body weight * 0.16[1]
	Overall Study Average		0.555			[1] - 0.16 = percent solids in earthworms to convert to a dry weight ingestion rate
Water Ingestion Rate (g/g-day)	A B	0.223		Conservative value:	0.00428 L/day	Ingestion rate * Maximum Body weight
				Average value	0.00360 L/day	Ingestion rate * Average Body weight
Carolina wren						
Body Weight (g)[1]		14.2	17.6	Minimum Value	0.0142 kg	
		21.1		Maximum Value	0.02110 kg	
				Overall Study Average	0.01760 kg	
Food Ingestion Rate (g/g-day)				*Based on Metabolic Scaling*		
				Conservative value:	0.00463 kg/day	Used maximum body weight in below equation
				Average value	0.00407 kg/day	Used average body weight in below equation
						Food ingestion rates were calculated from Nagy et al., (1999) for insectivores as follows:
						$FI = (9.7*BW(g)^{0.705})/18kJ/g/1000$
Water Ingestion Rate (g/g-day)				*Based on Metabolic Scaling*		
				Conservative value:	0.00445 L/day	Used maximum body weight in below equation
				Average value	0.00394 L/day	Used average body weight in below equation
						Water ingestion rates were calculated from USEPA (1993) Equation 3-15 as follows:
						$IR (L/day) = 0.059*BW^{0.67}(kg)$
Star-nosed mole						
Body Weight (g)[2]		34	56	Minimum Value	0.0340 kg	
		78		Maximum Value	0.0780 kg	
				Overall Study Average	0.0560 kg	
Food Ingestion Rate (g/g-day)				*Based on Metabolic Scaling*		
				Conservative value:	0.00561 kg/day	Used maximum body weight in below equation
				Average value	0.00456 kg/day	Used average body weight in below equation
						Food ingestion rates were calculated from Nagy et al., (1999) for insectivores as follows:
						$FI = (6.98*BW(g)^{0.672})/18.7kJ/g/1000$
Water Ingestion Rate (g/g-day)				*Based on Metabolic Scaling*		
				Conservative value:	0.00997 L/day	Used maximum body weight in below equation
				Average value	0.00855 L/day	Used average body weight in below equation
						Water ingestion rates were calculated from USEPA (1993) Equation 3-17 as follows:
						$IR (L/day) = 0.099*BW^{0.9}(kg)$

APPENDIX D

DRY WEIGHT DERIVATION OF BODY WEIGHT AND FOOD INTAKE FACTORS FOR REPRESENTATIVE PISCIVOROUS WILDLIFE RECEPTORS

Species/Factor	Age/Sex/Season[a]	Value	Derivation of Factors Used in Food Chain Modeling		
Mink[b]					
Body Weight (g)	A M summer	1040	Minimum Value	0.550 kg	
	A M fall	1233	Maximum Value	1.233 kg	
	A F summer	550	Overall average	0.852 kg	
	A F fall	586	Average female	0.568 kg	
Food Ingestion Rate (g/g-day)	A M summer	0.13	Conservative scenario:	0.0678 kg/day	Maximum ingestion rate (0.22 g/g/day) × maximum body weight (1.233 kg) × 0.25[c]
	A M winter	0.12			
	A F winter	0.16	Less conservative scenario:	0.0227 kg/day	Female ingestion rate (0.16 g/g/day) × average female body weight (0.568 kg) × 0.25[c]
	A M year-round	0.22			
Green Heron[d]					
Body Weight (g)	AB	212	Mean of 34 adults from Florida = 212 g, standard deviation = 5.92 g (Dunning, 1993)		
			Conservative scenario:	0.200 kg	Mean minus 2 standard deviations (Dunning, 1993)
			Less conservative scenario:	0.212 kg	Mean (Dunning, 1993)
Food Ingestion Rate (g/g-day)	-	-	Conservative scenario:	0.031 kg/day	Using allometric equation from Nagy (2001) for 0.224 kg marine bird (0.224 kg = mean plus 2 standard deviations from Dunning (1993) green heron data)
			Less conservative scenario:	0.030 kg/day	Using allometric equation from Nagy (2001) for 0.212 kg marine bird

Notes:

a A=adult, M=male, F=female, B=both sexes

b Data from Wildlife Exposure Factors Handbook (USEPA, 1993).

c Food ingestion was multiplied by 0.25 (based on 75 percent moisture content in fish) to convert to dry weight ingestion rate.

d Green heron data not available in Wildlife Exposure Factors Handbook (USEPA, 1993). Values obtained from other sources as shown.

APPENDIX D

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Surface Soil/Sediment Combined Concentration (mg/kg)				Surface Water Concentration (mg/L)		Earthworm Bioaccumulation Factors		Earthworm Concentrations (mg/kg)		Invertebrate Bioaccumulation Factors		Invertebrate Concentrations (mg/kg)[2,4]	
	Maximum Detection	Average All	Average of Positive Detections	Average [1]	Maximum Detection	Average Concentration[1]	Conservative	Average	Maximum Detection	Average	Conservative	Average	Maximum Detection	Average
Inorganics														
ARSENIC	9.27E+01	3.3E+01	3.4E+01	3.30E+01	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		5.91E+00	2.85E+00	6.90E-01	1.43E-01	6.40E+01	4.72E+00
CADMIUM	9.00E-01	3.0E-01	5.2E-01	2.98E-01	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		7.62E+00	3.17E+00	7.99E+00	6.00E-01	7.19E+00	1.79E-01
CHROMIUM	5.43E+01	2.2E+01	2.2E+01	2.21E+01	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		1.66E+01	6.77E+00	4.68E-01	1.00E-01	2.54E+01	2.21E+00
COPPER	5.13E+01	2.5E+01	2.5E+01	2.55E+01	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		2.64E+01	1.31E+01	5.25E+00	1.56E+00	2.69E+02	3.96E+01
LEAD	8.27E+01	4.0E+01	4.0E+01	3.96E+01	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		2.84E+01	1.57E+01	6.07E-01	7.10E-02	5.02E+01	2.81E+00
MERCURY	1.60E+00	3.8E-01	4.2E-01	3.77E-01	0.00E+00	0.00E+00	Regression - Sample et al., (1998)		1.27E+00	7.78E-01	2.87E+00	1.14E+00	4.59E+00	4.28E-01
NICKEL	3.69E+01	1.4E+01	1.4E+01	1.37E+01	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		3.91E+01	1.46E+01	2.32E+00	4.86E-01	8.56E+01	6.68E+00
SELENIUM	9.30E+00	1.4E+00	2.9E+00	1.42E+00	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		4.76E+00	1.20E+00	1.00E+00	1.00E+00	9.30E+00	1.42E+00
ZINC	6.69E+02	1.6E+02	1.8E+02	1.59E+02	0.00E+00	0.00E+00	Regression or BAF from Eco SSL		7.23E+02	4.51E+02	7.53E+00	1.94E+00	5.04E+03	3.07E+02

1 - If the average of all value is the greater than the maximum detection, the average of the positive detections was used as the average value.

APPENDIX D

AMERICAN ROBIN - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Max Soil Conc. (mg/kg)	Max SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	9.27E+01	0.00E+00	5.91E+00	2.45E+00	0.00E+00	9.54E-01	3.41E+00	2.24E+00	4.51E+00	1.5E+00	7.6E-01
CADMIUM	9.00E-01	0.00E+00	7.62E+00	2.38E-02	0.00E+00	1.23E+00	1.25E+00	1.47E+00	6.35E+00	8.5E-01	2.0E-01
CHROMIUM	5.43E+01	0.00E+00	1.66E+01	1.44E+00	0.00E+00	2.68E+00	4.12E+00	2.66E+00	1.56E+01	1.5E+00	2.6E-01
COPPER	5.13E+01	0.00E+00	2.64E+01	1.36E+00	0.00E+00	4.26E+00	5.62E+00	4.05E+00	3.49E+01	1.4E+00	1.6E-01
LEAD	8.27E+01	0.00E+00	2.84E+01	2.19E+00	0.00E+00	4.58E+00	6.77E+00	1.63E+00	4.46E+01	4.2E+00	1.5E-01
MERCURY	1.60E+00	0.00E+00	1.27E+00	4.23E-02	0.00E+00	2.04E-01	2.47E-01	6.40E-03	6.40E-02	3.9E+01	3.9E+00
NICKEL	3.69E+01	0.00E+00	3.91E+01	9.77E-01	0.00E+00	6.31E+00	7.28E+00	6.71E+00	1.86E+01	1.1E+00	3.9E-01
SELENIUM	9.30E+00	0.00E+00	4.76E+00	2.46E-01	0.00E+00	7.68E-01	1.01E+00	2.90E-01	8.19E-01	3.5E+00	1.2E+00
ZINC	6.69E+02	0.00E+00	7.23E+02	1.77E+01	0.00E+00	1.17E+02	1.34E+02	6.61E+01	1.71E+02	2.0E+00	7.8E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	7.73E-02	kg
Food Ingestion Rate = (If)	1.25E-02	kg/day
Water Ingestion Rate = (Iw)	1.21E-02	L/day
Soil Ingestion Rate = (Is)	2.05E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

APPENDIX D

AMERICAN ROBIN - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Avg Soil Conc. (mg/kg)	Avg SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	3.30E+01	0.00E+00	2.85E+00	3.12E-01	0.00E+00	4.21E-01	7.34E-01	2.24E+00	4.51E+00	3.3E-01	1.6E-01
CADMIUM	2.98E-01	0.00E+00	3.17E+00	2.82E-03	0.00E+00	4.68E-01	4.71E-01	1.47E+00	6.35E+00	3.2E-01	7.4E-02
CHROMIUM	2.21E+01	0.00E+00	6.77E+00	2.09E-01	0.00E+00	1.00E+00	1.21E+00	2.66E+00	1.56E+01	4.5E-01	7.7E-02
COPPER	2.55E+01	0.00E+00	1.31E+01	2.41E-01	0.00E+00	1.94E+00	2.18E+00	4.05E+00	3.49E+01	5.4E-01	6.2E-02
LEAD	3.96E+01	0.00E+00	1.57E+01	3.74E-01	0.00E+00	2.31E+00	2.69E+00	1.63E+00	4.46E+01	1.6E+00	6.0E-02
MERCURY	3.77E-01	0.00E+00	7.78E-01	3.56E-03	0.00E+00	1.15E-01	1.19E-01	6.40E-03	6.40E-02	1.9E+01	1.9E+00
NICKEL	1.37E+01	0.00E+00	1.46E+01	1.30E-01	0.00E+00	2.15E+00	2.28E+00	6.71E+00	1.86E+01	3.4E-01	1.2E-01
SELENIUM	1.42E+00	0.00E+00	1.20E+00	1.34E-02	0.00E+00	1.77E-01	1.91E-01	2.90E-01	8.19E-01	6.6E-01	2.3E-01
ZINC	1.59E+02	0.00E+00	4.51E+02	1.50E+00	0.00E+00	6.66E+01	6.81E+01	6.61E+01	1.71E+02	1.0E+00	4.0E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	8.04E-02	kg
Food Ingestion Rate = (If)	1.19E-02	kg/day
Water Ingestion Rate = (Iw)	1.13E-02	L/day
Soil Ingestion Rate = (Is)	7.60E-04	kg/day
Home Range = (HR)	6.10E-01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

APPENDIX D

SHORT-TAILED SHREW - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Max Soil Conc. (mg/kg)	Max SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	9.27E+01	0.00E+00	5.91E+00	2.97E-01	0.00E+00	6.31E-01	9.27E-01	1.04E+00	4.55E+00	8.9E-01	2.0E-01
CADMIUM	9.00E-01	0.00E+00	7.62E+00	2.88E-03	0.00E+00	8.13E-01	8.15E-01	7.70E-01	6.90E+00	1.1E+00	1.2E-01
CHROMIUM	5.43E+01	0.00E+00	1.66E+01	1.74E-01	0.00E+00	1.77E+00	1.95E+00	2.40E+00	5.82E+01	8.1E-01	3.3E-02
COPPER	5.13E+01	0.00E+00	2.64E+01	1.64E-01	0.00E+00	2.82E+00	2.98E+00	5.60E+00	8.27E+01	5.3E-01	3.6E-02
LEAD	8.27E+01	0.00E+00	2.84E+01	2.65E-01	0.00E+00	3.03E+00	3.29E+00	4.70E+00	1.86E+02	7.0E-01	1.8E-02
MERCURY	1.60E+00	0.00E+00	1.27E+00	5.12E-03	0.00E+00	1.35E-01	1.40E-01	3.20E-02	1.60E-01	4.4E+00	8.8E-01
NICKEL	3.69E+01	0.00E+00	3.91E+01	1.18E-01	0.00E+00	4.17E+00	4.29E+00	1.70E+00	1.48E+01	2.5E+00	2.9E-01
SELENIUM	9.30E+00	0.00E+00	4.76E+00	2.98E-02	0.00E+00	5.08E-01	5.37E-01	1.43E-01	6.61E-01	3.8E+00	8.1E-01
ZINC	6.69E+02	0.00E+00	7.23E+02	2.14E+00	0.00E+00	7.71E+01	7.92E+01	7.54E+01	2.98E+02	1.1E+00	2.7E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.50E-02	kg
Food Ingestion Rate = (If)	1.60E-03	kg/day
Water Ingestion Rate = (Iw)	4.28E-03	L/day
Soil Ingestion Rate = (Is)	4.80E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

APPENDIX D

SHORT-TAILED SHREW - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Avg Soil Conc. (mg/kg)	Avg SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	3.30E+01	0.00E+00	2.85E+00	2.65E-02	0.00E+00	2.54E-01	2.80E-01	1.04E+00	4.55E+00	2.7E-01	6.2E-02
CADMIUM	2.98E-01	0.00E+00	3.17E+00	2.39E-04	0.00E+00	2.82E-01	2.82E-01	7.70E-01	6.90E+00	3.7E-01	4.1E-02
CHROMIUM	2.21E+01	0.00E+00	6.77E+00	1.77E-02	0.00E+00	6.02E-01	6.20E-01	2.40E+00	5.82E+01	2.6E-01	1.1E-02
COPPER	2.55E+01	0.00E+00	1.31E+01	2.04E-02	0.00E+00	1.17E+00	1.19E+00	5.60E+00	8.27E+01	2.1E-01	1.4E-02
LEAD	3.96E+01	0.00E+00	1.57E+01	3.17E-02	0.00E+00	1.39E+00	1.42E+00	4.70E+00	1.86E+02	3.0E-01	7.6E-03
MERCURY	3.77E-01	0.00E+00	7.78E-01	3.02E-04	0.00E+00	6.93E-02	6.96E-02	3.20E-02	1.60E-01	2.2E+00	4.3E-01
NICKEL	1.37E+01	0.00E+00	1.46E+01	1.10E-02	0.00E+00	1.30E+00	1.31E+00	1.70E+00	1.48E+01	7.7E-01	8.8E-02
SELENIUM	1.42E+00	0.00E+00	1.20E+00	1.14E-03	0.00E+00	1.07E-01	1.08E-01	1.43E-01	6.61E-01	7.6E-01	1.6E-01
ZINC	1.59E+02	0.00E+00	4.51E+02	1.27E-01	0.00E+00	4.01E+01	4.02E+01	7.54E+01	2.98E+02	5.3E-01	1.35E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.61E-02	kg
Food Ingestion Rate = (If)	1.43E-03	kg/day
Water Ingestion Rate = (Iw)	3.60E-03	L/day
Soil Ingestion Rate = (Is)	1.29E-05	kg/day
Home Range = (HR)	9.70E-01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

APPENDIX D

STAR-NOSE MOLE - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Max Sed Conc. (mg/kg)	Max SW Conc. (mg/L)	Invertebrate Conc.[1] (mg/kg)	Dose (mg/kg/d) from: Sediment	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	9.27E+01	0.00E+00	6.40E+01	4.59E-01	0.00E+00	1.06E+01	1.10E+01	2.47E+00	4.55E+00	4.5E+00	2.4E+00
CADMIUM	9.00E-01	0.00E+00	7.19E+00	4.46E-03	0.00E+00	1.19E+00	1.19E+00	7.70E-01	6.90E+00	1.5E+00	1.7E-01
CHROMIUM	5.43E+01	0.00E+00	2.54E+01	2.69E-01	0.00E+00	4.19E+00	4.46E+00	2.40E+00	5.82E+01	1.9E+00	7.7E-02
COPPER	5.13E+01	0.00E+00	2.69E+02	2.54E-01	0.00E+00	4.44E+01	4.47E+01	5.82E+00	8.14E+01	7.7E+00	5.5E-01
LEAD	8.27E+01	0.00E+00	5.02E+01	4.09E-01	0.00E+00	8.28E+00	8.69E+00	4.70E+00	1.86E+02	1.8E+00	4.7E-02
MERCURY	1.60E+00	0.00E+00	4.59E+00	7.92E-03	0.00E+00	7.57E-01	7.65E-01	3.20E-02	1.60E-01	2.4E+01	4.8E+00
NICKEL	3.69E+01	0.00E+00	8.56E+01	1.83E-01	0.00E+00	1.41E+01	1.43E+01	1.70E+00	1.48E+01	8.4E+00	9.7E-01
SELENIUM	9.30E+00	0.00E+00	9.30E+00	4.60E-02	0.00E+00	1.53E+00	1.58E+00	2.00E-01	3.30E-01	7.9E+00	4.8E+00
ZINC	6.69E+02	0.00E+00	5.04E+03	3.31E+00	0.00E+00	8.31E+02	8.34E+02	1.60E+02	3.20E+02	5.2E+00	2.6E+00

Body Weight = (BW)	3.40E-02	kg
Invertebrate Ingestion Rate = (Ii)	5.61E-03	kg/day
Water Ingestion Rate = (Iw)	9.97E-03	L/day
Sediment Ingestion Rate = (Is)	1.68E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Cells are shaded if the hazard quotient is greater than 1.0

Dose (sediment) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * Ii)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (water) + Dose (invertebrate)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Level
NOAEL = No Observed Adverse Effects Level
Sed = Sediment
SW = Surface Water

APPENDIX D

STAR-NOSE MOLE - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Avg Sed Conc. (mg/kg)	Avg SW Conc. (mg/L)	Invertebrate Conc.[1] (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	3.30E+01	0.00E+00	4.72E+00	2.42E-02	0.00E+00	3.85E-01	4.09E-01	2.47E+00	4.55E+00	1.7E-01	9.0E-02
CADMIUM	2.98E-01	0.00E+00	1.79E-01	2.19E-04	0.00E+00	1.46E-02	1.48E-02	7.70E-01	6.90E+00	1.9E-02	2.1E-03
CHROMIUM	2.21E+01	0.00E+00	2.21E+00	1.62E-02	0.00E+00	1.80E-01	1.96E-01	2.40E+00	5.82E+01	8.2E-02	3.4E-03
COPPER	2.55E+01	0.00E+00	3.96E+01	1.87E-02	0.00E+00	3.22E+00	3.24E+00	5.82E+00	8.14E+01	5.6E-01	4.0E-02
LEAD	3.96E+01	0.00E+00	2.81E+00	2.90E-02	0.00E+00	2.29E-01	2.58E-01	4.70E+00	1.86E+02	5.5E-02	1.4E-03
MERCURY	3.77E-01	0.00E+00	4.28E-01	2.76E-04	0.00E+00	3.49E-02	3.52E-02	3.20E-02	1.60E-01	1.1E+00	2.2E-01
NICKEL	1.37E+01	0.00E+00	6.68E+00	1.01E-02	0.00E+00	5.44E-01	5.54E-01	1.70E+00	1.48E+01	3.3E-01	3.8E-02
SELENIUM	1.42E+00	0.00E+00	1.42E+00	1.04E-03	0.00E+00	1.16E-01	1.17E-01	2.00E-01	3.30E-01	5.8E-01	3.5E-01
ZINC	1.59E+02	0.00E+00	3.07E+02	1.16E-01	0.00E+00	2.50E+01	2.51E+01	1.60E+02	3.20E+02	1.6E-01	7.8E-02

Body Weight = (BW)	5.60E-02	kg
Invertebrate Ingestion Rate = (Ii)	4.56E-03	kg/day
Water Ingestion Rate = (Iw)	8.55E-03	L/day
Sediment Ingestion Rate = (Is)	4.10E-05	kg/day
Home Range = (HR)	1.00E+00	acres
Contaminated Area = (CA)	Assume equal to home range	

Cells are shaded if the hazard quotient is greater than 1.0

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * Ii)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (water) + Dose (invertebrate)
H=HR/CA (Assume = to 1)

Conc = Concentration
Invert = Invertebrate
LOAEL = Lowest Observed Adverse Effects Level
NOAEL = No Observed Adverse Effects Level
Sed = Sediment
SW = Surface Water

APPENDIX D

CAROLINA WREN - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Max Sed Conc. (mg/kg)	Max SW Conc. (mg/L)	Invertebrate Conc.[1] (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	9.27E+01	0.00E+00	6.40E+01	4.96E+00	0.00E+00	2.09E+01	2.58E+01	2.24E+00	4.51E+00	1.2E+01	5.7E+00
CADMIUM	9.00E-01	0.00E+00	7.19E+00	4.81E-02	0.00E+00	2.34E+00	2.39E+00	1.47E+00	6.35E+00	1.6E+00	3.8E-01
CHROMIUM	5.43E+01	0.00E+00	2.54E+01	2.90E+00	0.00E+00	8.29E+00	1.12E+01	2.66E+00	1.56E+01	4.2E+00	7.2E-01
COPPER	5.13E+01	0.00E+00	2.69E+02	2.74E+00	0.00E+00	8.78E+01	9.06E+01	4.05E+00	3.48E+01	2.2E+01	2.6E+00
LEAD	8.27E+01	0.00E+00	5.02E+01	4.42E+00	0.00E+00	1.64E+01	2.08E+01	1.63E+00	4.46E+01	1.3E+01	4.7E-01
MERCURY	1.60E+00	0.00E+00	4.59E+00	8.56E-02	0.00E+00	1.50E+00	1.58E+00	6.40E-03	6.40E-02	2.5E+02	2.5E+01
NICKEL	3.69E+01	0.00E+00	8.56E+01	1.97E+00	0.00E+00	2.79E+01	2.99E+01	6.71E+00	1.86E+01	4.5E+00	1.6E+00
SELENIUM	9.30E+00	0.00E+00	9.30E+00	4.97E-01	0.00E+00	3.03E+00	3.53E+00	4.00E-01	8.00E-01	8.8E+00	4.4E+00
ZINC	6.69E+02	0.00E+00	5.04E+03	3.58E+01	0.00E+00	1.64E+03	1.68E+03	1.45E+01	1.31E+02	1.2E+02	1.3E+01

Body Weight = (BW)	1.42E-02	kg
Invertebrate Ingestion Rate = (Ii)	4.63E-03	kg/day
Water Ingestion Rate = (Iw)	4.45E-03	L/day
Soil Ingestion Rate = (Is)	7.59E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Cells are shaded if the hazard quotient is greater than 1.0

Dose (sediment) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * Ii)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
CI = Contaminant concentration in invertebrate
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (water) + Dose (invertebrate)
H=HR/CA (Assume = to 1)

Conc = Concentration
Invert = Invertebrate
LOAEL = Lowest Observed Adverse Effects Level
NOAEL = No Observed Adverse Effects Level
Sed = Sediment
SW = Surface Water

APPENDIX D

CAROLINA WREN - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENT CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Avg Sed Conc. (mg/kg)	Avg SW Conc. (mg/L)	Invertebrate Conc.[1] (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
ARSENIC	3.30E+01	0.00E+00	4.72E+00	4.89E-01	0.00E+00	1.09E+00	1.58E+00	2.24E+00	4.51E+00	7.1E-01	3.5E-01
CADMIUM	2.98E-01	0.00E+00	1.79E-01	4.42E-03	0.00E+00	4.14E-02	4.58E-02	1.47E+00	6.35E+00	3.1E-02	7.2E-03
CHROMIUM	2.21E+01	0.00E+00	2.21E+00	3.27E-01	0.00E+00	5.11E-01	8.39E-01	2.66E+00	1.56E+01	3.2E-01	5.4E-02
COPPER	2.55E+01	0.00E+00	3.96E+01	3.77E-01	0.00E+00	9.16E+00	9.54E+00	4.05E+00	3.48E+01	2.4E+00	2.7E-01
LEAD	3.96E+01	0.00E+00	2.81E+00	5.86E-01	0.00E+00	6.50E-01	1.24E+00	1.63E+00	4.46E+01	7.6E-01	2.8E-02
MERCURY	3.77E-01	0.00E+00	4.28E-01	5.58E-03	0.00E+00	9.91E-02	1.05E-01	6.40E-03	6.40E-02	1.6E+01	1.6E+00
NICKEL	1.37E+01	0.00E+00	6.68E+00	2.03E-01	0.00E+00	1.55E+00	1.75E+00	6.71E+00	1.86E+01	2.6E-01	9.4E-02
SELENIUM	1.42E+00	0.00E+00	1.42E+00	2.10E-02	0.00E+00	3.29E-01	3.50E-01	4.00E-01	8.00E-01	8.7E-01	4.4E-01
ZINC	1.59E+02	0.00E+00	3.07E+02	2.35E+00	0.00E+00	7.10E+01	7.33E+01	1.45E+01	1.31E+02	5.1E+00	5.6E-01

Body Weight = (BW)	1.76E-02	kg
Invertebrate Ingestion Rate = (Ii)	4.07E-03	kg/day
Water Ingestion Rate = (Iw)	3.94E-03	L/day
Soil Ingestion Rate = (Is)	2.61E-04	kg/day
Home Range = (HR)	3.00E-01	acres
Contaminated Area = (CA)	Assume equal to home range	

Cells are shaded if the hazard quotient is greater than 1.0

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * Ii)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (water) + Dose (invertebrate)
H=HR/CA (Assume = to 1)

Conc = Concentration
Invert = Invertebrate
LOAEL = Lowest Observed Adverse Effects Level
NOAEL = No Observed Adverse Effects Level
Sed = Sediment
SW = Surface Water

APPENDIX D

MINK - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENTS CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Maximum Sediment/Soil Concentration (mg/kg)	Maximum Surface Water Concentration (mg/L)	BSAF[1]	Estimated Fish or Invertebrate Concentration (mg/kg)	Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL HQ	LOAEL HQ
Inorganics									
Arsenic	9.27E+01	0.00E+00	0.690	6.40E+01	8.96E+00	1.04	4.55	8.62E+00	1.97E+00
Chromium	5.43E+01	0.00E+00	0.468	2.54E+01	3.76E+00	2.4	58.17	1.57E+00	6.47E-02
Copper	5.13E+01	0.00E+00	5.250	2.69E+02	3.38E+01	5.6	82.7	6.04E+00	4.09E-01
Lead	8.27E+01	0.00E+00	0.607	5.02E+01	7.15E+00	4.7	186.4	1.52E+00	3.84E-02
Mercury	1.60E+00	0.00E+00	2.870	4.59E+00	5.85E-01	0.032	0.16	1.83E+01	3.65E+00
Nickel	3.69E+01	0.00E+00	2.320	8.56E+01	1.10E+01	1.7	14.77	6.46E+00	7.44E-01
Selenium	9.30E+00	0.00E+00	1.000	9.30E+00	1.25E+00	0.143	0.661	8.77E+00	1.90E+00
Zinc	6.69E+02	0.00E+00	7.530	5.04E+03	6.29E+02	75.4	298	8.34E+00	2.11E+00

Notes:
Cells are shaded if the hazard quotient (HQ) is greater than 1.0
Dose=[(If×Cf)+(Is×Cs)+(Iw×Cw)]/BW

Body Weight = (BW)	0.550 kg	Cf = Contaminant concentration in fish or invertebrates
Food Ingestion Rate = (If)	0.0678 kg/day	Cs = Contaminant concentration in sediment
Water Ingestion Rate = (Iw)	0.000 L/day	Cw = Contaminant concentration in water
Sediment Ingestion Rate = (Is)	0.0064 kg/day	

[1] BSAF = Biota-sediment-accumulation factor. BSAFs for organic chemicals represent sediment to fish biotransfer factors. Sediment to fish BSAFs were not available for inorganics, and thus, BSAFs for inorganics represent sediment to invertebrate biotransfer factors (see text).

APPENDIX D

MINK - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENTS CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Average Sediment/Soil Concentration (mg/kg)	Average Surface Water Concentration (mg/L)	BSAF[1]	Estimated Fish or Invertebrate Concentration (mg/kg)	Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL HQ	LOAEL HQ
Inorganics									
Arsenic	3.30E+01	0.00E+00	0.143	4.72E+00	3.11E-01	1.04	4.55	2.99E-01	6.83E-02
Chromium	2.21E+01	0.00E+00	0.100	2.21E+00	1.70E-01	2.4	58.17	7.08E-02	2.92E-03
Copper	2.55E+01	0.00E+00	1.556	3.97E+01	1.68E+00	5.6	82.7	3.00E-01	2.03E-02
Lead	3.96E+01	0.00E+00	0.071	2.81E+00	2.59E-01	4.7	186.4	5.51E-02	1.39E-03
Mercury	3.77E-01	0.00E+00	1.140	4.30E-01	1.86E-02	0.032	0.16	5.80E-01	1.16E-01
Nickel	1.37E+01	0.00E+00	0.486	6.66E+00	3.17E-01	1.7	14.77	1.86E-01	2.14E-02
Selenium	1.42E+00	0.00E+00	1.000	1.42E+00	6.20E-02	0.143	0.661	4.34E-01	9.38E-02
Zinc	1.59E+02	0.00E+00	1.940	3.08E+02	1.29E+01	75.4	298	1.71E-01	4.33E-02

Notes:
Cells are shaded if the hazard quotient (HQ) is greater than 1.0
Dose=[(If×Cf)+(Is×Cs)+(Iw×Cw)]/BW

Body Weight = (BW)	0.568 kg	Cf = Contaminant concentration in fish
Food Ingestion Rate = (If)	0.0227 kg/day	Cs = Contaminant concentration in sediment
Water Ingestion Rate = (Iw)	0.000 L/day	Cw = Contaminant concentration in water
Sediment Ingestion Rate = (Is)	0.0021 kg/day	

[1] BSAF = Biota-sediment-accumulation factor. BSAFs for organic chemicals represent sediment to fish biotransfer factors. Sediment to fish BSAFs were not available for inorganics, and thus, BSAFs for inorganics represent sediment to invertebrate biotransfer factors (see text).

APPENDIX D

GREEN HERON - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENTS CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Maximum Sediment/Soil Concentration (mg/kg)	Maximum Surface Water Concentration (mg/L)	BSAF[1]	Estimated Fish or Invertebrate Concentration (mg/kg)	Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL HQ	LOAEL HQ
Inorganics									
Arsenic	9.27E+01	0.00E+00	0.690	6.40E+01	1.07E+01	2.24	4.51	4.76E+00	2.36E+00
Chromium	5.43E+01	0.00E+00	0.468	2.54E+01	4.37E+00	2.66	15.63	1.64E+00	2.80E-01
Copper	5.13E+01	0.00E+00	5.250	2.69E+02	4.22E+01	4.05	34.87	1.04E+01	1.21E+00
Lead	8.27E+01	0.00E+00	0.607	5.02E+01	8.44E+00	1.63	44.63	5.18E+00	1.89E-01
Mercury	1.60E+00	0.00E+00	2.870	4.59E+00	7.25E-01	0.0064	0.064	1.13E+02	1.13E+01
Nickel	3.69E+01	0.00E+00	2.320	8.56E+01	1.36E+01	6.71	18.57	2.02E+00	7.30E-01
Selenium	9.30E+00	0.00E+00	1.000	9.30E+00	1.52E+00	0.29	0.819	5.23E+00	1.85E+00
Zinc	6.69E+02	0.00E+00	7.530	5.04E+03	7.86E+02	66.1	171.4	1.19E+01	4.59E+00

Notes:
Cells are shaded if the hazard quotient (HQ) is greater than 1.0
Dose=[(If×Cf)+(Is×Cs)+(Iw×Cw)]/BW

Body Weight = (BW)	0.2 kg	Cf = Contaminant concentration in fish
Food Ingestion Rate = (If)	0.031 kg/day	Cs = Contaminant concentration in sediment
Water Ingestion Rate = (Iw)	0.000 L/day	Cw = Contaminant concentration in water
Sediment Ingestion Rate = (Is)	0.0016 kg/day	

[1] BSAF = Biota-sediment-accumulation factor. BSAFs for organic chemicals represent sediment to fish biotransfer factors. Sediment to fish BSAFs were not available for inorganics, and thus, BSAFs for inorganics represent sediment to invertebrate biotransfer factors (see text).

APPENDIX D

GREEN HERON - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL HAZARD QUOTIENTS CALCULATION
AOC 721
CHARLESTON NAVAL COMPLEX, CHARLESTON, SOUTH CAROLINA

Chemical	Average Sediment/soil Concentration (mg/kg)	Average Surface Water Concentration (mg/L)	BSAF[1]	Estimated Fish or Invertebrate Concentration (mg/kg)	Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL HQ	LOAEL HQ
Inorganics									
Arsenic	3.30E+01	0.00E+00	0.143	4.72E+00	9.01E-01	2.24	4.51	4.02E-01	2.00E-01
Chromium	2.21E+01	0.00E+00	0.100	2.21E+00	4.69E-01	2.66	15.63	1.76E-01	3.00E-02
Copper	2.55E+01	0.00E+00	1.556	3.97E+01	5.80E+00	4.05	34.87	1.43E+00	1.66E-01
Lead	3.96E+01	0.00E+00	0.071	2.81E+00	6.78E-01	1.63	44.63	4.16E-01	1.52E-02
Mercury	3.77E-01	0.00E+00	1.140	4.30E-01	6.35E-02	0.0064	0.064	9.92E+00	9.92E-01
Nickel	1.37E+01	0.00E+00	0.486	6.66E+00	1.04E+00	6.71	18.57	1.55E-01	5.60E-02
Selenium	1.42E+00	0.00E+00	1.000	1.42E+00	2.11E-01	0.29	0.819	7.28E-01	2.58E-01
Zinc	1.59E+02	0.00E+00	1.940	3.08E+02	4.48E+01	66.1	171.4	6.77E-01	2.61E-01

Notes:
Cells are shaded if the hazard quotient (HQ) is greater than 1.0
Dose=[(IfxCf)+(IsxCs)+(IwxCw)]/BW

Body Weight = (BW)	0.212 kg	Cf = Contaminant concentration in soil
Food Ingestion Rate = (If)	0.030 kg/day	Cs = Contaminant concentration in sediment
Water Ingestion Rate = (Iw)	0.000 L/day	Cw = Contaminant concentration in water
Sediment Ingestion Rate = (Is)	0.0015 kg/day	

[1] BSAF = Biota-sediment-accumulation factor. BSAFs for organic chemicals represent sediment to fish biotransfer factors. Sediment to fish BSAFs were not available for inorganics, and thus, BSAFs for inorganics represent sediment to invertebrate biotransfer factors (see text).

APPENDIX E

RESPONSE TO COMMENTS

Review of RCRA Facility Investigation Report for Area of Concern 721 dated September 2012
Charleston Naval Complex, North Charleston, SC
Prepared by Annie M. Gerry
January 15, 2013

COMMENTS

1. **Page ES-3, Human Health Assessment** - The text reads, *"However, groundwater is not currently used as a potable water source and is not expected to be used as a potable water source in the future."*

   All groundwater in the state of South Carolina is classified as "GB" per the regs (R. 61-68.H) and cannot be changed unless petitioned by the State Legislature. Therefore, this sentence is incorrect and groundwater will need to be cleaned up to class GB standards as specified in the Water Classification Standards R.61-68. Please revise this sentence.

Navy Response: This sentence has been deleted from the text.

2. **Page 3-5, Section 3.2.7 Vertical and Horizontal Sampling** - The text reads *"A topographic divide extends northeast from monitoring well 044004 through monitoring well 04006 across the site area."*

   Monitoring well 044004 could not be located on any of the provided figures. Please show the location of this monitoring well. Also, it would be useful to provide a figure showing the location of every monitoring well associated with this site and distinguish if they are permanent, abandoned or temporary wells.

   In addition, indicating the topographic divide on the figure would be helpful.

Navy Response: A new Figure 3-1 showing the locations of the topographic divide and all SWMU 44 monitoring wells has been added to the report. All SWMU 44 monitoring wells are permanent wells.

3. **Page 6-2, Section 6.4 Effects of Soil Removal on Other Media** - This section states that groundwater samples were collected before and after the soil removal (in 2008), but does not reference the figure showing the locations of the groundwater samples. Please provide figures showing the groundwater samples before and after the soil removal.

   In addition, this section states that sixteen groundwater samples were collected in 2003 but a figure referencing these locations is not provided or listed. Please provide a figure showing these sample locations.

Navy Response: The text has been clarified to indicate these samples were collected from Monitoring Wells 044005, 044006, and 044007 in 2003 and 2008, and furthermore, that the sixteen samples collected in 2003 were from four quarterly sampling events that included a duplicate sample.

4. It appears that a potentiometic map was not provided for the groundwater samples collected in latest sampling event of 2008. Please provide the most current potentiometric map for AOC 721.

Navy Response: During the 2008 sampling event, groundwater samples and water level measurements were collected from Monitoring Wells 044005, 044006, and 044007 only. These three wells are not located in an alignment that would allow for the triangulation needed to create a potentiometric map. The 1996 (Figure 2-1) and 2002 (Figure 2-2) potentiometric maps were based on water levels collected from all of the shallow monitoring wells in Zone C, and are the most current potentiometric maps available. Also, please note that the water levels shown for these three wells on Figure 2-2 are the 1996 water levels (i.e., same as on Figure 2-1); however, the contours shown are from the 2002 potentiometric map. This typographical error has been corrected. Also, future sampling events will include collection of water level measurements from all site monitoring wells so that a current potentiometric map can be produced.

5. **Page 9-2, Section 9.1.1 Baseline Human Health Risk Assessment, 1st paragraph, last sentence** - See Comment 1 and revise accordingly.

   Navy Response: This sentence has been deleted from the text.

Responses to SCDNR Comments (dated March 21, 2013) on AOC 721 RCRA Facility Investigation Report (dated September 2012)

1. **Comment:** 8.5.2 Assessment Endpoints and Measures of Effects**:** Because much of AOC 721 is tidally influenced, the list of potential ecological receptor groups should include piscivorous mammals and piscivorous birds. The mink and green heron were used as surrogate species for these two groups of receptors in the Zone J RFI, and would be appropriate species to use in the ecological risk assessment for AOC 721, as well. A conservative Area Use Factor (AUF) should be used for this evaluation, particularly since AOC 721 is an extension of SWMU 44, which is also a former coal storage area with the same contaminants of potential concern.

   Response: *The ERA will be revised as requested to include the mink as a representative piscivorous mammal and the green heron as a representative piscivorous bird. Risks to these receptors will be evaluated using the same approach used in the Zone J RFI.*

2. **Comment:** 8.5.2.3 Aquatic Organisms: The only source of risk to aquatic organisms considered in the ecological risk assessment is surface water contamination. Demersal fish and invertebrates are also exposed to contamination through direct contact with sediments and the ingestion of prey in lower level trophic groups (e.g., benthic infauna). These two additional routes of exposure should be included in the conceptual exposure model, and both predator and prey species of fish should be included in the ecological risk assessment. An appropriate prey species would be the mummichog, while an appropriate predator species would be the red drum.

   Response: *The commenter is apparently requesting that potential sediment-related risks to demersal fish be evaluated using food chain modeling, with the mummichog and red drum as representative fish species. The Navy believes that the uncertainty associated with this approach would be so great that the results would be of negligible benefit. For example, the amount of sediment ingested by these species has not been adequately documented, and assumptions would be speculative. Furthermore, such an approach was not requested for the Zone J RFI nor for other Navy investigations in the Charleston area. While it is true that demersal fish are exposed to contamination through direct contact with sediments and the ingestion of benthic infauna, a suitable approach for evaluating these risks is not clear. Finally, the RFI investigation of Zone J, which encompasses Noisette Creek, concluded that sediment contamination in Noisette Creek posed minimal risks to benthic receptors in the creek, and to piscivorous birds and mammals foraging in the creek. Thus, sediment contamination in the ditch at AOC 721 is localized and apparently is not a major contributor of contaminants to Noisette Creek. The Navy suggests that*

the ERA be revised to discuss the uncertainty associated with potential sediment-related risks to demersal fish.

3. Comment: 8.6.1 Measures of Effects and Assessment Endpoints: The last sentence on p. 8-22 states that *"Risks to carnivorous receptors were not specifically calculated; however, risks are accounted for by using insectivorous birds and mammals as surrogates."* This statement does not appear to take into account the ecological risk to carnivorous (or piscivorous) species posed by contaminants such as mercury that not only bioaccumulate, but also biomagnify in successively higher trophic levels. This issue could be addressed by including piscivorous mammals and piscivorous birds in the ecological risk assessment, as recommended above.

Response: *The ERA will be revised as requested to include the mink as a representative piscivorous mammal and the green heron as a representative piscivorous bird. Risks to these receptors will be evaluated using the same approach used in the Zone J RFI.*

RESPONSE TO SC DHEC COMMENT LETTER (DATED: JUNE 8, 2012),
prepared by Meredith Amick, P.E., Environmental Engineer
RCRA FACILITY INVESTIGATION REPORT FOR AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

Comments are shown in bold font. Responses follow each comment and are shown in regular font.

1. **Because of AOC 721's proximity to the railroad lines as well as the placement of dredge spoils at AOC 721, the Department will allow use of the Railroad Lines background values. For the constituents (or media {i.e. groundwater}) that do not have Railroad Lines background values, please use the Zone C values to appropriately screen the data. The Zone C and Railroad Lines background values are provided in the November 2001 background study.**

   Response: The Railroad Lines and Zone C background values from the November 2001 background study have been used in the revised RFI report.

2. **Please show the location of SWMU 44 on the figures.**

   Response: The location of SWMU 44 has been added to the figures.

3. **On Table 4-5 and any other table that uses similar notation, the actual site analytical value should be called out (highlighted, etc.) in addition to the background number or screening level it exceeds.**

   Response: Site analytical values have been highlighted as requested where appropriate.

4. **Tag maps should show only constituents that exceed background and the appropriate screening value and denote the screening values that are exceeded.**

   Response: Tag maps have been revised as requested.

5. **Please clarify on Figure 4-5 the meaning of "Excavated Soil Sample."**

   Response: "Excavated Soil Sample" has been changed to "Post-Excavation Confirmation Sample".

6. **Because the drainage ditch sampled runs into Noisette Creek, please discuss the Noisette Creek sampling results from the Zone J RFI.**

   Response: A discussion of the Noisette Creek sampling results from the Zone J RFI has been added.

7. **On the figures provided in the document please show where the 2005 Interim Measure removal was completed. Additionally on the tag maps please provide dates that the data was obtained, this will help the Department determine which data was obtained pre and post removal.**

   Response: The figures have been revised as requested.

8. **Please discuss how the soil removal did/or should affect the sediment, surface water, and groundwater analytical results.**

   Response: The requested discussion has been added.

9. **Page 7-6 references screening surface water to groundwater RSLs. Please screen surface water data to the appropriate surface water screening values.**

   Response: As presented in Section 7.2.3.4 of the RFI Report, there are no RSLs for surface water or sediment. COPCs in surface water were selected by comparing detected site concentrations to their respective tap water RSLs.

   Alternative surface water screening criteria obtained by Annie Gerry (DHEC) from the Bureau of Water was determined to be less conservative than Tetra Tech's approach. To that end, DHEC approved Tetra Tech's use of tap water criteria to screen surface water concentrations via E-Mail on August 13, 2012.

10. **Page 7-8 references screening groundwater data to RSLs and background. Please note the groundwater data for analytes with a MCL should be screened against the MCL instead of the RSL.**

    Response: Groundwater analytes with an MCL have been screened against their MCL rather than their RSL.

RESPONSE TO SC DHEC COMMENT LETTER (DATED: JUNE 6, 2012),
prepared by Kent Krieg, Risk Assessor
RCRA FACILITY INVESTIGATION REPORT FOR AOC 721
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA
RISK-RELATED COMMENTS

1. **As presented, the Department does not agree with the selected background values. Please refer to Amick comment # 1.**

   Response: The Railroad Lines and Zone C background values from the November 2001 background study have been used in the revised RFI report, as requested.

2. **The report references screening values from the September 2008 (i .e. Table 4-5,4-7, and 4-9) that have since been updated. The Department expects the most recent screening levels to be used in documents. It is important to note that the screening levels of some chemicals may have lowered and, therefore, it would be necessary to expand the COPC list. The document should reflect these changes as well as update the related text and tables.**

   Response: Screening levels have been updated and the document revised accordingly.

3. **As stated in USEPA Region 4 guidance, "the arithmetic average of the wells in the highly concentrated area of the plume" can be used as the EPC for groundwater risk calculations. Although this is an acceptable means to determine the EPC for groundwater, the State does not concur with the use of the arithmetic mean of all results, even if 10 or more samples were collected. Using the maximum concentration value as the EPC may be effective. This approach does not require defining the maximum area of concentration within the plume for each contaminant. As stated in RAGS, the maximum concentration may be used to place an upper bound on exposure. Although this will add to the conservative nature of the risk assessment, it will assist the risk managers in defining groundwater COCs and, ultimately, cleanup at the site. Please be sure to make note of the various tables, calculations, and recommendations throughout the document that are dependent upon the EPC value.**

   Response: Maximum concentration values have been used as the Exposure Point Concentration in the revised document.

4. **To assist the Risk Manager's potential concurrence with the general recommendation related to risks that fall within the "target cancer risk" range as describe in 7.5.2 Interpretation of Risk Assessment Results, the Department requests that these risks be listed in the results section (rather than only those that exceed 10-4).**

   Response: Comment noted and document revised accordingly.

5. **The document references conclusions contained within the unapproved Zone J document to demonstrate the minimal contribution AOC 721 has on Noisette Creek. Please include a note that this document is still under review by the Department and has not yet been finalized. (p. 8-25).**

Response: The requested clarification about the status of the Zone J RFI report has been added to the document.