N40003.AR.001183
PUERTO RICO NA
5090.3a

Final

RCRA Facility Investigation Report

SWMU 14

Naval Activity Puerto Rico
EPA ID No. PR2170027203
Ceiba, Puerto Rico

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Norfolk, Virginia

Contract No. N62470-02-D-3052
CTO-0110

March 23, 2007

Prepared by

CH2M HILL
Federal Group, Inc.

Baker
Environmental, Inc.

CDM
Federal Programs Corp.

I certify under penalty of law that I have examined and am familiar with the information submitted in this document and all attachments and that this document and its attachments were prepared either by me personally or under my direction or supervision in a manner designed to ensure that qualified and knowledgeable personnel properly gather and present the information contained therein. I further certify, based on my personal knowledge or on my inquiry of those individuals immediately responsible for obtaining the information, that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowingly and willfully submitting a materially false statement.

Signature: Jeffrey G. Meyers

Name: **Jeffrey G. Meyers, P.E., CHMM**

Title: **BRAC Environmental Co-Ordinator**

Navy BRAC PMO, S.E.

Date: **March 23, 2007**

FINAL

RCRA FACILITY INVESTIGATION REPORT
SWMU 14 - FIRE TRAINING AREA

NAVAL ACTIVITY PUERTO RICO
EPA ID NO. PR2170027203
CEIBA, PUERTO RICO

CONTRACT TASK ORDER 0110

MARCH 23, 2007

Prepared for:

DEPARTMENT OF THE NAVY
NAVAL FACILITIESENGINEERING COMMAND
ATLANTIC DIVISION
Norfolk, Virginia

Under the:

LANTDIV CLEAN Program
Contract N62470-02-D-3052

Prepared by:

BAKER ENVIRONMENTAL, INC.
Moon Township, Pennsylvania

CH2M Hill
Herndon, Virginia

TABLE OF CONTENTS

Page

LIST OF ACRONYMS AND ABBREVIATIONS vii

1.0 INTRODUCTION 1-1
1.1 Purpose 1-1
1.2 Objectives 1-1
1.3 Organization of the RFI Report 1-2

2.0 FACILITY BACKGROUND 2-1
2.1 NAPR Description and History 2-1
2.2 SWMU 14 Description and History 2-1
2.3 Current Conditions 2-2
2.3.1 Current Site Conditions 2-3
2.3.2 Site Usage 2-3
2.3.3 Previous Investigations 2-3
2.3.4 Human Health Risk Assessment 2-4
2.3.5 Overall Previous Study Conclusions and Recommendations 2-5

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA 3-1
3.1 Climatology 3-1
3.2 Topography 3-1
3.3 Geology, Hydrology, and Hydrogeology 3-2
3.3.1 Soils 3-2
3.3.2 Regional Geology 3-3
3.3.3 Regional Hydrology 3-3
3.3.4 Site-Specific Hydrogeology 3-4

4.0 2006 RCRA FACILITY INVESTIGATION ACTIVITIES 4-1
4.1 Soil Boring Advancement and Temporary Well Installation 4-1
4.2 Environmental Sampling and Analysis Program 4-1
4.2.1 Surface and Subsurface Soils 4-2
4.2.2 Groundwater 4-2
4.3 Quality Assurance/Quality Control Sampling and Analysis Program 4-2
4.3.1 Field Duplicates 4-2
4.3.2 Trip Blanks 4-2
4.3.3 Field Blanks 4-3
4.3.4 Equipment Rinsates 4-3
4.3.5 Matrix Spike/Matrix Spike Duplicates 4-3

5.0 NATURE AND EXTENT OF CONTAMINATION 5-1
5.1 2006 Field Screening PID Results 5-1
5.2 Surface Soils 5-2
5.3 Subsurface Soils 5-2
5.4 Groundwater 5-3

TABLE OF CONTENTS
(Continued)

Page

5.5 2006 Laboratory Data Validation Summary 5-4
5.5.1 Summary of Detected Compounds in Field QA/QC Samples 5-4
5.5.2 CompuChem SDG 9335 5-5
5.5.3 CompuChem SDG 9336 5-6
5.5.4 Paradigm Analytical Labs SDG G349-146 5-9

6.0 HUMAN HEALTH RISK ASSESSMENT 6-1
6.1 Site Location and Characterization 6-1
6.2 Hazard Identification 6-1
6.2.1 Data Evaluation 6-1
6.2.2 Selection of COPCs 6-2
6.2.3 Summary of COPCs 6-6
6.3 Exposure Assessment 6-6
6.3.1 Potential Human Receptors 6-7
6.3.2 Conceptual Site Model 6-9
6.3.3 Quantification of Exposure 6-9
6.3.4 Data Analysis 6-9
6.3.5 Exposure Input Parameters 6-10
6.4 Toxicity Assessment 6-14
6.4.1 Reference Doses 6-14
6.4.2 Carcinogenic Slope Factors 6-14
6.4.3 Dermal Absorption Efficiency 6-15
6.4.4 OnSite Johnson and Ettinger Model 6-16
6.5 Risk Characterization 6-16
6.5.1 Quantification and Characterization of Carcinogenic Risks 6-17
6.5.2 Quantification and Characterization of Noncarcinogenic Risks 6-17
6.5.3 Potential Human Health Effects 6-18
6.6 Sources of Uncertainty 6-21
6.6.1 Sampling and Analysis 6-21
6.6.2 Selection of COPCs 6-22
6.6.3 Exposure Assessment 6-22
6.6.4 Toxicological Assessment 6-23
6.6.5 Human Risk Characterization 6-24
6.7 Summary and Conclusions of the Baseline HHRA 6-24
6.8 HHRA References 6-26

7.0 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT 7-1
7.1 Environmental Setting 7-1
7.1.1 Site Location and History 7-2
7.1.2 Terrestrial and Aquatic Habitats 7-2
7.1.3 Biota 7-3
7.2 Sources of Available Analytical Data 7-5

TABLE OF CONTENTS
(Continued)

Page

7.3 Screening-Level Problem Formulation 7-7
7.3.1 Preliminary Conceptual Model 7-7
7.3.2 Endpoints and Risk Questions 7-10
7.3.3 Fate and Transport Mechanisms 7-13
7.4 Screening-Level Effects Evaluation 7-13
7.4.1 Media-Specific Screening Values 7-14
7.4.2 Ingestion-Based Screening Values 7-14
7.5 Screening-Level Exposure Estimation 7-15
7.5.1 Selection Criteria for Analytical Data and Their Use in the Screening-Level ERA 7-15
7.5.2 Exposure Estimation 7-16
7.6 Screening-Level Risk Calculation 7-19
7.6.1 Selection of Ecological Chemicals of Potential Concern 7-19
7.6.2 SWMU 14 Screening-Level Risk Calculation 7-21
7.7 Uncertainties Associated With the Screening-Level Ecological Risk Assessment 7-25
7.8 Screening-Level Ecological Risk Assessment Decision Point and Recommendations 7-29
7.9 ERA References 7-30

8.0 CONCLUSIONS AND RECOMMENDATIONS 8-1
8.1 Conclusions 8-1
8.1.1 Historical Impacts 8-1
8.1.2 Human Health Risk Assessment 8-2
8.1.3 Ecological Risk Assessment 8-3
8.2 Recommendations 8-3

9.0 REFERENCES 9-1

LIST OF TABLES

4-1 Summary of 2006 RFI Surface Soil, Subsurface Soil, and Groundwater Sampling and Analysis
4-2 Summary of 2006 RFI Quality Assurance / Quality Control Sampling and Analysis
4-3 Parameter Lists and Contract Required Quantitation Limits (CRQL)

5-1 Photoionization Detector Readings
5-2 Summary of Detected Results – Surface Soil
5-3 Summary of Detected Results – Subsurface Soil
5-4 Summary of Detected Results – Groundwater
5-5 Summary of Detected Results – Quality Assurance / Quality Control

TABLE OF CONTENTS
(continued)

LIST OF TABLES (continued)

6-1 Surface Soil Data and COPC Selection Summary
6-2 Subsurface Soil Data and COPC Selection Summary
6-3 Groundwater Data and COPC Selection Summary
6-4 Summary of Exposure Parameters
6-5 Human Health Risk Assessment Toxicity Factors
6-6 Summary of Receptor Risks and Hazards for COPCs, RME, Current Adult Trespassers
6-7 Summary of Receptor Risks and Hazards for COPCs, RME, Current Adolescent Trespassers
6-8 Summary of Receptor Risks and Hazards for COPCs, RME, Current/Future On-Site Workers
6-9 Summary of Receptor Risks and Hazards for COPCs, CT, Current/Future On-Site Workers
6-10 Summary of Receptor Risks and Hazards for COPCs, RME, Future Adult Residents
6-11 Summary of Receptor Risks and Hazards for COPCs, CT, Future Adult Residents
6-12 Summary of Receptor Risks and Hazards for COPCs, RME, Future Child Residents
6-13 Summary of Receptor Risks and Hazards for COPCs, CT, Future Child Residents
6-14 Summary of Receptor Risks and Hazards for COPCs, RME, Future Construction Workers
6-15 Summary of Receptor Risks and Hazards for COPCs, CT, Future Construction Workers
6-16 Summary of Uncertainties in the Results of the Human Health Risk Assessment

7-1 List of Birds Reported From Naval Activity Purto Rico
7-2 Preliminary Assessment Endpoints, Risk Questions, and Measurement Endpoints
7-3 Log K_{ow} and K_{oc} Values for Organic Chemicals
7-4 Surface Soil Screening Values
7-5 Ingestion-Based Screening Values for Birds
7-6 Calculation of 2,3,7,8-TCDD Equivalents for Subsurface Soil Sample 14SB04-01
7-7 Soil Bioconcentration Factors Used for Terrestrial Plants and Soil Bioaccumulation
7-8 Soil Bioaccumulation Factors Used for Small Mammal Prey Items
7-9 Conservative Exposure Parameters for Upper Trophic Level Receptors
7-10 Dietary Composition for Upper Trophic Level Receptors
7-11 Frequency and Range of Surface Soil Data (Maximum Concentrations) Compared to Surface Soil Screening Values
7-12 Frequency and Range of Subsurface Soil Data (Maximum Concentrations) Compared to Surface Soil Screening Values
7-13 Summary of Hazard Quotients for Food Web Exposures: Surface Soil
7-14 Summary of Hazard Quotients for Food Web Exposures: Subsurface Soil
7-15 Summary of Ecological Chemicals of Potential Concern

TABLE OF CONTENTS
(continued)

LIST OF FIGURES

1-1 SWMU 14 Location Map

2-1 RFI Soil and Groundwater Sampling Locations

6-1 Conceptual Site Model

7-1 Navy Ecological Risk Assessment Tiered Approach
7-2 Terrestrial and Aquatic Habitats Occurring at Naval Activity Peurto Rico
7-3 Naval Activity Puerto Rico Wetlands Delineation North and East Sections
7-4 The Cowardin Wetland Classification System
7-5 Surface and Subsurface Soil Sampling Locations
7-6 Preliminary Conceptual Site Model

LIST OF APPENDICIES

A 2006 Field Activities
- SWMU 14 Field Log Book Notes
- Chain-of-Custody Forms
- Soil Boring Logs and Well Construction Records

B Summary of Analytical Results
- Surface Soil (1996 and 2006)
- Subsurface Soil (2006)
- Groundwater (2006)
- Quality Assurance / Quality Control (2006)

C 2006 RFI Data Validation Summaries
- CompuChem SDG 9335
- CompuChem SDG 9336
- Paradigm Analytical Labs SDG G349-146

D Human Health Risk Assessment Data Sets
E HHRA Statistical Summary (ProUCL Computational Output)
F Chemical Intake Equations
G Risk Calculation Spread Sheets
H RAGS Part D Tables
I Identification of Bioaccumulative Chemicals

LIST OF ACRONYMS AND ABBREVIATIONS

AF	Adherence Factor
AFFF	aqueous film forming foam
AFWTF	Atlantic Fleet Weapons Training Facility
AOC	Areas of Concern
AUF	Area Use Factor
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	Bioaccumulation Factor
Baker	Baker Environmental, Inc.
BCF	Bioconcentration Factor
bgs	below ground surface
BTAG	Biological Technical Assistance Group
BW	Body Weight
Cal EPA	California Environmental Protection Agency
CCME	Canadian Council of Ministers of the Environment
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy Program
CLP	Contract Laboratory Program
cm^2	Square Centimeters
CNO	Chief of Naval Operations
COPC	Chemicals of Potential Concern
CRI	Contract Required Quantitation Limit Check Standard
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
CSF	Carcinogenic Slope Factor
CT	Central Tendency
CTO	Contract Task Order
%D	Percent Difference
DAD	Dermally Absorbed Dose
DPT	Direct Push Technology
DRMO	Defense Restoration and Marketing Office
DRO	Diesel Range Organics
Eco-SSL	Ecological Soil Screening Level
ECP	Environmental Condition of Property
ED	Exposure Duration
EF	Exposure Frequency
EPC	Exposure Point Concentration
EMPC	Estimated Maximum Possible Concentration
ERA	Ecological Risk Assessment
ET	Exposure Time
F	Fahrenheit

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

GPS	Global Positioning System
GRO	Gasoline Range Organics
HEAST	Health Effects Assessment Summary Table
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Amendments (to RCRA)
IAS	Initial Assessment Study
ICR	Increased Cancer Risk
IDL	Instrument Detection Limit
ILCR	Incremental Lifetime Cancer Risk
Inc.	Incorporated
IR	Installation Restoration – or – Ingestion Rate
IRIS	Integrated Risk Information System
K_d	Adsorption Coefficient
K_{oc}	Organic Carbon Partition Coefficient
K_{ow}	Octonal-Water Partition Coefficient
K_p	Permeability Constant
kg	Kilograms
kg/day	Kilograms per Day
L/day	Liters per Day
LANTDIV	Department of the Navy, Atlantic Division
LCS	Laboratory Control Sample
LD_{50}	Lethal Dose – Median, Acute
LLC	Limited Liability Corporation
LOAEL	Lowest Observed Adverse Effects Level
LNAPL	light, non-aqueous phase liquid
m^3/hr	Cubic Meters per Hour
MATC	Maximum Acceptable Toxicant Concentrations
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
µg/kg	Micrograms per Kilogram
µg/l	Micrograms per Liter
mg	Milligrams
mgd	Million Gallons per Day
mg/cm^2	Milligrams per Square Centimeter
mg/day	Milligrams per Day
mg/kg	Milligrams per Kilogram
mg/kg/day	Milligrams per Kilogram per Day
mg/kg-BW/day	Milligrams per Kilogram Body Weight per Day
mg/l	Milligrams per Liter
MHSPE	Ministry of Housing, Spatial Planning and Environment

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

MRL	Method Reporting Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
ml	milliliter
NACIP	Navy Assessment and Control of Installation Pollutants Program
NAWQC	National Ambient Water Quality Criteria
NAPR	Naval Activity Puerto Rico
NAVFAC	Naval Facilities Engineering Command Atlantic Division
NCEA	National Center for Environmental Assessment
NEESA	Navel Energy and Environmental Support Activity
NFESC	Naval Facilities Engineering Command
NOAEL	No Observed Adverse Effects Level
NPL	National Priorities List
NSRR	Naval Station Roosevelt Roads
o/w	Oil/Water
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEM1	Palustrine Emergent Persistent
PID	Photoionization Detector
ppm	Parts per Million
PPRTV	Provisional Peer Reviewed Toxicity Value
ppt	Parts per Thousand
PRDNR	Puerto Rico Department of Natural Resources
Purple K	Potassium Bicarbonate
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RfD	Reference Dose
RFI	RCRA Facility Investigation
RME	Reasonable Maximum Exposure
RPD	Relative Percent Difference
RRF	Relative Response Factor
%RSD	Relative Standard Deviation (as a Percent)
SCCRBS	Selection of Contaminants of Concern by Risk-Based Screening
SDG	Sample Delivery Group
STSC	Superfund Health Risk Technical Support Center
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

TAL	Target Analyte List
TCL	Target Compound List
TEF	Toxicity Equivalence Factor
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This document presents the results from the performance of a Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI) at the Solid Waste Management Unit (SWMU) 14 Fire Training Pit Area, Naval Activity Puerto Rico (NAPR), Ceiba, Puerto Rico (Figure 1-1). This document was prepared by Baker Environmental, Inc. (Baker), for the Naval Facilities Engineering Command Atlantic Division (NAVFAC). This RFI Report is being developed under Contract Task Order (CTO) 110 under the NAVFAC Atlantic Division (LANTDIV) Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62470-02-D-3052.

1.1 Purpose

This report has been prepared to document the findings of the post-closure 2006 RFI field work and to consolidate this information with data generated during a 1996 Phase I RFI effort targeting potential impacts to surface soils associated with SWMU 14. All data is compared against current evaluation criteria to identify chemicals of potential concern (COPC) for further evaluation in both a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA). The HHRA included herein supersedes a preliminary HHRA, submitted to the United States Environmental Protection Agency (USEPA) on February 4, 2000, as it includes a more in-depth evaluation based on potential subsurface soil and groundwater impacts as well as updated risk-based evaluation criteria.

1.2 Objectives

The objectives of the RFI are to:

- Determine if any contaminants are present from past operation of the fire training pit, to the extent practical, from the completion of field activities (surface soil, subsurface soil and groundwater sampling) as described in the 2006 RFI Work Plan;
- Assess and document potential human health risks posed by the site; and
- Assess and document potential ecological risks posed by the site.

The two investigation areas associated with SWMU 14 are 1) the original/current fire training pit and 2) the temporary fire training pit – both shown on Figure 1-1. Specific elements of the 2006 field effort performed to support this RFI include:

Original /Current Fire Training Pit

Surface soil sampling at three locations outside the concrete fire training pit perimeter; one location corresponds to the former drainage swale at the southern edge of the fire training pit area;

- Subsurface soil sampling collected at two depths from three locations outside the concrete fire training pit perimeter (corresponding with the three surface soil sampling locations above) and three boring locations inside the perimeter of the fire training pit;
- The installation of three temporary wells inside three of the six soil borings; and
- Groundwater sampling at the three temporary wells.

Temporary Fire Training Pit

- Surface soil sampling at one location located in the center of the temporary pit;
- Subsurface soil sampling collected at two depths from one location located in the center of the temporary pit (corresponding with the single surface soil sampling location above);
- Installation of one temporary well in the center of the temporary pit; and
- Groundwater sampling at the temporary well location.

The subsurface soil locations inside the original/current fire training pit perimeter were selected to provide analytical information relating to soils of the original fire training pit area located below the existing concrete pad. The soil sample locations outside the concrete pad were selected to further delineate any potential contamination related to the fire training pit activities. All sampling locations were selected in areas not previously sampled; thereby expanding the area of characterization. Additionally, one sample located in the southernmost portion of SWMU 14 was selected to represent the soils that would have been considered the drainage ditch area when the ditch was evident prior to the construction of the current pit in 1983.

1.3 Organization of the RFI Report

This report is organized into nine sections. Section 1.0 of this document discusses the purpose and objectives of this RFI. Section 2.0 provides a description of the current conditions of the site, including the history of SWMU 14, and a summary of previous investigations. Section 3.0 provides a description of the physical characteristics of the study area including climatology, topography, and hydrogeology. The scope of field investigation that was conducted in 2006 is provided in Section 4.0 (work plan summary) – this includes a soil sampling and analysis program, a temporary monitoring well installation program, a groundwater sampling and analysis program, a quality assurance/quality control (QA/QC) sampling program, as well as other investigation considerations. The nature and extent of contamination as determined from the results is reported in Section 5.0 and includes the surface soil sampling data collected in 1996. Section 6.0 and Section 7.0 provide the human health and ecological risk assessments, respectively. Section 8.0 presents the conclusions and recommendations from the RFI, while Section 9.0 lists relative report references.

2.0 FACILITY BACKGROUND

This section provides the history and description of NAPR and SWMU 14, as well as the current conditions at SWMU 14.

2.1 NAPR Description and History

NAPR occupies over 8,600 acres of the northern portion of the east coast of Puerto Rico, along Vieques Passage with Vieques Island lying to the east about 10 miles off the harbor entrance. NAPR also occupies the immediately adjacent islands of Piñeros and Cabeza de Perro. The northern entrance to NAPR is about 35 miles east along the coast road (Route 3) from San Juan. The property consists of 3,938 acres of upland (developable) property and 4,955 acres of environmentally sensitive areas including wetlands, mangrove, and wildlife habitat. The closest large town is Fajardo (population approximately 37,000), which is about 5 miles north of NAPR off Route 3. Ceiba (population approximately 17,000) adjoins the west boundary of NAPR.

The facility was commissioned in 1943 as a Naval Operations Base and re-designated Naval Station Roosevelt Roads (NSRR) in 1957. NSRR operated until March 31, 2004 when NSRR underwent operational closure. On April 1, 2004 NSRR was re-designated as NAPR. The current primary mission of NAPR is to protect the physical assets remaining, comply with environmental regulations, and sustain the value of the property until final disposal of the property.

On October 20, 1994, a Final RCRA Part B permit was issued by USEPA Region II to NSRR. This permit contains requirements for RFI activities at 24 SWMUs and three areas of concern (AOC). Prior to 1993, environmental activities at NSRR, exclusive of underground storage tanks (USTs), were conducted in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulations under the Department of the Navy's Installation Restoration (IR) Program. The RCRA Part B permit, issued for the Defense Reutilization and Marketing Office (DRMO) at NSRR, included provisions for corrective action under the Hazardous and Solid Waste Amendments (HSWA) to RCRA.

2.2 SWMU 14 Description and History

The history of the fire training pit sites (designated as SWMU 14) is described in the following paragraphs. Historically, the site consists of three different fire training pits described as the original pit, temporary pit, and current pit. SWMU 14, the Fire Training Pit Area located at NAPR, Ceiba, Puerto Rico was operated by the Air Operations Department from the early 1960s through 1983.

The original fire training pit was an unlined pit approximately 40 feet in diameter that was used from the early 1960s through the beginning of 1983. The Initial Assessment Study (IAS) conducted in 1984 estimated that approximately 120,000 gallons of waste solvents, fuels, and oils were placed in the pit and set on fire for fire fighting training during the 20 years of operation (Naval Energy and Environmental Support Activity [NEESA], 1984). Also burned were wood, trash, plastic, fuel filter elements, oily rags, and other debris. The fires were extinguished using aqueous film forming foam (AFFF) and potassium bicarbonate (Purple K). Past aerial photographs show drainage from this pit to the ditch along the runway shoulder. The ditch runs from the southern portion of SWMU 14 southwestward along the taxi-way of the airfield.

The original pit was taken out of operation at the beginning of 1983 for the construction of a new fire training pit at the same location. When the new/current pit was built, all of the visibly oil-stained, contaminated soil was excavated in the immediate vicinity of the old pit; there are no records of ultimate disposal for this contaminated material. A soil sample was taken and no polychlorinated biphenyls (PCBs) were detected (NEESA, 1984). No other specific information is available concerning the depth and aerial extent of soil contamination identified and excavated in 1983.

A temporary fire training pit was constructed to the north of the original pit and was in operation during the construction of the current fire training pit in 1983. This temporary pit was an unlined gravel pit with a diameter of about 2,000 feet and was used approximately six times. An estimated 3,000 gallons of waste fuel, oil, and solvents were burned in this area. Small amounts of fuel were allowed to soak into the ground (NEESA, 1984).

A new/current fire training pit was constructed in 1983 over top of the location of the original fire training pit. This consisted of the construction of a concrete lined pit and oil/water (o/w) separator to serve the pit. The pit is approximately 40 feet in diameter and consists of a concrete apron approximately 10 feet wide that encircles the concrete lined pit. Fluids from the fire training operation are contained in the pit and go through the o/w separator before entering the Forestall Wastewater Treatment system. It should be noted that the drainage swale identified in the description of the original pit was graded over during the construction of the new pit and is no longer present at this site.

SWMU 14 consists of the area encompassed by the current fire training pit, the temporary training pit, and the historical location of the drainage swale associated with the original pit as described above. Figure 1-1 shows the locations of the original, temporary, and current pits associated with SWMU 14. An o/w separator associated with the current fire training pit lies just northeast of its location (SWMU 12). [The RCRA Section 7003 Administrative Order states that the corrective action for SWMU 12 is complete without controls.]

Previous assessments conducted at SWMU 14 include: the Navy's 1984 IAS, the 1995 Final RFI Management Plans (Baker, 1995), the 1996 Phase I RFI (Baker, 1996), the Draft Interim Decision Document for SWMU 14 (Baker, 2000), comment letters between the USEPA and the Navy, and issues discussed during the conference call on October 10, 2000.

In July 2000, both USEPA Region II and the Navy agreed on an interim decision document that outlined that no additional site characterization would be performed until fire training activities ceased at this site since no human health risks were identified (Baker, 2000). On March 31, 2004, the fire training activities were suspended and the RFI Work Plans (Baker, 2005) were developed and approved by the USEPA. Mobilization for the RFI field activities occurred March 5, 2006 with demobilization on March 10, 2006.

2.3 Current Conditions

The following section is a discussion of the current conditions that exist at the fire training pit areas at SWMU 14.

2.3.1 Current Site Conditions

The current fire training pit is a concrete structure, constructed below grade, with a concrete apron. The pit prevents seepage of contaminants to the subsurface soils beneath the fire training area. A drainage system encircling the apron intercepts any overtopping, which is directed to an o/w separator. The temporary pit utilized in 1983 is covered with grass and is maintained via grass cutting operations.

2.3.2 Site Usage

The current fire training pit was utilized for training purposes until March 31, 2004, when operations ceased. The training consisted of Navy personnel simulating an aircraft crash by igniting pieces of aircraft with two to three (55 gallon) containers of JP-5 fuel per training session. The facility underwent repair work to prepare for the usage of Tech-flame which could have been used to ignite the fires. Personnel were required to use water (only) to extinguish the training fires developed at this pit. On average, fire training activities lasted from three to four hours and were conducted two to four times a month.

2.3.3 Previous Investigations

Various investigations have been conducted at SWMU 14 over the years including an Initial Assessment Study, a Phase I RFI, a preliminary HHRA, and a Draft Interim Decision Document. These items and other miscellaneous items are discussed below.

The Navy conducted an IAS in 1984 to identify and assess sites posing a potential threat to human health or to the environment due to contamination from past hazardous waste operations. The IAS reviewed historical records, aerial photographs, surface and aerial surveys, and personnel interviews. Because contaminated soils associated with the original fire pit were removed during construction of the new pit and no PCBs were detected, and because the temporary pit was used so little, the IAS team concluded that there is no threat to human health or the environment from this site. No further action under the Navy Assessment and Control of Installation Pollutants (NACIP) Program was warranted.

The 1994 RCRA/HSWA Permit issued to NSRR requested that a Phase I RFI be conducted to encompass subsurface soils down to the water table. Groundwater investigations will be contingent on the subsurface soil sampling results.

Project Plans were developed and approved by the USEPA to conduct the Phase I RFI for SWMU 14. The Final Phase I RFI document dated September 14, 1995 contains the entire set of project plans including a Project Management Plan, Data Collection Quality Assurance Plan, and the Health and Safety Plan (Baker, 1995). These project plans are referenced herein and were still relevant for the performance of the work performed under the 2006 supplemental RFI. The Health and Safety Plan addresses all potential exposures at SWMU 14 and reflects the current site conditions at the facility. The only changes at this site since the 1996 Phase I RFI work was conducted is that the facility is closed and no longer in use for fire training. This document also complies with applicable Occupational Safety and Health Administration (OSHA) requirements.

The Phase I RFI field investigation was conducted in March 1996. This field investigation included the performance of a limited soil gas survey along the perimeter of the original/current fire training pit and surface soil sampling from those areas identified from the soil gas survey

exhibiting the highest photoionization detector (PID) readings. As part of the 1996 Phase I RFI, a total of five surface soil samples (14SS04 through 14SS08), as shown on Figure 2-1, were collected at the soil gas sampling locations which exhibited the highest PID readings which ranged from 21.1 parts per million (ppm) to 79.2 ppm. Fourteen semi-volatile organic compounds (SVOCs), twelve being Polynuclear Aromatic Hydrocarbons (PAHs), one congener of polychlorinated biphenyl (PCB) (Aroclor-1260), and total petroleum hydrocarbons (TPH) diesel range organics (DRO) and gasoline range organics (GRO) were detected in surface soil samples. The 1996 Phase I RFI Report was submitted to the USEPA on July 1, 1996 (Baker, 1996). On January 28, 2000, the Navy informed the USEPA of an omission in the data set contained in the report. Due to this omission, an initial HHRA was developed utilizing the data set from the 1996 Phase I RFI investigation at SWMU 14. The results of the initial HHRA did not indicate an unacceptable cancer risk for any of the exposure scenarios or pathways. This report was submitted to the USEPA for review and comment on February 4, 2000 (Baker, 2000).

The USEPA provided comments on the Draft HHRA Report for SWMU 14 on July 5, 2000, finding that the preliminary HHRA evaluation for exposure to surface soils is generally adequate and identified deficiencies in site characterization. The USEPA requested that a supplemental site characterization work plan be submitted to adequately characterize all media.

The Navy responded to the USEPA comments dated July 5, 2000 in a letter dated August 22, 2000. These responses were followed up by the submission of a Draft Interim Decision Document (Baker, 2000) that was submitted to the USEPA on November 22, 2000. The purpose of this document was to provide information to support the Navy's recommendation to postpone final site disposition until the site was no longer utilized for training activities. This interim decision document generation was agreed to by both the USEPA Region II and the Navy during a conference call on July 5, 2000.

The USEPA approved the Interim Decision Document on May 4, 2001 based on the recommendations given in Section 4.0 of the document, that "once fire training operations cease [at this unit], additional site characterization of the site will be conducted". Fire Training operations ceased on March 31, 2004, at which time funding for the implementation of the 2006 RFI Work Plan for SWMU 14 was procured.

2.3.4 Human Health Risk Assessment

The preliminary HHRA was designed to support the Interim Decision Document for SWMU 14. It was conducted in accordance with USEPA Regulations and was consistent with the applicable risk assessment guidance documents. The objective of the HHRA was to assess the human health risks associated with exposures to surface soil contamination identified in the Phase I RFI at Operable Units 1, 6, and 7 (Baker, 1996) for NAVFAC.

The following presents a summary of the preliminary HHRA. The Interim Decision Document SWMU14 – Fire Training Pit Area dated November 22, 2000 houses the risk assessment in its entirety and should be consulted for a more detailed analysis.

A hazard identification process summarized the analytical data for existing surface soil data and identified COPCs. Once COPCs were identified, reference doses and slope factors for each were presented and methods for assessing cancer and non-cancer dose-response relationships were discussed.

An exposure assessment identified potentially exposed populations, exposure pathways, and exposure parameters used for estimating site-specific risk, and a risk characterization estimated risks for each scenario, and provided a qualitative uncertainty analysis. The risk characterization provided quantitative calculations for potentially carcinogenic COPCs estimate inferentially (versus probabilistically) the potential increased cancer risk (ICR) for an individual in a specified population. This unit of risk refers to a potential cancer risk that is above the background cancer risk in unexposed individuals. For example, an ICR of 1×10^{-6} indicates that an exposed individual has an increased probability of one in one million of developing cancer subsequent to exposure, over the course of his lifetime.

For the preliminary HHRA, COPCs were identified by comparing the chemicals in surface soil samples to Residential USEPA Region III Risk Based Concentrations (RBCs) (current in 2000). RBCs were derived using conservative USEPA promulgated default values and the most recent toxicological criteria available. RBCs for potentially carcinogenic and noncarcinogenic chemicals were individually derived based on a target incremental lifetime cancer risk of 1×10^{-6} and a target hazard quotient (HQ) of 1.0, respectively. For potential carcinogens, the toxicity criteria applicable to the derivation of the RBCs were chronic oral cancer slope factors; for noncarcinogens they were oral reference doses.

The following chemicals exceeded residential RBCs values, and were retained as COPCs for further analysis:

- benzo(a)anthracene;
- benzo(b)fluoranthene;
- benzo(a)pyrene;
- dibenz(a,h)anthracene; and
- indeno(1,2,3-c,d)pyrene.

The results of preliminary HHRA did not indicate an unacceptable cancer risk for any of the exposure scenarios or pathways. Current land use scenarios that were evaluated include commercial/utility worker and trespasser. Future land use scenarios evaluated include commercial/utility worker, trespasser, military residential (adult and child), and construction worker. Each scenario evaluated the risk associated with ingestion of contaminants in surface soil, inhalation of particulates from surface soil, and dermal contact with surface soil. Based on the results of the preliminary HHRA it was determined that the COPCs detected in surface soils at SWMU 14 would not pose a significant health risk to current or future receptors.

2.3.5 Overall Previous Study Conclusions and Recommendations

Engineering controls were in place to prevent subsurface and groundwater exposure to activities conducted at the fire training pit. The engineering controls include a concrete pad with a concrete apron, and an o/w separator which were maintained throughout the utilization of the fire training pit. SWMU 14 would not be utilized for any other function except for fire training activities. Once fire training operations cease, additional site characterization of the site would be conducted. If it was determined that an unacceptable risk was present, the area would be remediated as appropriate. Therefore, it was recommended that additional site characterization and a final decision of whether or not corrective action would be necessary once the usage of the area was terminated. The 2006 RFI supports the recommendations of the Interim Decision Document by conducting additional post-closure characterization work.

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

The physical setting of NAPR was documented in the 1984 IAS (NEESA, 1984). This information is summarized in the paragraphs that follow.

3.1 Climatology

The climate associated with NAPR is characterized as warm and humid, with frequent showers occurring throughout the year. A major factor affecting the weather is the pattern of trade winds associated with the Bermuda High, the center of which is in the vicinity of 30° North, 30° West. The prevailing wind direction reflects the easterly trade winds. The area receives a surface flow varying between the northeast to the southeast about 75 percent of the year, and as much as 95 percent of the time in July when the easterly winds are strongest. The differential heating of the land and sea during the day tends to give a more northerly component to the flow on the northern side of the island and a more southerly component on the southern side. During the night, a land breeze causes a prevailing southeasterly flow in the north and a prevailing northeasterly flow over the southern coast. The mean annual wind velocity is 5.5 knots, with a minimum in November and a maximum in August. Gales associated with westward moving disturbances in the trade winds or hurricanes passing either north or south of the area have the highest probability of occurrence from June through October.

Uniform temperatures prevail, with small diurnal ranges as a result of insular exposure and the relatively small land areas. The warmest months are August and September, while the coolest are January and February. Mean annual maximum temperatures range from 82.0° Fahrenheit (F) in January to 88.2° F in August. The mean annual minimum temperatures vary from 64.0° F in January to 73.2° F in June. The highest maximum temperature recorded was 95.0° F, while the lowest minimum was 59.0° F. Rain usually occurs at least nine days in every month, with an average of 60 inches per year although a dry winter season occurs from December through April. About 22 thunderstorm-days occur per year, with maximum frequencies of 3 days per month from May through October.

In late summer, the mean sky cover begins a steady decrease from a monthly maximum average of 6.5-tenths coverage in September to a minimum monthly average of 4.4-tenths coverage in February. From March through August, the monthly average cloud cover increases steadily from 4.5- to 6.0 tenths coverage during the period. Over the open sea, a maximum of clouds (usually broken stratocumulus) occurs during early morning, with the skies clearing or becoming scattered with cumulus by afternoon. Completely clear or overcast skies are rare during daylight hours, while clear skies frequently occur at night.

The hurricane season is from mid-June through mid-September; maximum winds exceed 95 knots during severe hurricanes. An average of two tropical storms per year occurs in the study area, one of which usually reaches hurricane intensity.

3.2 Topography

The regional area of NAPR consists of an interrupted, narrow coastal plain with small valleys extending from the Sierra de Luquillo range, which has been severely eroded by streams into valleys several hundreds of feet deep. Slopes of up to 60° are common.

In the immediate area of NAPR, elevations range from sea level to approximately 295 feet. Immediately to the north of the NAPR boundary, the hills rise abruptly to heights of 800 to 1,050 feet above sea level, with the tallest peak located within 2 kilometers of the NAPR boundary. There is a series of three hilly areas on NAPR, two of which separate the southern airfield area from the Port/Industrial, Housing, and Personnel Support areas. The third set of hills is in the Bundy area. These ridgelines not only separate sections of NAPR, but also dictate the degree of allowable development. The ridgeline south of the airfield provides an excellent barrier, which effectively decreases the aircraft-generated noise reaching the Unaccompanied Enlisted Personnel Housing areas to an acceptable level. Relief is low along the shoreline and lagoons and mangrove swamps are common.

3.3 Geology, Hydrology, and Hydrogeology

Subsections 3.3.1 through 3.3.3 below present descriptions of the geologic, hydrologic, and hydrogeologic conditions across NAPR. These are generally applicable, but may or may not be specifically-applicable, to the SWMU 14 area. In 2004, Baker conducted a series of Phase II Environmental Condition of Property (ECP) investigations across NAPR. Subsection 3.3.4 discusses hydrogeologic information most relevant to SWMU 14 gained from the ECP investigations.

3.3.1 Soils

The soil associations found at NAPR are predominantly of two types typical of humid areas, namely the Swamps-Marshes Association and the Mabi-Rio-Arriba-Cayagua Association, as well as the Descalabrado-Guayama Association, which is typical of dry areas. In addition, isolated areas of the Caguabo-Mucara-Naranjito Association, the Coloso-Toa-Bajura Association, and the Jacana Amelia-Fraternidad Association are found at NAPR.

The Swamps-Marshes and Mabi-Rio-Arriba-Cayagua associations cover over one half of NAPR's surface area and are equally distributed. Primarily the Descalabrado-Guayama and Caguabo-Mucara-Naranjito associations cover the remaining area.

The Swamps-Marshes Association consists of deep, very poorly drained soils. This association is found in level or nearly level areas that are slightly above sea level but are wet, and when the tide is high, are covered or affected by saltwater or brackish water. The soils are sandy or clayey, and contain organic materials from decaying mangrove trees. Coral, shells, and marl at varying depths underlie them. The high concentration of salt inhibits the growth of all vegetation except mangrove trees, and in small-scattered patches, other salt-tolerant plants.

The Mabi-Rio-Arriba-Cayagua Association consists generally of deep, somewhat poorly drained and moderately well drained, nearly level to moderately steep soils found on foot and side slopes, terraces, and alluvial fans. Soils of this association at NAPR are basically clayey.

The Descalabrado-Guayama Association generally consists of shallow, well drained, strongly sloping to very steep soils on volcanic uplands. Soils of this association are found primarily in the hilly areas located directly inland and adjacent to the soils of the Swamps-Marshes Association.

The Caguabo-Mucara-Naranjito Association consists generally of shallow and moderately deep, well drained, sloping to very steep soils on volcanic uplands. This association consists of soils that formed in residual material weathered from volcanic rocks. This association is represented at NAPR by soils of the Sabana series, which are found on the side slopes and the hilly terrain west of Langley Drive in the Fort Bundy area. These soils are suited for pasture and woodland. Steep slopes, susceptibility to erosion, and depth to bedrock are the main limitations for farming and for recreation and urban areas.

The Coloso-Toa-Bajura Association consists of deep, moderately well drained to poorly drained, nearly level soils found on floodplains. This soil association extends along the western boundary of NAPR and around the airfield. The soils of this association formed in fine-textured and moderately fine-textured sediment of mixed origin on floodplains. The Coloso soils are deep and somewhat poorly drained; the Toa soils are deep and moderately well drained; and the Bajura soils and Maunabo soils are deep and poorly drained. The Reilly soils, also part of this association, are shallow sand and gravel and are excessively drained; they lie adjacent to streams. The minor soils are Talante, Vivi, Fortuna, Vega Alta, and Vega Baja. The Talante, Vivi, Fortuna, and Vega Baja soils are found on floodplains, while the Vega Alta soils occupy slightly higher positions on terraces.

The Jacana-Amelia-Fraternidad Association consists generally of moderately deep and deep, well drained and moderately well drained, nearly level to strongly sloping soils on terraces, alluvial fans, and foot slopes. This association is represented at NAPR by soils of the Jacana series, which consist of moderately deep, well-drained soils found on the foot slopes and low rolling hills along Langley Drive and just east of the airfield. These soils formed in fine-textured sediment and residuum derived from basic volcanic rocks.

3.3.2 Regional Geology

The underlying geology of NAPR area is predominantly volcanic (composed of lava and tuff), as well as sedimentary (rocks derived from discontinuous beds of limestone). These rocks all range in age from early Cretaceous to middle Eocene. The volcanic rocks and interbedded limestone have been complexly faulted, folded, metamorphosed, and variously intruded by dioritic rocks. This complex geological structuring occurred sometime after the deposition of the limestone during the middle Tertiary, when Puerto Rico was separated from the other major Antillean Islands by block faulting, and was arched, uplifted, and tilted to the northeast. Culebra, Vieques, and the Virgin Islands are part of the Puerto Rican block; they are separated from the main island simply because of the drowning that resulted from the tilting.

In addition to the predominant volcanic and sedimentary rock, unconsolidated alluvial and older deposits from the Quaternary period underlie the northwestern and western sectors of the base.

The primary geologic formations on and near NAPR are various beach deposits, alluvium, quartz diorite and granodiorite, quartz keratophyre, the Daguao Formation, and the Figuera Lava. The Peña Pobre fault zone traverses NAPR.

3.3.3 Regional Hydrology

The surface waters that flow across the northeastern plain of Puerto Rico, where NAPR is located, originate on the eastern slopes of the Sierra De Luquillo Mountains. Surface runoff is channeled into various rivers and streams that eventually flow into the Caribbean Sea. The

Daguao River and Quebrada Seca Stream (a tributary to Rio Daguao) collect surface waters from the hills immediately north of NAPR and, in periods of heavy rain, flooding on NAPR occurs. The Daguao-Quebrada Seca watershed comprises an area of approximately 7.6 square miles (4,900 acres), and the river falls some 700 feet from its source to sea level. Increased development in the town of Ceiba, especially in areas adjacent to NAPR's northern boundary, has significantly increased the surface runoff reaching NAPR, causing ponding and erosion in the Boxer Drive area. Boxer Drive, for a major portion of its length, is subject to surface water flooding, as are Hangar 200 and AIMD Hangar 379 and adjacent apron areas. This condition has been alleviated by the construction of a new highway (Route 3) immediately outside the fence and the realignment of Boxer Drive both with attendant storm water management features.

In the low-lying shore areas, seawater flooding results from storms, wind, and abnormally high tides. The tidal ranges in the NAPR area are rather small, with a maximum spring range of less than three feet. The tides are semidiurnal and have a usual range of about one-foot in the main harbor of NAPR.

Little information exists concerning the hydrogeology of NAPR. The only known potential sources of groundwater lie in lenticular beds of clay, sand and gravel, and rock fragments, which occur at a depth of less than 30 meters. No wells have been developed on site from these layers. Some wells had been developed upgradient of NAPR in Ceiba, some three kilometers from base headquarters, but were abandoned due to high levels of salinity.

The quality of surface waters is variable, reflecting the drainage area through which the water flows. Generally, surface waters have high turbidities and bio-organics (naturally occurring organics, such as decay products of vegetable and animal matter) due to the periodic heavy rains that can easily erode soils from steep slopes, exposed areas and disturbed streambeds. Water from alluvial aquifers along the coast of NAPR is of a calcium bicarbonate type, and has high concentrations of iron and manganese. The source of these minerals is unknown, but they may be derived from buried swamp or lagoon deposits.

A seawater-freshwater interface is present in the aquifers throughout the coastal areas of Puerto Rico, usually within a short distance inland of the coastline.

The NAPR potable water treatment plant receives raw water from the Rio Blanco through a 27-inch reinforced concrete pipe that replaced the old, open channel. The intake is located at the foot of the El Yunque rain forest. This buried raw water line traverses a distance of 14 miles from the intake to the NAPR boundary. A raw water reservoir is located at the water treatment plant and has a 45 million gallon capacity. Additionally, there are two fire protection storage reservoirs with a total capacity of 520,000 gallons.

NAPR has been served for over 30 years by the present treatment facility. The plant (Building 88) has a capacity of 4.0 million gallons per day (mgd). Water flows by gravity into a 45 million-gallon raw water storage basin from which the plant draws its supply at a rate of 1.3 mgd on average. Treatment consists of pre-chlorination, coagulation sedimentation, filtration, and post-chlorination.

3.3.4 Site-Specific Hydrogeology

In 2004, Baker conducted a Phase II ECP investigation involving 20 sites throughout NAPR. Some consistent stratigraphic trends were observed during the ECP. The site-specific

hydrogeology can be better understood in the context of NAPR regional geology. For the sake of simplicity, the NAPR regional geology can be divided into three regions:

- Upland areas
- Near-shore flat lands
- Inland flat lands

The upland areas of NAPR includes the hills encompassing the Tow Way Fuel Farm and hospital areas, and the hills encompassing the area behind the Exchange, the former Atlantic Fleet Weapons Training Facility (AFWTF) Command, and Fort Bundy area. These upland areas are underlain by bedrock (predominately Gabbro) and exhibit varying degrees of weathering. Typically, the bedrock is overlain be a relatively thin residual soil (i.e., residuum). Residuum is unconsolidated soil, originating from weathered-in-place bedrock. This residuum generally consists of sand, silt, and clay.

The near-shore areas include the mangrove swamp areas as well as the shores of Ensenada Honda and Puerca Bay. The near-shore areas are typically underlain by marine sand layers (with coral and shell fragments), silt and clay layers, and occasional peat layers. In some near-shore areas, particularly by the harbor and Camp Moscrip in the southeastern portion of the base, fill material overlays the marine layers. The fill consists of rock fragments, debris (e.g., brick), sand, silt, and clay.

The inland flat land area generally encompasses the airfield and golf course areas. The inland flat land area is typically underlain by relatively thick residuum. The residuum generally consists predominately of clay. Fill material overlays the residuum in some areas, particularly the airfield, and generally consists of sand and gravel with lesser amounts of silt and clay.

SWMU 14 is in the inland flat land area. A consistent stratigraphic sequence was observed during the 2006 RFI. Outside of the fire training pit, a thin fill layer was observed at 14-SB03 (approximately 1-foot thick). The fill generally consisted of sand and rock fragments. Extensive clay was observed in all borings below the surficial fill material. A few weathered zones were observed, typically characterized by narrow decomposed clay zones and brown iron staining. Beneath the fire training pit (14SB05 and 14SB06) a weathered zone was observed around 13 to 14-feet below ground surface (bgs). Groundwater occurs in some of these weathered zones (e.g., 14SB05 at approximately 19-feet bgs). Groundwater yields at SWMU 14 were not measured quantitatively, but were observed to be very low. Static water levels were not observed prior to sampling. Additionally, the temporary wells typically yielded less than 1,000 milliliter (ml) of water in a day during sampling.

The stratigraphic sequence was similar to other nearby ECP sites (Sites 11 and 12). The clays tended to exhibit similar characteristics as well. Low to moderate groundwater yield were observed at these sites in weathered zones 10- to 12-feet bgs.

Based on professional experience and the literature, surficial clays typically exhibit common features. Upper portions of surficial clays tend be fractured due to weathering (Parker, 1999). These fractures are predominantly vertical and exhibit varying degrees of interconnectivity. Fracture frequency tends to decrease with depth. Because of the parallel orientation of the fractures and typical soil bore holes, fractures are often not observed, which was the case with this RFI.

Free product or fuel-contaminated fire-fighting fluids will migrate through fractures, probably taking torturous paths (Pankow & Cherry, 1996). Light non-aqueous phase liquids (LNAPLs) such as diesel fuel will migrate downward until it encounters a capillary barrier, or groundwater filled fractures. LNAPL will dissolve from fractures into the clay matrix, through diffusion driven by a concentration gradient. The rate and penetration depth is dependent on the concentration gradient. LNAPL in contact with groundwater in fractures also will dissolve into the groundwater. The dissolved contaminants will then migrate through the fractures with groundwater flow. Along these paths, contaminants will continue to diffuse into the clay matrix, but with lesser penetration. Once dissolved in groundwater, fuels dissociate. Individual compounds will travel at different rates due to retardation (Fetter, 1988). Plume length and shape are partly dependent on source characteristics (e.g., quantity, event duration, number of events, etc.).

4.0 2006 RCRA FACILITY INVESTIGATION ACTIVITIES

The areas around the original/current fire training pit and the temporary fire training pit were investigated at SWMU 14 during March 2006. Section 4.1 discusses soil boring advancement and temporary monitoring well installation. Section 4.2 presents a discussion of the soil, groundwater and QA/QC sampling programs involved with the 2006 RFI. Analytical results are discussed in detail in Section 5.0.

4.1 Soil Boring Advancement and Temporary Well Installation

Surface and subsurface soil samples were collected using direct-push technology (DPT) through the use of a Geoprobe® Macro Core Sampler in conjunction with a Geoprobe® 66DT track-mounted rig. GeoEnviroTech of San Juan, Puerto Rico was the DPT contractor. As presented in the Revised Final RFI Work Plan (Baker, 2005), a total of seven soil borings (14SB01 through 14SB07) were advanced in two separate areas of SWMU 14 (Figure 2-1). Six soil borings were located in and around the original/current fire training pit; one soil boring was located in the center of the temporary fire training pit. Each boring site was field located with a hand held Global Positioning System (GPS) receiver. Soil boring logs have been produced and are provided in Appendix A.

Based on elevated PID levels observed at soil borings 14SB01 and 14SB02 in the area of the original/current fire training pit, temporary monitoring wells were installed at each of these locations. A clearly defined groundwater zone was not observed at these borings. Therefore, the bore holes were reamed to approximately 2-inches in diameter by driving Geoprobe® casing with a disposable stainless steel drive point. Temporary well materials were subsequently installed by hand in the casing; 10-foot long screens were utilized (12.6 to 22.6-feet bgs at 14SB01; 14 to 24-feet bgs at 14SB02). The casings were withdrawn to expose the well screens to the formation.

A third temporary monitoring well was installed at 14SB07, at the center of the temporary fire training pit. One water bearing fracture was observed. Therefore, one 5-foot screen was installed (17 to 22-feet bgs). Temporary well materials were installed by hand in the open bore hole at 14SB07.

GeoEnviroTech personnel pulled all well materials from the bore holes upon completion of groundwater sampling. Spent well materials were decontaminated and subsequently disposed.

4.2 Environmental Sampling and Analysis Program

Table 4-1 provides a summary of the soil and groundwater sampling and analytical program performed for the 2006 RFI program at SWMU 14. In addition, this table shows information related to field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples (since these are collected concurrent with the environmental samples). Other QA/QC samples (trip blanks, field blanks, and equipment rinsates) were collected and analyzed in accordance with Table 4-2. Also, analytical methods/descriptions, parameter lists, and Contract Required Quantitation Levels (CRQL) are presented in Table 4-3.

4.2.1 Surface and Subsurface Soils

Surface soil samples were collected at soil borings 14SB01, 14SB02, 14SB03, and 14SB07 from a depth of 0 to 1-foot bgs. Subsurface soil samples were collected at all soil borings from two-foot intervals (e.g., 1 to 3 feet bgs, 3 to 5 feet bgs, etc) down to groundwater. All soil borings were advanced to a depth of 20 to 25-feet bgs.

Each of the surface and several of the subsurface soil samples were screened in the field using a PID; screening results were recorded in a field logbook. Soil samples for volatile organic compound (VOC) analysis were placed in pre-preserved vials (one containing methanol and two containing sodium bisulfate).

Four surface soil samples and fourteen subsurface soil primary environmental samples were submitted to CompuChem Laboratories in Research Triangle Park, North Carolina for analysis of RCRA Appendix IX (VOCs), SVOCs, PCBs and metals, as well as low level PAHs, and TPH GRO and DRO. In addition three of the subsurface soil samples also were analyzed for dioxins/furans.

4.2.2 Groundwater

Three groundwater samples were collected, one from each of the temporary wells installed at 14SB01, 14SB02 and 14SB07. Sample 14TW02 was submitted to the analytical laboratory for Appendix IX VOCs, SVOCs, PCBs and total metals, as well as low level PAHs, and TPH GRO and DRO. Due to low well yields, the analyte list was reduced for samples 14TW01 and 14TW07. Appendix IX PCBs and total metals were eliminated for sample 14TW01. Only Appendix IX PCBs were eliminated for sample 14TW07. In addition, dioxins/furans were not required/requested as part of the groundwater analytical program.

4.3 Quality Assurance/Quality Control Sampling and Analysis Program

4.3.1 Field Duplicates

A total of 18 soils samples were collected as part of the 2006 RFI field sampling activity. The RFI Work Plan specifies one duplicate sample to be collected for every ten primary soil samples collected. Thus, two field duplicate samples (14SB01-11D and 14SB06-07D) were collected concurrently. Both of the duplicate samples are associated with subsurface soils. Each was analyzed for Appendix IX VOCs, SVOCs, PCBs and total metals, as well as low level PAHs, and TPH GRO and DRO. In addition, 14SB06-07D was analyzed for dioxins/furans. Groundwater duplicate samples could not be collected due to low well yields. Duplicate samples are useful in evaluating the field sampling methodology.

4.3.2 Trip Blanks

One trip blank sample accompanied each cooler containing the samples for Appendix IX VOC and/or TPH GRO analysis. A total of two trip blank samples were prepared: 14TB01 was submitted on March 6, 2006; 14TB02 was submitted on March 8, 2006. Trip blank sample results are used to determine whether cross-contamination occurred during sampling and/or shipping.

4.3.3 Field Blanks

Field blank samples were collected from two different source waters encountered during this investigation. One field blank sample (14FB01) was collected from lab grade deionized water used as the source water for the final rinse stage of the decontamination procedure. The other field blank sample (14FB02) was from an NAPR potable water source used for soil and groundwater sample collection equipment washing. It should be noted that store bought distilled water was not utilized during this investigation as was discussed in the work plan. Therefore a field blank of store bought distilled water was not required for this investigation and was not collected.

Field blank samples are always analyzed for the same parameters as the related environmental samples. Therefore, both field blank samples were sent to the laboratory for analysis of Appendix IX VOCs, SVOCs, PCBs and total metals, as well as low level PAHs, TPH GRO and DRO, and dioxins/furans. Field blank testing is useful in determining if other water sources used in the cleaning/decontamination procedures associated with the sampling event are free of contamination.

4.3.4 Equipment Rinsates

Three decontaminated equipment rinsate samples were collected, submitted, and analyzed as part of the QA/QC program. 14ER01 is rinsate of the stainless steel spoon associated with the DPT technology used for soil boring advancement. In addition, 14ER02 is rinsate from the Macrocore® Acetate liner. Finally, 14ER03 is rinsate from silicon/polyethylene tubing associated with groundwater sampling.

Equipment rinsate samples are always analyzed for the same parameters as the related environmental samples. Therefore, each equipment rinsate samples was analyzed for of Appendix IX VOCs, SVOCs, PCBs and total metals, as well as low level PAHs, TPH GRO and DRO. In addition, 14ER02 also was analyzed for dioxins/furans. Results from equipment rinsate samples are useful in determining if the sampling equipment was contaminant-free during the field investigation.

4.3.5 Matrix Spike/Matrix Spike Duplicates

A total of 18 soils samples were collected as part of the 2006 RFI field sampling activity. The RFI Work Plan specifies one matrix spike/matrix spike duplicate sample be collected for every 20 primary samples collected (for each matrix). Therefore, one QA/QC soil sample, 14SB01-11-MS/MSD, was collected to evaluate the matrix effect upon the analytical methodology. A single MS/MSD sample of groundwater, which would normally have been required, could not be collected due to low well yields.

5.0 NATURE AND EXTENT OF CONTAMINATION

This section discusses the nature of SWMU 14 contamination determined from chemical analysis of environmental samples from both the 1996 Phase I RFI and the March 2006 RFI. All of the laboratory analytical data went through a formal data validation process. Data validation for the 1996 data has been presented in historic SWMU 14 related documents and is not presented again herein. Complete validated data tables for the 2006 RFI field effort are included in Appendix B; in addition, relevant portions of the data validation reports for the 2006 RFI Sample Delivery Groups (SDGs) are provided in Appendix C; a summary discussion of the necessary laboratory level data adjustments to the 2006 data is presented in Section 5.5.

The 2006 PID field screening results are presented first (not validated). While these readings were taken to protect the field team from excessive exposure and to assist with temporary well location selection, they also provide the reader with an initial insight into historical impacts and potential geographic "hot spots". Data for surface soils, subsurface soils, and groundwater media are subsequently discussed. Detected compounds for each media are compared to applicable regulatory and background criteria. Applicable criteria for soils include USEPA Region III Industrial RBCs, EPA Region III Residential RBCs, and background levels calculated as the mean plus two times the standard deviation of the mean (inorganics only) (Baker, 2006). Applicable criteria for groundwater are USEPA Region III Tap Water RBCs, Federal Drinking Water Maximum Contaminant Levels (MCLs), and NAPR base wide background criteria, when available.

5.1 2006 Field Screening PID Results

Table 5-1 summarizes the PID results obtained during the field effort. The two southernmost borings at the original/current fire training pit area showed minimal impacts from historical operations – 14SB03 (outside the pit perimeter) and 14SB06 (inside the pit perimeter). 14SB01 (northernmost boring) showed relatively high PID readings (up to 729 ppm in the 17 to 18-foot interval) and consistently tested positive down to the bottom of the soil boring at 23 feet bgs. 14SB02 had readings as high as 144 ppm in the 5 to 6-foot bgs interval, but was relatively clean past a depth of 14 foot bgs. Because of the elevated readings at these two borings, each was ultimately converted to a temporary monitoring well to be able to assess the potential impact to area groundwater. Borings 14SB04 and 14SB05 also indicated probable impact from historic activity, with generally more moderate readings, extending the entire depth of each boring. PID readings in the uppermost 5 feet of 14SB04 were substantially higher in the 14SB04 sample than the 14SB05 sample; the results indicate a more prominent impact in the northern and eastern portions of the original/current fire training pit.

PID readings along the 14SB07 boring advanced in the center of the temporary fire pit were minor, with a maximum reading of 5.4 ppm in the 10 to 11 foot interval. No positive readings were obtained below a depth of 16 feet for this location. Therefore, the screening indicates minimal soil and groundwater impact. However, because this was the only boring advanced in vicinity of the temporary fire pit, it also was converted to a temporary monitoring well to be able to assess the potential groundwater impacts.

5.2 Surface Soils

Five surface soil samples were collected and analyzed during the 1996 Phase I RFI. An additional four surface soils samples were collected and analyzed as part of the 2006 RFI field activities. All nine surface soil samples were analyzed for Appendix IX VOCs, SVOCs, PCBs, as well as low level PAHs, TPH DRO and GRO. In addition, the four surface soil samples collected in 2006 were analyzed for Appendix IX metals. Dioxins/furans were not required/requested as part of the surface soil analytical program. A detected results table for the combined surface soil data set is presented in Table 5-2. Results are compared to USEPA Region III Residential Soil RBCs, Industrial Soil RBCs, and NAPR Basewide Background (metals only) criteria.

Several parameters that exceeded one or more of these criteria were identified in the surface soils:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Arsenic
- Chromium
- Cobalt
- Lead
- Selenium
- Vanadium

In general, the VOCs, SVOCs and PAHs associated with the surface soils are primarily related to uncombusted fuels contamination. This is evident also in the fact the TPH DRO and/or GRO analyses came back positive in the five surface soil samples from 1996. It is notable that levels of PAHs in the 2006 data set were substantially below the levels detected in the 1996 dataset; also TPH DRO and GRO analyses showed non-detectable levels of these compounds in the four 2006 surface soil samples. This may be an indication of slow volatilization and/or natural attenuation processes occurring at the ground surface since the fire pits were abandoned. In fact, no VOCs, SVOCs, PAHs, PCBs, TPH DRO or GRO were detected in the surface soil sample collected at the temporary pit, which has been abandoned for nearly 23 years.

Arsenic in three of four surface soil samples collected in 2006 exceeded both the residential and industrial RBCs (all at estimated concentrations of 2.9 milligram per kilogram [mg/kg] or less). One of these values also exceeded NAPR background levels. It is probable that surface soils have been slightly impacted by arsenic contamination. In addition, vanadium exceeds its USEPA Region III Residential Soil RBC in all four samples, but is present at levels consistent with or below NAPR background in three of four cases. Chromium, cobalt, lead, and selenium exceed NAPR background values in a few instances and may be indicative of some surface soil metals contamination.

5.3 Subsurface Soils

No subsurface soil samples were collected and analyzed during the 1996 Phase I RFI. A total of fourteen subsurface soils samples were collected and analyzed as part of the 2006 RFI field activities. All fourteen subsurface soil samples were analyzed for Appendix IX VOCs, SVOCs,

PCBs, and metals, as well as low level PAHs, TPH DRO and GRO. In addition, the three subsurface soil samples collected in 2006 were analyzed for dioxins/furans. A detected results table for the subsurface soil data set is presented in Table 5-3. Results are compared to USEPA Region III Residential Soil RBCs, Industrial Soil RBCs, and NAPR Basewide Background (metals only) criteria.

Several parameters that exceeded one or more of these criteria were identified in the subsurface soils:

- 1,2,3,4,6,7,8-HpCDD
- OCDD
- Arsenic
- Barium
- Cadmium
- Cobalt
- Lead
- Vanadium

In general, the VOCs, SVOCs and PAHs associated with the subsurface soils are primarily related to uncombusted fuels contamination. This also is evident in the fact the TPH DRO and/or GRO analyses came back positive in ten of the fourteen subsurface soil samples.

Small concentrations of dioxins are produced when organic material is burned in the presence of chlorine. This is independent of the form of the chlorine – i.e., either chloride ions or organochlorine compounds. Therefore, dioxins are produced in a wide range of scenarios, including trash burn barrels, coal fired utilities, residential wood burning, metal smelting, and diesel exhaust. The trace levels of dioxins detected in the subsurface soil sample 14SB01-01 are consistent with the burning of diesel fuel and solvents (in combination or close succession) at the original/current fire training pit.

Of the metals tested, only arsenic in five samples exceeded all three of the comparison criteria, with a maximum detection of 4.2 mg/kg and all five results qualified as estimated. It is probable that subsurface soils have been slightly impacted by arsenic contamination. In addition, vanadium exceeds its USEPA Region III Residential Soil RBC in all 14 samples, but is present at levels consistent with or below NAPR background. Lead exceeds the NAPR background values for clay soil in five of fourteen subsurface soil samples, indicating the potential for lead contamination at SWMU 14. There were no locations that indicate exceedance of the residential RBC screening level for lead. Barium, cadmium, and cobalt exceed NAPR background values in only a few instances and are likely dataset anomalies rather than an indication of substantial metals contamination.

5.4 Groundwater

No groundwater samples were collected and analyzed during the 1996 Phase I RFI. A total of three groundwater samples were collected and analyzed as part of the 2006 RFI field activities. Sample 14TW02 was submitted to the analytical laboratory for Appendix IX VOCs, SVOCs, PCBs and total metals, as well as low level PAHs, and TPH GRO and DRO. Due to low well yields, the analyte list was reduced for samples 14TW01 and 14TW07. Appendix IX PCBs and total metals were eliminated for sample 14TW01. Only Appendix IX PCBs were eliminated for sample 14TW07. In addition, dioxins/furans were not required/requested as part of the groundwater analytical program.

A detected results table for the groundwater data set is presented in Table 5-4. Results are compared to USEPA Region III Tap Water RBCs, Federal Drinking Water MCLs, and NAPR Basewide Background (metals only) criteria. Several parameters exceeded one or more of these criteria:

- 1,2-Dichloroethane
- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Vanadium

In general, the VOCs, SVOCs and PAHs associated with the groundwater are primarily related to fuel contamination. This also is evident in the fact the TPH DRO and GRO analyses came back positive in each of the three groundwater samples. Trace levels of chlorinated organic compounds (e.g., 1,2-dichloroethane) are probably related to the historic burning solvents at the fire pits. Of the metals tested, only vanadium (59.2 microgram per liter [µg/l] in 14TW02 and 74 µg/l in 14 TW07) exceeded USEPA Region III Tap Water RBC; however, these levels are well below vanadium's NAPR base wide background criterion. Therefore, groundwater likely has not been detrimentally impacted by metals contamination.

5.5 2006 Laboratory Data Validation Summary

More specific data validation findings, as they relate to each SDG, are discussed in Sections 5.5.2 through 5.5.4 below. Data validation reports are included in Appendix C.

5.5.1 Summary of Detected Compounds in Field QA/QC Samples

Field generated QA/QC samples for the 2006 field effort consisted of trip blanks, field blanks, equipment rinsates, and environmental duplicates. Trip blanks were only analyzed for VOCs and GRO. Other blanks were analyzed for all fractions requested in this investigation including Appendix IX VOCs, SVOCs, PCBs, and total metals, as well as low level PAHs, TPH DRO and GRO. Table 5-5 presents the detected compounds found in the trip blanks, equipment rinsates, and field blanks.

Only benzene in sample 14TB01 was detected in the trip blanks for this investigation (at 0.11 ug/l). Trip blank 14TB02 was determined to be contaminant free.

Detections in two field blanks 14FB01 and FB02 included six VOCs (acetone, bromodichloromethane, chloroform, dibromochloromethane, methylene chloride, and toluene) and TPH DRO. In addition, ten low level PAHs were detected, all estimated at levels below their reporting limits: 1-methylnapthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene. Finally, seven inorganic compounds were found in the field blanks: barium, chromium, copper, lead, silver, vanadium, and zinc.

Analysis of the three equipment rinsate samples resulted in the detection of two VOCs (methylene chloride and toluene) and TPH DRO. In addition, eight low level PAHs were

detected, all estimated at levels below their reporting limits: 1-methylnapthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, chrysene, fluoranthene, fluorene, and phenanthrene. Finally, eight inorganic compounds were found in the equipment rinsates: antimony, barium, chromium, copper, lead, silver, vanadium, and zinc.

5.5.2 CompuChem SDG 9335

This SDG is relevant to the analytical findings associated with the 2006 aqueous sampling (groundwater, equipment rinsates, field blanks, and trip blanks), excluding the dioxin/furan fraction (see Section 5.5.4 below). Laboratory analyses were performed by CompuChem Laboratories (Cary, North Carolina). Validation services were provided by DataQual Environmental Services, LLC (St. Louis, Missouri). Validation conclusions are as follows:

<u>VOCs</u>

- Various volatile organic compounds had unacceptable low relative response factor values during initial and continuing calibration which resulted in qualifying non-detected values as rejected. The percent difference measure resulted in qualifying some non-detect results as estimated. Results in all of the samples were affected by this particular validation measure.

- Blank contamination was noted in the QC blanks of the following constituents: methylene chloride, toluene, acetone, chloroform, bromodichloromethane, and dibromochloromethane. This validation measure resulted in the qualification of their respective results in equipment blank sample 14ER03, and field blank samples 14FB01 and 14FB02 to be qualified as estimated.

- The benzene results in sample 14TW01 exceeded the calibration range in the initial analysis which resulted in a re-analysis of the sample after dilution.

<u>SVOCs</u>

- The associated continuing calibration exhibited high percent difference for several compounds that resulted in various non-detect results to be qualified as estimated.

<u>PAHs</u>

- Four semi-volatile organic compounds (1-methylnaphthalene, fluoranthene, 2-methylnaphthalene, and acenaphthylene) had unacceptable relative response factor and percent relative standard deviation values during initial and continuing GC/MS calibration, which resulted in qualifying all of their non-detect results for this compound as estimated.

- Acenaphthene exhibited high internal standard area recovery which resulted in the qualification of its detected result in one sample to be considered an estimated value.

- Blank contamination was noted in the QC blanks of the following constituents: chrysene, 1-methylnaphthalene, fluorene, fluoranthene, 2-methylnaphthalene, and acenaphthylene. This validation measure resulted in the qualification of their respective results in

equipment blank sample 14ER03, and field blank samples 14FB01 and 14FB02 to be qualified as estimated.

- The results for naphthalene in sample 14TW01 exceeded the calibration range in the initial analysis which resulted in the dilution and re-analysis of the sample.

Metals

- The check standard associated with the samples exhibited a recovery above the QC limit for chromium and blow the QC limit for selenium. As a result, all reported positive results were qualified as estimated for chromium and all detected and non-detect results for selenium were qualified as estimated.

- Field blank contamination resulted in the detected results for antimony, barium, copper, potassium, and zinc to be qualified as either rejected or non-detects in sample 14TW02. While the detected results for barium, beryllium, calcium, magnesium, and potassium in sample 14TW07 to be qualified as non-detects.

- All samples resulted reported at concentrations reported between the instrument detection limit and the contract required detection limits were qualified as estimated values.

Data Validation Summary for SDG 9335

The majority of the data validation measures for this SDG involved the qualification of non-detected results as estimated or rejected primarily due to issues identified during initial and continuing GC/MS calibration or blank contamination. Three detected results for metals in sample 14TW02 and four detected results in sample 14TW07 were qualified as non-detects. However, the only metal that did not have a valid result in groundwater was potassium, which is considered essential macronutrients with low toxicity. Overall, the changes in the results due to the application of the data validation objectives are not expected to significantly compromise the data quality objectives for this SDG.

5.5.3 CompuChem SDG 9336

This SDG is relevant to the analytical findings associated with the 2006 surface and subsurface soil sampling, excluding the dioxin/furan fraction (see Section 5.5.4 below). Laboratory analyses were performed by CompuChem Laboratories (Cary, North Carolina). Validation services were provided by DataQual Environmental Services, LLC (St. Louis, Missouri). Validation conclusions are as follows:

VOCs

- Sample 14SB04-10 exceeded its holding time by four day which resulted in all of the results in the sample to be qualified as estimated.

- Various volatile organic compounds had unacceptable low relative response factor values during initial calibration which resulted in qualifying non-detected values as rejected. The percent difference measure resulted in qualifying some results as estimated.

- The associated method and/or QC blanks exhibited contamination of the following: acetone, trans-1,4-dichloro-2-butene, benzene, methylene chloride, toluene, acetone, chloroform, bromodichloromethane, and dibromochloromethane. This validation measure resulted in the non-detected results for these constituents to be qualified as either estimated or rejected in the following samples: trip blank sample 14TB01, equipment blank samples 14ER01 and 14ER02, and field blank samples 14FB01 and 14FB02.

- Four samples (14SB01-06, 14SB02-03, 14SB05-09 and 14SB04-10) exhibited non-compliant surrogate recoveries that resulted in various non-detected results in those samples to be qualified as estimated.

- The matrix spike and matrix spike duplicate exhibited non-compliance recoveries for chloroethane, which resulted in the results for this constituent to be qualified as estimated in most of the samples analyzed.

SVOCs

- The associated continuing calibrations exhibited higher percent difference for several compounds, which resulted in qualifying their respective results as estimated.

- Sample 14SB01-11 and field duplicate 14SB01-11DUP did not exhibit comparable results for 2-methylnaphthalene, which resulted in qualifying the results for the constituent as estimated.

PAHs

- The associated continuing calibrations exhibited higher percent difference for several compounds, which resulted in qualifying their respective results as estimated. The constituents affected include: 1-methylnaphthalene, fluoranthene, 2-methylnaphthalene, and acenaphthylene.

- Blank contamination was noted in the QC blanks of the following constituents: chrysene, 1-methylnaphthalene, fluorene, fluoranthene, 2-methylnaphthalene, and acenaphthylene. This validation measure resulted in the qualification of their respective results in equipment blank sample 14ER03, and field blank samples 14FB01 and 14FB02 to be qualified as estimated.

- The results for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene in sample 14SB02-3 and 1-methylnaphthalene, and 2-methylnaphthalene in sample 14SB02-8 and 14SB01-11DUP exceeded the calibration range in the initial analysis which resulted in the samples being diluted and re-analyzed.

Metals

- The check standard associated with the samples exhibited a recovery above the QC limit for chromium and blow the QC limit for selenium. As a result, all reported positive results were qualified as estimated for chromium and all detected and non-detect results for selenium were qualified as estimated.

- Field blank contamination resulted in the detected results for antimony, barium, copper, potassium, and zinc to be qualified as either rejected or non-detects in sample 14FB02.

- Seven analytes were recovered outside the QC limits in the matrix spike and/or matrix spike duplicate associated with the soil samples. The analytes affected include: antimony, thallium, arsenic, lead, selenium, vanadium, and copper. In a majority of the cases this validation measure resulted in the detected concentration to be qualified as estimated. However, the detected concentrations of copper in all of the samples were qualified as rejected. In addition, the detected concentrations of sodium in eight samples and the detected concentrations of calcium in four samples were rejected due to this validation measure.

- All samples resulted reported at concentrations reported between the instrument detection limit and the contract required detection limits were qualified as estimated values.

Diesel Range Organics

- One sample (14SB06-07DUPRE) was extracted two days outside the extraction holding time, which resulted in the qualification of the detected concentration in the sample as estimated.

- Blank contamination was noted in one field QC blank which resulted in the detected concentrations in twelve samples to be qualified as either non-detects or rejected.

- The matrix spike and matrix spike duplicate sample exhibited low recoveries for the target compound, which resulted in the detected concentration in sample 14SB01-11 to be qualified as estimated.

Gasoline Range Organics

- Sample 14SB01-06 was rejected due to an exceedance of the instrument calibration limits and replaced with the results from the diluted sample (14SB01-06DL).

- The matrix spike and matrix spike duplicate sample exhibited low recoveries for the target compound, which resulted in the detected concentration in sample 14SB01-11 to be qualified as estimated.

- Sample 14SB01-11 and field duplicate sample 14SB01-11DUP did not exhibit comparable results. As a result, the GRO results in the duplicate sample was qualified as estimated.

Data Validation Summary for SDG 9336

The majority of the validation measures for this SDG involved metals, and DRO. With regards to the metals, a number of detected results were qualified as rejected do the matrix spike and/or matrix spike duplicate issues. Most of the metal results rejected due to this measure were for low toxicity constituents such as sodium and calcium. However, the most significant issue for metals was the rejection of all of the results for copper. Although, no highly elevated detected

concentrations of copper were rejected, some of the rejected values exceeded screening criteria. As a result, any future analysis of the results in this SDG should take into account the lack of valid results for copper. The DRO results in 12 samples collected were qualified as non-detects or rejected due to blank contamination. However, 8 samples had valid results for DRO analysis. With the exception of a lack of valid results for copper, the overall data quality objectives for the SDG were not compromised.

5.5.4 Paradigm Analytical Labs SDG G349-146

This SDG is relevant to the analytical findings associated with the dioxin/furan fractions analyzed for various subsurface soil, equipment rinsate, and field blank samples. Laboratory analyses were performed by Paradigm Analytical Labs (Wilmington, NC). Validation services were provided by DataQual Environmental Services, LLC (St. Louis, Missouri). Validation conclusions are as follows:

<u>Dioxins/Furans</u>

- Contamination in the method blank sample results in the qualification of detected results for Total TCDFs in the following samples to be rejected: 14SB04-01, 14SB05-09, 14SB06-07, and 14SB06-07DUP.

- Sample 14FB01 had the detected concentration to total TCDFs to be qualified as estimated.

<u>Data Validation Summary for SDG G349-146</u>

Although the Total TCFS concentrations were rejected in four samples, the data for the individual congener results were considered valid. As a result, data quality objectives for the SDG were not compromised.

6.0 HUMAN HEALTH RISK ASSESSMENT

A baseline HHRA was performed as part of the RFI for SWMU 14 to evaluate if unacceptable risks may be associated with potential exposure to existing conditions at the site. The baseline HHRA considers the most likely routes of potential human exposure for both current and future risk scenarios. The baseline HHRA was conducted in accordance with the Risk Assessment Guidance for Superfund (RAGS), Part A, Human Health Evaluation Manual (USEPA, 1989), and the most recent updates, such as RAGS Part D (USEPA, 2001a) and Part E (USEPA, 2004). The HHRA was based on an evaluation of analytical data acquired during the Phase I RFI (Baker, 1996) conducted in March 1996 and the March 2006 RFI.

The baseline HHRA is comprised of eight sections; Section 6.1 presents the Site Location and Characterization. Section 6.2 presents the Hazard Identification, which evaluates the site investigation data and identifies COPCs across the site with regard to potential health effects. Sections 6.3 and 6.4 present the Exposure Assessment and Toxicity Assessment, respectively. The Risk Characterization, including a discussion of potential human health effects, is presented in Section 6.5. Section 6.6 outlines the potential sources of uncertainty encountered in the process of performing a risk assessment, and their potential effects on the estimation of human health risks. A summary of the baseline HHRA is provided in Section 6.7. References are provided in Section 6.8.

6.1 Site Location and Characterization

Refer to Section 2.2 "SWMU 14 Description and History" for a characterization of the human health exposure setting.

6.2 Hazard Identification

6.2.1 Data Evaluation

The data used in the HHRA are presented in full in Appendix D. A statistical analysis, including the minimum, maximum, mean, standard deviation and 95 percent upper confidence limit (95% UCL), was run for each data set (i.e., soil and groundwater). A statistical summary of data used in the HHRA is located in Appendix E. For duplicate samples, the higher of the two concentrations was used, not both. All of the data was utilized except for soil samples greater than 10 feet bgs because it is unlikely that contact with soils greater than 10 feet bgs will occur. Unfiltered groundwater data were used to estimate exposure concentrations, since groundwater samples were collected using low-flow purging/sampling techniques. However, USEPA RAGS Part A guidance also states that filtered groundwater data can provide useful information for understanding chemical transport within an aquifer. As appropriate, filtered groundwater data will be qualitatively evaluated in relationship to corresponding unfiltered groundwater data. The following paragraphs describe the data used in the HHRA for SWMU 14.

Surface soil samples were collected at soil borings 14SB01, 14SB02, 14SB03, and 14SB07 from a depth of 0 to 1 foot bgs. Subsurface soil samples were collected at all soil borings from two-foot intervals (e.g., 1 to 3 feet bgs, 3 to 5 feet bgs, etc.) down to groundwater. Four surface soil samples and fourteen subsurface soil samples were submitted to CompuChem Laboratories in Research Triangle Park, North Carolina for analysis of Appendix IX VOCs, SVOCs, PCBs and

metals, as well as low level PAHs, TPH DRO and GRO. Three subsurface soil samples from beneath the pit were also analyzed for dioxins/furans.

Three groundwater samples were collected from the three temporary wells. One sample was collected from 14TW02 and submitted to the fixed-base analytical laboratory for Appendix IX VOCs, SVOCs, PCBs and total metals, as well as low level PAHs, and TPH DRO and GRO. Due to low well yields at 14TW01 and 14TW07, the analyte list was reduced. Appendix IX VOCs and SVOCs, as well as low level PAHs, TPH DRO and GRO were analyzed at 14TW01, and Appendix IX VOCs, SVOCs, and total metals, as well as low level PAHs, TPH DRO and GRO were analyzed at 14TW07.

6.2.2 Selection of COPCs

The selection of COPCs was based on the information provided in the USEPA Region III Technical Guidance on Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening (USEPA, 1993a) and USEPA's Risk Assessment Guidance for Superfund (RAGS), Volume I. Human Health Evaluation Manual (Part A), Interim Final, (USEPA, 1989).

6.2.2.1 COPC Selection Criteria

USEPA Region III suggests that: "The baseline risk assessment process can be made more efficient by focusing on dominant contaminants and routes of exposure at the earliest feasible stage. The mechanisms recommended for this are (1) a re-ordering of the process of eliminating contaminants and routes of exposure, and (2) use of a risk-based concentration screen (USEPA 1993a)." For this HHRA, a risk based concentration screen was used to identify the dominant contaminants or COPCs.

COPCs are those constituents having the greatest potential to affect human health and the environment. The COPCs are selected by comparing the maximum concentrations detected in environmental samples to regulatory criteria. Chemicals exceeding regulatory criteria are retained as COPCs for further evaluation; chemicals detected at concentrations below these criteria are not evaluated unless other circumstances (frequency of exposure detected in other media, same chemical class [i.e., PAHs] or documented usage) warrant the re-inclusion and further evaluation of chemicals selected as COPCs.

The primary criterion used in selecting chemicals as COPCs at SWMU 14 was comparing maximum detected sample concentrations to the USEPA Region III RBC Values (USEPA, 2006), in accordance with USEPA Region III Selection of Contaminants of Concern by Risk-Based Screening (SCCRBS) guidance (USEPA, 1993a).

In conjunction with concentration comparisons to the USEPA Region III RBC values, a comparison to concentrations detected in field and laboratory blanks was conducted by a third-party data validator, to ensure that only site-related contaminants are evaluated in the quantitative estimation of human health effects. Furthermore, those constituents generally considered to be essential nutrients (calcium, magnesium, potassium, and sodium, which have relatively low toxicity) were not evaluated in this baseline HHRA. Inorganic constituents were also compared to corresponding background screening concentrations. A description of actual background screening concentrations used can be found later in this section.

The toxicity of a chemical detected in a given environmental medium, as well as the history of site-related activities are other important criteria applied in selecting COPCs at SWMU 14. Therefore, in conjunction with concentration comparisons to USEPA Region III RBC values, evaluations of toxicity and site history were considered to determine whether chemicals eliminated by a direct comparison to RBC values should be re-included as COPCs. Each of the aforementioned criteria is discussed in the paragraphs that follow.

USEPA Region III RBC Values – Region III RBC values were derived using conservative USEPA promulgated default values and the most recent toxicological criteria available (USEPA, 2006). RBCs for potentially carcinogenic and noncarcinogenic chemicals were individually derived based on a target Incremental Lifetime Cancer Risk (ILCR) of 1×10^{-06} and a target Hazard Quotient of 1.0, respectively. For potential carcinogens, the toxicity criteria applicable to the derivation of the RBC are oral and inhalation cancer slope factors; for noncarcinogens, they are chronic oral and inhalation reference doses. For noncarcinogens, each RBC value was reduced by a factor of 10 to ensure that chemicals with additive effects are not prematurely eliminated during screening (USEPA, 1993a).

In this baseline HHRA, constituents in groundwater will be compared to tap water RBC values. Constituents identified in soil will be compared to residential soil RBCs.

Blank Concentrations - If a chemical is detected in both the environmental sample and a blank sample, it may not be retained as a COPC in accordance with RAGS depending on the concentration of the chemical in the media. Therefore, blank data were compared with results from environmental samples. If the blanks contained detectable results for common laboratory contaminants (i.e., acetone, 2-butanone, methylene chloride, toluene, and phthalate esters), environmental sample results were considered as positive results only if they exceed 10 times the maximum amount detected in the associated blank. If the chemical detected in the blank(s) is not a common laboratory contaminant, environmental sample results were considered as positive results only if they exceeded five times the maximum amount detected in the associated blank(s). Furthermore, the elimination of an environmental sample result would directly correlate to a reduction in the prevalence of the contaminant in that media.

Associated blanks collected during the field investigation for SWMU 14 included field (water source) blanks, trip blanks, and rinsate blanks. The aforementioned methodologies for evaluating blanks were implemented during independent third party analytical data validation prior to the selection of COPCs in the risk assessment.

Essential Nutrients - Despite their inherent toxicity, certain inorganic constituents are essential nutrients. Essential nutrients need not be considered further in the baseline HHRA if they are present in relatively low concentrations (i.e., slightly elevated above naturally occurring levels), or if the constituent is toxic at doses much higher than those which could be assimilated through exposures at the site (USEPA, 1989). Elements evaluated as essential nutrients include calcium, magnesium, potassium, and sodium. Although iron is considered an essential nutrient, it is evaluated quantitatively in this HHRA since toxicity criteria are available for this analyte.

Background or Naturally Occurring Levels - Generally, a comparison to naturally occurring levels applies only to inorganic analytes, because the majority of organic contaminants are not naturally occurring. Background samples are collected from areas that are not influenced by site contamination. The background data used for comparison purposes in this HHRA are taken from the Revised Final Summary Report for Environmental Background Concentrations of Inorganic

Compounds (Baker, 2006), for NAPR. The criterion used for screening is the upper limit of the mean (ULM), which is calculated as the mean plus two times the standard deviation of the mean. Therefore, sample concentrations for inorganics in surface soil, subsurface soil, and groundwater were compared to the ULM of the corresponding background data sets.

Re-Inclusion of Chemicals as COPCs - Chemicals can be re-included as COPCs for quantitative evaluation in the baseline HHRA, despite having been eliminated as such from a comparison to RBC values (or other aforementioned criteria). For example, a chemical that was detected at concentrations below the corresponding RBC value may be re-included as a COPC if a chemical is considered a Class A carcinogen (human carcinogen), or if it is reasonable to assume that the chemical could be site-related (especially if it has been detected in other media of concern). In addition, all carcinogenic PAHs detected in a medium of concern are re-included as COPCs if only one carcinogenic PAH is retained as a COPC in that medium based on the potential additive toxic effects of carcinogenic PAHs.

6.2.2.2 Selection of COPCs

As discussed previously, soil and groundwater were sampled at SWMU 14. Data were combined for each medium for the human health risk assessment.

The following subsections present the rationale for selection of COPCs. Tables 6-1 through 6-3 present the selection of COPCs for each environmental medium based on comparisons of maximum detected concentrations of constituents with corresponding USEPA Region III RBCs, and other applicable criteria (see Section 6.2.2.1). Constituents retained as COPCs are indicated by the shaded rows in the tables. These tables also include exposure concentrations for COPCs, which are discussed further in Section 6.3, Exposure Assessment. Information is presented in these tables only for those constituents detected at least once in the medium of interest. Sample locations, analytical results, and corresponding figures are presented in Section 5.0 and appendices of this RFI report.

Surface Soil

The data and COPC selection summary for surface soil samples collected at SWMU 14 are presented in Table 6-1.

There were no VOCs detected in the surface soil at concentrations above corresponding residential soil RBC values. 2-Hexanone currently has no screening criteria available; therefore, it was retained as a surface soil COPC as a conservative measure.

The carcinogenic PAHs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected in the surface soil at maximum concentrations above residential soil RBCs and were retained as COPCs for surface soil. Benzo(k)fluoranthene and chrysene were detected at concentrations below corresponding residential soil RBC values. However, these carcinogenic PAHs were re-included as COPCs for surface soil because of the potential additive toxic effects of carcinogenic PAHs.

There were no PCBs detected in the surface soil at concentrations above corresponding residential soil RBC values. Therefore, PCBs were not retained as surface soil COPCs.

TPH DRO and GRO were detected in the surface soil. TPH DRO and GRO currently have no screening criteria available; therefore, they were retained as surface soil COPCs as a conservative measure.

Table 6-1 shows that arsenic, chromium, thallium, and vanadium were detected in surface soil at concentrations exceeding corresponding residential soil RBCs and were retained as surface soil COPCs. Only the maximum detected concentrations of arsenic, chromium, thallium, and vanadium exceeded corresponding background screening concentrations.

Subsurface Soil

The data and COPC selection summary for subsurface soil samples collected at SWMU 14 are presented in Table 6-2.

There were no VOCs detected in the subsurface soil at concentrations above corresponding residential soil RBC values. Therefore, VOCs were not retained as COPCs for subsurface soil. It should be noted that PCBs were not detected in subsurface soil.

There were no SVOCs detected in the subsurface soil at concentrations above corresponding residential soil RBC values. Therefore, SVOCs were not retained as COPCs for subsurface soil.

The dioxins 1,2,3,4,6,7,8-HpCDD and OCDD were detected at concentrations above corresponding residential soil RBC values. Therefore, these dioxin compounds were retained as subsurface soil COPCs.

TPH DRO and GRO were detected in the subsurface soil. TPH DRO and GRO currently have no screening criteria available; therefore, they were retained as subsurface soil COPCs as a conservative measure.

Table 6-2 shows that arsenic, chromium, and vanadium were detected in subsurface soil at concentrations exceeding corresponding residential soil RBCs and were retained as subsurface soil COPCs. Two of four detected arsenic concentrations exceeded the background screening concentration, while chromium and vanadium were detected at concentrations below background.

Groundwater

Table 6-3 summarizes the COPC selection performed for constituents detected in groundwater samples collected at SWMU 14.

1,2-Dichloroethane and benzene were detected in the groundwater at concentrations above corresponding tap water RBC values. Therefore, these VOCs were retained as COPCs for groundwater. Iodomethane currently has no screening criteria available; therefore, it was retained as a groundwater COPC as a conservative measure.

There were no SVOCs detected in the groundwater at concentrations above corresponding tap water RBC values. Therefore, SVOCs were not retained as COPCs for groundwater.

The carcinogenic PAHs benzo(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected in the groundwater at a maximum concentrations above tap water RBCs and were retained as COPCs for groundwater. Benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene were detected at concentrations below corresponding tap

water RBC values. However, these carcinogenic PAHs were re-included as COPCs for groundwater because of the potential additive toxic effects of carcinogenic PAHs. 1-Methylnaphthalene and naphthalene were also detected in the groundwater at maximum concentrations above tap water RBCs and were retained as COPCs for groundwater.

TPH DRO and GRO were detected in the groundwater. TPH DRO and GRO currently have no screening criteria available; therefore, they were retained as groundwater COPCs as a conservative measure.

Table 6-3 shows that of the unfiltered (total) inorganic constituents detected in groundwater, chromium and vanadium were retained as COPCs since concentrations of these metals exceeded their corresponding tap water RBCs. Chromium and vanadium were detected at concentrations below corresponding background screening concentrations.

6.2.3 Summary of COPCs

The following chemicals were retained for further analysis as COPCs in the environmental media obtained from SWMU 14:

- *Surface Soil*: 2-Hexanone, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, TPH DRO and GRO, arsenic, chromium, thallium, and vanadium.

- *Subsurface Soil*: 1,2,3,4,6,7,8-HpCDD; OCDD; TPH DRO and GRO; arsenic; chromium; and vanadium.

- *Groundwater*: 1,2-Dichloroethane, benzene, iodomethane, 1-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, TPH DRO and GRO, chromium, and vanadium.

6.3 Exposure Assessment

The exposure assessment estimates the magnitude of actual and/or potential human exposure, the frequency and duration of those exposures, and the pathways (i.e., inhalation, ingestion, and dermal contact) by which people are potentially exposed. To determine whether human exposure could occur at SWMU 14 in the absence of remedial action, an exposure assessment that identifies potential exposure pathways and receptors was conducted. The following four elements were considered to determine whether a complete exposure pathway was present (USEPA, 1989):

- A source and potential mechanism of chemical release
- An environmental retention or transport medium
- A point of potential human contact with the contaminated medium; and
- A human exposure route (e.g., ingestion) at the contact point

The exposure scenarios discussed in this report represent USEPA's Reasonable Maximum Exposure (RME). Relevant equations for assessing intakes and exposure parameters were obtained from RAGS Part A (USEPA, 1989), Exposure Factors Handbook (USEPA, 1997a),

RAGS Part E Supplemental Guidance for Dermal Risk Assessment (USEPA, 2004), Dermal Exposure Assessment: Principles and Applications, Interim Report (USEPA, 1992), and Standard Default Exposure Factors, Interim Final (USEPA, 1991). The Central Tendency (CT) risk descriptor was also used for exposure scenarios when the RME scenarios indicated a potential risk to human health, to more completely present the range of possible risks. The CT exposure calculations use less conservative exposure parameters (as appropriate) to calculate chemical intakes for the CT-case scenarios. The CT exposure parameters are provided in Table 6-4 along with the RME exposure parameters.

6.3.1 Potential Human Receptors

NSRR underwent operational closure on March 31, 2004. On April 1, 2004, NSRR was re-designated as NAPR. The current primary mission of NAPR is to protect the physical assets remaining, comply with environmental regulations, and sustain the value of the property until final disposal of the property. It is assumed that long-term plans for the facility would be similar to those that had been in place prior to closure with land use also generally the same. Based on information available regarding the physical features, site setting, site historical activities, and current and expected land uses, six potential human receptors have been selected for evaluation. These include:

- Current On-site Adult Trespasser
- Current On-site Adolescent Trespasser (9-15 years)
- Current/Future On-site Adult Workers
- Future Adult Residents
- Future Child Residents (1-6 years)
- Future Construction Worker

At present, there is no activity at SWMU 14. What is known of the site history and some additional background information about this site can be found in Section 2.0 of this report. The following paragraphs are a general description of receptor scenarios.

In the current scenario, it is conservatively assumed that on-site trespassers and on-site workers could access the site and potentially be exposed to COPCs at the site. Potential exposure via ingestion of and dermal contact with surface soil was considered for adult and adolescent trespassers. Additionally, the inhalation pathway (fugitive dusts and/or volatiles) is considered for soil. The potential exposure pathways evaluated for the on-site worker include ingestion and dermal contact with surface soil and subsurface soil, and inhalation of fugitive dusts from soil. Soil at this depth could be accessible to a current on-site worker performing grounds-keeping/site maintenance activities or a future on-site worker should the site become a commercial/industrial setting, in which case shallow subsurface soil could be disturbed and brought to the surface. Currently, groundwater is not used for potable purposes at the site; consequently exposure to groundwater in the current scenario will not be evaluated.

In the future scenario, although land use is likely to remain the same, it is assumed that residential development of the site could occur in order to provide an “upper bound” for potential risks. As a result, a construction worker and residential receptors will be evaluated. For the future residential adult and child (ages 1-6 years) receptors, exposure to surface soil, subsurface soil, and groundwater will be evaluated as appropriate. Exposure to groundwater as a potable source will be assessed, which includes exposure via ingestion and dermal contact and inhalation while showering (adults only) or bathing. Inhalation of volatiles in groundwater while showering was

evaluated only for the future residential adult. Young children are not expected to shower and therefore, are not evaluated for exposure to inhalation of VOCs in groundwater. Rather, young children are evaluated for dermal contact exposure to groundwater while bathing. Albeit unlikely, an adult and child receptor could become exposed to soil (i.e., as a result of landscaping activities). The potential exposure pathways include ingestion and dermal contact with soil and soil particulate and/or volatile inhalation.

While the land use at SWMU 14 is likely to remain the same in the future, the area surrounding the SWMU could support a building. Currently, there are buildings located northeast of SWMU 14. Therefore, volatilization of contaminants in groundwater, and the subsequent mass transport of these vapors into indoor spaces, is conservatively evaluated as a potential inhalation exposure pathway for future residents at SWMU 14. The Johnson and Ettinger on-line screening-level Vapor Intrusion Model (http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.htm) was used to evaluate residential exposure to volatile groundwater COPCs via vapor intrusion.

Future construction workers that may perform excavation and construction at the site were also evaluated for ingestion and dermal contact exposures to (as appropriate) excavated surface soil and subsurface soil, as well as the inhalation of fugitive dusts and/or volatiles emanating from soil during excavation/construction activities. Dermal contact exposure of construction workers with groundwater was also evaluated as a conservative measure. The depths of soil samples used in the risk evaluation for construction workers were 0 to 12 feet bgs because 12 feet bgs was the maximum depth sampled.

Specifically, the following potential human exposure receptors and exposure pathways were retained for quantitative evaluation in this baseline HHRA.

Current On-Site Adult and Adolescent (Ages 9-15 Years) Trespassers

- Ingestion of Surface Soil
- Dermal Contact with Surface Soil
- Inhalation of Fugitive Dusts/Volatiles Emanating from Surface Soil

Current/Future On-Site Adult Workers

- Ingestion of Surface Soil and Subsurface Soil
- Dermal Contact with Surface Soil and Subsurface Soil
- Inhalation of Fugitive Dusts/Volatiles Emanating from Surface Soil and Subsurface Soil

Future On-Site Adult and Child (Ages 1-6 Years) Residents

- Ingestion of Surface Soil and Subsurface Soil
- Dermal Contact with Surface Soil and Subsurface Soil
- Inhalation of Fugitive Dusts/Volatiles Emanating from Surface Soil and Subsurface Soil
- Ingestion of Groundwater
- Dermal Contact with Groundwater
- Inhalation of Volatile Emissions Emanating from Groundwater (Adults only)
- Inhalation of Indoor Air (Vapor Intrusion)

Future Construction Workers

- Ingestion of Surface Soil and Subsurface Soil
- Dermal Contact with Surface Soil and Subsurface Soil
- Inhalation of Fugitive Dusts/Volatiles from Surface Soil and Subsurface Soil
- Dermal Contact with Groundwater

6.3.2 Conceptual Site Model

Development of a conceptual site model of potential exposure is critical in evaluating exposures for the human receptors. The conceptual site model considers all reasonable current and future potential exposures and media of concern under a no-action scenario. Current and potential future exposure scenarios for SWMU 14 are summarized in the conceptual site model in Figure 6-1 of this HHRA. Current exposures at SWMU 14 are trespassers and adult on-site workers. Future exposures at this site may consist of residents, adult on-site workers, and construction workers.

Potential contaminant release mechanisms from affected media include storm water runoff, leaching to underlying groundwater, and advective transport in the direction of groundwater flow. Potentially affected media at SWMU 14 may include one or more of the following: surface and subsurface soil and groundwater.

6.3.3 Quantification of Exposure

Exposure to contaminants is quantified using 1) data from the site (i.e., concentrations of contaminants) and 2) determining human exposure to the environmental media. The chemical concentrations used in the estimation of chronic daily intakes (CDIs) and dermally absorbed doses (DADs) for each medium are considered representative of the types of potential exposures encountered by each receptor throughout the time of exposure. Groundwater is in motion; thus chemical concentrations detected in this medium change frequently over time. Soil generally moves more slowly through erosion and deposition. Therefore, groundwater contaminant concentrations may be best represented by the most recently collected data, while soil concentrations can include some older data, as appropriate. The manner in which environmental data are represented also depends on the number of samples and sampling locations available for a given area and a given medium. For example, exposure can occur to a portion of the site (i.e., a "hotspot") or the entire site, depending on the type of scenario considered for a given receptor. A discussion of site data and human exposure at SWMU 14 is presented in the following sections of "Data Analysis" and "Exposure Input Parameters".

6.3.4 Data Analysis

USEPA recommends using the average concentration to represent "a reasonable estimate of the concentration likely to be contacted over time" (USEPA, 1989). This concentration, commonly termed the exposure point concentration (EPC), is a conservative estimate of the average chemical concentration in an environmental medium at hazardous waste sites. The EPC is determined for each individual exposure unit within a site. An exposure unit is the area throughout which a receptor moves and encounters an environmental medium for the duration of the exposure. Unless there is site-specific evidence to the contrary, an individual receptor is

assumed to be equally exposed to media within all portions of the exposure unit over the time frame of the risk assessment (USEPA, 2002).

USEPA's most recent guidance, Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002), provides tools to calculate upper confidence limits to be used as EPCs in risk assessments. The USEPA 2002 guidance recommends the use of the software package, ProUCL (USEPA, 2001b), to calculate upper confidence limits for use in risk assessments. The most recent version of ProUCL is Version 3.0.

The ProUCL software has been developed by USEPA to compute an appropriate 95% UCL of the unknown population mean. All upper confidence limit computation methods contained in the USEPA guidance documents are available in ProUCL, Version 3.0. ProUCL also can compute a 95% UCL of the mean based upon the gamma distribution, which is better suited to model positively skewed environmental data sets (USEPA, 2001b). ProUCL tests for normality, lognormality, and a gamma distribution of the data set, and computes a conservative and stable 95% UCL of the unknown population mean (assuming the data set consists of points from a single population) (USEPA, 2001b). Several parametric and distribution-free non-parametric methods are included in ProUCL. The upper confidence limit computation methods in ProUCL cover a wide range of skewed data distributions arising from the various environmental applications.

It should be noted that ProUCL was not used to calculate EPCs for groundwater COPCs. The maximum detected concentrations for groundwater COPCs were used as default EPCs. This is because there were only three samples in the data set. Furthermore, a contaminant plume was not identified with the results of those three samples.

The computational output from the ProUCL calculations performed for each COPC is presented in Appendix E. The equations for estimating intakes due to direct exposures to site-related chemicals for the various identified pathways are presented in Appendix F.

For results reported as "nondetect" (i.e., results flagged with the following validation qualifiers: U, UJ, UL, and UK), a value of one half of the sample-specific detection limit was used to calculate the 95% UCL. Similarly, for results reported as "nondetect due to blank contamination" (i.e., results flagged with a B), a value of one half of the sample-specific detection limit was used to calculate the 95% UCL. A value of half the detection limit was assigned to nondetects when estimating the 95% UCL and the arithmetic mean because the actual value could be between zero and a value just below the detection limit. 95% UCLs were calculated only for the constituents detected in at least one sample collected from the environmental medium of interest.

Estimated concentrations also were used to calculate the 95% UCL, such as "J" qualified (estimated), "L" qualified (estimated, biased low) and "K" qualified (estimated, biased high) data. Reported concentrations qualified with an "R" (rejected) were not used in the statistical evaluation.

6.3.5 Exposure Input Parameters

Table 6-4 presents the exposure parameters used in the estimation of potential CDIs/DADs for COPCs retained for each receptor identified below. When USEPA exposure parameters are not available, best professional judgment and site-specific information are used to derive a conservative and defensible value. The following paragraphs present the rationale for the RME

assumptions for each receptor group evaluated in the baseline HHRA. RME is defined as the highest exposure that is reasonably expected to occur at a site.

Current Adult and Adolescent Trespassers

This scenario assumes that current adult and adolescent (9 - 15 years) trespassers could come into contact with surface soil at SWMU 14. Therefore, these receptors were evaluated for potential exposure to surface soil via ingestion, dermal contact, and inhalation of fugitive dust. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 6-4.

A 70 kilogram (kg) adult and a 45 kg adolescent (USEPA, 1997a) were assumed to have exposure durations (EDs) of 24 years and 9 years, respectively (USEPA, 1991). Exposure times (ETs) were estimated to be 2 hours per day (USEPA, 1997a) in relationship to inhalation of fugitive dusts. The ingestion rate (IR) of surface soil was assumed to be 100 milligrams per day (mg/day) for both the adolescent and the adult (USEPA, 1993b), with a conservative assumption of 100 percent fraction ingested from the source (professional judgment). The exposure frequency (EF) was assumed to be 52 events/year, based on anticipated exposures of one day/week/year (professional judgment). Respiration rates of 1.27 cubic meters per hour (m^3/hr) for the adult and 0.69 m^3/hr for the adolescent (USEPA, 1997a) were also used in relationship to inhalation of fugitive dusts from surface soil. Averaging times of 8,760 days for adults and 3,285 days for adolescents for noncarcinogens, and 25,550 days for carcinogens were also used (USEPA, 1989).

The USEPA recommended weighted soil to skin adherence factor (AF) of 0.07 milligrams per square centimeter (mg/cm^2) for the residential adult (USEPA, 1997a) was used for the adult trespasser for soil. This is based on the 50th percentile weighted AF for gardeners, which is the activity determined to represent a reasonable, high-end contact activity. The USEPA recommended weighted 0.2 mg/cm^2 AF for the young child was conservatively used for the adolescent trespasser for soil and is based on the 95th percentile weighted AF for children playing at a day care center or in wet soil (USEPA, 1997a). Dermal absorption values provided in USEPA RAGS Part E (USEPA, 2004) or USEPA Region III default dermal absorption values of 0.05 percent for VOCs, 10 percent for PAHs, 50 percent for SVOCs and nitramines, 6 percent for PCBs and pesticides, 1 percent for inorganic constituents and 3.2 percent for arsenic were applied in evaluating dermal exposures to soil (USEPA, 1995). Skin surface areas of 3,200 square centimeters (cm^2) for the adolescent (25% of the total body surface area of 12,900 cm^2 for youths ages 7-17) and 5,700 cm^2 for the adult (USEPA 1997a) were assumed for the surface soil scenario.

Current/Future Adult On-Site Workers

This scenario assumes that current/future adult on-site workers (to be considered as a industrial/commercial worker scenario in the future) could come into contact with surface soil and subsurface soil at SWMU 14. Therefore, this receptor was evaluated for potential exposure to surface and subsurface soil via ingestion, dermal contact, and inhalation of fugitive dust in both current and future scenarios. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 6-4. Unless otherwise noted, the CT exposure parameters are the same as for RME.

The IR for on-site workers exposed to soil was assumed to be 100 mg/day (USEPA, 1997a) for the RME scenario and 50 mg/day (USEPA, 1993b) for the CT exposure scenario, and the fraction

ingested was assumed to be 100 percent. An EF of 250 days per year (USEPA, 1991) for soil was used in conjunction with an ED of 25 years (USEPA, 1991) for the RME scenario. An EF of 219 days per year (USEPA, 1991) for soil was used in conjunction with an ED of 9 years (USEPA, 2004) for the CT exposure scenario. A respiration rate of 1.27 m^3/hr for the adult (USEPA, 1997a) and an ET of 8 hours/day (professional judgment assuming a typical 8 hour work day) were also used in relationship to inhalation of fugitive dusts from soil. An averaging time (AT) of 70 years or 25,550 days was used for exposure to potentially carcinogenic compounds while an averaging time of 9,125 days (RME) and 3,285 days (CT exposure) was used for noncarcinogenic exposures.

There is a potential for on-site workers to absorb COPCs by dermal contact. A skin surface area of 5,700 cm^2 (RME) and 5,000 cm^2 (CT exposure) for an adult (USEPA, 1997a) was used to evaluate dermal contact with soil. The AF of 0.2 mg/cm^2 was used for soil and is based on the 50th percentile weighted AF for utility workers, which is the activity determined by USEPA to represent a reasonable, high-end contact activity (USEPA, 1997a). Dermal absorption values provided in USEPA RAGS Part E (USEPA, 2004) or USEPA Region III default dermal absorption values of 0.05 percent for VOCs, 10 percent for PAHs, 50 percent for SVOCs and nitramines, 6 percent for PCBs and pesticides, 1 percent for inorganic constituents and 3.2 percent for arsenic were applied in evaluating dermal exposures to soil (USEPA, 1995).

Future Adult and Young Child Residents

This scenario assumes that future adult and young child (1-6 years) residents could come into contact with surface soil and subsurface soil at SWMU 14. Therefore, these receptors were evaluated for potential exposure to surface and subsurface soil via ingestion, dermal contact, and inhalation of fugitive dust. It is also conservatively assumed that the shallow groundwater could be used for potable purposes in the future. Therefore, future residents were evaluated for potential exposure to groundwater via ingestion, dermal contact, and inhalation of volatiles while showering. Exposures to organic and total inorganic COPCs were evaluated. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 6-4. Unless otherwise noted, the CT exposure parameters are the same as for RME.

Future adult and young child residents could contact surface soil and subsurface soil during outdoor recreational activities in the area immediately surrounding their homes. A 70 kg adult and a 15 kg child were assumed for exposure durations of 24 years and 6 years, respectively (USEPA, 1997a). Exposure durations of 7 years for the adult and 2 years for the child were used for CT exposure (professional judgment assuming average exposure durations). The exposure time was conservatively assumed to be 24 hours per day (professional judgment). The ingestion rate for surface soil and subsurface soil was assumed to be 200 mg/day for the young child and 100 mg/day for the adult (USEPA, 1991), with a 100 percent fraction ingested from source, over 350 days/year (USEPA, 1991) for soil. Ingestion rates for surface soil of 100 mg/day for the young child and 50 mg/day for the adult over 234 days per year were used for CT exposure (USEPA, 1993b). Respiration rates of 0.69 m^3/hr for the child (USEPA, 1997a) and 1.27 m^3/hr for the adult (USEPA, 1997a) were also used in relationship to inhalation of fugitive dusts. Averaging times of 8,760 days for adults and 2,190 days for children for non-carcinogens, and 25,550 days for carcinogens were also used (USEPA, 1989).

The USEPA recommended weighted AF of 0.07 mg/cm^2 was used for soil for the residential adult (USEPA, 1997a). This is based on the 50th percentile weighted AF for gardeners, which is the activity determined to represent a reasonable, high-end contact activity. The USEPA recommended weighted 0.2 mg/cm^2 AF for the young child was used for soil and is based on the

95th percentile weighted AF for children playing at a day care center or in wet soil (USEPA, 1997a). Dermal absorption values provided in USEPA RAGS Part E (USEPA, 2004) or USEPA Region III default dermal absorption values of 0.05 percent for VOCs, 10 percent for PAHs, 50 percent for SVOCs and nitramines, 6 percent for PCBs and pesticides, 1 percent for inorganics and 3.2 percent for arsenic were applied in evaluating dermal exposures to soil (USEPA, 1995). Skin surface areas of 2,800 cm^2 for the young child and 5,700 cm^2 for the adult (USEPA 1997a) were assumed for the surface soil and subsurface soil scenarios. These are the values currently recommended by the USEPA for exposure to contaminated soil and are the averages of the 50th percentiles for males and females greater than 18 years of age (adults) and from 1 to 6 years old (young children). Skin surface areas of 2,000 cm^2 for the young child and 5,000 cm^2 for the adult (USEPA, 1997a) were assumed for the CT exposure scenario.

A groundwater ingestion rate of 1 liter per day (l/day) was used for children and 2 l/day for adults (USEPA 1989). This value assumes that residents obtain all of their drinking water from the same source for the exposure duration. Ingestion rates of 1 l/day for children (USEPA, 1989) and 1.4 l/day for adults (USEPA, 1993b) were assumed for the CT exposure scenario. The exposure times to groundwater of 0.58 hours/day for the adult and 1.0 for the child (USEPA, 2004) were used. Exposure times of 0.25 hours/day for the adult and 0.33 hours/day (USEPA, 2004) were assumed for the CT exposure scenarios. Equations and estimated, chemical-specific permeability constant (K_p) values presented by USEPA (USEPA, 2004) were used to estimate the absorption of organic COPCs by skin exposed to groundwater. Skin surface areas of 6,600 cm^2 for the young child and 18,000 cm^2 for the adult (USEPA, 2004) were assumed for the groundwater exposure scenario. Most of the same assumptions used for estimating exposures to soil (i.e., exposure duration, exposure frequency, body weight, inhalation rates, and carcinogenic and noncarcinogenic averaging time) were also applied to the evaluation of ingestion and dermal exposures to groundwater and inhalation of volatiles in groundwater.

Future Adult Construction Workers

Potential exposures to soil COPCs may occur to construction workers while performing soil excavation and construction activities at SWMU 14. Exposure pathways evaluated include ingestion, dermal contact, and inhalation of fugitive dust of surface and subsurface soil. Exposure to groundwater at SWMU 14 was evaluated as a conservative measure. The shallow groundwater aquifer was measured between 14 and 18 feet bgs as noted in the drilling information from the installation of the three temporary wells. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 6-4. Unless otherwise noted, the CT exposure parameters are the same as for RME.

Exposure was assumed to occur for 8 hours per day (professional judgment assuming a typical 8 hour work day), 180 days per year (professional judgment conservatively assuming the number of actual working days on a construction site) (RME), for a construction period of 1 year (professional judgment conservatively assuming duration of a construction project). An EF of 90 days per year (professional judgment assuming half of the RME EF of 180 days per year) was used for CT exposure. The USEPA default value for the soil IR of 480 mg/day, a 100 percent fraction ingested from source, and a respiration rate of 2.0 m^3/hour (USEPA, 1997a) were also assumed for a 70 kg construction worker (USEPA, 1997a). For CT exposure, a soil IR of 240 mg/day (professional judgment assuming half of the RME IR of 480 mg/day) was used. A skin surface area of 3,300 cm^2 (RME) for an adult (USEPA, 1997a) assumed to wear a short-sleeved shirt, long pants, and shoes, was used to evaluate dermal contact with soil and groundwater. For CT exposure, a skin surface area of 3,230 cm^2 was used (USEPA, 1992). The soil to skin adherence factor of 0.2 mg/ cm^2 (USEPA, 1997a) was used for soil. Dermal absorption values

provided in USEPA RAGS Part E (USEPA, 2004) or USEPA Region III default dermal absorption values of 0.05 percent for VOCs, 10 percent for PAHs, 50 percent for SVOCs and nitramines, 6 percent for PCBs and pesticides, 1 percent for inorganic constituents and 3.2 percent for arsenic were applied in evaluating dermal exposures to soil (USEPA, 1995). The averaging time of 365 days for noncarcinogens and 25,550 days for carcinogens, respectively, were also used (USEPA, 1989).

6.4 Toxicity Assessment

This section will review the available toxicological information for COPCs retained for quantitative evaluation.

An important component of the HHRA process is the relationship between the dose of a compound (amount to which an individual or population is potentially exposed) and the potential for adverse health effects resulting from exposure to that dose. Dose-response relationships provide a means by which potential public health impacts may be evaluated. Standard reference doses (RfDs) and/or carcinogenic slope factors (CSFs) have been developed for many of the COPCs. This section provides a brief description of these parameters.

6.4.1 Reference Doses

The RfDs are developed for chronic and/or subchronic human exposure to chemicals, and are based solely on the noncarcinogenic effects of chemical substances. These values are defined as an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of adverse effects during a lifetime. The RfD is expressed as dose per unit body weight per unit time (mg/kg/day).

6.4.2 Carcinogenic Slope Factors

CSFs are used to estimate an upper bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen (USEPA, 1989). This factor is reported in units of proportion (of a population) affected per mg/kg/day and is derived through an assumed low-dosage, linear multistage model and an extrapolation from high to low dose-responses determined from animal studies. The slope factor represents the upper 95th percent confidence limit on the increased cancer risk from a lifetime exposure to an agent. CSFs can also be derived from USEPA promulgated unit risk values for air and/or water. CSFs derived from unit risks cannot, however, be applied to environmental media other than the medium considered in the unit risk estimate.

Slope factors are also accompanied by weight-of-evidence classifications, which designate the strength of the evidence that the COPC is a potential human carcinogen.

Quantitative indices of toxicity and USEPA weight-of-evidence classifications are presented in Table 6-5 for the identified COPCs.

The hierarchy (USEPA, 2003) for choosing these toxicity values was:

- Tier 1 - Integrated Risk Information System (IRIS) (USEPA, 2007)

- Tier 2 - USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) (database of values developed on a chemical-specific basis when requested by USEPA's Superfund program)
- Tier 3 – Other Toxicity Values (includes additional USEPA and non-USEPA sources of toxicity information)

IRIS is the generally preferred source of human health toxicity values. IRIS generally contains RfDs, Reference Concentrations (RfCs), CSFs, drinking water unit risk values, and inhalation unit risk values that have gone through a peer review and USEPA consensus review process. IRIS normally represents the official Agency scientific position regarding the toxicity of the chemicals based on the data available at the time of the review.

The second tier is USEPA's PPRTVs. Generally, PPRTVs are derived for one of two reasons. First, the Superfund Health Risk Technical Support Center (STSC) reviews the toxicity values in the Health Effects Assessment Summary Table (HEAST) (USEPA, 1997b), which is now a Tier 3 source. As the reviews are completed, those toxicity values will be removed from HEAST, and any new toxicity value developed in such a review becomes a PPRTV and placed in the PPRTV database. Second, Regional Superfund Offices may request a PPRTV for contaminants lacking a relevant IRIS value. The STSC uses the same methodologies for both situations.

The third tier includes other sources of information. These sources should provide toxicity information based on similar methods and procedures as those used for Tiers 1 and 2, contain values which are peer reviewed, are available to the public, and are transparent about the methods and processes used to develop the values. Tier 3 sources include, but are not limited to, the following:

- The California Environmental Protection Agency (Cal EPA) toxicity values;
- The Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels; and
- HEAST toxicity values.

6.4.3 Dermal Absorption Efficiency

The following discussion is presented to provide general information regarding the use of administered dose to estimate absorbed dose when assessing potential dermal exposures. Many of the RfDs and CSFs are derived from oral toxicological studies based on administered dose, and do not account for the amount of a substance that can penetrate exchange boundaries after contact (e.g., absorbed dose). As a result, there is very little information available regarding dermal toxicity criteria. Therefore, in order to account for a difference in toxicity between an administered dose and an absorbed dose, the RfDs and CSFs (that were based on an administered dose) were adjusted, as described by the USEPA (USEPA, 1989), using experimentally-derived oral absorption efficiencies. The adjustment for the oral RfD that would correspond to a dermally absorbed dose is represented by multiplying the RfD by an oral absorption efficiency. The adjustment for the oral CSF that would correspond to the dermally absorbed dose is represented by dividing the CSF by oral absorption efficiency. Recommended oral absorption efficiencies for those compounds/analytes with chemical-specific dermal absorption factors were obtained from RAGS Part E (USEPA, 2004) The oral absorption efficiencies were obtained from sources such as the National Center for Environmental Assessment (NCEA), IRIS, ATSDR toxicological profiles, toxicology publications, toxicology references, and USEPA Regional Offices. In some instances, published information is not available to determine the absorption efficiency. On these

occasions, adjustments to the toxicity value are not conducted (e.g., an absorption efficiency of 100% was assumed) (USEPA, 2004). It should be noted that the oral to dermal adjustment factors used in this baseline HHRA for SWMU 14 (presented in Table 6-5) were all 100 percent (i.e., none of the RfDs or CSFs required adjustment).

6.4.4 OnSite Johnson and Ettinger Model

Johnson and Ettinger (1991) introduced a screening-level model which incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from subsurface soils or groundwater into indoor spaces located directly above or in close proximity to the contaminant source. The Johnson and Ettinger model is a one-dimensional analytical solution to convective and diffusive vapor transport and provides an estimated attenuation coefficient relating the vapor concentration in the indoor space to the vapor concentration at the contaminant source. Inputs to the model include chemical properties of the contaminant, saturated and unsaturated zone soil properties, and structural properties of the building. The model was subsequently revised to incorporate the default values recommended in the USEPA OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway (Johnson and Ettinger, 2002).

The OnSite Johnson and Ettinger Model (on-line calculator) (http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.htm) implements the Johnson and Ettinger simplified model to evaluate the vapor intrusion pathway into buildings. This Johnson and Ettinger model replicates the implementation that the USEPA Office of Solid Waste and Emergency Response used in developing its draft vapor intrusion guidance, but includes a number of enhancements that are facilitated by web implementation, including temperature dependence of Henry's Law Constants and automatic sensitivity analysis of certain parameters. Results produced by the OnSite Johnson and Ettinger model may differ from ones obtained from other USEPA Johnson and Ettinger sources, but these differences are expected to be negligible.

The following site-specific parameters are used for SWMU 14, replacing the default parameters. An average temperature of 10°C was used. Depth to groundwater was input as 14.5 feet, which was obtained from temporary well 14TW01 (location of maximum concentrations of volatile groundwater COPCs). Although the soil at SWMU 14 is mostly clay, a soil type of sandy loam was input due to the limited selection of soil types for the OnSite model. The building type of slab-on-grade was input because it is unlikely for a building in this general location to have a basement. Exposure parameters for a RME residential scenario were input, specifically a 30 year exposure duration, 350 days/year exposure frequency, and an averaging time of 70 years for carcinogens. The chemical-specific properties were provided by the model.

6.5 Risk Characterization

The risk characterization combines the selected COPCs, the exposure assessment, and the toxicity assessment to produce a quantitative estimate of current and future potential human health risks associated with SWMU 14. Sections 6.5.1 and 6.5.2 discuss the USEPA methodologies used for quantifying and characterizing carcinogenic and noncarcinogenic human health risks. ILCRs and Hazard Indices (HIs) are calculated to characterize potential human health effects. These terms are defined in the sections that follow. ILCRs and HIs are estimated for current and future

receptors exposure scenarios that were identified in Section 6.3, and are discussed in Section 6.5.3.

6.5.1 Quantification and Characterization of Carcinogenic Risks

Quantitative risk calculations for potentially carcinogenic compounds estimate inferentially (versus probabilistically) the potential ILCR for an individual in a specified population. This unit of risk refers to a potential cancer risk that is above the background cancer risk in unexposed individuals. For example, an ILCR of 1 x 10^{-06} indicates that an exposed individual has an increased probability of one in one million of developing cancer subsequent to exposure, over the course of their lifetime.

The potential lifetime ILCR for an individual was estimated from the following relationship:

$$ILCR = \sum_{i=1}^{n} (CDI_i \, or DAD_i) \times CSF_i \qquad \text{(Equation 6-1)}$$

Where the CSF_i is expressed as $(mg/kg/day)^{-1}$ for compound i, and the CDI_i and DAD_i is expressed as mg/kg/day for compound i. Since the units of CSF are (mg chemical/kg body weight/day) $^{-1}$ and the units of intake or dose are mg chemical/kg body weight/day, the ILCR value is dimensionless. The aforementioned equation was derived assuming that cancer is a non-threshold process and that the potential excess risk level is proportional to the cumulative intake over a lifetime.

For quantitative estimation of risk, it is assumed that cancer risks from various exposure routes are additive. Estimated ILCR values will be compared to 1 x 10^{-06} to 1 x 10^{-04}, which represents the target risk range of ILCR values considered by the USEPA to represent an acceptable (i.e., de minimis) risk (USEPA, 1990).

6.5.2 Quantification and Characterization of Noncarcinogenic Risks

Noncarcinogenic compounds assume that a threshold toxicological effect exists. Therefore, the potential for noncarcinogenic effects are calculated by comparing (i.e., dividing) CDI_i and DAD_i levels with RfDs for each COPC.

Noncarcinogenic effects are estimated by calculating the HQ for individual chemicals and the HI for overall chemicals and pathways by the following equation:

$$HI = \sum_{i=1}^{n} HQ_i \qquad \text{(Equation 6-2)}$$

$$where: HQ_i = \frac{(CDI_i \, or DAD_i)}{RfD_i} \qquad \text{(Equation 6-3)}$$

An HQ is the ratio of the daily intake or absorbed dose to the reference dose. CDI_i is the chronic daily intake (mg/kg/day) of contaminant i; DAD_i is the dermally absorbed dose (mg/kg/day) of contaminant i, and RfD_i is the reference dose (mg/kg/day) of the contaminant i over a prolonged period of exposure. Since the units of RfD are mg/kg/day and the units of CDI/DAD are mg/kg/day, the HQ and HI are dimensionless. To account for the additivity of noncarcinogenic

risk following exposure to numerous chemicals, the HI, which is the sum of all the HQs, will be calculated. A ratio of 1.0 is used for comparison to the HQ and HI (USEPA, 1990). Ratios less than 1.0 indicate that adverse noncarcinogenic health effects are unlikely. Ratios greater than 1.0 indicate that adverse noncarcinogenic health effects may occur at that exposure level. However, this does not mean that adverse effects will definitely occur, since the RfD incorporates safety and modifying factors to ensure that it is well below that dose for which adverse effects have been observed. This procedure assumes that the risks from exposure to multiple chemicals are additive, an assumption that is probably valid for compounds that have the same target organ or cause the same toxic effect.

6.5.3 Potential Human Health Effects

Total site risks were estimated for current trespasser, current/future on-site workers, future residential, and future construction worker receptors. Total site risks were estimated for current/future on-site workers, future residents, and future construction workers using both RME and CT exposure scenarios. CT exposure scenarios were only evaluated if the RME scenario resulted in unacceptable risks. Current trespassers were evaluated for surface soil exposures. Current/future on-site workers were evaluated for surface soil and subsurface soil exposures. Future residents were evaluated for surface soil, subsurface soil, and groundwater exposures. Future construction workers were evaluated for surface soil, subsurface soil, and groundwater exposures.

The most significant carcinogenic and noncarcinogenic risks estimated were for the future resident adult and child receptors. Tables 6-6 through 6-15 present a break down of the total site risks by medium and pathway. Exceedences of USEPA acceptable risk criteria are represented by the shaded regions of the tables. All calculation spreadsheets used for estimating potential carcinogenic and noncarcinogenic risks for receptors are presented in Appendix G. RAGS Part D tables are presented in Appendix H.

There were no carcinogenic risks or adverse health hazards calculated that exceeded USEPA's acceptable criteria for the current adult and adolescent trespassers upon exposure to environmental media at SWMU 14. These results are presented in Tables 6-6 and 6-7.

6.5.3.1 Current/Future Adult On-Site Workers

As shown on Table 6-8, there were no carcinogenic risks calculated that exceeded USEPA's acceptable risk range of 1×10^{-06} to 1×10^{-04} for the current/future adult on-site worker. However, the total site HI for the on-site worker (3.4) under the RME scenario exceeded 1.0. Potential exposure to surface soil contributed approximately 55 percent to the total site HI. Ingestion of and dermal contact with vanadium in surface soil contributed primarily to the surface soil HI (1.9) for the on-site worker. Vanadium concentrations in the surface soil contributed approximately 92 percent to the surface soil HI for the on-site worker. Potential exposure to subsurface soil contributed approximately 45 percent to the total site HI. Similar to the surface soil exposure pathways, ingestion of and dermal contact with vanadium in the subsurface soil contributed primarily to the subsurface soil HI (1.5). Vanadium concentrations in the subsurface soil contributed approximately 95 percent to the subsurface soil HI for the on-site worker. As presented on Table 6-8, the gastrointestinal system target organ HI value (3.2) and the kidney target organ HI value (3.2) both exceeded 1.0. As presented on Table 6-9, the total site HI calculated under the CT exposure scenario for the on-site worker was 2.4. According to USEPA

guidance, the HI values greater than 1.0 indicate cumulative adverse health effects may occur for this receptor from exposure to surface and subsurface soil at SWMU 14.

As discussed in the previous paragraph, vanadium was the primary contributor to the unacceptable HI for the on-site worker. It is important to note that vanadium is present in high concentrations in the background soil data collected for NAPR. Tables 6-1 and 6-2 show that the detected concentrations of vanadium in subsurface soil samples collected from SWMU 14 were less than the background screening concentration (ULM). Further, the 95% UCL value for vanadium used as the exposure concentration in SWMU-related subsurface soil in the calculation of risk was also less than the background screening concentration. Therefore, it follows that a quantitative HHRA conducted on the background soil data would likely yield unacceptable noncarcinogenic risk from vanadium.

6.5.3.2 Future Adult and Young Child Residents

As shown on Tables 6-10 and 6-12, there were carcinogenic risks calculated that exceed USEPA's acceptable risk range of 1×10^{-06} to 1×10^{-04} for the future adult and young child resident. The total site ILCR for the adult resident was 8.2×10^{-04}, and the total site ILCR for the child resident was 5.0×10^{-04}. It follows that the total lifetime ILCR also exceeds 1×10^{-04}. Potential exposure to groundwater contributed approximately 94 percent to the total site ILCR for the adult resident and approximately 79 percent to the total site ILCR for the child resident. The exceedence of the total site ILCRs for the residents was primarily driven by the presence of benzene and carcinogenic PAHs (specifically, benzo[a]pyrene and dibenz[a,h]anthracene) in groundwater.

The total site HI for the residential adult (7.6) under the RME scenario exceeded 1.0. Potential exposure to groundwater contributed approximately 70 percent to the total site HI; while surface soil and subsurface soil contributed approximately 16 and 13 percent, respectively. Ingestion and inhalation of groundwater COPCs contributed primarily to the groundwater HI (5.3) for the residential adult. Benzene and vanadium concentrations in the groundwater contributed approximately 32 percent and 44 percent, respectively, to the groundwater HI for the future adult resident. The surface soil HI (1.3) also exceeded 1.0. Ingestion of and dermal contact with vanadium concentrations in surface soil contributed primarily to this exceedence. As presented on Table 6-10, the gastrointestinal system target organ HI value (4.5) and the kidney target organ value (4.5) exceeded 1.0. As shown in Table 6-11, the total site HI calculated under the CT exposure scenario for the future adult resident was 3.2. According to USEPA guidance, the HI values greater than 1.0 indicate cumulative adverse health effects may occur for this receptor from exposure to groundwater and soil at SWMU 14.

As shown on Table 6-12, the total site HI for the residential child receptor (28) under the RME exposure scenario exceeded 1.0. Potential exposure to groundwater contributed approximately 38 percent to the total site HI; while surface soil and subsurface soil contributed approximately 34 and 28 percent, respectively. Ingestion of groundwater COPCs contributed primarily to the groundwater HI (10.6) for the residential child. Benzene and vanadium concentrations in the groundwater contributed approximately 32 percent and 44 percent, respectively, to the groundwater HI for the future child resident. The surface soil and subsurface soil HIs (9.6 and 7.9, respectively) also exceeded 1.0. Ingestion of and dermal contact with vanadium concentrations in surface soil and subsurface soil contributed primarily to these exceedences. As presented on Table 6-12, the gastrointestinal system target organ HI value (22) and the kidney target organ value (22) exceeded 1.0. As shown in Table 6-13, the total site HI calculated under the CT exposure scenario for the future child resident was 13.5. According to USEPA guidance,

the HI values greater than 1.0 indicate cumulative adverse health effects may occur for this receptor from exposure to groundwater and soil at SWMU 14.

Similar to the on-site worker receptor scenario, vanadium was the primary contributor to the unacceptable HI for the future residents. It is important to note that vanadium is present in high concentrations in the background soil and groundwater data collected for NAPR. Tables 6-1 through 6-3 show that the detected concentrations of vanadium in subsurface soil and groundwater samples collected from SWMU 14 were less than their respective background screening concentrations. Further, the 95% UCL value for vanadium used as the exposure concentration in SWMU-related subsurface soil in the calculation of risk was also less than the background screening concentration. The maximum detected vanadium concentration in groundwater used as the exposure concentration was less than background (see Table 6-3). Therefore, it follows that a quantitative HHRA conducted on the background soil and groundwater data would likely yield unacceptable noncarcinogenic risk from vanadium.

The OnSite Johnson and Ettinger model (http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.htm) was used to estimate potential exposure to groundwater contaminants via vapor intrusion to indoor air. The groundwater COPCs benzene and 1,2-dichloroethane were evaluated using the model. Iodomethane was not evaluated due to lack of toxicity criteria. The results of the model are presented in Appendix G. As shown on the Indoor Air Simulation Results pages, there were no unacceptable carcinogenic risks calculated for exposure to either benzene (best estimate cancer risk = 1.44×10^{-05}) or 1,2-dichloroethane (best estimate cancer risk = 2.59×10^{-07}) in indoor air. Furthermore, these results would not significantly impact the total site risks for the future residents.

6.5.3.3 Future Construction Worker

As shown on Table 6-14, there were no carcinogenic risks calculated that exceeded USEPA's acceptable risk range of 1×10^{-06} to 1×10^{-04} for the future construction worker. However, the total site HI for the construction worker (4.1) under the RME scenario exceeded 1.0. Potential exposure to surface soil contributed approximately 46 percent to the total site HI. Ingestion of and dermal contact with vanadium in surface soil contributed primarily to the surface soil HI (1.9) for the construction worker. Vanadium concentrations in the surface soil contributed approximately 90 percent to the surface soil HI for the construction worker. Potential exposure to subsurface soil contributed approximately 38 percent to the total site HI. Similar to the surface soil exposure pathways, ingestion of and dermal contact with vanadium in the subsurface soil contributed primarily to the subsurface soil HI (1.5). Vanadium concentrations in the subsurface soil contributed approximately 93 percent to the subsurface soil HI for the construction worker. As presented on Table 6-14, the gastrointestinal system target organ HI value (3.6) and the kidney target organ HI value (3.6) both exceeded 1.0. Potential exposure to groundwater contributed approximately 16 percent to the total site HI. Vanadium concentrations in the groundwater contributed approximately 90 percent to the groundwater HI for the construction worker (dermal exposure pathway only). As presented on Table 6-15, the total site HI calculated under the CT exposure scenario for the on-site worker was 1.5. According to USEPA guidance, the HI values greater than 1.0 indicate cumulative adverse health effects may occur for this receptor from exposure to surface and subsurface soil at SWMU 14.

Similar to the other receptor scenarios, vanadium was the primary contributor to the unacceptable HI for the future construction worker. As previously noted, vanadium is present in high concentrations in the background soil and groundwater data collected for NAPR. Tables 6-1 through 6-3 show that the detected concentrations of vanadium in subsurface soil and

groundwater samples collected from SWMU 14 were less than their respective background screening concentrations. Further, the 95% UCL value for vanadium used as the exposure concentration in SWMU-related subsurface soil in the calculation of risk was also less than the background screening concentration. The maximum detected vanadium concentration in groundwater used as the exposure concentration was less than background (see Table 6-3). Therefore, it follows that a quantitative HHRA conducted on the background soil and groundwater data would likely yield unacceptable noncarcinogenic risk from vanadium.

6.6 Sources of Uncertainty

Uncertainties are encountered throughout the risk assessment process. This section discusses the sources of uncertainty inherent in the following elements of the HHRA performed for SWMU 14:

- Sampling and analysis
- Selection of COPCs
- Exposure assessment
- Toxicity assessment
- Risk characterization

Table 6-16 summarizes the potential effects of certain uncertainties on the estimation of human health risks. Uncertainties associated with this risk assessment are discussed in the following paragraphs.

6.6.1 Sampling and Analysis

The development of a risk assessment depends on the reliability of, and uncertainties associated with, the analytical data available to the risk assessor. These, in turn, are dependent on the operating procedures and techniques applied to the collection of environmental samples in the field and their subsequent analyses in the laboratory. To minimize the uncertainties associated with sampling and analysis at SWMU 14, USEPA-approved sampling and analytical methods were employed. Data was generated following USEPA's Statement of Work for the Contract Laboratory Program (CLP). Samples were analyzed for full Target Compound List (TCL) and Target Analyte List (TAL) analyses as well as cyanide. Samples were taken from locations specified in the approved Work Plan along with the necessary QA/QC samples. The data were validated and found to meet the data quality objectives and all validation criteria.

Analytical data are limited by the precision and accuracy of the methods of analysis, which are reflected by the RPD of duplicate analyses and the percent recovery of spikes, respectively. In addition, the statistical methods used to compile and analyze the data (mean concentrations, detection frequencies) are subject to the overall uncertainty in data measurement. Furthermore, chemical concentrations in environmental media fluctuate over time and with respect to sampling location. Analytical data must be sufficient to consider the temporal and spatial characteristics of contamination at the site with respect to exposure.

Uncertainty exists also in the fact that contamination may or may not be fully delineated. And so, having a complete data set impacts the representativeness of exposure concentrations derived from the data.

6.6.2 Selection of COPCs

Soil and groundwater water COPCs were selected based on comparisons of the maximum detected concentration with USEPA Region III RBCs for residential soil (soil) and tap water (groundwater).

RBCs were derived using conservative, USEPA-promulgated default values, and the most recent toxicological criteria available. In accordance with Region III Chemicals of Concern Screening Guidance (USEPA, 1993a), all noncarcinogenic RBCs were divided by 10 to account for potential additive effects. This adjustment corresponds to assuming an HQ of 0.1, rather than 1.0. This adds additional conservatism to the COPC selection process.

RfDs and CSFs have been combined with "standard" exposure scenarios to calculate the RBCs. Actual exposure scenarios and parameters may differ from those used to calculate the RBC.

NSRR underwent operational closure on March 31, 2004. On April 1, 2004, NSRR was re-designated as NAPR. The current primary mission of NAPR is to protect the physical assets remaining, comply with environmental regulations, and sustain the value of the property until final disposal of the property. It is assumed that long-term plans for the facility would be similar to those that had been in place prior to closure with land use also generally the same. Therefore, the application of the residential RBC values to soil and groundwater COPC selections provide a list of COPCs that are very conservative for NAPR and specifically, SWMU 14. Conservative COPC selections in the baseline HHRA protect public health because the results of the baseline HHRA determine remedial alternatives and remedial action objectives should they be warranted.

6.6.3 Exposure Assessment

In performing exposure assessments, uncertainties arise from two main sources. First, uncertainties arise in estimating the fate of a compound in the environment, including estimating release and transport in a particular environmental medium. Second, uncertainties arise in the estimation of chemical intakes resulting from contact by a receptor with a particular medium.

To estimate an intake, certain assumptions must be made about exposure events, exposure durations, and the corresponding assimilation of constituents by the receptor. Exposure parameters have been generated by the scientific community and have been reviewed by the USEPA. The USEPA has published an Exposure Factors Handbook (USEPA, 1997a), which contains the best and latest values. These exposure parameters have been derived from a range of values generated by studies of limited numbers of individuals. It is assumed that all potential receptors remain on or near the site throughout the exposure periods and that their exposures to chemicals from the site are all uniform. In all instances, values used in this risk assessment, scientific judgments, and conservative assumptions agree with those of the USEPA.

The use of a RME approach, designed to avoid underestimating daily intakes, was employed throughout this risk assessment. The use of 95% UCL estimates of the arithmetic mean versus maximum values as the concentration term in estimating the CDI or DAD for soil and groundwater exposure scenarios reduces the potential for underestimating exposure.

6.6.4 Toxicological Assessment

In making quantitative estimates of the toxicity of varying dosages of compounds to human receptors, uncertainties arise from two sources. First, data on human exposure and the subsequent effects are usually insufficient, if they are at all available. Human exposure data usually lack adequate concentration estimations and suffer from inherent temporal variability. Therefore, animal studies are often used and new uncertainties arise from the process of extrapolating animal results to humans. Second, to obtain observable effects with a manageable number of experimental subjects, high doses of a compound are often used. In this situation, a high dose means that high exposures are used in the experiment with respect to most environmental exposures. Therefore, when applying the results of the animal experiment to human exposures, the effects at the high doses must be extrapolated to approximate effects at lower doses.

In extrapolating effects from high doses in animals to low doses in humans, scientific judgment and conservative assumptions are employed. In selecting animal studies for use in dose-response calculations, the following factors are considered:

- Studies are preferred where the animal closely mimics human pharmacokinetics.
- Studies are preferred where dose intake most closely mimics the intake route and duration for humans.
- Studies are preferred which demonstrate the most sensitive response to the compound in question.

For compounds believed to cause threshold effects (i.e., noncarcinogens), safety factors are employed in the extrapolation of effects from animals to humans and from high doses to low doses. In deriving carcinogenic potency factors, the 95% UCL value is promulgated by the USEPA to prevent underestimation of potential risk.

All potential toxic endpoints for human receptors have been addressed to the extent allowed by the data evaluated from the most recent toxicological/epidemiological studies used to derive the cancer slope factors and reference doses. Therefore, any uncertainties associated with toxic endpoints are directly correlated to the information obtained from, and reliability of those studies.

TPH was detected in soil and groundwater and retained as COPCs because there were no screening criteria for those chemicals. Currently there are no toxicity criteria for TPH. Therefore, potential risk posed by TPH was not quantified in the baseline HHRA. Some toxicity data and cancer assessments are available for whole, unweathered petroleum products. However, there are uncertainties associated with the use of this information because the composition of each type of petroleum product is variable depending on the crude oil from which it was refined, differences in the refining process, and differences in the formulation of the final product. Further this would apply only if one knows what petroleum product was released. In many cases, the released material is not known or more than one product may have been released and toxicity data for the whole petroleum products that are relatively heterogeneous are not necessarily applicable to the fractions to which exposures actually occur. Additionally, it is believed that the TPH present at NAPR represents a highly weathered fraction further indicating the inapplicability of using toxicity data for whole petroleum products to quantify risk.

2-Hexanone in surface soil and iodomethane in groundwater were also retained as COPCs because there were no screening criteria for those chemicals. There were also no toxicity criteria with which to quantitatively evaluate potential exposure to these chemicals. However, it is not likely that this would underestimate risk because the majority of COPCs have very conservative toxicity criteria and were evaluated quantitatively. Furthermore, this HHRA uses conservative exposure parameters to quantitatively evaluate potential exposure to site-related COPCs.

The OnSite Johnson and Ettinger model (http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.htm) was used to estimate risk to future residential receptors from volatile groundwater COPCs via vapor intrusion to indoor air. However, it is important to note that the model is a screening-level model with gross assumptions about complex chemical and physical processes. While research exists on the sensitivity of the Johnson and Ettinger model to individual parameter uncertainty, little published information is available on the combined effects of multiple uncertain parameters and their effect on screening decisions. These assumptions and uncertainties related to individual parameters used in the model cause the results to be highly uncertain. However, due to the overall conservative nature of the HHRA, it is not expected that this would significantly underestimate total risk.

6.6.5 Human Risk Characterization

The risk characterization bridges the gap between potential exposure and the possibility of systemic or carcinogenic human health effects, ultimately providing impetus for the remediation of the site or providing a basis for no remedial action.

Uncertainties associated with risk characterization include the assumption of chemical additivity and the inability to predict synergistic or antagonistic interactions between COPCs. These uncertainties are inherent in any inferential risk assessment. USEPA promulgated inputs to the quantitative risk assessment and toxicological indices are calculated to be protective of the human receptor and to err conservatively, so as to not underestimate the potential human health risks.

6.7 Summary and Conclusions of the Baseline HHRA

Total site risks were estimated for current and future human receptors. Current trespassers were evaluated for surface soil exposures. Current/future on-site workers were evaluated for surface soil and subsurface soil exposures. Future residents were evaluated for surface soil, subsurface soil and groundwater exposures. Future construction workers were evaluated for surface soil, subsurface soil, and groundwater (dermal only) exposures.

The most significant carcinogenic risks and noncarcinogenic health hazards estimated were for the future resident adult and child receptors. Noncarcinogenic health hazards were also estimated for the current/future on-site worker, and future construction worker. There were no carcinogenic risks or adverse health hazards calculated that exceeded USEPA's acceptable criteria for the current adult and adolescent trespassers upon exposure to environmental media at SWMU 14.

Current/Future Adult On-Site Worker

There were no carcinogenic risks calculated that exceeded USEPA's acceptable risk range of 1×10^{-06} to 1×10^{-04} for the current/future adult on-site worker. The total site HI for the on-site worker (3.4) under the RME scenario exceeded 1.0. Potential exposure to vanadium in surface soil and subsurface soil contributed primarily to the surface soil HI. As a result, the

gastrointestinal system target organ HI value and the kidney target organ HI value both exceeded 1.0. Also, the total site HI calculated under the CT exposure scenario exceeded 1.0.

Future Adult and Young Child Residents

There were carcinogenic risks calculated that exceed USEPA's acceptable risk range of 1×10^{-06} to 1×10^{-04} for the future adult and young child resident. The total site ILCR for the adult resident was 8.2×10^{-04}, and the total site ILCR for the child resident was 5.0×10^{-04}. It follows that the total lifetime ILCR also exceeds 1×10^{-04}. Potential exposure to groundwater contributed predominately to the total site ILCR for the adult and child resident. The exceedence of the total site ILCRs for the residents was primarily driven by the presence of benzene and carcinogenic PAHs (specifically, benzo[a]pyrene and dibenz[a,h]anthracene) in groundwater.

The total site HI for the residential adult (7.6) and child (28) receptors under the RME scenario exceeded 1.0. Potential exposure (via ingestion and inhalation pathways) to benzene and vanadium concentrations in the groundwater, as well as ingestion of and dermal contact with vanadium concentrations in surface and subsurface soil contributed primarily to this exceedence. The gastrointestinal system target organ HI values and the kidney target organ values exceeded 1.0 for both adult and child residents. Also, the total site HIs calculated under the CT exposure scenarios exceeded 1.0.

Future Construction Worker

There were no carcinogenic risks calculated that exceeded USEPA's acceptable risk range of 1×10^{-06} to 1×10^{-04} for the future construction worker. The total site HI for the construction worker (4.1) under the RME scenario exceeded 1.0. Potential exposure to vanadium in surface soil and subsurface soil contributed primarily to the surface soil HI. As a result, the gastrointestinal system target organ HI value and the kidney target organ HI value both exceeded 1.0. Also, the total site HI calculated under the CT exposure scenario exceeded 1.0.

USEPA guidance states that HI values greater than 1.0 indicate cumulative adverse health effects may occur. As discussed in the previous paragraphs, vanadium in the soil and groundwater pose potential unacceptable noncarcinogenic health hazards to all receptors. However, it is important to note that vanadium is present in high concentrations in the background soil and groundwater data collected for NAPR. The detected concentrations of vanadium in subsurface soil and groundwater samples collected from SWMU 14 were less than their respective background screening concentrations (ULM). Further, the 95% UCL value for vanadium used as the exposure concentrations in SWMU-related subsurface soil in the calculation of risk was also less than background. Therefore, it follows that a quantitative HHRA conducted on the background soil and groundwater data would likely yield unacceptable noncarcinogenic risk from vanadium. Therefore, while vanadium remains a COPC, based on comparison with NAPR background data, it is recommended that vanadium concentrations in SWMU-related soil and groundwater be further evaluated to determine if they are statistically from the same population as background. Additionally, the HHRA indicates unacceptable carcinogenic risk to future residents from benzene and carcinogenic PAHs in the groundwater. Benzene in the groundwater also poses potential unacceptable noncarcinogenic health hazards to future residents.

6.8 HHRA References

Baker, 2006. Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds, RCRA/HSWA Permit No. PR2170027203, Naval Activity Puerto Rico, Ceiba, Puerto Rico. October 2006.

Baker, 1996. Draft RCRA Facility Investigation for Phase I Investigations at Operable Units 1, 6, and 7, Naval Station Roosevelt Roads, Ceiba, Puerto Rico.

Johnson and Ettinger, 2002. Johnson, P. C., R. A. Ettinger, J. Kurtz, R. Bryan , and J. E. Kester. 2002. Migration of Soil Gas Vapors to Indoor Air: Determining Vapor Attenuation Factors Using a Screening-Level Model and Field Data from the CDOT-MTL Denver, Colorado. Technical Task Force Bulletin No. 16, American Petroleum Institute. April.

Johnson and Ettinger, 1991. Johnson, P. C, and R. A. Ettinger. 1991. Heuristic model for predicting the intrusion rate of contaminant vapors in buildings. Environ. Sci. Technol. 25: 1445-1452.

Naval Energy and Environmental Support Activity (NEESA). 1984. Initial Assessment Study of Naval Station Roosevelt Roads, Puerto Rico. NEESA 13-051.

USEPA, 2007. Integrated Risk Information System. Environmental Criteria and Assessment Office, Cincinnati, Ohio. http://www.epa.gov/iris/index.html.

USEPA, 2006. EPA Region III Risk-Based Concentration Table, Revised October 2006. Philadelphia, Pennsylvania: Hazardous Waste Management Division Office of Superfund Programs.

USEPA, 2004. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual Part E Supplemental Guidance for Dermal Risk Assessment. Interim. Final. Office of Emergency and Remedial Response. Washington, DC. July 2004. EPA 540/R/99/005.

USEPA, 2003. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. December 5, 2003.

USEPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-010. December 2002.

USEPA, 2001a. Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manuel (Part D, Standardizing Planning, Reporting, and Review of Superfund Risk Assessments), Interim. Office of Emergency and Remedial Response. Publication 9285.7-01D. December 2001.

USEPA, 2001b. ProUCL-Version 3.0. [software for Windows 95, accompanied by "ProUCL User's Guide."] Prepared for USEPA by Lockheed Martin.

USEPA, 1997a. Exposure Factors Handbook. Office of Research and Development. Washington, D.C. August 1997. EPA/600/P-95/002F.

USEPA, 1997b. Health Effects Summary Tables FY 1997. Office of Solid Waste and Emergency Response, Washington, D.C. May 1995. OERR 9200.6-303(95-1).

USEPA, 1995. Assessing Dermal Exposure from Soil. Hazardous Waste Management Division, Office of Superfund Programs. Region III, Philadelphia, Pennsylvania. December 1995.

USEPA, 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive No. 9355.4-12. Office of Emergency and Remedial Response, Washington, D.C. EPA/540/F-94/043, PB94-963282.

USEPA, 1993a. Selecting Exposure Routes and Contaminant of Concern by Risk-Based Screening, Region III Technical Guidance Manual. Region III, Philadelphia, Pennsylvania. January 1993. EPA/903/R-93-001.

USEPA, 1993b. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Draft. Washington, D.C. November 4, 1993.

USEPA, 1992. Dermal Exposure Assessment: Principles and Applications. Interim. Office of Research and Development. Washington, D.C. January 1992. EPA/600/8-91/011B.

USEPA, 1991. Risk Assessment Guidance for Superfund Volume I. Human Health Evaluation Manual Supplemental Guidance: "Standard Default Exposure Factors" Interim Final. Office Solid Waste and Emergency Response. Washington, D.C. March 25, 1991. OSWER Directive 9285.6-03.

USEPA, 1990. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule. Federal Register, 40 Code of Federal Regulations Part 300, March 8, 1990.

USEPA, 1989. Risk Assessment Guidance for Superfund Volume I. Human Health Evaluation Manual (Part A) Interim Final. Office of Solid Waste and Emergency Response. Washington, D.C. December 1989. EPA/540/1-89-002.

7.0 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

This section presents a screening-level ERA for SWMU 14. The screening-level ERA integrates and evaluates analytical data generated during the Phase I RFI conducted in 1996 (Baker, 1996) with analytical data generated during the 2006 RFI (see Sections 4.0 and 5.0).

The screening-level ERA was conducted in accordance with the Chief of Naval Operations (CNO) document entitled Navy Policy for Conducting Ecological Risk Assessments (CNO, 1999). The Navy ERA process (see Figure 7-1) consists of eight steps organized into three tiers and represents a clarification and interpretation of the eight-step ERA process outlined in the USEPA ERA guidance for the Superfund program (USEPA, 1997). Tier 1 of the Navy ERA process represents the screening-level ERA:

- Screening-level problem formulation and ecological effects evaluation (Step 1).
- Screening-level exposure estimate and risk calculation (Step 2).

Under Navy policy (CNO, 1999), if the results of Steps 1 and 2 (Tier 1 screening-level ERA) indicate that, based on a set of conservative exposure assumptions, there are chemicals present in environmental media that may present a risk to receptor species/communities, the ERA process proceeds to the baseline ERA. According to Superfund guidance (USEPA, 1997), Step 3 represents the problem formulation phase of the baseline ERA. Under Navy policy, the baseline ERA is defined as Tier 2, and the first activity under Tier 2 is Step 3a. In Step 3a, the conservative exposure assumptions applied in Tier 1 are refined and risk estimates are recalculated using the same conceptual site model. The evaluation of risks in Step 3a may also include consideration of background data, chemical bioavailability, and the frequency of detection. If the re-evaluation of the conservative exposure assumptions does not support an acceptable risk determination, the site continues through the baseline ERA process (Step 3b baseline ERA problem formulation).

The Revised Final RFI Work Plan (Baker, 2006) outlined the approach for conducting the ERA at SWMU 14. The risk assessment process for SWMU 14 was to include Step 3a of the Navy ERA process (refinement of conservative exposure assumptions). However, during preparation of the screening-level problem formulation, a data gap was identified which prevented an estimation of risk in the Step 2 screening-level risk calculation for certain potentially complete exposure pathways. Specifically, a potential migration pathway from a source of contamination to relevant abiotic media (surface water and/or sediment) was not addressed by the 1996 and 2006 RFIs. Screening-level risk estimates are provided for those exposure pathways with adequate analytical data on which to base a risk estimate (media-pathway-receptor combinations involving surface and subsurface soil). However, additional data are necessary to determine if exposure pathways involving surface water and sediment are complete. For this reason, the ERA process was terminated after Step 2 (screening-level exposure estimate and risk calculation) with a recommendation for the collection of additional data. A decision for media-pathway-receptor combinations evaluated by this screening-level ERA is also provided (i.e., no further action is warranted or further evaluation is warranted in Step 3a of the Navy ERA process).

7.1 Environmental Setting

The sections that follow provide a brief description of SWMU 14. The habitats occurring within and contiguous to SWMU 14 are also described, as well as the biota that may be present. The description of habitats and biota relies primarily on literature-based information for Puerto Rico and NAPR.

7.1.1 Site Location and History

Refer to Section 2.2 "SWMU 14 Description and History" for a discussion of the site location and historical site use. Sections 7.1.2 and 7.1.3 below discusses the ecological setting - terrestrial and aquatic habitats, as well as biota - for the site.

7.1.2 Terrestrial and Aquatic Habitats

A description of terrestrial and marine habitats within and contiguous to SWMU 14 is provided in the sections that follow. As discussed in Section 7.1, the description of vegetative habitat units is based primarily on literature-based information for Puerto Rico and NAPR.

7.1.2.1 Terrestrial Habitats

The upland habitat bounded by NAPR is classified as subtropical dry forest (Ewel and Witmore, 1973). Similar to other forested areas of Puerto Rico, this region was previously clear-cut in the early part of the century, primarily for pastureland (Geo-Marine, Inc., 1998). After acquisition by the Navy, a secondary growth of thick scrub, dominated by lead tree (*Leucaena spp.*), Christmas tree (*Randia aculeate*), sweet acacia (*Acacia famesiana*), and Australian corkwood (*Sesbania grandiflora*) grew in the previously grazed sections (Geo-Marine, Inc., 1998). Secondary growth communities (upland coastal forest communities and coastal scrub forest communities) exist today throughout the station's undeveloped upland. The upland vegetative community at SWMU 14 consists of maintained grasses of unknown species composition (likely to include *Bothriochloa ischaemum*, *Chloris barbata*, and *Digitaria* sp. based on maintained grasses identified during a habitat characterization conducted at SWMU 45 in May 2000 (Geo-Marine, Inc., 2000). In addition to the maintained grasses, coastal scrub forest communities are located north and west of SWMU 14 (see Figure 7-2). Identical to the maintained grassy areas within SWMU 14, the species composition of these communities are not known. However, vegetation identified within coastal scrub communities elsewhere at NAPR have included lead tree, almacigo (*Bursa simaruba*), Christmas tree, oxhorn bucida (*Bucida buceras*), basket wiss (*Trichostigma octandrum*), common guayaba (*Psidium guajava*), and *Panicum maximum* (no common name) (Geo-Marine, Inc., 2000). Many of these species are likely present with the coastal scrub forest communities contiguous to SWMU 14.

Cobana negra (*Stahlia monosperma*), a federally threatened tree species, is known to occur between the boundary of black mangrove communities and coastal upland forest communities. This species is also known to occur in coastal forests of southeastern Puerto Rico (Little and Wadsworth, 1964). A single individual has been reported at NAPR. Although the location of the sighting was not documented, NAPR personnel believe the tree is located within the upland coastal forest community behind the former Navy Exchange store, approximately 1.1 miles south of SWMU 14).

7.1.2.2 Aquatic Habitats

The marine environment surrounding NAPR includes mudflats, mangroves (black mangrove [*Avicenia germinans*] and red mangrove [*Rhizophora mangle*] communities), and seagrass beds (turtle grass [*Thalassia testudium*] and manatee grass [*Syringodium filliforme*]). The total area of mudflats, mangroves, and sea grass beds in the offshore environment is approximately 161 acres, 2,700 acres, and 1,900 acres, respectively (Geo-Marine, Inc., 1998). Coral reefs are also located in the offshore marine environment. Seagrass beds represent grazing areas for the green sea turtle (*Chelonia mydas*) and the West Indian manatee (*Trichechas manatus*). The green sea turtle is a federally threatened species, and the West Indian manatee is a federally endangered species. Both species have been reported from the marine environment surrounding NAPR.

The nearest marine habitat downgradient from SWMU 14 is the Ensenada Honda (approximately 1.3 miles southeast of SWMU 14). A map showing the spatial relationship of SWMU 14 to the Ensenada Honda is provided as Figure 7-3. Included on this figure are freshwater and marine wetland units identified by the Cowardin Wetland Classification System (Cowardin et al., 1979 [see Figure 7-4]). The wetlands depicted on Figure 7-3 were delineated by Geo-Marine, Inc. in December 1999 from 1993 color infrared and 1998 true color aerial photography. Twenty percent of the wetlands delineated by aerial photography were field checked to verify the accuracy of the delineations. Field verification was based on the 1987 Corps of Engineers wetland delineation manual (United States Army Corps of Engineers [USACE], 1987). As evidenced by Figure 7-3, there are no freshwater wetland units within or immediately contiguous to SWMU 14. However, as discussed in Section 7.1.1, the drainage ditch historically connected to the original fire pit (via a swale) terminates within a freshwater wetland unit classified as palustrine emergent persistent (PEM1) by the Cowardin Wetland Classification System (Cowardin et al., 1979). This ditch also receives drainage from two PEM1 wetland units located west of SWMU 14 (beyond the coastal scrub forest community discussed in Section 7.1.2.1 above) and several drop inlets located between the airfield runway and taxiway. Additional PEM1 wetland units also exist south of SWMU 14 and the airfield taxiway and runway. The species composition of these PEM1 wetland units is not known. The only wetland unit hydraulically connected to SWMU 14 is the PEM1 wetland unit that receives drainage from the ditch historically connected to the old fire training pit.

7.1.3 Biota

A description of the biota occurring within Puerto Rico and the landmass encompassed by NAPR is provided in the sections that follow.

7.1.3.1 Mammals

A total of 22 terrestrial mammal species are known historically from Puerto Rico; however, all mammals except bats (13 species) have been extirpated (United States Geological Survey [USGS], 1999). None of the bats found on Puerto Rico are exclusive to the island. The specific bat species known to occur on Puerto Rico are listed below:

- Fruit-eating bats: Jamaican fruit bat (*Artibeus jamaicensis*), Antillean fruit bat (*Brachyphylla cavernarum*), and red fig-eating bat (*Stenoderma rufum*)
- Nectivorous bats: brown flower bat (*Erophylla sezekoni bombifrons*) and greater Antillean long-tounged bat (*Monophyllus redmani*)
- Insectivorous bats: Antillean ghost-faced bat (*Mormoops blainvillii*), Parnell's mustached bat (*Pteronotus parnellii*), sooty mustached bat (*Pteronotus quadridens*), big brown bat

(*Eptesicus fuscus*), red bat (*Lasiurus borealis*), velvety free-tailed bat (*Molossus molossus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*)

- Piscivorous bats: Mexican bulldog bat (*Noctilio leporinus*)

The West Indian manatee is known to occur in the marine environment surrounding NAPR. As depicted on Figure 7-2, sea grass beds are located throughout much of the shallow water habitat within the Ensenada Honda and the marine environment surrounding NAPR. Their locations represent potential feeding habitat for this marine mammal.

Several mammals have been introduced into Puerto Rico, including the black rat (*Rattus rattus*), Norway rat (*Rattus norvegicus*), and mongoose (*Herpestes javanicus*). These nonindigenous mammals have been implicated in the decline of native bird and reptile populations (USGS, 1999 and United States Fish and Wildlife Service [USFWS], 1996).

7.1.3.2 Birds

A total of 239 bird species are native to Puerto Rico (Raffaele, 1989). This total includes breeding permanent residents and non-breeding migrants. In addition, many nonindigenous bird species have been introduced to Puerto Rico, including the shiny cowbird (*Molothrus bonariensis*) and several parrot species, such as the budgerigar (*Melopsittacus undulates*), orange-fronted parrot (*Aratinga canicularis*), and monk parrot (*Myiopsitta monaqchus*). Of the 239 species native to Puerto Rico, 12 are endemic to the island (Raffaele, 1989).

Numerous native and migratory bird species have been reported at NAPR (Geo-Marine, Inc., 1998). A list of bird species reported at NAPR or having the potential to occur is provided in Table 7-1. The list, compiled from literature-based information pre-dating 1990, includes the great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), little blue heron (*Florida caerulea*), black-crowned night heron (*Nycticorax nycticorax*), belted kingfisher (*Ceryle alcyon*), spotted sandpiper (*Actitis macularia*), greater yellowlegs (*Tringa melanoleauca*), black-bellied plover (*Squatarola squatarola*), clapper rail (*Rallus longirostris*), Royal tern (*Thalasseus maximus*), sandwich tern (*Thalasseus sandvicensis*), least tern (*Stema albifrons*), yellow warbler (*Dendroica petechia*), palm warbler (*Dendroica palmarum*), prairie warbler (*Dendroica discolar*), magnolia warbler (*Dendrocia magnolia*), mourning dove (*Zenaida macroura*), red-legged thrush (*Mimocichla plumbea*), common nighthawk (*Chordeiles minor*), and red-tailed hawk (*Buteo jamaicensis*). Endemic species reported from NAPR include the Puerto Rican lizard cuckoo (*Saurothera vieilloti*), Puerto Rican flycatcher (*Myiarchus antillarum*), Puerto Rican woodpecker (*Malanerpes portoricensis*), Puerto Rican emerald (*Chlorostilbon maugaeus*), and yellow-shouldered blackbird (*Agelaius xanthomus*).

The yellow-shouldered blackbird is a federally endangered species. One of the principal reasons for the status of this species is attributed to parasitism by the nonindigenous shiny cowbird, which lays its eggs in blackbird nests and sometimes punctures the host's eggs (USFWS, 1983). Other factors contributing to the status of this species include nest predation by the introduced black rat, Norway rat, and mongoose, as well as habitat modification and destruction (USFWS, 1996). The entire land area of NAPR was declared critical habitat for the yellow-shouldered blackbird in 1976; however, a 1980 agreement with the USFWS exempted certain areas from this categorization (Geo-Marine, Inc., 1998). SWMU 14 is not located within the critical habitat designation. A study conducted by the Naval Facilities Engineering Command (NFESC, 1996) reported that the mangrove forests surrounding NAPR should be considered the most important nesting habitats for the yellow-shouldered blackbird. A survey conducted in July 2002 by the Puerto Rico Department of Natural Resources (PRDNR, 2002) reported fifteen yellow-

shouldered blackbirds (including five juveniles) at NAPR. At the time of the survey, the birds were using the structures at the NAPR airport for resting cover (the nearest airport structure is approximately 4,200 feet northeast of SWMU 14). Although nesting pairs were not observed (the survey was not conducted during the breeding season), the airport structures contained several inactive nests. The inactive nests and juvenile birds indicate that a small breeding population is present at NAPR. As discussed in Section 7.1.2.1, the vegetative community at SWMU 14 is limited to maintained grasses of unknown species composition. Because yellow-shouldered blackbirds are arboreal feeders that forage within the canopy and sub-canopy of trees (USFWS, 1996), they are not expected to forage within the available habitat at SWMU 14. Other federally listed bird species that have been reported at NAPR or have the potential to occur are the brown pelican (*Pelecanus occidentalis occidentalis*), roseate tern (*Sterna dougallii dougallii*), and the piping plover (*Charadrius melodus*) (Geo-Marine, Inc., 1998). Given their habitat preferences (aquatic) and prey preferences (fish or aquatic invertebrates), these species have little potential to occur at SWMU 14.

7.1.3.3 Reptiles and Amphibians

A total of 23 amphibians and 47 reptiles are known from Puerto Rico and the adjacent waters (USGS, 1999). Fifteen of the amphibians and 29 of the reptiles are endemic, while four amphibian species and three reptilian species have been introduced (USGS, 1999). Puerto Rico's native amphibian species include 16 species of tiny frogs commonly called coquis. On the coastal lowlands, almost all coqui species are arboreal. The only amphibians listed under provisions of the Endangered Species Act of 1973 are the Puerto Rican ridge-headed toad (*Peltophryene lemur*) and the golden coqui (*Eleutherodactylus jasperi*). Both species are listed as threatened. Distribution of the golden coqui is restricted to areas of dense bromeliad growth. All specimens to date have been collected from a small semicircular area of a 6-mile radius south of Cayey (approximately 30 miles southwest of NAPR), generally at elevations above 700 meters (USFWS, 1984). The Puerto Rican ridge-headed toad occurs at low elevations (below 200 meters) where there is exposed limestone or porous, well drained soil offering an abundance of fissures and cavities (USFWS, 1987). A single large population is known to exist from the southwest coast in Guánica Commonwealth Forest, and a small population is believed to survive on the north coast near Quebradillas, Arecibo, Barceloneta, Vega Baja, and Bayamón (USFWS, 1987). It has also been collected on the southeastern coastal plain near Coamo (USFWS, 1987). Given the habitat preferences and locations of known occurrences, these two species are not expected to occur at NAPR.

Puerto Rico's native reptilian species include 31 lizards, 8 snakes, 1 freshwater turtle, and 5 sea turtles (USGS, 1999). Of the five sea turtles, only the green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), and loggerhead sea turtle (*Dermochelys coriacea*) nest within Puerto Rico. These three sea turtles, as well as the leatherback sea turtle (*Caretta caretta*) and the Puerto Rican boa (*Epicrates inornatus*) represent the reptilian species listed under the provisions of the Endangered Species Act of 1973 (USGS, 1999). Given the presence of sea grass beds within the Ensenada Honda, this surface water body represents potential feeding habitat for the listed sea turtles. The Puerto Rican boa uses a variety of habitats but is most commonly found in karst forest habitats. Given the absence of karst forest habitat and the absence of any known occurrence of this species at or contiguous to SWMU 14, there is a low probability of occurrence for this species at the Fire Training Pit Area.

7.1.3.4 Fish and Aquatic Invertebrates

A diverse fish and invertebrate community can be found in the marine environment surrounding NAPR. This can be attributed to the varied habitats that include marine and estuarine open water habitat, mud flats, sea grass beds, and mangrove forests. The fish community is represented by stingrays, herrings, groupers, needlefish, mullets, barracudas, jacks, snappers, grunts, snooks, lizardfishes, parrotfishes, gobies, filefishes, wrasses, damselfishes, and butterflyfish (Geo-Marine, Inc., 1998). The benthic invertebrate community includes sponges, corals, anemones, sea cucumbers, sea stars, urchins, and crabs. Fish and invertebrate species inhabiting the freshwater habitats located on NAPR have not been documented in the literature.

7.2 Sources of Available Analytical Data

Sampling activites at SWMU 14 have previously been conducted under two separate investigations. A Phase I RFI was conducted in 1996, and consisted of a limited gas survey along the perimeter of the new/current fire training pit. A total of 50 sampling nodes were established and spaced along two concentric rings. The first ring was established three feet from the edge of

the concrete apron, while the second ring was established at a distance of 10 feet from the edge of the apron. Each ring contained 25 sampling nodes. Each sampling node (generated by driving a metal pin one to two feet into the ground) was screened by inserting the tip of a PID and recording the results. A total of five surface soil samples were collected at the locations which exhibited the highest PID readings. The five surface soil samples (designated 14SS01 through 14SS05) were analyzed for Appendix IX VOCs, SVOCs, PCBs, and TPH DRO and GRO. The Phase I RFI Report describing the findings of this investigation was submitted to the USEPA on July, 1, 1996 (Baker, 1996).

A second RFI was conducted in March 2006 and included the collection of four surface soil samples (designated 14SB01-00, 14SB02-00, 14SB03-00, and 14SB07-00; collected 0 to 1 foot bgs), fourteen subsurface soil samples (designated 14SB01-06, 14SB01-11, 14SB02-03, 14SB02-08, 14SB03-06, 14SB03-11, 14SB04-01, 14SB04-10, 14SB05-02, 14SB05-09, 14SB06-01, 14SB06-07, 14SB07-06, and 14SB07-08; collected at various depths ranging from 1.5 to 3.0 feet bgs to 21.0 to 23.0 feet bgs), and three groundwater samples (designated 14TW01, 14TW02, and 14TW07). Each surface soil, subsurface soil, and groundwater sample was analyzed for Appendix IX VOCs, SVOCs, and metals, as well as TPH DRO and GRO. Three subsurface soil samples (14, SB04-01, 14SB05-09, and 14SB06-07) also were analyzed for dioxins/firans. A description of the 2006 RFI and associated analytical data is presented in Sections 4.0 and 5.0 of this document, respectively.

Analytical data for soil samples collected from the surface to a depth of one-foot bgs during the 1996 and 2006 RFI were quantitatively evaluated as surface soil in this screening-level ERA. This depth range is the most active biological zone (most soil heterotrophic activity occurs within the surface soil and soil invertebrates occur on the surface or within the oxidized root zone [Suter II, 1995]). As discussed, subsurface soil samples were collected from various depth intervals during the 2006 RFI. Specific depth intervals sampled were 1.5 to 3.0 feet bgs, 3.5 to 5.0 feet bgs, 5.0 to 7.0 feet bgs, 11.0 to 13.0 feet bgs, 13.0 to 15.0 feet bgs, 15.0 to 17.0 feet bgs, 17.0 to 19.0 feet bgs, 19.0 to 21.0 feet bgs, and 21.0 to 23.0 feet bgs. Analytical data for soil samples collected from the 1.5 to 3.0-foot depth interval (14SB04-01 and 14SB06-01) were quantitatively evaluated as subsurface soil in this screening-level ERA. Analytical data for subsurface samples collected from deeper depth intervals were not evaluated since these depths are not likely to represent a significant exposure point for ecological receptors.

Analytical data for groundwater samples collected during the Supplemental and RFI field investigations were excluded from evaluation in this screening-level ERA for the following reasons:

- Groundwater does not represent an exposure point for ecological receptors.
- Depth to groundwater at the site ranges from 14.5 feet bgs (14TW01) to 17.4 feet bgs (14TW08). As such, groundwater expressions (e.g., seeps) are not likely present. Furthermore, based on the depth to groundwater, the various PEM1 wetland units contiguous to SWMU 14 do not likely represent groundwater discharge points.
- A likely discharge point for groundwater originating from the site is the Ensenada Honda, given that SWMU 14 is approximately 1.3 miles from the Ensenada Honda, any chemicals detected in groundwater would be expected to undergo significant attenuation prior to reaching this surface water body.

Surface soil and subsurface soil sampling locations are depicted on Figure 7-5.

7.3 Screening-Level Problem Formulation

Problem formulation establishes the goals, scope, and focus of the ERA. The products of the screening-level problem formulation are (1) the preliminary conceptual model and (2) the assessment and measurement endpoints. The purpose of the preliminary conceptual model is to describe how ecological receptors may be exposed to chemicals originating from the site. The preliminary conceptual model is developed using information regarding major habitats and ecological receptors, media of concern, and potential contaminant sources in conjunction with an understanding of potential transport pathways, exposure pathways, and exposure routes. The fate, transport, and toxicological properties of the chemicals present at the site are also considered during this process. Assessment and measurement endpoints define the ecological attributes to be protected. They are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist.

7.3.1 Preliminary Conceptual Model

Exposure, and thus potential for risk, can only occur if each of the following conditions are present (USEPA, 1998):

- A source of contamination must be present.
- Release and transport mechanisms must be available to move the contaminants from the source to an exposure point.
- An exposure point must exist where ecological receptors could contact affected media.
- An exposure route must exist whereby the contaminant can be taken up by ecological receptors.

Figure 7-6 presents a preliminary conceptual model for SWMU 14. The conceptual model outlines potential sources of contaminants, transport pathways, exposure media, potential exposure routes, and receptor groups. Specific components of the preliminary conceptual model (i.e., source areas, transport pathways, and exposure pathways and routes) are discussed in the sections that follow.

7.3.1.1 Source Areas

The fire training pits (original fire training pit, temporary fire training pit, and new/current fire training pit), as well as associated fire training activities represent potential sources for the release of chemicals to abiotic media (i.e., surface and subsurface soil). Contaminated surface and subsurface soil also represent potential source areas for the release of chemicals to groundwater and/or downgradient surface soil, surface water, and sediment.

7.3.1.2 Transport Pathways

A transport pathway describes the mechanisms whereby chemicals may be transported from a source of contamination to ecologically relevant media. As depicted on Figure 7-6, potential mechanisms for contaminant transport from potential source areas at SWMU 14 are believed to include the following:

- Overland transport of chemicals with surface soil via surface runoff to down-gradient surface soil.

- Discharge of fluids associated with firing training operations to a drainage ditch and subsequent transport with surface run-off to down-gradient surface water and sediment (historical transport pathway; see discussion below).
- Leaching of chemicals from surface soil and/or subsurface soil by infiltrating precipitation and transport to surface water and sediment with groundwater.
- Uptake by biota from surface soil, subsurface soil, surface water, and sediment and trophic transfer to upper trophic level receptors.

There are no storm sewers present at SWMU 14 or its immediate area that can serve as a pathway for the transport of chemicals with surface soil (via surface run-off) to down-gradient surface water or sediment. Furthermore, sheet flow conveyances to off-site surface soil are hindered by the nearly level terrain at SWMU 14 and the nature of the on-site habitat (maintained grasses). Leaching of chemicals from surface soil and/or subsurface soil by infiltrating precipitation and transport to Ensenada Honda surface water and sediment with groundwater represents a potential transport pathway. However, this pathway is considered insignificant based on the distance of SWMU 14 to the Ensenada Honda (see Section 7.2).

As discussed in Section 7.1.1, past aerial photographs show that the original fire training pit was connected to a drainage ditch via a swale. Fluids associated with fire training operations within the original fire training pit may have discharged to the drainage ditch. The drainage ditch eventually terminates within a freshwater wetland (classified as a PEM1 by the Cowardin Wetland Classification System [Cowardin et al., 1979]). Soil samples were not collected from the drainage ditch, nor were surface water or sediment samples collected from the PEM1 wetland during previous field investigations (i.e., 1996 and 2006 RFIs). Because the PEM1 wetland unit represents a potential exposure point where ecological receptors could contact affected media (i.e., surface water and sediment), the lack of ditch soil analytical data (which can be used to indicate if a release to the ditch has occurred) or surface water and sediment analytical data (which would indicate if chemicals associated with fire training operations have migrated to the wetland) prevents an evaluation of this potential transport pathway. As such, this screening-level ERA is limited to an evaluation of potential exposures by ecological receptors to chemicals in surface and subsurface soil.

7.3.1.3 Exposure Pathways and Routes

An exposure pathway links a source of contamination with one or more receptors via exposure to one or more media. Requirements for a complete exposure pathway were presented in Section 7.3.1. As depicted on Figure 7-6, potentially complete and significant exposure pathways exist at SWMU 14.

An exposure route describes the specific mechanism(s) by which a receptor is exposed to a chemical present in an environmental medium. The most common exposure routes are dermal contact, direct uptake, ingestion, and inhalation. Terrestrial plants may be exposed to chemicals present in surface soil directly through their root surfaces during water and nutrient uptake. Unrooted, floating aquatic plants, rooted submerged aquatic plants, and algae may be exposed to chemicals directly from the water or (for rooted plants) from sediments. Terrestrial and aquatic invertebrates may be exposed to chemicals in surface soil, surface water, and sediment, through dermal adsorption and ingestion. Much of the toxicological data available for terrestrial and aquatic invertebrates are based upon *in situ* studies that represent both pathways. Therefore, both pathways are typically considered together in screening-level ERAs. Invertebrates also represent a link between surface soil, surface water, and/or sediment and upper trophic level receptors

through food web transfer. As such, they are often included as prey items for upper trophic level dietary exposures.

Birds and mammals may be exposed to chemicals through: (1) the inhalation of gaseous chemicals or chemicals adhered to particulate matter; (2) the incidental ingestion of contaminated abiotic media (e.g., soil or sediment) during feeding or cleaning activities; (3) the ingestion of contaminated water; (4) the ingestion of contaminated plant and/or animal tissues for chemicals that have entered food webs; and/or (5) dermal contact with contaminated abiotic media. These exposure routes, where applicable, are depicted on Figure 7-6. Their relative importance depends in part on the chemical being evaluated. For chemicals having the potential to bioaccumulate (e.g., PCBs), the greatest exposure to wildlife is likely to be from the ingestion of prey. For chemicals having a limited potential to bioaccumulate (e.g., aluminum), the exposure of wildlife to chemicals is likely to be greatest through the direct ingestion of abiotic media, such as surface soil.

Direct ingestion of drinking water is only considered if the salinity of a potential drinking water source is less than 15 parts per thousand (ppt), the approximate toxic threshold for wildlife receptors (Humphreys, 1988). As evidenced by Figure 7-4, there are no fresh surface water bodies within or immediately contiguous to SWMU 14. The only potential drinking water source linked to the Fire Training Pit Area is the PEM1 wetland unit that receives drainage from the ditch historically connected to the original fire training pit. As surface water samples have not been collected within this PEM1 wetland unit, ingestion of surface water was not considered in risk calculations for upper trophic level receptors.

Certain potential exposure pathways and/or routes identified on or excluded from Figure 7-6 were not evaluated in the screening-level ERA. Though potentially complete, these pathways were considered insignificant relative to other pathways due to low potential for exposure and low levels of relevant contaminants. For example, dermal exposures were not identified as significant relative to ingestion exposures for upper trophic level receptors and were not evaluated in the screening-level ERA. This approach is supported by evidence outlined in Suter II et al. (2000) and the USEPA (2000a), including the general fate properties of the majority of compounds detected in soil (e.g., low affinity for dermal uptake), the low potential exposure frequency and duration, and the protection offered by feathers, fur, and scales to avian, mammalian, and reptilian receptors. In addition, literature reviews indicate that dermal exposures to wildlife from classes of chemicals known or suspected to be of concern via dermal adsorption (e.g., VOCs, organophosphorous pesticides, and petroleum compounds) are often overestimated in laboratory studies (where feathers/fur are removed) and do not represent realistic exposure scenarios (USEPA, 2000a). Furthermore, though burrowing reptiles (which would be expected to experience the most significant exposure) inhabit the upland vegetative units at SWMUs 1 and 2, chemicals known or suspected to be of concern via dermal adsorption are not known to be associated with historical activities at the site (e.g., organophosphorous pesticides) or were detected at a low frequency and concentration (e.g., VOCs). Moreover, in developing surface soil screening levels for twenty-four important compounds identified from National Priorities List (NPL) sites and Biological Technical Assistant Group (BTAG) recommendations, USEPA calculated that the contribution of dermal exposures to the total dose received by terrestrial receptors to be 0.5 percent or less and therefore omitted the dermal pathway from their exposure estimates (USEPA, 2000a). Incidental ingestion of surface soil during feeding and preening activities was considered in risk estimates for upper trophic level terrestrial receptors. Direct contact exposures also were considered for lower trophic level terrestrial receptors (i.e., terrestrial invertebrates).

Inhalation of gaseous chemicals and chemicals adhered to particulate matter (e.g., soil) were also excluded from evaluation in this screening-level ERA as the inhalation pathway is considered insignificant relative to ingestion pathways. As described above for dermal exposures, this approach is consistent with Suter II et al. (2000) and USEPA (1997 and 2000a), which recognize the relatively small contribution the inhalation pathway contributes to exposure estimates. For example, USEPA (2000a) estimates the expected contribution of exposure to dust particles and VOCs via inhalation to be 0.01 percent and 0.5 percent or less, respectively relative to ingestion. Site conditions further reduce the importance of this exposure route relative to ingestion. The vegetative groundcover at SWMU 14 (maintained grasses) minimizes the suspension of dust and the potential for exposure via inhalation of chemicals adhered to soil particles. Furthermore, inhalation of gaseous chemicals that have volatilized from surface soil is likely to be insignificant given that VOCs were detected at a low frequency and concentration.

Potentially complete and significant exposure pathways for terrestrial mammals (i.e., incidental ingestion of surface soil and ingestion of contaminated plant and/or animal tissues for chemicals that have entered food webs) were not selected for evaluation. The exclusion of mammals is appropriate because the potentially exposed mammalian receptors are limited to non-indigenous, nuisance species (see Section 7.1.3.1). However, because they represent a potential link between surface soil chemicals and terrestrial carnivores, they were included as food items in this screening-level ERA.

Though potentially complete exposure pathways have been identified for terrestrial reptiles (e.g., various lizard species known to occur at NAPR [Geo-marine, Inc., 2000) and terrestrial amphibians (e.g., coquis) at SWMU 14 (see Figure 7-6), there is a paucity of data concerning the toxicological effects of chemicals for reptiles and amphibians, rendering a quantitative evaluation problematic (USEPA, 2000a and 2003a). However, it can be qualitatively stated that reptiles and amphibians are not at risk if no risks are identified to other upper trophic level receptors utilizing the site that occupy a similar trophic level. This approach is consistent with USEPA Region III BTAG policy (USEPA, 2006). Although this represents an uncertainty in the assessment, it is assumed that terrestrial reptiles and amphibians are not likely to be more sensitive to chemical exposures than the other receptor groups that are included in the screening-level ERA.

7.3.2 Endpoints and Risk Questions

The conclusion of the screening-level problem formulation includes the selection of ecological endpoints, which are based on the preliminary conceptual model. Two types of endpoints, assessment endpoints and measurement endpoints, are defined as part of the ERA process as are risk hypotheses or risk questions (USEPA, 1997 and 1998). An assessment endpoint is an explicit expression of the environmental component or value that is to be protected. A measurement endpoint is a measurable ecological characteristic that is related to the component or value chosen as the assessment endpoint. The considerations for selecting assessment and measurement endpoints are summarized in USEPA (1992, and 1997) and discussed in detail by Suter II (1989, 1990, and 1993). Risk hypotheses are testable hypotheses about the relationship among the assessment endpoints and their predicted responses when exposed to contaminants.

Endpoints in the screening-level ERA define ecological attributes that are to be protected (assessment endpoints) and a measurable characteristic of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has or may occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be

adversely affected by chemicals attributable to the site (USEPA, 1997). Assessment endpoints contain an entity (e.g., red-tailed hawk) and an attribute of that entity (e.g., survival rate). Individual assessment endpoints usually encompass a group of species or populations (the receptor) with some common characteristic, such as specific exposure route or contaminant sensitivity, with the receptor then used to represent the assessment endpoint in the risk evaluation.

Assessment and measurement endpoints may involve ecological components from any level of biological organization, from individual organisms to the ecosystem itself (USEPA, 1992). Effects on individuals are important for some receptors, such as rare and endangered species; however, population- and community-level effects are typically more relevant to ecosystems. Population- and community-level effects are usually difficult to evaluate directly without long-term and extensive study. However, measurement endpoint evaluations at the individual level, such as an evaluation of the effects of chemical exposure on reproduction, can be used to predict effects on an assessment endpoint at the population or community level. In addition, use of criteria values designed to protect the vast majority (e.g., 95 percent) of the components of a community (e.g., National Ambient Water Quality Criteria [NAWQC] for the Protection of Aquatic Life) can be useful in evaluating potential community- and/or population-level effects.

Table 7-2 summarizes the assessment endpoints, risk hypotheses, and measurement endpoints selected for the screening-level ERA. As evidenced by Table 7-2, the assessment endpoints selected were based on the survival, growth, and reproduction of terrestrial receptor groups (terrestrial plants and invertebrates), terrestrial reptiles and amphibians, and terrestrial upper trophic level birds (herbivores, omnivores, and carnivores). The population traits of interest for each of the assessment endpoints represent components of a healthy population. Failure or impairment of survival, growth, or reproduction will adversely affect the ability of the population to be healthy and viable and fill its appropriate role in an ecosystem.

7.3.2.1 Selection of Receptors

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, specific receptor species (e.g., mourning dove) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (e.g., avian herbivores) used to represent the assessment endpoints (e.g., survival, growth, and reproduction of avian herbivores). Selection criteria typically include those species that:

- Are known to occur, or are likely to occur, at the site;
- Have a particular ecological, economic, or aesthetic value;
- Are representative of taxonomic groups, life history traits, and/or trophic levels in the habitats present at the site for which complete exposure pathways are likely to exist;
- Can, because of toxicological sensitivity or potential exposure magnitude, be expected to represent potentially sensitive populations at the site; and
- Have sufficient ecotoxicological information available on which to base an evaluation.

Lower trophic level receptor species were evaluated based on those taxonomic groupings (e.g., terrestrial plants and invertebrates) for which screening values have been developed. These groupings and screening values are used in most ERAs. As such, specific receptor species of lower trophic level terrestrial biota were not chosen because of the limited species-specific information available. These receptors were instead dealt with on a community level via a comparison to media-specific screening values.

The terrestrial upper trophic level receptor species listed below were chosen for dietary exposure modeling based on the criteria listed above, the general guidelines presented in USEPA (1991), the description of habitats and biota presented in Sections 7.1.2 and 7.1.3, respectively, and the assessment endpoints (see Table 7-2).

- Mourning dove (*Zenaida macroura*) (avian herbivore)
- American robin (*Turdus migratorius*) (avian omnivore)
- Red-tailed hawk (*Buteo jamaicensis*) (avian carnivore)

The mourning dove and red-tailed hawk are known to occur in Puerto Rico (Raffaele, 1989). These two species also have been reported at NAPR (see Table 7-1). The American robin was selected as a surrogate species to represent birds reported from NAPR with similar feeding habits and dietary preferences (e.g., red-legged thrush). As previously discussed in Section 7.1.3.2, SWMU 14 is not located within the critical habitat designation for the yellow-shouldered blackbird. Furthermore, the yellow-shouldered blackbird is not expected to forage within the habitat offered by SWMU 14 (maintained grasses of unknown species composition). Although exposure pathways for the yellow-shouldered blackbird are likely incomplete at SWMU 14, aspects of the feeding ecology of the American robin and yellow-shouldered blackbird indicate that the American robin can be protectively used as a surrogate receptor:

- The American robin forages on the ground for soft-bodies invertebrates, whereas the yellow-shouldered black bird is an arboreal feeder that forages within the canopy and sub-canopy of trees (USFWS, 1996). The invertebrate prey item for the American robin is assumed to be earthworms in this screening-level ERA. Because earthworms are in direct contact with soil, they will bioaccumulate soil contaminants at higher concentrations than arboreal invertebrates. Modeled dietary intakes that include earthworm ingestion will result in a conservative estimate of food web exposures for the yellow-shouldered blackbird.
- The diet of the American robin is assumed to include 9.1 percent soil, whereas soil consumption by the yellow-shouldered blackbird is likely to be negligible based on their arboreal feeding behavior. Modeled dietary intakes that include soil ingestion also will result in a conservative estimate of food web exposures for the yellow-shouldered blackbird.

A terrestrial mammal was not selected as an ecological receptor for the following reasons:

- With the exception of bats, all native terrestrial mammals have been extirpated from Puerto Rico. Life history information for Puerto Rico's native bat species is severely limited or lacking altogether. The uncertainty associated with the exclusion of representative bat species as ecological receptors in the screening-level ERA is addressed in Section 7.7.
- The terrestrial mammals represented by potentially complete exposure pathways are limited to nonindigenous, nuisance species (i.e., Norway rat, black rat, and mongoose) that have been implicated in the decline of native reptilian and bird populations.

While exposure pathways to terrestrial reptiles and amphibians are likely to be complete, specific reptilian and amphibian species were not selected as receptors in this screening-level ERA since the life history and toxicological database concerning the effects of chemicals on reptiles and amphibians is severely limited. It is assumed that reptiles and amphibians potentially present at the site are not exposed to significantly higher concentrations of chemicals and are not more

sensitive to chemicals than the other receptor species evaluated in the risk assessment. This assumption is a source of uncertainty in the screening-level ERA.

7.3.3 Fate and Transport Mechanisms

In the absence of measured values of chemicals within biotic media, the transport and partitioning of constituents into particular environmental compartments, and their ultimate fate in those compartments, can be predicted from key physical-chemical characteristics. The physical-chemical characteristics that are most relevant for exposure modeling in this assessment include water solubility, adsorption to solids, octanol-water partitioning, and degradability. These characteristics are defined below.

The water solubility of a compound influences it's partitioning to aqueous media. Highly water-soluble chemicals, such as most VOCs, have a tendency to remain dissolved in the water column rather than partitioning to sediment (Howard, 1991). Compounds with high water solubility also generally exhibit a lower tendency to bioconcentrate in aquatic organisms and a greater likelihood of biodegredation, at least over the short term (Howard, 1991).

Adsorption is a measure of a compound's affinity for binding to solids, such as soil or sediment particles. Adsorption is expressed in terms of partitioning, with either the adsorption coefficient (K_d), a unitless expression of the equilibrium concentration in the solid phase versus the water phase or as organic carbon partition coefficient ($K_{oc,}$ K_d normalized to the organic carbon content of the solid phase; again unitless) (Howard, 1991). For a given organic chemical, the higher the K_{oc} or K_d, the greater the tendency for that chemical to adhere strongly to soil or sediment particles. K_{oc} values can be measured directly or can be estimated from either water solubility or the octanol-water partition coefficient using one of several available regression equations (Howard, 1991).

Octanol-water partitioning indicates whether a compound is hydrophilic or hydrophobic. The Octanol-water partition coefficient (K_{ow}) expresses the relative partitioning of a compound between octanol (lipids) and water. A high affinity for lipids equates to a high K_{ow} and vice versa. As discussed above, K_{ow} has been shown to correlate well with adsorption to soil or sediment particles and the potential to bioaccumulate in the food chain (Howard, 1991). Typically expressed as log K_{ow}, a value of 3.0 or less generally indicates that the chemical will not bioconcentrate to a significant degree (Maki and Duthie, 1978). Log K_{ow} values and K_{oc} values for organic chemicals analyzed in environmental media collected from SWMU 14 (i.e., Appendix IX VOCs, SVOCs, and dioxins/furans) are presented in Table 7-3.

Degradability is an important factor in determining whether there will be significant loss of mass or change in the form of a chemical over time in the environment. The half-life of a compound is typically used to describe losses from either degradation (biological or abiotic) or from transfer from one compartment to another (e.g., volatilization from soil to air). The half-life is the time required for one-half of the mass of a compound to undergo the loss or degradation process.

7.4 <u>Screening-Level Effects Evaluation</u>

The purpose of the screening-level effects evaluation is the establishment of chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. One set of screening values is typically developed for each selected assessment endpoint. For this evaluation, two types of screening values were developed (media-specific screening values and ingestion-based screening values). Media-specific screening values were developed for soil

(surface and subsurface), while ingestion-based screening values were developed for terrestrial food web (dietary) exposures.

7.4.1 Media-Specific Screening Values

The literature-based toxicological benchmarks used as media-specific screening values for chemicals in surface and subsurface soil are summarized in table 7-4. USEPA ecological soil screening levels (Eco-SSLs) (documentation is available at http://www.epa.gov/ecotox/ecossl/) for terrestrial plants and invertebrates were preferentially used as soil screening values. For a given chemical, if an Eco-SSL was avialble for both receptor groups, the lowest value was selected as the soil screening value. For those chemicals lacking terrestrial plant and invertebrate Eco-SSLs, the literature-based toxicological benchmarks listed below were used as soil screening values.

- Toxicological thresholds for earthworms and microorganisms (Efroymson et al., 1997a)
- Toxicological thresholds for plants (Efroymson et al., 1997b)

Identical to the Eco-SSLs, when more than one screening value was available for a given chemical from Efroymson et al. (1997a and 1997b), the lowest value was selected as the soil screening value. For those chemicals lacking an Eco-SSL or a toxicological threshold from Efroymson et al. (1997a and 1997b), the following literature-based values, listed in their order of decreasing preference, were used as soil screening values:

- Toxicity reference values for plants and invertebrates listed in USEPA (1999).
- Soil standards developed by the Ministry of Housing, Spatial Planning and Environment (MHSPE, 2000), assuming a minimum default soil organic carbon content of 2.0 percent.
- Canadian soil quality guidelines (agricultural land use) developed by the Canadian Council of Ministers of the Environment (CCME, 2006).

CCME soil quality guidelines were given the lowest preference since many are background-based interim guidelines that do not represent effect-based concentrations.

7.4.2 Ingestion-Based Screening Values

Ingestion-based screening values for dietary exposures were derived for each receptor species and chemical evaluated for food web exposures. Toxicological information from the literature for wildlife species most closely related to the receptor species was used if available. This information was supplemented by laboratory studies of non-wildlife species when necessary.

Chronic No Observed Adverse Effect Levels (NOAELs) based on growth or reproduction were preferentially used as ingestion-based screening values for upper trophic level receptors. NOAELs represent the highest dose of a chemical at which an effect being measured in a toxicity test does not occur. If several chronic toxicity studies were available from the literature, the most appropriate study was selected for each receptor species based on study design, study methodology, study duration, study endpoint and test species. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic Lowest Observed Adverse Effect Levels (LOAELs) or median lethal dose acute values (LD_{50}). LOAELs represent the lowest dose of a chemical at which an effect being measured in a toxicity test occurs, while an LD_{50} represents the dose of a chemical at which half of the organisms being tested die. An uncertainty factor of 10 was used to convert a reported chronic LOAEL to a chronic NOAEL

(USEPA, 1997), while an uncertainty factor of 100 was used to convert the acute LD_{50} to a chronic NOAEL (i.e., the LD_{50} was multiplied by 0.01 to obtain the chronic NOAEL; USEPA, 1997).

Ingestion-based screening values for the terrestrial bird species selected as ecological receptors (American robin, mourning dove, and red-tailed hawk), expressed as milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day), are provided in Table 7-5. Sample et al. (1996) consider a scaling factor of 1.0 most appropriate for interspecies extrapolation between birds. Therefore, the NOAEL and LOAEL values listed in Table 7-5 were not adjusted to reflect differences in body weights between avian test species and avian receptor species.

Not all chemicals analyzed in surface and subsurface soil were evaluated for food web exposures. The organic chemicals evaluated for food web exposures were limited to those listed in Table 7-3 with the potential to bioaccumulate to a significant extent. Bioaccumulative organic chemicals are defined in the screening-level ERA as those with a maximum reported log octanol-water partition coefficient (log K_{ow}) greater than or equal to 3.0. Rational for using a log K_{ow} of 3.0 to define an organic chemical with the potential to bioaccumulate is included as Appendix I. For conservatism, all inorganic chemicals except cyanide also were evaluated for food web exposures. Cyanide was excluded from evaluation because it is readily metabolized and does not bioaccumulate (Eisler, 1991). The list of chemicals selected for evaluation of food web exposures contains many chemicals that are not identified as "important bioaccumulative compounds" by the USEPA (2000b). Their inclusion in the evaluation of terrestrial food web exposures is consistent with the conservatism of this screening-level ERA.

7.5 Screening-Level Exposure Estimation

This section presents the analytical data, exposure assumptions, and the exposure models and input parameters that were used to estimate the potential exposure of ecological receptors to chemicals in surface and subsurface soil.

7.5.1 Selection Criteria for Analytical Data and Their Use in the Screening-Level ERA

The available analytical data (described in Section 4.2) were reviewed against a set of selection criteria to identify specific data that would be used to estimate potential ecological receptor exposures. The criteria used to select these analytical data are listed below.

- Data must have been validated by a qualified data validator using acceptable data validation methodology. Rejected (R) values were not used in the screening-level ERA. Unqualified data and data qualified as J and NJ were treated as detected, while data qualified as U or UJ were treated as non-detected.

- The available soil analytical data were divided into surface soil data (i.e., analytical data for soil samples collected from the 0 to 1.0-foot depth interval) and subsurface soil data (analytical data for soil samples collected from the 1.5 to 3.0-foot depth interval), and evaluated independently from each other. The evaluation of available soil analytical data was limited to these depth ranges since most soil heterotrophic activity and soil invertebrates occur on the surface or within the oxidized root zone (Suter II, 1995).

- Maximum reporting limits were conservatively used to estimate exposure for non-detected chemicals.

- In some instances, duplicate samples were collected in the field. The maximum concentration of each chemical (or the maximum non-detected value) in the original or duplicate sample was used as a conservative estimate of contaminant concentration at a particular sampling point. Results from duplicate samples were not evaluated individually.

7.5.2 Exposure Estimation

Maximum detected concentrations in surface and subsurface soil were used to conservatively estimate potential chemical exposures for the ecological receptors selected to represent the assessment endpoints. For conservatism, maximum detection limits for chemicals that were analyzed for but not detected were also compared to media-specific screening values and (where appropriate) used for food web exposure modeling. This was done to ensure that reporting limits were similar to, or less than, chemical concentrations at which potential adverse effects to ecological receptors may occur. For samples with duplicate analyses, the higher of the two concentrations was used in the screening (when both values were detects or both values were non-detects). In cases where one result was a detection and the other a non-detect, the detected value was used in the assessment.

With the exception of 2,3,7,8-TCDD, media-specific and ingestion-based screening values are not available for dioxin/furan congeners.. For the evaluation of terrestrial food web exposures, the concentrations of these chemicals in subsurface soil sample 14SB04-01 were converted to 2,3,7,8-TCDD equivalents using the toxicity equivalence factors (TEFs) reported by Van den Berg et al. (1998) for birds (see Table 7-6). 2,3,7,8-TCDD equivalents were summed and used in the estimation of avian dietary exposures. TEFs have not been established for terrestrial plants and invertebrates. As a measure of conservatisms, congener concentrations in subsurface soil sample 14SB04-01 were evaluated directly as 2,3,7,8-TCDD. Under this approach, each individual congener concentration was compared directly to the 2,3,7,8-TCDD soil screening value. In the case of invertebrates, this approach is considered extremely conservative since it has been demonstrated that they are insensitive to 2,3,7,8-TCDD induced toxicity (USEPA, 2003b). This approach is also likely to be extremely conservative for terrestrial plants since available data indicates that aquatic plants are relatively insensitive to 2,3,7,8-TCDD (USEPA, 2003b).

7.5.2.1 Terrestrial Receptor Groups

Maximum measured chemical concentrations in surface and subsurface were compared to the media-specific screening values discussed in Section 7.4.1 and summarized in Table 7-4 to conservatively evaluate the potential for adverse ecological effects to the lower trophic level receptor groups selected as assessment endpoints (terrestrial plants and invertebrates). Exposure point concentrations for the terrestrial receptor groups (terrestrial plants and invertebrates) were maximum measured surface soil and subsurface soil concentrations.

7.5.2.2 Upper Trophic Level Receptors

Exposures for upper trophic level terrestrial receptor species via the food web were determined by estimating chemical-specific concentrations in each dietary component using uptake and food web models. Incidental ingestion of soil was also included when calculating the total level of exposure. Drinking water exposures were not considered when estimating the total level of

exposure (see Section 7.3.1.3). As indicated previously, maximum measured soil concentrations were used in all calculations to provide a conservative assessment.

Tissue concentrations were modeled for terrestrial plants (food item for American robin and mourning dove), soil invertebrates (food item for American robin), and small mammals (food item for red-tailed hawk). Specific small mammals species were not selected as dietary items for the red-tailed hawk. Instead, a specific trophic level (omnivore) was used to represent the small mammals present in Puerto Rico that may serve as potential food items (e.g., Norway rat and black rat). Small mammal herbivores and insectivores were excluded as food items for the red-tailed hawk because they are not part of the Puerto Rican mammalian fauna (see Section 7.1.3.1).

7.5.2.2.1 *Exposure Point Concentrations*

The uptake of chemicals from the abiotic media into terrestrial food items is based (where available) on conservative (e.g., maximum or 90th percentile) bioconcentration factors (BCFs) or bioaccumulation factors (BAFs) from the literature. A BCF indicates the degree to which a chemical may accumulate in organisms coincident with the concentration of the chemical in the surrounding media. They are calculated by dividing the concentration of a chemical in the tissue of organisms by the concentration in the surrounding media. BAF values consider both direct exposures to the surrounding media, as well as uptake from dietary exposures. As such, BAFs were given preference over BCFs when estimating prey item tissue concentrations. Default factors of 1.0 were used only when data are unavailable for chemicals in the literature. The methodology and models used to derive these estimates are described below.

Terrestrial Plants. Tissue concentrations in the aboveground vegetative portion of terrestrial plants were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific soil-to-plant BCFs obtained from the literature. The BCF values used were based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for terrestrial plants (15 percent [0.15]; Sample et al., 1997).

BCFs for terrestrial plants are those reported in Baes et al. (1984) or Bechtel Jacobs (1998). For organic chemicals without literature based BCFs, soil-to-plant BCFs were estimated using the algorithm provided in Travis and Arms (1988):

$$Log\ B_v = 1.588 - (0.578)\ (Log\ K_{ow}) \qquad \text{(Equation 7-1)}$$

where:

$Log\ B_v$ = Log soil-to-plant BCF (unitless; dry weight basis)
$Log\ K_{ow}$ = Log octanol-water partitioning coefficient (unitless)

The Log K_{ow} values used in the calculations were obtained primarily from the USEPA (1995 and 1996) and are listed in Table 7-3. The soil-to-plant BCFs used in the screening-level ERA are summarized in Table 7-7.

Earthworms. Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same

chemical in the surrounding environmental medium (in this case, surface soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Since earthworms consume soil, BAFs are more appropriate values and were used in the food web models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) were given preference over undepurated analyses when selecting BAF values since direct ingestion of surface soil is accounted for separately in the food web model.

The BCF/BAF values used in this screening-level ERA (see Table 7-7) are based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms (16 percent [0.16]; USEPA, 1993). For inorganic chemicals without available measured BCFs/BAFs, an earthworm BAF of 1.0 was assumed.

Small Mammals. Whole-body tissue concentrations in small mammals (omnivores) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BAFs, the small mammal tissue concentration was obtained by multiplying the maximum measured surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BAF. The BAF values used are based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for small mammals (32 percent [0.32]; USEPA, 1993). The soil-to-small mammal BAFs used in the screening-level ERA (see Table 7-8) are those in Sample et al. (1998b) for omnivores (or for general small mammals if omnivore values were unavailable).

For those chemicals without soil-to-small mammal BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for small mammal species is via the diet, it was assumed that the concentration of each chemical in a small mammal's tissues is equal to the chemical concentration in its diet, that is, a diet to whole-body BAF (wet-weight basis) of one was assumed. Resulting tissue concentrations (wet-weight) were converted to dry weight using an estimated solids content of 32 percent (see above).

The use of a diet to whole-body BAF of one is likely to result in a conservative estimate of chemical concentrations for chemicals that are not known to biomagnify in terrestrial food chains (e.g., aluminum). For chemicals that are known to biomagnify (e.g., PCBs), a diet to whole-body BAF value of one will likely result in a realistic estimate of tissue concentrations based on reported literature values. For example, a maximum BAF (wet weight) value of 1.0 was reported by Simmons and McKee (1992) for PCBs based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for DDT of 0.3 for voles and 0.2 for short-tailed shrews. Reported BAF (wet-weight) values for dioxin are only slightly above one (1.4) for the deer mouse (USEPA, 1990).

7.5.2.2.2 *Dietary Intakes*

Dietary intakes for each upper trophic level receptor species were calculated using the following formula (Equation 7-2) modified from USEPA (1993).

$$DI_x = \frac{[[\sum_i[(FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)]][AUF]}{BW} \quad \text{(Equation 7-2)}$$

where:

DI_x = Dietary intake for chemical x (mg chemical/kg body weight/day)
FIR = Food ingestion rate (kilograms per day [kg/day], dry-weight)
FC_{xi} = Maximum concentration of chemical x in food item i (mg/kg, dry weight)
PDF_i = Proportion of diet composed of food item i (mg/kg, dry weight)
SC_x = Maximum concentration of chemical x in surface soil/subsurface soil (mg/kg, dry weight)
PDS = Proportion of diet composed of soil (dry weight basis)
BW = Body weight (kg, wet weight)
AUF = Area Use Factor (unitless)

Conservative receptor-specific exposure parameters (maximum food ingestion rates and minimum body weights) for the American robin, mourning dove, and red-tailed hawk are provided in Table 7-9. The food items selected for each receptor species and the percent contribution to their total diet is provided in Table 7-10. As was previously discussed in Section 7.3.1.3, receptor exposures via surface water ingestion were not included in the estimation of dietary intakes. As such, drinking water ingestion rates for the receptor species are not included in Table 7-9.

Table 7-9 contains exposure parameters and Table 7-10 contains a dietary composition for a small mammal omnivore. As discussed in Section 7.5.2.2, the diet of the red-tailed hawk (excluding surface soil) is assumed to be small mammal omnivores. This assumption is based on likely small mammal prey species present in Puerto Rico (rats). Identification of exposure parameters and food items was necessary when estimating small mammal whole body tissue concentrations for those chemicals that lack a literature-based soil-to-small mammal BAF (i.e., an exposure dose was necessary to estimate tissue concentrations). An assumed diet of 49 percent terrestrial vegetation, 49 percent terrestrial invertebrates, and 2 percent soil was selected as the diet for a small mammal omnivore.

For this screening-level ERA, an AUF of 1.0 was assumed (i.e., each receptor is assumed to spend 100 percent of its time on the site). As such, receptor-specific home ranges were not considered in the estimation of dietary intakes.

7.6 Screening-Level Risk Calculation

The screening-level risk calculation is the final step in a screening-level ERA. In this step, maximum chemical concentrations in abiotic media or maximum exposure doses for upper trophic level receptor species are compared with the corresponding screening values to derive screening risk estimates. The outcome of this step is a list of potential ecological COPCs for each media-pathway-receptor combination evaluated or a conclusion of negligible risk.

7.6.1 Selection of Ecological Chemicals of Potential Concern

Ecological COPCs were selected using the hazard quotient method. For a given chemical, an HQ was calculated by dividing the maximum chemical concentration in the medium being evaluated

by the corresponding media-specific screening value or, in the case of upper trophic level receptors, by dividing the maximum exposure dose by the corresponding ingestion-based screening value.

The following conservative methodology was used to identify ecological COPCs for terrestrial plant and invertebrate exposures to chemicals in surface and subsurface soil:

- The maximum detected concentrations in surface soil and subsurface soil were used to calculate media-specific HQs. For a given medium, chemicals with HQs greater than or equal to 1.0 based on maximum detected concentrations were identified as ecological COPCs.

- For non-detected chemicals, maximum reporting limits were used to calculate media-specific HQ values. Non-detected chemicals with HQs greater than or equal to 1.0 based on maximum reporting limits were identified as ecological COPCs.

- Detected and non-detected chemicals without media-specific screening values were identified as ecological COPCs.

To select preliminary ecological COPCs by evaluating food web exposures, maximum chemical concentrations in surface and subsurface soil were used to estimate dietary doses for each receptor. HQs were calculated with NOAELs, LOAELs, and Maximum Acceptable Toxicant Concentrations (MATCs). The MATC is derived by taking the geometric mean of the NOAEL and LOAEL. Calculations with NOAELs provide the most conservative risk estimate, while calculations with LOAELs provide the least conservative risk estimate. Calculations with MATCs provide realistic risk estimates since the MATC represents an estimation of the threshold concentration (i.e., the concentration above which a toxic effect on the test endpoint is produced). For the screening-level ERA, chemicals (detected and non-detected) with NOAEL-based HQs greater than or equal to 1.0 were identified as ecological COPCs. Identical to the media-specific screening evaluation, detected and non-detected chemicals without ingestion-based screening values were identified as ecological COPCs for upper trophic level receptor exposures.

HQs greater than or equal to 1.0 indicate the potential for risk since the chemical concentration or dose (exposure) exceeds the screening value (effect). However, screening values and exposure doses are derived using intentionally conservative assumptions (maximum media concentrations, maximum ingestion rates, and minimum body weights) such that HQs greater than or equal to 1.0 do not necessarily indicate that risks are present or impacts are occurring. Rather, they identify chemical-pathway-receptor combinations requiring further evaluation. Following the same reasoning, HQs less than one indicate that risks are very unlikely, enabling a conclusion of no unacceptable risk to be reached with high confidence.

It is noted that the screening-level ERA considers independent effects of chemicals. However, the potential does exist for multiple chemicals in environmental media to interact. Much uncertainty is involved with the interpretation of chemical interactions due to the complexity of potential effects (e.g., synergistic, antagonistic, or additive), and due to varying toxicities of compounds in different species. For these reasons, cumulative effects were not addressed in this screening-level ERA. Chemical interactions can be addressed by site-specific studies conducted in Step 6 of the Navy ERA process (i.e., site investigation and data analysis [see Figure 7-1]).

7.6.2 SWMU 14 Screening-Level Risk Calculation

Screening-level risk calculations for SWMU 14 surface and subsurface soil are presented in Table 7-11 (surface soil) and Table 7-12 (subsurface soil), while screening-level risk calculations for terrestrial food web exposures are presented in Table 7-13 (surface soil) and Table 7-14 (subsurface soil). Ecological COPCs were identified in Step 2 of the screening-level ERA using the procedures outlined in Section 7.6.1.

7.6.2.1 Surface Soil

Table 7-11 presents the results of the screening-level risk calculation for SWMU 14 surface soil. Six VOCs (2-butanone, 2-hexanone, benzene, bromomethane, ethylbenzene, and xylene [total]) were detected in SWMU 14 surface soil. Maximum detected benzene, ethylbenzene, and xylene concentrations (9.5 micrograms per kilogram [µg/kg], 0.7 J µg/kg, and 2.7J µg/kg, respectively) are less than surface soil screening values (i.e., HQ values less than 1.0); therefore, these three VOCs are not identified as ecological COPCs. The detected VOCs 2-butanone, 2-hexanone, and bromomethane are identified as ecological COPCs based on the lack of surface soil screening values. Although not detected, vinyl chloride is identified as an ecological COPC because the maximum reporting limit for this VOC exceeds the surface soil screening value (HQ = 1.09). An additional twenty-four non-detected VOCs are identified as ecological COPCs based on the lack of surface soil screening values (see Table 7-11).

Two SVOCs [bis(2-ethylhexyl)phthalate and diethyl phthalate] were detected in SWMU 14 surface soil. However, because maximum detected concentrations [97J µg/kg for bis(2-ethylhexyl)phthalate and 54J µg/kg for diethyl phthalate] are less than surface soil screening values, they are not identified as ecological COPCs. Six non-detected SVOCs (1,2,4,5-tetrachlorobenzene, 2,4-dimethylphenol, 2-methylphenol, 3-methylphenol, 4-methylphenol, and pentachlorophenol) are identified as ecological COPCs because maximum reporting limits exceed surface soil screening values (HQ values range from 1.21 for pentachlorophenol to 4.20 for 2, methylphenol, 3-methylphenol, and 4-methylphenol and 2,4-dimethylphenol. An additional fifty-four non-detected SVOCs are identified as ecological COPCs based on the lack of surface soil screening values.

Thirteen PAHs were detected in SWMU 14 surface soil. Maximum detected anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene concentrations exceed surface soil screening values, with HQ values ranging from 2.00 for benzo(k)fluoranthene to 6.33 for benzo(b)fluoranthene. Information available from the literature indicates that PAH toxicities in waters, tissues, and sediments are additive or nearly additive (USEPA 2003c). Assuming that PAH toxicities in soils are also additive or nearly additive, the combined toxicological contributions of the PAH mixture in SWMU 14 soils was considered. A search of the literature identified one soil toxicological benchmark for PAH mixtures. MHSPE (2000) developed target and intervention values for a mixture of ten PAHs [naphthalene, anthracene, phenanthrene, fluoranthene, benzo(a)pyrene, benzo(a)anthracene, chrysene, benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene]. The sum of maximum PAH concentrations for the eighteen individual PAH compounds analyzed for in SWMU 14 surface soil (33,634 ug/kg; maximum reporting limit used for non-detected PAHs) exceeds the mean of the MHSPE target and intervention value (4,100 ug/kg; based on an organic carbon content of 2.0 percent). The sum of the maximum concentrations for the ten individual PAHs that form the basis of the MHSPE (2000) target and intervention values (15,608 ug/kg) also exceeds the mean of the MHSPE (2000) values. Finally, the sum of maximum PAH concentrations exceeds the least conservative toxicological threshold

identified from the literature for individual PAHs (30,000 ug/kg for fluorine [Efroymson et al., 1997a]). Based on the exceedences identified above, all PAHs analyzed for in SWMU 14 surface soil are identified as ecological COPCs.

Aroclor-1260 was detected in seven of nine (7/9) surface soil samples at concentrations ranging from 6NJ µg/kg (14SS08) to 28 µg/kg (14SS04). Because the maximum detected concentration is less than the surface soil screening value (HQ = 0.01), Aroclor-1260 is not identified as an ecological COPC for SWMU 14 surface soil. The non-detected PCBs also are not identified as ecological COPCs because maximum reporting limits are less than soil screening values.

Thirteen metals were detected in SWMU 14 surface soil. Although detected, antimony, arsenic, barium, cadmium, lead, mercury, nickel, and thallium are not identified as ecological because maximum detected concentrations are less than surface soil screening values. Maximum detected chromium, cobalt, selenium, vanadium, and zinc concentrations exceed surface soil screening values. HQ values range from 1.76 for zinc to 188 for chromium. Based on maximum detected concentrations greater than surface soil screening values, chromium, cobalt, selenium, vanadium, and zinc are identified as ecological COPCs for SWMU 14 surface soil. Copper was analyzed for in SWMU 14 surface soil collected during the 2006 RFI field investigation. However all analytical results for this metal were rejected during data validation activities (see Appendix C). As discussed in Section 7.5.1, rejected values were not used in the screening-level ERA. Based on the lack of any usable data to evaluate potential risks to terrestrial plants and invertebrates, copper is identified as an ecological COPC for SWMU 14 surface soil. Maximum reporting limits for the non-detected metals (beryllium and silver) are less than soil screening values (HQs = <0.01). Therefore, these two metals are not identified as ecological COPCs.

In summary, chromium, cobalt, selenium, vanadium, and zinc were identified as ecological COPCs for SWMU 14 surface soil because maximum detected concentrations exceed surface soil screening values. The detected VOCs 2-butanone, 2-hexanone, and bromomethane were identified as ecological COPCs based on the lack of surface soil screening values. Eighteen PAH compounds (detected and non-detected) where identified as ecological COPCs because the sum of maximum concentrations exceeded a total PAH toxicological benchmark. One non-detected VOC (vinyl chloride) and six non-detected SVOCs (1,2,4,5-tetrachlorobenzene, 2,4-dimethylphenol, 2-methylphenol, 3-methylphenol, 4-methylphenol, and pentachlorophenol) were identified as ecological COPCs because maximum reporting limits exceeded surface soil screening values. An additional twenty-four non-detected VOCs and fifty-four non-detected SVOCs were identified as ecological COPCs based on the lack of soil screening values. Finally, copper was identified as an ecological COPC for SWMU 14 surface soil based on the lack of any usable data (all copper surface soil data from the 2006 RFI field investigation were rejected during data validation activities).

7.6.2.2 Subsurface Soil

Table 7-12 presents the results of the screening-level risk calculation for SWMU 14 subsurface soil. Three VOCs (2-butanone, carbon disulfide, and ethylbenzene) were detected in SWMU 14 subsurface soil. The maximum detected concentration of ethylbenzene is less than the surface soil screening value (HQ = 0.15). As such, this VOC is not identified as an ecological COPC for SWMU 14 subsurface soil. However, 2-butanone and carbon disulfide are identified as ecological COPCs for SWMU 14 subsurface soil based on the lack surface soil screening values. Twelve non-detected VOCs also are identified as ecological COPCs because maximum reporting limits exceed surface soil screening values. An additional twenty-five non-detected VOCs are

identified as ecological COPCs for SWMU 14 subsurface soil based on the lack of surface soil screening values.

SVOCs were not detected in subsurface soil collected at SWMU 14. However, the non-detected SVOCs 1,2,4,5-tetrachlorobenzene, 2,4-dimethylphenol, 2, methylphenol, 3-methylphenol, and 4-methylphenol are identified as ecological COPCs because maximum reporting limits exceed surface soil screening values (HQ = 4.0 for 2,4-dimethylphenol, 2-methylphenol, 3-methylphenol, and 4-methylphenol; HQ = 8.0 for 1,2,4,5-tetrachlorobenzene). An additional fifty-four non-detected SVOCs are identified as ecological COPCs for SWMU 14 subsurface soil based on the lack of surface soil screening values.

Six PAHs [2-methylnapthalene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene] were detected in SWMU 14 subsurface soil. Detected concentrations ranged from 5.6J µg/kg for indeno(1,2,3-cd)pyrene to 1,700 µg/kg for 2-methylnapthalene. Of these six detected PAHs, only 2-methylnapthalene had a maximum concentration greater than the surface soil screening value. As discussed in Section 7.6.2.1, PAH toxicities in surface soil are assumed to be additive or nearly additive. MHSPE (2000) developed target and intervention values for a mixture of ten PAHs [naphthalene, anthracene, phenanthrene, fluoranthene, benzo(a)pyrene, benzo(a)anthracene, chrysene, benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene]. The sum of maximum PAH concentrations for the eighteen individual PAH compounds analyzed for in SWMU 14 surface soil (6,497 ug/kg; maximum reporting limit used for non-detected PAHs) exceeds the mean of the MHSPE target and intervention value (4,100 ug/kg; based on an organic carbon content of 2.0 percent). Althought the sum of the maximum concentrations for the ten individual PAH compounds that form the basis of the MHSPE (2000) target and intervention values (2,827 ug/kg) is less than the mean of the MHSPE (2000) values, all PAH compounds analyzed for in SWMU 14 subsurface soil, including the non-detected PAHs, are conservatively identified as ecological COPCs for SWMU 14 subsurface soil.

PCBs were not detected in SWMU 14 subsurface soil. Furthermore, maximum reporting limits are less than surface soil screening values. Based on the absence of detections and no exceedence of screening values based on maximum reporting limits, Aroclor compounds are not identified as ecological COPCs for SWMU 14 subsurface soil. A single subsurface soil sample (14SB04-01) was analyzed for dioxin/furan chemicals. Of the seventeen congeners analyzed for, two were detected (1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD] was detected at 1.27J µg/kg and octachlorodibenzo-p-dioxin [OCDD] was detected at 11.6 µg/kg). As discussed in Section 7.5.2, TEFs have not been established for terrestrial plants and invertebrates. As a measure of conservatism, congener concentrations in subsurface soil sample 14SB04-01 were evaluated directly as 2,3,7,8-TCDD. Under this approach, each individual congener concentration was compared directly to the 2,3,7,8-TCDD soil screening value (500 ug/kg; USEPA, 1999). As evidenced by Table 7-12, each individual congener concentration is less than the 2,3,7,8-TCDD soil screening value. The sum of the individual congener concentrations (16.55 ug/kg; reporting limits used for non-detected congeners) also is less than the 2,3,7,8-TCDDs soil screening value. Based on these comparisons, dioxin/furan chemicals are not identified as ecological COPCs for SWMU 14 subsurface soil.

Eleven metals were detected in SWMU 14 subsurface soil. Chromium, cobalt, selenium, vanadium, and zinc were identified as ecological COPCs because maximum detected concentrations exceed surface soil screening values. HQ values ranges from 1.10 for selenium to 89 for vanadium. Copper was analyzed for in SWMU 14 subsurface soil collected during the 1996 RFI Phase I and 2006 RFI field investigations. Identical to surface soil, available analytical results were rejected during data validation activities (see Baker, 1996 and Appendix C). Based

on the lack of any usable data, this metal is identified as an ecological COPC for SWMU 14 subsurface soil. Non-detected metals (i.e., beryllium, mercury, silver, and thallium) were not identified as ecological COPCs because maximum reporting limits are less than soil screening values.

In summary, chromium, cobalt, selenium, vanadium, and zinc were identified as ecological COPCs for SWMU 14 subsurface soil because maximum detected concentrations exceeded surface soil screening values. Two detected VOCs (2-butanone and carbon disulfide) were identified as ecological COPCs based on the lack of surface soil screening values. Eighteen PAH compounds (detected and non-detected) where identified as ecological COPCs because the sum of maximum concentrations exceeded a total PAH toxicological benchmark. The non-detected SVOCs 1,2,4,5-tetrachlorobenzene, 2,4-dimethylphenol, 2-methylphenol, 3-methylphenol, and 4-methylphenol were identified as ecological COPCs because maximum reporting limits exceeded surface soil screening values. An additional twenty-five non-detected VOCs and fifty-four non-detected SVOCs were identified as ecological COPCs based on the lack of surface soil screening values. Finally, copper was identified as an ecological COPC for SWMU 14 subsurface soil based on the lack of any usable data (all copper subsurface soil data from the 1996 RFI Phase I field investigation and 2006 RFI field investigation were rejected during data validation activities).

7.6.2.3 Terrestrial and Food Web Exposures

Results of the screening-level risk calculation for SWMU 14 terrestrial food web exposures are presented in Table 7-13 (surface soil) and Table 7-14 (subsurface soil). A discussion of these results is presented in the sections that follow.

7.6.2.3.1 Surface Soil

Results of the risk calculation for terrestrial food web exposures to chemicals in surface soil are presented in Table 7-13. Based on the comparison of maximum exposure doses to NOAEL-based screening values, seven detected metals (cadmium, chromium, lead, mercury, selenium, vanadium, and zinc) have HQ values greater than or equal to 1.0 for one or more of the terrestrial avian receptors. The highest HQ values were calculated for the American robin, including a HQ of 18.23 for mercury, 13.51 for vanadium, and 6.52 for chromium. Based on maximum exposures doses greater than NOAEL-based screening values, these seven metals are identified as ecological COPCs for terrestrial food web exposures to chemicals in surface soil. Although not detected, beryllium is identified as an ecological COPC based on the lack of a NOAEL-based screening value for each of the avian receptors. As discussed in Section 7.6.2.1, available copper data were rejected during data validation activities. Based on the lack of any usable data to evaluate potential risks to terrestrial avian receptors, copper also is identified as an ecological COPC for SWMU 14 terrestrial food web exposures.

Ethylbenzene and diethylphthlate were detected and are identified as ecological COPCs for surface soil food web exposures based on the lack of ingestion-based screening values. Eight non-detected VOCs and twenty-eight non-detected SVOCs also are identified as ecological COPCs for surface soil food web exposures based on the lack of ingestion-based screening values.

7.6.2.3.2 Subsurface Soil

Results of the screening-level risk calculations for terrestrial food web exposures to chemicals in subsurface soil are presented in Table 7-14. Based on the comparison of maximum exposure

doses to NOAEL-based screening values, six detected metals (cadmium, chromium, lead, vanadium, selenium, and zinc) have HQ values greater than 1.0 for one or more of the terrestrial avian receptors. Identical to surface soil, the highest HQ values were calculated for the American robin, including an HQ of 7.44 for vanadium and 4.90 for zinc. Although not detected, mercury is identified as an ecological COPC for subsurface soil food web exposures because the maximum exposure dose for the American robin and mourning dove (based on the maximum reporting limits) exceeds the NOAEL-based screening value. The non-detected metal beryllium also is identified as an ecological COPC based on the lack of an ingestion-based screening value for each avian receptor. As discussed in Section 7.6.2.2, available copper data were rejected during data validation activities. Based on the lack of any usable data to evaluate potential risks to terrestrial avian receptors, copper is identified as an ecological COPC for SWMU 14 terrestrial food web exposures.

Dioxin/furan chemicals were detected in subsurface soil sample 14SB04-01 (1,2,3,4,6,7,8-HpCDD was detected at 1.27J µg/kg and OCDD was detected at 11.6 µg/kg) and identified as ecological COPCs because maximum exposure doses, based on the sum of 2,4,7,8-TCDD equivalents, exceed NOAEL-based screening values for the American robin and red-tailed hawk. Ethylbenzene also was detected in subsurface soil and is identified as an ecological COPC based on the lack of ingestion-based screening values. An additional eight non-detected VOCs and twenty-nine non-detected SVOCs are identified as ecological COPCs based on the lack of ingestion-based screening values.

7.7 Uncertainties Associated With the Screening-Level Ecological Risk Assessment

The procedures used in this evaluation to assess risks to ecological receptors, as in all such assessments, are subject to uncertainties because of the limitations of the available data and the need to make certain assumptions and extrapolations based on incomplete information. The major uncertainties associated with the screening-level ERA for SWMU 14 are identified and discussed below.

Analytical Data

- The analytical data used in the screening-level ERA included data for surface soil samples collected during the 1996 RFI. Given the age of these data, they do not represent current levels of potential exposure. The uncertainty associated with the age of the 1996 RFI data is reduced by the inclusion of more recent data (i.e., data for samples collected during the 2006 RFI).

- A second source of uncertainty related to the analytical data applies to the spatial coverage of surface and subsurface soil analytical data. A single surface soil sample was collected at the location of the temporary fire training pit (14SB07-01), while subsurface soil data for the depth interval evaluated in this screening-level ERA (1.5 to 3.0 feet bgs) is lacking altogether. The limited surface soil data is a source of uncertainty at this location since it is not known if the available soil data capture maximum concentrations in soil.

- A third source of uncertainty related to the analytical data applies to the depth intervals surface and subsurface soil samples were collected from. Surface soil analytical data were available from the 0 to 1.0 foot depth interval, while subsurface soil analytical data were available from the 1.5 to 3.0 foot depth interval. As such, analytical data were not

available for a depth interval from 1.0 to 1.5 feet bgs. If maximum soil concentrations at the SWMU occur within this depth interval, the lack of analytical data for the 1.0 to 1.5 foot depth interval resulted in an understatement of risk estimates and/or ecological COPCs.

- A fourth source of uncertainty related to the analytical data applies to "J" flagged data. Analytical data for many chemicals were were qualified as estimated, "J" because the results fall between the method detection limit (MDL) and method reporting limit (MRL). Although concentrations that fall between the MDL and MRL are considered detected, the confidence in the quantified values is low.

- A fifth source of uncertainty related to the analytical data applies to copper. Available surface soil and subsurface soil data from the 1996 RFI Phase I and 2006 RFI field investigations were rejected during data validation activities (see Baker, 1996 and Appendix C). Therefore, it is not known if this metal in present in SWMU 14 surface and subsurface soil at ecologically important concentrations. As there was no usable data to evaluate potential exposures and risks to terrestrial invertebrate and plant communities, this metal was identified as an ecological COPC for surface and subsurface soil. Copper also was identified as an ecological COPC for avian food web exposures to chemicals in surface and subsurface soil.

Identification of Ecological COPCs

- Chemicals without available screening values were identified as ecological COPCs even if they were not detected. Non-detected chemicals with reporting limits greater than screening values also were identified as ecological COPCs in the screening-level ERA. This approach likely overstates the number of actual COPCs.

- A second source of uncertainty related to the selection of ecological COPCs applies to the use of NOAEL-based screening values in risk calculations for upper trophic level receptors. The use of NOAEL-based screening values is extremely conservative since they give no indication as to how much higher a concentration must be before adverse effects are observed.

Exposure Point Concentrations

- The maximum measured concentration provides a conservative estimate for immobile biota or those with a limited home range. The most realistic exposure estimates for mobile species with relatively large home ranges and for species populations (even those that are immobile or have limited home ranges) are those based on the mean chemical concentrations in each medium to which these receptors are exposed. This is reflected in the wildlife dietary exposure models contained in the Wildlife Exposure Factors Handbook (USEPA, 1993), which specify the use of average media concentrations. Given the mobility of the upper trophic level receptor species used in the screening-level ERA, the use of maximum chemical concentrations (rather than mean concentrations) to estimate the exposure via food webs is very conservative.

Media-Specific Screening Values

- Literature-based toxicological thresholds were not available for many of the chemicals evaluated in the screening-level ERA. Furthermore, many of the surface soil screening values used in the comparison to surface soil analytical data were background-based concentrations (see Table 7-4). Because background-based screening values do not represent effect concentrations, their use in the screening-level ERA likely resulted in an overstatement of the actual number of ecological COPCs.

- When a toxicological threshold was available for both plants and invertebrates, the minimum value was selected as the screening value. For several chemicals, only a plant or earthworm toxicological threshold was available from the literature. It was assumed in the screening-level ERA that the screening value selected for these chemicals are protective of both receptor communities. If a given chemical does not have an available screening value for both terrestrial plants and invertebrates, this approach will result in an underestimation of potential risks if the screening value is not based on the most sensitive receptor community.

- TEFs have not been established for terrestrial plants and invertebrates. As a measure of conservatisms, dioxin/furan congener concentrations in subsurface soil sample 14SB04-01 were evaluated directly as 2,3,7,8-TCDD. Under this approach, each individual congener concentration was compared directly to the 2,3,7,8-TCDD soil screening value. This approach likely resulted in an overstatement of potential risks to terrestrial invertebrayes since it has been demonstrated that they are insensitive to 2,3,7,8-TCDD induced toxicity (USEPA, 2003b). In addition, potential risks to terrestrial plants are likely to be overstated since available data indicates that aquatic plants are relatively insensitive to 2,3,7,8-TCDD (USEPA, 2003b).

<u>Ingestion-Based Screening Values</u>

- Data on the toxicity of many chemicals to the receptor species were sparse or lacking, requiring the extrapolation of data from other wildlife species or from laboratory studies with non-wildlife species. This is a typical limitation for ecological risk assessments because so few wildlife species have been tested directly for most chemicals. The uncertainties associated with toxicity extrapolation were minimized through the selection of the most appropriate test species for which suitable toxicity data were available. The factors that were considered in selecting a test species to represent a receptor species included taxonomic relatedness, trophic level, foraging method, and similarity of diet. Regardless, the use of NOAEL and LOAEL values derived from laboratory studies with non-wildlife species may have resulted in an overstatement or understatement of potential risks if the sensitivities of the receptor and test species differ appreciable

- A second source of uncertainty related to the derivation of ingestion screening values applies to metals. Most of the toxicological studies on which the ingestion-based screening values for metals were based used forms of the metal (such as salts) that have high water solubility and high bioavailability to receptors. Since the analytical samples on which site-specific exposure estimates were based measured total metal concentrations, regardless of form, and these highly bioavailable forms are expected to compose only a fraction of the total metal concentration, this is likely to result in an overestimation of potential risks for these chemicals.

- A third source of uncertainty related to the derivation of ingestion screening values concerns the use of uncertainty factors. For example, in some cases NOAELs were extrapolated from LOAELs using an uncertainty factor of ten. This approach is likely to be conservative since Dourson and Stara (1983) determined that 96 percent of the chemicals included in a data review had LOAEL/NOAEL ratios of five or less.

- A fourth source of uncertainty related to the derivation of ingestion-based screening values applies to mercury. The NOAEL-based mercury screening value used for birds (0.0064 mg/kg-BW/day) was based on an organometallic (methylated) form (methyl mercury dicyandiamide). Avian screening values for inorganic forms of mercury are substantially higher (0.45 mg/kg-BW/day for mercuric chloride [see Table 7-10]). The USEPA (2001) reports that between 0.5 to 5.3 percent of the total mercury in soil is present as methylmercury. These data indicate that methylmercury represents a fraction of the total mercury in surface soil. As such, the use of an ingestion-based screening value based on a methylated form assumes that 100 percent of the detected mercury is present as methyl mercury, likely resulting in an overestimation of potential risk.

Ecological Receptors

- Although exposure pathways to terrestrial reptiles and amphibians are likely to be complete, reptilian and amphibian species were not selected as ecological receptors because the life history and toxicological database concerning the effects on reptiles and amphibians is severely limited. It was assumed that any terrestrial reptiles and amphibians present at SWMU 14 are not exposed to significantly higher concentrations of chemicals and are not more sensitive to chemicals than the other receptor species evaluated in the risk assessment. If reptiles and amphibians are exposed to significantly higher concentrations of chemicals and/or are more sensitive to chemicals than the other receptor species evaluated by this ERA, this approach will result in an underestimation of potential risks to herpetofauna.

- Although thirteen species of bats reside in Puerto Rico, representative species were not selected as ecological receptors in the screening-level ERA because life history information is severely limited or lacking altogether. Although the exclusion of bats from evaluation in this screening-level ERA represents an uncertainty, potential exposures to soil contaminants is expected to be negligible for most, if not all, feeding guilds. The absence of fruit-bearing and flowering vegetation excludes potential exposures by fruit-eating species (Jamaican fruit bat, Antillean fruit bat, red fig-eating bat) and nectar-feeding species (brown flower bat and Greater Antillean long-tongued bat). Insectivorous bats (Antillean ghost-faced bat, Parnell's mustached bat, sooty mustached bat, big brown bat, red bat, velvety free-tailed bat, and Brazilian free-tailed bat) feed primarily on flying insects that would not be expected to have any appreciable exposure to soil contaminants. Finally, the lack of any surface water bodies within or contiguous to SWMU 14 capable of supporting fish precludes potential exposures to chemicals detected in surface and subsurface soil by fish-eating bats (Mexican bulldog bat).

Exposure Routes

- Although inhalation and/or dermal adsorption represent potential exposure routes for upper trophic level receptors, they were not evaluated in the screening-level ERA

because they were considered insignificant relative to ingestion exposures (see Section 7.3.1.3). While this is a reasonable assumption for the terrestrial birds selected as ecological receptors, the exclusion of inhalation and dermal adsorption represents a source of uncertainty that may have results in an underestimation of potential risks.

Food Web Exposure Modeling

- Chemical concentrations in terrestrial food items (plants, earthworms, and small mammal omnivores) were modeled from measured media concentrations and were not directly measured. The use of generic, literature-derived exposure models and BAFs introduces some uncertainty into the resulting estimates and may have resulted in an overstatement or understatement of potential risks. The values selected and the methodology employed was intended to provide a reasonable estimate of potential food web exposure concentrations.

- A second source of uncertainty related to the food web models is the use of default assumptions for exposure parameters such as BCFs and BAFs. Although BCFs or BAFs for many chemicals were readily available from the literature and were used in the ERA, the use of a default factor of 1.0 to estimate the concentration of some chemicals in receptor prey items is a source of uncertainty. The assumption that the chemical body burden in the prey item is at the same concentration as in soil is conservative for chemicals that are not known not to accumulate to any significant degree. However, if a chemical does accumulate in receptor prey items, the use of a default factor of 1.0 may have resulted in an underestimation of potential risks to the upper trophic level receptors evaluated by this ERA.

- A third source of uncertainty related to the food web models is the use of unrealistically conservative exposure parameters. The use of maximum ingestion rates and minimum body weights resulted in a conservative estimate of exposure. In addition, AUFs were assumed to equal one. This is a conservative assumption since a significant percentage of each upper trophic level receptor species time could be spent foraging off-site in areas not impacted by site-related chemicals or areas where chemical concentrations are expected to be significantly lower.

Chemical Mixtures

- Information on the ecotoxicological effects of chemical interactions is generally lacking, which required (as is standard for ecological risk assessments) that the chemicals be evaluated on a compound-by-compound basis during the comparison to screening values. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).

7.8 Screening-Level Ecological Risk Assessment Decision Point and Recommendations

The results of the screening-level ERA for SWMU 14 indicated that, based on a set of conservative exposure assumptions, there are multiple chemicals in surface soil and subsurface soil that may present risks to one or more receptors species/receptor groups evaluated (see Table 7-15). Under Navy policy, if the results of the Steps 1 and 2 (Tier 1 screening-level ERA) indicate that there are chemicals present in environmental media that may present risks to

receptor species/receptor groups, the ERA process proceeds to the baseline ERA (i.e., Step 3a). Based on the presence of multiple chemicals in surface soil and subsurface soil that may present risks to one or more of the receptor species/receptor groups evaluated by this ERA, further evaluation in Step 3a is warranted. However, prior to proceeding to Step 3a, a data gap identified in the Step 1 problem formulation should be addressed through additional sampling to allow for an evaluation of all media-pathway-receptor combinations that may exist at the SWMU. This data gap and specific recommendations are discussed below.

Past aerial photographs show that the original fire training pit was connected to a drainage ditch via a swale. Fluids associated with fire training operations within the original fire training pit may have discharged to the drainage ditch. The drainage ditch eventually terminates within a freshwater wetland (classified as a PEM1 by the Cowardin Wetland Classification System [Cowardin et al., 1979]). Soil samples were not collected from the drainage ditch, nor were surface water or sediment samples collected from the PEM1 wetland during previous field investigations (i.e., 1996 and 2006 RFIs). Because the PEM1 wetland unit represents a potential exposure point where ecological receptors could contact affected media (i.e., surface water and sediment), the lack of ditch soil analytical data (which can be used to indicate if a release to the ditch has occurred) or surface water and sediment analytical data (which would indicate if chemicals associated with fire training operations have migrated to the wetland) prevented an evaluation of this potential transport pathway. For this reason, it is recommended that soil samples be collected from the ditch to determine if a release of fluids associated with fire training operations has occurred. If analytical results indicate that site-related chemicals are present along the length of the ditch, additional sampling (i.e., surface water and sediment) within the PEM1 wetland unit would be necessary to allow for an evaluation of potential risks associated with the surface water and sediment exposure pathways.

7.9 ERA References

Baes III, C.F., R.D. Scharp, A.L. Sjoreen, and R.W. Shor. 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture. ORNL 5786. Oak Ridge National Laboratory, Oak Ridge, TN.

Baker Environmental, Inc. (Baker). 2006. Revised Final RCRA Facility Investigation Work Plan, Fire Training Pit Area, SWMU 14, Naval Activity Puerto Rico, Ceiba, Puerto Rico.

Baker. 1996. Draft RCRA Facility Investigation Report for Phase I Investigations at Operable Units 1, 6, and 7, Naval Station Roosevelt Roads, Ceiba, Puerto Rico.

Bechtel Jacobs. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Prepared for U.S. Department of Energy. BJC/OR-133. September 1998.

Beyer, W. N. and C. Stafford. 1993. Survey and Evaluation of Contaminants in Earthworms and in Soils Derived from Dredged Material at Confined Disposal Facilities in the Great Lakes Region. Environmental Monitoring and Assessment. 24:151-165.

Beyer, W.N. 1996. Accumulation of Chlorinated Benzenes in Earthworms. Bulletin of Environmental Contamination and Toxicology. 57:729-736.

Canadian Council of Ministers of the Environment (CCME). 2002. Canadian Soil Quality Guidelines (CSoQGs). http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/soil/default.cfm.

Chief of Naval Operations (CNO). 1999. Navy Policy for Conducting Ecological Risk Assessments. Memorandum from Chief of Naval Operations to Commander, Naval Facilities Engineering Command. Ser. N453E/9U595355. April 5, 1999.

Coulston, F. and A.C. Kolbye, Jr. (eds). 1994. Interpretive Review of the Potential Adverse Effects of Chlorinated Organic Chemicals on Human Health and the Environment. Regulatory Toxicology and Pharmacology. 20:S1-S1056.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79-31. Office of Biological Services, Fish and Wildlife Service, U.S. Department of the Interior, Washington, DC.

Diaz, G.J., R.J. Julian, and E.J. Squires. 1994. Lesions in Broiler Chickens Following Experimental Intoxication with Cobalt. Avian Diseases. 38:308-316.

Dourson, M.L. and J.F. Stara. 1983. Regulatory History and Experimental Support of Uncertainty (Safety) Factors. Regulatory Toxicology and Pharmacology. 3:224-238.

Efroymson, R.A., Will, M.E., and Suter II, G.W. (1997a). Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. (ES/ER/TM-126/R2).

Efroymson, R.A., Will, M.E., Suter II, G.W., and Wooten, A.C. (1997b). Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory. Oak Ridge, TN. (ES/ER/TM-85/R3).

Eisler, R. 1991. Cyanide Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. U.S. Fish and Wildlife Service Biological Report 85(1.23), Contaminant Hazard Reviews Report No. 23. 55 pp.

Eisler, R. 1989. Pentachlorophenol Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. U.S. Fish and Wildlife Service Biological Report 85(1.17), Contaminant Hazard Reviews Report No. 17. 72 pp.

Ewel, J.J., and J.L. Whitmore. 1973. The Ecological Life Zones of Puerto Rico and the U.S. Virgin Islands. Institute of Tropical Forestry, Rio Piedras, PR. (U.S. Forest Service Research Paper ITF-18).

Geo-Marine, Inc. 2000. Habitat Characterization of Solid Waste Management Units (SWMU) 1, SWMU 2, and SWMU 45, Naval Station Roosevelt Roads, Puerto Rico. Geo-Marine, Inc., Plano, TX. October 11, 2000.

Geo-Marine, Inc. 1998. Integrated Natural Resource Management Plan for U.S. Naval Station Roosevelt Roads: Plan Years 1998-2007. Geo-Marine, Inc., Plano, TX.

Grimes, J. and M. Jaber. 1989. Para-dichlorobenzene: An Acute Oral Toxicity Study with the Bobwhite, Final Report. Prepared by Wildlife International Ltd. - Easton, MD under project No. 264-101 and submitted to Chemical Manufacturers Association, Washington, D.C. July 19, 1989.

Hill, E.F. and M.B. Camardese. 1986. Lethal Dietary Toxicities of Environmental Contaminants and Pesticides to Coturnix. U.S. Fish and Wildlife Services Technical Report 2.

Howard, P.H. 1991. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume III. Lewis Publishers, Chelsea, MI.

Humphreys, D.J. 1988. Veterinary Toxicology, 3rd Edition. B. Tindall, London, England. 356 p. (ISBN 0702012491).

Jackson, W.B. 1992. Norway Rat and Allies. Chapter 54 *In* Chapman, J.A. and G.A. Feldhamer (eds.), Wild Mammals of North America: Biology, Management, and Economics. The John Hopkins University Press, Baltimore MD. pp.1077-1088.

Levey, D.J. and W.H. Karasov. 1989. Digestive Responses of Temperate Birds Switched to Fruit or Insect Diets. Auk. 106:675-686.

Little, E.L. and F.H. Wadsworth. 1964. Common Trees of Puerto Rico and the Virgin Islands. Agricultural U.S Department of Agriculture, Forest Department, Washington, D.C. Agricultural Handbook No. 249.

Maki, A.W. and J.R. Duthie. 1978. Summary of Propose Procedures for the Evaluation of Aquatic Hazard. *In* Cairns, J., Jr., K.L Dickson, and A.W. Maki (eds.), Estimating the Hazard of Chemical Substances to Aquatic Life. ASTM STP 657. pp.153-163.

Martin, A.C., H.S. Zim, and A.L. Nelson. 1951. American Wildlife and Plants: A Guide to Wildlife Food Habits. Dover Publications, Inc. New York, NY. 500 pp.

Menzie, C.A., D.E. Burmaster, J.S. Freshman, and C.A. Callahan. 1992. Assessment of Methods for Estimating Ecological Risk in the Terrestrial Component: A Case Study at the Baird & McGuire Superfund Site in Holbrook, Massachusetts. Environ. Toxicol. and Chem. 11:245-260.

Ministry of Housing, Spatial Planning and Environment (MHSPE). 1994. Intervention Values. Directorate-General for Environmental Protection, Department of Soil Protection, The Hague, Netherlands. May 9 1994. DBO/07494013.

Nagy, K.A. 1987. Field Metabolic Rate and Food Requirement Scaling in Mammals and Birds. Ecol. Monogr. 57:111-128.

Naval Facilities Engineering Command (NFESC). 1996. Survey of Potential Habitat for Yellow-Shouldered Blackbird on U.S. Naval Station Roosevelt Road, Puerto Rico. Naval Facilities Engineering Command, Atlantic Division, Norfolk, VA.

Opresko, D.M., B.E. Sample, and G.W. Suter II. 1993. Toxicological Benchmarks for Wildlife. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-86.

Patton, J.F. and M.P. Dieter. 1980. Effects of Petroleum Hydrocarbons on Hepatic Function in the Duck. Comp. Biochem. Physiol. 65C:33-36.

Puerto Rico Department of Natural Resources (PRDNR). 2002. Memorandum from Eduardo A. Ventosa-Febles to Jose L. Chabert, Director of Wildlife Division. August 12, 2002.

Raffaele, H.A. 1989. A Guide to the Birds of Puerto Rico and the Virgin Islands. Princeton University Press, Princeton, N.J. 254pp.

Rigdon, R.H. and J. Neal. 1963. Fluorescence of Chickens and Eggs Following the Feeding of Benzpyrene Crystals. Texas Reports on Biology and Medicine. 21(4):558-566.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter II, and T.L. Ashwood. 1998a. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-220.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter II. 1998b. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-219.

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, Oak Ridge TN. ORNL/TM-13391.

Sample, B.E., D.M. Opresko and W. Suter. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory, Health Sciences Research Division, Oak Ridge, Tennessee.

Sample, B.E. and G.W. Suter II. 1994. Estimating Exposure of Terrestrial Wildlife to Contaminants. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-125.

Simmons, G.J. and M.J. McKee. 1992. Alkoxyresorufin Metabolism in White-Footed Mice at Relevant Environmental Concentrations of Aroclor 1254. Fundamental and Applied Toxicology. 19:446-452.

Suter II, G.W., R.E. Efroymson, B.E. Sample, and D.S. Jones. 2000. Ecological Risk Assessment for Contaminated Sites. Lewis Publishers, Boca Raton, FL. 438 pp.

Suter II, G.W. 1995. Guide for Performing Screening Ecological Risk Assessments at DOE Facilities. Oak Ridge National Laboratory, Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-153.

Suter, G.W. II. 1993. Ecological Risk Assessment. Lewis Publishers, Chelsea, MI. 538 pp.

Suter, G.W. II. 1990. Endpoints for Regional Ecological Risk Assessment. Environmental Management. 14:9-23.

Suter, G.W. II. 1989. Ecological Endpoints. Chapter 2 *In* Warren-Hicks, W., B.R. Parkhurst, and S.S. Baker, Jr. (eds), Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference. EPA/600/3-89/013.

Syracuse Research Corporation (SRC). 1998. Experimental Octanol/Water Partition Coefficient (Log P) Database. http://esc.syrres.com/~esc1/srckowdb.htm.

Terrestrial Toxicity Database (TERRETOX). 1998. Environmental Research Laboratory, U.S. Environmental Protection Agency, Duluth, MN.

Tomlinson, R.E., D.D. Dolton, R.R. George, and R.R. Mirarchi. 1994. Mourning Dove. In T.C. Tacha and C.E. Braun (eds), Migratory Shore and Upland Game Bird Management in North America. Int. Assoc. Fish and Wildlife Agencies, Washington, D.C. pp. 1-26.

Travis, C.C. and A.D. Arms. 1988. Bioconcentration of Organics in Beef, Milk, and Vegetation. Environ. Science and Technology. 22:271-274.

U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS.

U. S. Environmental Protection Agency (USEPA). 2006a. Ecological Risk Assessment Frequently Asked Questions: Ecological Receptors. http://www.epa.gov/reg3hwmd/risk/eco/faqs/ecorecept.html.

USEPA. 2006b. Ecological Soil Screening Levels for Copper (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-68.

USEPA. 2006c. Ecological Soil Screening Levels for Silver (interim Final). Office of Solid Waste and Emergency Response, Washinton, D.C. OSWER Directive 9285.7-77.

USEPA. 2005a. Ecological Soil Screening Levels for Antimony (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-61.

USEPA. 2005b. Ecological Soil Screening Levels for Arsenic (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-62.

USEPA. 2005c. Ecological Soil Screening Levels for Barium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-63.

USEPA. 2005d. Ecological Soil Screening Levels for Beryllium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-64.

USEPA. 2005e. Ecological Soil Screening Levels for Cadmium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-65.

USEPA. 2005f. Ecological Soil Screening Levels for Cobalt (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-67

USEPA. 2005g. Ecological Soil Screening Levels for Lead (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-70.

USEPA. 2005h. Ecological Soil Screening Levels for Chromium (Interim final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-66.

USEPA. 2005i. Ecological Soil Screening Levels for Vanadium (Interim final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-75.

USEPA. 2004. Integrated Risk Information System Database for Risk Assessment. Office of Research and Development. http://www.epa.gov/iriswebp/iris/index.html.

USEPA. 2003a. Guidance for Developing Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. Washington, D.C. OSWER Directive 9285.7-55.

USEPA. 2003b. Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans and Biphenyls in Ecological Risk Assessment (External Review Draft). Risk Assessment Forum, Washington, D.C. 630/P-03/002A.

USEPA. 2003c. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. Office of Research and Development, Washington, D.C. EPA-600-R-02-013.

USEPA. 2001. Water Quality Criteria for the Protection of Human Health: Methylmercury. Office of Science and Technology, Office of Water, Washington, D.C. EPA-823-R-01-001.

USEPA. 2000a. Draft Ecological Soil Screening Level Guidance. Office of Emergency and Remedial Response, Washington, D.C. July 2000.

USEPA. 2000b. Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs. Bioaccumulation Analysis Workgroup, Washington, D.C.(EPA-823-R-00-001).

USEPA. 1999. Screening-Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA/530/D-99/001A.

USEPA. 1998. Guidelines for Ecological Risk Assessment. Risk Assessment Forum, Washington, DC. EPA/630/R-95/002B.

USEPA. 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (Interim Final). Office of Solid Waste and Emergency Response. EPA/540/R-97-006.

USEPA. 1996. Superfund Chemical Data Matrix. EPA/540/R-96/028.

USEPA. 1995. Internal Report on Summary of Measured, Calculated and Recommended Log K_{ow} Values. Environmental Research Laboratory, Athens, GA. April 10, 1995.

USEPA. 1993. Wildlife Exposure Factors Handbook. Office of Research and Development, Washington, D.C. EPA/600/R-93/187a.

USEPA. 1992. Framework for Ecological Risk Assessment. USEPA, Risk Assessment Forum, Washington, DC. EPA/630/R92/001.

USEPA. 1991. Criteria for Choosing Indicator Species for Ecological Risk Assessments at Superfund Sites. EPA/101/F-90/051.

USEPA. 1990. Assessment of Risks from Exposure of Humans, Terrestrial and Avian Wildlife, and Aquatic Life to Dioxins and Furans from Disposal and Use of Sludge from Bleached Kraft and Sulfide Pulp and Paper Mills. EPA/560/5-90/013.

U.S Geological Survey (USGS). 1999. Status and Trends of the Nation's Biological Resources. http://biology.usgs.gov/s+t/SNT/index.htm.

U.S. Fish and Wildlife Service (USFWS). 1996. Recovery Plan for the Yellow-Shouldered Blackbird (*Agelaius xanthomus*). USFWS, Southeast Region, Atlanta, GA.

USFWS. 1987. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the Puerto Rican Crested Toad. Federal Register, 52 (149):28828-28831.

USFWS. 1984. Recovery Plan for the Golden Coqui (*Eleutherodactylus jasperi*). USFWS, Southeast Region, Atlanta, GA.

USFWS. 1983. Yellow-Shouldered Blackbird Recovery Plan. USFWS, Southeast Region, Atlanta, GA.

Van den Berg, M, L. Birnbaum, A.T.C. Bosveld, B. Brunstrom, P. Cook, M. Feely, J.P. Giesy, A. Hanberg, R. Hasegawa, S.W. Kennedy, T. Kubiak, J.C. Larsen, F.X. Rolaf van Leeuwen, A.K.D. Liem, C. Nolt, R.E. Peterson, L. Poellinger, S. Safe, D. Schrenk, D. Tillitt, M. Tysklind, M. Younes, F. Waern, and T. Zacharewski. 1998. Toxic Equivalency Factors (TEFs) for PCBS, PCDDs, PCDFs for Humans and Wildlife. Environ. Health Perspect. 106(12):775-792.

Van Gestel, C.A.M. and W. Ma. 1988. Toxicity and Bioaccumulation of Chlorophenols in Earthworms, in Relation to Bioavailability in Soil. Ecotoxicology and Environmental Safety. 15:289-297.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The findings of the post-closure 2006 RFI field work for SWMU 14 were consolidated with data generated during a 1996 Phase I RFI effort. Data was compared against current evaluation criteria to identify COPCs for further evaluation in a HHRA as well as a Screening Level (Steps 1 and 2) ERA. The HHRA included herein supersedes a preliminary HHRA, submitted to the USEPA on February 4, 2000, as it includes a more in-depth evaluation based on potential subsurface soil and groundwater impacts as well as updated risk-based evaluation criteria.

8.1 Conclusions

The objectives of the 2006 RFI were to:

- Determine if any contaminants are present from past operation of the fire training pit, to the extent practical, from the completion of field activities (surface soil, subsurface soil, and groundwater sampling) as described in the 2006 RFI Work Plan;
- Assess and document potential human health risks posed by the site; and
- Assess and document potential ecological risks posed by the site.

The following present specific conclusions related to each of the RFI objectives.

8.1.1 Historical Impacts

PID readings taken during the 2006 RFI soil boring advancement work indicated, and validated analytical data confirmed, that surface soils, subsurface soils, and groundwater at the original/current fire pit and the temporary fire pit have been impacted by historical fire training activities. Contamination consistent with uncombusted fuel and, potentially, solvents were detected in trace quantities.

8.1.1.1 Original/Current Fire Training Pit

Detected organic parameters in the surface and subsurface soils were compared to applicable USEPA Region III Residential and/or Industrial RBCs. No organic parameter criteria exceedances were noted for the 2006 surface soil analyses (although 1996 surface soil data indicated some PAH contamination above criteria). This may be due to some natural attenuation having taken place during the ten year span between sampling events. One subsurface soil sample (14SB04-01) was determined to have exceeded any of the organic parameter criteria - two dioxin compounds: 1,2,3,4,6,7,8-HpCDD and OCDD. Dioxins are common trace level by-products of burning diesel fuel and chlorinated compounds (solvents).

Minor metals contamination also may be present in the surface and subsurface soils, although natural vanadium levels at NAPR generally exist above USEPA Region III Residential RBC limits. Arsenic exceedances in the soil samples were only slightly above the comparison criteria and were qualified as estimated by the laboratory/data validator.

Two groundwater samples from this area were found to contain organic parameters that exceed USEPA Region III Tap Water RBCs and/or Federal Drinking Water MCLs. Sample 14TW01

showed the highest degree of impact, with benzene found at 220 μg/l and numerous low-level PAHs detected.

8.1.1.2 Temporary Fire Training Pit

The surface soil sample collected at the temporary pit contained no organic parameter hits and no TPH DRO or GRO hits. The corresponding two subsurface soil samples at this location showed no organic parameter hits (TPH indicators not tested).

Minor metals contamination also may be present; again, natural vanadium levels at NAPR generally exist above USEPA Region III Residential RBC limits and the arsenic exceedances for these surface and subsurface soil samples were only slightly above the comparison criteria and were qualified as estimated by the laboratory/data validator.

The temporary pit groundwater sample did contain TPH DRO at a level of 1.5 milligram per liter (mg/l). A few organic parameters were found in trace quantities, none of which exceeded applicable USEPA Region III Tap Water RBCs or Federal Drinking Water MCLs.

8.1.2 Human Health Risk Assessment

Site risks were estimated for current and future human receptors:

- Current adult and adolescent trespassers were evaluated for surface soil exposures -- no carcinogenic risks or adverse health hazards were calculated that exceeded USEPA's acceptable criteria.

- Current/future adult on-site workers were evaluated for surface soil and subsurface soil exposures -- no carcinogenic risks were calculated that exceeded USEPA's acceptable risk range. However, the total site HI calculated for the on-site worker (3.4) under the RME scenario exceeded 1.0. Potential exposure to vanadium in surface soil and subsurface soil contributed primarily to the surface soil HI. As a result, the gastrointestinal system target organ HI value and the kidney target organ HI value both exceeded 1.0. Also, the total site HI calculated under the CT exposure scenario exceeded 1.0.

Future adult and young child residents were evaluated for surface soil, subsurface soil, groundwater, and indoor air exposures -- carcinogenic risks were found that exceeded USEPA's acceptable risk range. The total site ILCR for the adult resident was 8.2×10^{-04}; the total site ILCR for the child resident was 5.0×10^{-04}. It follows that the total lifetime ILCR exceeds 1×10^{-04}. Potential exposure to groundwater contributed predominately to the total site ILCR for the adult and child resident, driven by the presence of benzene and carcinogenic PAHs (specifically, benzo(a)pyrene and dibenz(a,h)anthracene). In addition, the total site HI for the residential adult (7.6) and child (28) receptors under the RME scenario exceeded 1.0. Potential exposure (via ingestion and inhalation pathways) to benzene and vanadium concentrations in the groundwater, as well as ingestion of and dermal contact with vanadium concentrations in surface and subsurface soil contributed primarily to this exceedence. The gastrointestinal system target organ HI values and the kidney target organ values exceeded 1.0 for both adult and child residents. The total site HIs calculated under the CT exposure scenarios also exceeded 1.0.

- Future adult construction workers were evaluated for surface soil, subsurface soil, and groundwater (dermal only) exposures -- no carcinogenic risks were calculated that exceeded USEPA's acceptable risk range. The total site HI for the construction worker (4.1) under the RME scenario exceeded 1.0. Potential exposure to vanadium in surface soil and subsurface soil contributed primarily to the surface soil HI. As a result, the gastrointestinal system target organ HI value and the kidney target organ HI value both exceeded 1.0. Also, the total site HI calculated under the CT exposure scenario exceeded 1.0.

8.1.3 Ecological Risk Assessment

Numerous ecological exposure pathways were reviewed as part of a Tier 1 screening-level ERA for SWMU 14 to determine risk levels for various receptor species/receptor groups. The results indicated that, based on a set of conservative exposure assumptions, there are multiple chemicals in the surface and subsurface soils that may present unacceptable ecological risks to one or more of the receptor species/receptor groups evaluated. Based on the presence of multiple chemicals in surface soil and subsurface soil that may present risks to one or more of the receptor species/receptor groups evaluated by this ERA, further evaluation in Step 3a is warranted. However, prior to proceeding to Step 3a, a data gap identified in the Step 1 problem formulation should be addressed through additional sampling to allow for an evaluation of all media-pathway-receptor combinations that may exist at the SWMU. This data gap and specific recommendations are discussed below.

8.2 Recommendations

Past aerial photographs show that the original fire training pit was connected to a drainage ditch via a swale. Fluids associated with fire training operations within the original fire training pit may have discharged to the drainage ditch. The drainage ditch eventually terminates within a freshwater wetland (classified as a PEM1). The wetland unit represents a potential ecological exposure point where receptors could contact affected media (i.e., surface water and sediment). No soil samples were collected from the drainage ditch, nor were surface water or sediment samples collected from the wetland during the 1996 Phase I and 2006 RFI field activities. Because of the lack of analytical data for these areas, it was not possible to evaluate this potential transport pathway. Therefore, it is recommended that soil samples be collected from the ditch to determine if a release has ever occurred. If the ditch results indicate that site-related chemicals are present, then surface water and sediment sampling within the PEM1 wetland unit would be necessary.

Further evaluation of ecological risk in a Step 3a process is warranted. However, the data gap presented by the lack of analytical information relating to the drainage ditch and connecting wetland system needs to be addressed either prior to or in conjunction with the Step 3a ERA.

9.0 REFERENCES

Baker, 2006. Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Station Roosevelt Roads, Ceiba, Puerto Rico.

Baker, 2005. RCRA Facility Investigation Work Plan, Fire training Pit Area, SMWU 14. Naval Naval Activity Puerto Rico, Ceiba, Puerto Rico.

Baker, 2000. Draft Interim Decision Document, SWMU 14 – Fire Training Pit Area. Naval Station Roosevelt Roads, Ceiba, Puerto Rico.

Baker, 1997. Draft Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Station Roosevelt Roads, Ceiba, Puerto Rico.

Baker, 1996. Draft RCRA Facility Investigation for Phase I Investigations at Operable Units 1, 6, and 7, Naval Station Roosevelt Roads, Ceiba, Puerto Rico.

Baker, 1995. Final RCRA Facility Investigation Management Plans, Naval Station Roosevelt Roads, Ceiba, Puerto Rico.

Fetter, C.W., 1988. Applied Hydrogeology. MacMillan, 1988

Naval Energy and Environmental Support Activity (NEESA). 1984. Initial Assessment Study of Naval Station Roosevelt Roads, Puerto Rico. NEESA 13-051.

Pankow & Cherry, 1996. Dense Chlorinated Solvents and other DNAPLs in Groundwater. Waterloo Press.

Parker, B.L., 1999. Fractured Clayey Aquitards. In DNAPLs in Fractured Geologic Media, a Waterloo Educational Services Short Course, December 8-10, 1999.

TABLES

TABLE 4-1

SUMMARY OF 2006 RFI SURFACE SOIL, SUBSURFACE SOIL, AND GROUNDWATER SAMPLING AND ANALYSIS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

					Analysis Requested								
Sample Media	Site ID	Sample ID	Sample Depth (ft bgs)	Field Screening (PID)	App. IX VOCs	App. IX SVOCs	App. IX PCBs	Low Level PAHs	App. IX Metals (Total)	Dioxins/Furans	DRO	GRO	Comments
Surface Soil	14SB01	14SB01-00	0.0 - 1.0	X	X	X	X	X	X		X	X	
	14SB02	14SB02-00	0.0 - 1.0	X	X	X	X	X	X		X	X	
	14SB03	14SB03-00	0.0 - 1.0	X	X	X	X	X	X		X	X	
	14SB07	14SB07-00	0.0 - 1.0	X	X	X	X	X	X		X	X	
Subsurface Soil	14SB01	14SB01-06	11.0 - 13.0	X	X	X	X	X	X		X	X	
		14SB01-11	21.0 - 23.0	X	X	X	X	X	X		X	X	
		14SB01-11D	21.0 - 23.0		X	X	X	X	X		X	X	Duplicate
		14SB01-11 MS/MSD	21.0 - 23.0		X	X	X	X	X		X	X	Matrix Spike/Matrix Spike Duplicate
	14SB02	14SB02-03	5.0 - 7.0		X	X	X	X	X		X	X	
		14SB02-08	15.0 - 17.0		X	X	X	X	X		X	X	
	14SB03	14SB03-06	11.0 - 13.0		X	X	X	X	X		X	X	
		14SB03-11	21.0 - 23.0		X	X	X	X	X		X	X	
	14SB04	14SB04-01	1.5 - 3.0		X	X	X		X	X	X	X	
		14SB04-10	19.0 - 21.0		X	X	X	X	X		X	X	
	14SB05	14SB05-02	3.5 - 5.0		X	X	X	X	X		X	X	
		14SB05-09	17.0 - 19.0		X	X	X	X	X	X	X	X	
	14SB06	14SB06-01	1.5 - 3.0	X	X	X	X	X	X		X	X	
		14SB06-07	13.0 -15.0	X	X	X	X	X	X	X	X	X	
		14SB06-07D	13.0 -15.0		X	X	X	X	X	X	X	X	Duplicate
	14SB07	14SB07-06	11.0 - 13.0	X	X	X	X	X	X		X	X	
		14SB07-08	15.0 - 17.0		X	X	X	X	X		X	X	
Groundwater	14SB01[(1)]	14TW01	NA	NA	X	X		X			X	X	
	14SB02	14TW02	NA	NA	X	X	X	X	X		X	X	
	14SB07[(1)]	14TW07	NA	NA	X	X		X	X		X	X	
				Totals	24	24	22	23	23	4	24	24	

Notes:
[(1)]Due to low well yield and low sample volume, certain analysis were selected.
ft bgs - feet below ground surface
PID - Photoionization Detector
NA - Not Applicable.

TABLE 4-2

SUMMARY OF 2006 RFI QUALITY ASSURANCE / QUALITY CONTROL SAMPLING AND ANALYSIS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Analysis Requested								
Sample ID	App. IX VOCs	App. IX SVOCs	App. IX PCBs	Low Level PAHs	App. IX Metals (Total)	Dioxins/Furans	DRO	GRO	Comments
Trip Blank Samples									
14TB01	X							X	
14TB02	X							X	
Equipment Rinsate Samples									
14ER01	X	X	X	X	X		X	X	Stainless Steel Spoon
14ER02	X	X	X	X	X	X	X	X	Geoprobe Acetate Liner
14ER03	X	X	X	X	X		X	X	Silicon/Polyethylene Tubing
Field Blank Samples									
E-FB01	X	X	X	X	X	X	X	X	Lab Grade Deionized Water
E-FB02	X	X	X	X	X	X	X	X	NAPR Potable Water
Totals	7	5	5	5	5	3	5	7	

TABLE 4-3

PARAMETER LISTS AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Appendix IX - VOCs	Quantitation Limits*		Method Number (Description)
	Water (µg/L)	Low Soil (µg/kg)	
Acetone	25	50	8260B (5030) (low level)
Acetonitrile	40	200	8260B (5030) (low level)
Acrolein	20	100	8260B (5030) (low level)
Acrylonitrile	20	100	8260B (5030) (low level)
Benzene	1.0	5.0	8260B (5030) (low level)
Bromodichloromethane	1.0	5.0	8260B (5030) (low level)
Bromoform	1.0	5.0	8260B (5030) (low level)
Bromomethane	1.0	10	8260B (5030) (low level)
Carbon Disulfide	1.0	5.0	8260B (5030) (low level)
Carbon Tetrachloride	1.0	5.0	8260B (5030) (low level)
Chlorobenzene	1.0	5.0	8260B (5030) (low level)
Chloroethane	1.0	10	8260B (5030) (low level)
Chloroform	1.0	5.0	8260B (5030) (low level)
Chloromethane	1.0	10	8260B (5030) (low level)
Chloroprene	1.0	5.0	8260B (5030) (low level)
3-Chloro-1-propene	1.0	5.0	8260B (5030) (low level)
1,2-Dibromo-3-chloropropane	1.0	10	8260B (5030) (low level)
Dibromochloromethane	1.0	5.0	8260B (5030) (low level)
1,2-Dibromoethane	1.0	5.0	8260B (5030) (low level)
Dibromomethane	1.0	5.0	8260B (5030) (low level)
trans-1,4-Dichloro-2-butene	2.0	10	8260B (5030) (low level)
Dichlorodifluoromethane	1.0	5.0	8260B (5030) (low level)
1,1-Dichloroethane	1.0	5.0	8260B (5030) (low level)
1,2-Dichloroethane	1.0	5.0	8260B (5030) (low level)
trans-1,2-dichloroethene	1.0	5.0	8260B (5030) (low level)
1,1-Dichloroethene	1.0	5.0	8260B (5030) (low level)
Methylene Chloride	5.0	5.0	8260B (5030) (low level)
1,2-Dichloropropane	1.0	5.0	8260B (5030) (low level)
cis-1,3-Dichloropropene	1.0	5.0	8260B (5030) (low level)
trans-1,3-Dichloropropene	1.0	5.0	8260B (5030) (low level)
Ethyl benzene	1.0	5.0	8260B (5030) (low level)
Ethyl methacrylate	1.0	5.0	8260B (5030) (low level)
2-Hexanone	10	25	8260B (5030) (low level)

TABLE 4-3

PARAMETER LISTS AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Appendix IX - VOCs (Cont.)	Quantitation Limits*		Method Number (Description)
	Water (µg/L)	Low Soil (µg/kg)	
Iodomethane	5.0	5.0	8260B (5030) (low level)
Isobutanol	40	200	8260B (5030) (low level)
Methacrylonitrile	20	100	8260B (5030) (low level)
2-Butanone	10	25	8260B (5030) (low level)
Methyl methacrylate	1.0	5.0	8260B (5030) (low level)
4-Methyl-2-pentanone	10	25	8260B (5030) (low level)
Pentachloroethane	5.0	25	8260B (5030) (low level)
Propionitrile	20	100	8260B (5030) (low level)
Stryene	1.0	5.0	8260B (5030) (low level)
1,1,1,2-Tetrachloroethane	1.0	5.0	8260B (5030) (low level)
1,1,2,2-Tetrachloroethane	1.0	5.0	8260B (5030) (low level)
Tetrachloroethene	1.0	5.0	8260B (5030) (low level)
Toluene	1.0	5.0	8260B (5030) (low level)
1,1,1-Trichloroethane	1.0	5.0	8260B (5030) (low level)
1,1,2-Trichloroethane	1.0	5.0	8260B (5030) (low level)
Trichloroethene	1.0	5.0	8260B (5030) (low level)
Trichlorofluoromethane	1.0	5.0	8260B (5030) (low level)
1,2,3-Trichloropropane	1.0	5.0	8260B (5030) (low level)
Vinyl Acetate	2.0	10	8260B (5030) (low level)
Vinyl Chloride	1.0	10	8260B (5030) (low level)
Xylene	2.0	10	8260B (5030) (low level)
Appendix IX - SVOCs	**Quantitation Limits***		**Method Number (Description)**
	Water (µg/L)	**Low Soil (µg/kg)**	
Acenaphthene	10	330	8270C
Acenaphthylene	10	330	8270C
Acetophenone	10	330	8270C
2-Acetylaminofluorene	10	330	8270C
4-Aminobiphenyl	20	330	8270C
Aniline	20	660	8270C
Anthracene	10	330	8270C
Aramite	10	330	8270C
Benzo(a)anthracene	10	330	8270C

TABLE 4-3

PARAMETER LISTS AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Appendix IX - SVOCs (Cont.)	Quantitation Limits*		Method Number (Description)
	Water (µg/L)	Low Soil (µg/kg)	
Benzo(b)fluoranthene	10	330	8270C
Benzo(k)fluoranthene	10	330	8270C
Benzo(g,h,i)perylene	10	330	8270C
Benzo(a)pyrene	10	330	8270C
Benzyl alcohol	10	330	8270C
Bis(2-chloroethoxyl)methane	10	330	8270C
Bis(2-chloroethyl)ether	10	330	8270C
Bis(2-ethylhexyl)phthalate	10	330	8270C
4-Bromophenyl phenyl ether	10	330	8270C
Butylbenzylphthalate	10	330	8270C
4-Chloroaniline	20	660	8270C
4-Chloro-3-methylphenol	10	330	8270C
2-Chloronaphthalene	10	330	8270C
2-Chlorophenol	10	330	8270C
4-Chlorophenyl phenyl ether	10	330	8270C
Chrysene	10	330	8270C
3&4 Methylphenol	10	330	8270C
2-Methylphenol	10	330	8270C
Diallate	10	330	8270C
Dibenzofuran	10	330	8270C
Di-n-butyl phthalate	10	330	8270C
Dibenzo(a,h)anthracene	10	330	8270C
o-Dichlorobenzene	10	330	8270C
m-Dichlorobenzene	10	330	8270C
p-Dichlorobenzene	10	330	8270C
3,3'-Dichlorobenzidine	20	660	8270C
2,4-Dichlorophenol	10	330	8270C
2,6-Dichlorophenol	10	330	8270C
Diethylphthalate	10	330	8270C
p-(Dimethylamino)azobenzene	10	330	8270C
7,12-Dimethyl benz(a)anthracene	10	330	8270C
3,3-Dimethyl benzidine	20	1,700	8270C
2,4-Dimethylphenol	10	330	8270C

TABLE 4-3

PARAMETER LISTS AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Appendix IX - SVOCs (Cont.)	Quantitation Limits*		Method Number (Description)
	Water (µg/L)	Low Soil (µg/kg)	
alpha, alpha-Dimethylphenethylamine	2,000	67,000	8270C
Dimethyl phthalate	10	330	8270C
m-Dinitrobenzene	10	330	8270C
4,6-Dinitro-2-methylphenol	50	1,700	8270C
2,4-Dinitrophenol	50	1,700	8270C
2,4-Dinitrotoluene	10	330	8270C
2,6-Dinitrotoluene	10	330	8270C
Di-n-octylphthalate	10	330	8270C
1,4-Dioxane	10	330	8270C
Dinoseb	10	330	8270C
Ethylmethanesulfonate	10	330	8270C
Fluoranthene	10	330	8270C
Fluorene	10	330	8270C
Hexachlorobenzene	10	330	8270C
Hexachlorobutadiene	10	330	8270C
Hexachlorocyclopentadiene	10	330	8270C
Hexachloroethane	10	330	8270C
Hexachlorophene	5,000	170,000	8270C
Hexachloropropene	10	330	8270C
Indeno(1,2,3-cd)pyrene	10	330	8270C
Isophorone	10	330	8270C
Isosafrole	10	330	8270C
Methapyrilene	2,000	67,000	8270C
3-Methylcholanthrene	10	330	8270C
Methyl methanesulfonate	10	330	8270C
2-Methylnaphthalene	10	330	8270C
Naphthalene	10	330	8270C
1,4-Naphthoquinone	10	330	8270C
1-Naphthylamine	10	330	8270C
2-Naphthylamine	10	330	8270C
2-Nitroaniline	50	1,700	8270C
3-Nitroaniline	50	1,700	8270C
4-Nitroaniline	50	1,700	8270C

TABLE 4-3

PARAMETER LISTS AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Appendix IX - SVOCs (Cont.)	Quantitation Limits*		Method Number (Description)
	Water (µg/L)	Low Soil (µg/kg)	
Nitrobenzene	10	330	8270C
2-Nitrophenol	10	330	8270C
4-Nitrophenol	50	1,700	8270C
4-Nitroquinoline-1-oxide	20	3,300	8270C
n-Nitrosodi-n-butylamine	10	330	8270C
n-Nitrosodiethylamine	10	330	8270C
n-Nitrosodimethylamine	10	330	8270C
n-Nitrosodiphenylamine	10	330	8270C
n-Nitrosodi-n-propylamine	10	330	8270C
n-Nitrosomethylethylamine	10	330	8270C
n-Nitrosomorpholine	10	330	8270C
n-Nitrosopiperidine	10	330	8270C
n-Nitrosopyrrolidine	10	330	8270C
5-Nitro-o-toluidine	10	330	8270C
bis-(2-chloroisopropyl)ether	10	330	8270C
Pentachlorobenzene	10	330	8270C
Pentachloronitrobenzene	10	330	8270C
Pentachlorophenol	50	1,700	8270C
Phenacetin	10	330	8270C
Phenanthrene	10	330	8270C
Phenol	10	330	8270C
1,4-Phenylenediamine	2,000	1,700	8270C
2-Picolin	10	330	8270C
Pronamide	10	330	8270C
Pyrene	10	330	8270C
Pyridine	50	330	8270C
Safrole	10	330	8270C
1,2,4,5-Tetrachlorobenzene	10	330	8270C
2,3,4,6-Tetrachlorophenol	10	330	8270C
o-Toluidine	20	330	8270C
1,2,4-Trichlorobenzene	10	330	8270C
2,4,5-Trichlorophenol	10	330	8270C
2,4,6-Trichlorophenol	10	330	8270C
1,3,5-Trinitrobenzene	10	330	8270C

TABLE 4-3

PARAMETER LISTS AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Low Level PAHs	Quantitation Limits*		Method Number (Description)
	Water (µg/L)	Low Soil (µg/kg)	
Acenaphthene	0.2	6.7	8270C
Acenaphthylene	0.2	6.7	8270C
Anthracene	0.2	6.7	8270C
Benzo(a)anthracene	0.2	6.7	8270C
Benzo(b)fluoranthene	0.2	6.7	8270C
Benzo(k)fluoranthene	0.2	6.7	8270C
Benzo(g,h,i)perylene	0.2	6.7	8270C
Benzo(a)pyrene	0.2	6.7	8270C
Chrysene	0.2	6.7	8270C
Dibenzo(a,h)anthracene	0.2	6.7	8270C
Fluoranthene	0.2	6.7	8270C
Fluorene	0.2	6.7	8270C
Indeno(1,2,3-cd)pyrene	0.2	6.7	8270C
1-Methylnaphthalene	0.2	6.7	8270C
2-Methylnaphthalene	0.2	6.7	8270C
Naphthalene	0.2	6.7	8270C
Phenanthrene	0.2	6.7	8270C
Pyrene	0.2	6.7	8270C
Appendix IX - PCBs	**Quantitation Limits***		**Method Number (Description)**
	Water (µg/L)	**Low Soil (µg/kg)**	
Aroclor-1016	1.0	33	8082
Aroclor-1221	2.0	67	8082
Aroclor-1232	1.0	33	8082
Aroclor-1242	1.0	33	8082
Aroclor-1248	1.0	33	8082
Aroclor-1254	1.0	33	8082
Aroclor-1260	1.0	33	8082
Dioxins/Furans	**Quantitation Limits***		**Method Number (Description)**
	Water (ng/L)	**Low Soil (ng/g)**	
2,3,7,8-TCDD	5.000	0.50	8280A
2,3,7,8-PCDF	12.500	1.25	8280A
2,3,7,8-PCDD	12.500	1.25	8280A
2,3,7,8-HCDF	12.500	1.25	8280A
2,3,7,8-HCDD	12.500	1.25	8280A
2,3,7,8-TCDF	5.000	0.50	8280A

TABLE 4-3

PARAMETER LISTS AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Total Petroleum Hydrocarbons	Quantitation Limits*		Method Number (Description)
	Water (µg/L)	Low Soil (µg/kg)	
Diesel Range Organics (DRO)	100	3300	5030/8015B
Gasoline Range Organics (GRO)	50	250	3550/8015B
Appendix IX - Metals (Total)	**Quantitation Limits***		**Method Number (Description)**
	Water (µg/L)	**Low Soil (mg/kg)**	
Antimony	20	2.0	6010 (Inductively Coupled Plasma)
Arsenic	10	1.0	6010 (Inductively Coupled Plasma)
Barium	10	1.0	6010 (Inductively Coupled Plasma)
Beryllium	4.0	0.4	6010 (Inductively Coupled Plasma)
Cadmium	5.0	0.5	6010 (Inductively Coupled Plasma)
Chromium	10	1.0	6010 (Inductively Coupled Plasma)
Cobalt	10	1.0	6010 (Inductively Coupled Plasma)
Copper	20	2.0	6010 (Inductively Coupled Plasma)
Lead	5.0	0.5	6010 (Inductively Coupled Plasma)
Mercury	0.2	0.02	7470/7471 (Cold Vapor AA)
Nickel	40	4.0	6010 (Inductively Coupled Plasma)
Selenium	10	2.5	6010 (Inductively Coupled Plasma)
Silver	10	1.0	6010 (Inductively Coupled Plasma)
Thallium	25	2.5	6010 (Inductively Coupled Plasma)
Tin	50	10.0	6010 (Inductively Coupled Plasma)
Vanadium	10	1.0	6010 (Inductively Coupled Plasma)
Cyanide	0.010	1.0	9012 (Colorimetric)
Sulfide	1.0	25	9030 (Titrimetric, Iodine)
Zinc	20	2.0	6010 (Inductively Coupled Plasma)

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.
µg/L - micrograms per liter
µg/kg - micrograms per kilogram
ng/L - nanograms per liter
ng/g - nanograms per gram
NA - Not Applicable

TABLE 5-1

PHOTOIONIZATION DETECTOR READINGS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Depth (ft bgs)	14SB01 (ppm)	14SB02 (ppm)	14SB03 (ppm)	14SB04 (ppm)	14SB05 (ppm)	14SB06 (ppm)	14SB07 (ppm)
0 - 1	0.7	N/A	0.0	N/A	N/A	N/A	2.9
1 - 2	3.4	N/A	0.0	76.2	10.0	N/A	1.3
2 - 3	3.5	N/A	0.6	34.2	9.1	0.0	2.4
3 - 4	0.7	0.0	0.0	22.8	5.0	2.6	0.0
4 - 5	N/A	112.0	0.0	109.0	3.8	0.0	0.0
5 - 6	8.0	144.0	0.0	7.1	1.4	0.0	0.0
6 - 7	46.2	107.0	0.0	5.5	5.0	0.0	0.0
7 - 8	32.5	56.2	0.0	3.5	6.5	0.0	0.0
8 - 9	96.7	23.3	0.0	9.0	3.8	0.0	0.0
9 - 10	55.5	36.6	0.0	9.1	2.9	0.0	4.9
10 - 11	N/A	16.0	0.0	14.6	3.6	0.0	5.4
11 - 12	516.0	12.0	0.0	1.2	0.0	0.0	4.9
12 - 13	179.0	1.0	0.0	0.8	5.6	0.0	0.6
13 - 14	482.0	3.6	0.0	1.9	23.3	0.0	1.5
14 - 15	226.0	0.0	0.0	20.8	3.4	0.0	1.6
15 - 16	211.0	0.0	0.0	17.6	3.8	0.0	1.0
16 - 17	65.5	0.0	0.0	12.4	33.7	0.0	0.0
17 - 18	729.0	0.0	0.0	16.6	18.8	0.0	0.0
18 - 19	218.0	0.0	0.0	15.3	32.6	0.0	0.0
19 - 20	406.0	0.0	0.0	16.0	13.6	0.0	0.0
20 - 21	70.0	0.0	0.0	6.9	4.5	---	0.0
21 - 22	38.4	2.5	0.0	1.8	24.6	---	0.0
22 - 23	78.0	1.8	0.0	---	15.5	---	0.0

NA Not analyzed; soil from interval not field screened with PID.
ppm Parts per million (mg/kg)
--- Soil boring not advanced to this depth - no reading available.

TABLE 5-2

Revised: March 23, 2007

SUMMARY OF DETECTED RESULTS - SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	USEPA Region III Residential Soil RBCs	USEPA Region III Industrial Soil RBCs	NAPR [1] Basewide Background	Phase I RFIs					2006 RFI			
				14SS04 3/22/1996	14SS05 3/22/1996	14SS06 3/22/1996	14SS07 3/22/1996	14SS08 3/22/1996	14SB01-00 03-06-2006	14SB02-00 03-07-2006	14SB03-00 03-06-2006	14SB07-00 03-06-2006
Volatiles (ug/kg)												
2-Butanone (MEK)	46,928,571	613,200,000	NA	12 U	12 UJ	12 U	12 U	11 U	36 J	31 J	23 J	11 UJ
2-Hexanone (MBK)	NE	NE	NA	12 UJ	12 UJ	12 UJ	12 U	11 U	2.3 J	3 J	13 UJ	11 UJ
Benzene	11,613	52,029	NA	6 U	6 UJ	6 U	6 U	5 U	9.5	5.3 U	5.4 U	4.3 U
Bromomethane	109,500	1,430,800	NA	12 U	12 UJ	12 U	12 U	11 U	0.7 J	5 U	5.4 U	4.3 U
Ethylbenzene	7,821,429	102,200,000	NA	6 U	6 UJ	6 U	6 UJ	5 UJ	1.5 J	1.6 J	5.4 U	4.3 U
Xylenes, total	15,642,857	204,400,000	NA	6 U	6 UJ	6 U	6 U	5 U	2.3 J	2.7 J	16 U	13 U
Semivolatiles (ug/kg)												
Bis(2-ethylhexyl) phthalate	45,623	204,400	NA	400 U	410 U	97 J	390 U	360 U	380 U	410 U	380 U	420 U
Diethyl phthalate	62,571,429	817,600,000	NA	400 U	410 U	54 J	390 U	360 U	380 U	410 U	380 U	420 U
PAHs (ug/kg)												
1-Methylnaphthalene	1,564,286 [2]	20,440,000 [2]	NA	NA	NA	NA	NA	NA	7.6 U	6 J	7.8 UJ	8.5 UJ
2-Methylnaphthalene	312,857	4,088,000	NA	NA	NA	NA	NA	NA	7.6 U	7.4 J	7.8 UJ	8.5 U
Anthracene	23,464,286	306,600,000	NA	400 U	410 U	390 U	110 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)anthracene	220	3,920	NA	400 U	45 J	**300 J**	**3400**	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)pyrene (BaP)	22.0	392	NA	400 U	**45 J**	**1800**	**5000**	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(b)fluoranthene	220	3,920	NA	400 U	410 U	**2800**	**7600**	360 U	5.8 J	8.3 U	7.8 U	8.5 U
Benzo(g,h,i)perylene	2,346,429 [3]	30,660,000 [3]	NA	66 J	91 J	1200	3600	360 U	11	5.5 J	7.8 U	8.5 U
Benzo(k)fluoranthene	2,200	39,200	NA	400 U	410 U	640	**2400**	360 U	5.7 J	8.3 U	7.8 U	8.5 U
Chrysene	22,200	392,000	NA	400 U	50 J	690	3800	360 U	5 J	8.3 U	7.8 U	8.5 U
Dibenz(a,h)anthracene	22.0	392	NA	400 U	410 U	**210 J**	**920**	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Fluoranthene	3,128,571	40,880,000	NA	88 J	110 J	230 J	67 J	360 U	6.5 J	8.3 U	7.8 U	8.5 U
Indeno(1,2,3-cd)pyrene	220	3,920	NA	400 U	58 J	**1300**	**3800**	360 U	9.6	4.8 J	7.8 U	8.5 U
Phenanthrene	2,346,429 [3]	30,660,000 [3]	NA	400 U	410 U	39 J	58 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Pyrene	2,346,429	30,660,000	NA	170 J	270 J	650	100 J	360 U	6.6 J	8.3 U	7.8 U	8.5 U
PCBs (ug/kg)												
Aroclor-1260	319	1,431	NA	28	17	12	19	6 NJ	23 J	27 J	36 U	39 U
TPH (mg/kg)												
Diesel Range Organics (DRO)	NE	NE	NA	560	360	120	490	4.5 U	11 U	12 U	12 U	15 U
Gasoline Range Organics (GRO)	NE	NE	NA	3.7	3.8	1.8	1.8	0.032	0.57 U	0.62 U	0.58 U	0.63 U

TABLE 5-2 (Continued)

Revised: March 23, 2007

SUMMARY OF DETECTED RESULTS - SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

	USEPA Region III Residential Soil RBCs	USEPA Region III Industrial Soil RBCs	NAPR [1] Basewide Background	Phase I RFIs					2006 RFI			
				14SS04 3/22/1996	14SS05 3/22/1996	14SS06 3/22/1996	14SS07 3/22/1996	14SS08 3/22/1996	14SB01-00 03-06-2006	14SB02-00 03-07-2006	14SB03-00 03-06-2006	14SB07-00 03-06-2006
Inorganics (mg/kg)												
Antimony	31.3	409	2.46	NA	NA	NA	NA	NA	1.6 J	1.5 J	1.9 J	1.4 J
Arsenic	0.426	1.91	2.65	NA	NA	NA	NA	NA	**2.5 J**	**1.4 J**	**2.9 J**	**2.6 J**
Barium	15,643	204,400	199	NA	NA	NA	NA	NA	110 J	106 J	155 J	26.5 J
Cadmium	39.1	511	5.76	NA	NA	NA	NA	NA	1.3	1.1	1.6	0.58 U
Chromium	235 [4]	3,066 [4]	49.8	NA	NA	NA	NA	NA	38.7 J	43.3 J	75.1 J	33.8 J
Cobalt	1,564 [5]	20,440 [5]	46.2	NA	NA	NA	NA	NA	31.2 J	24.1 J	46.9 J	5.8 J
Lead	400 [6]	NE	22.0	NA	NA	NA	NA	NA	85.3 J	79.9 J	40 J	4.9 J
Mercury	23.5 [7]	307 [7]	0.109	NA	NA	NA	NA	NA	0.031 J	0.077	0.042	0.049
Nickel	1,564	20,440	20.7	NA	NA	NA	NA	NA	9.7 J	14.4 J	11.5 J	4.1 J
Selenium	391	5,110	1.18	NA	NA	NA	NA	NA	3 J	2.1 J	4.3 J	4.7 J
Thallium	5.48	71.5	NE	NA	NA	NA	NA	NA	0.43 UJ	0.46 UJ	0.65 J	0.47 UJ
Vanadium	78.2	1,022	287	NA	NA	NA	NA	NA	**187 J**	**187 J**	**323 J**	**287 J**
Zinc	23,464	306,600	115	NA	NA	NA	NA	NA	87.8 J	85 J	64.6 J	17.9 J

Notes:

(1) NAPR Basewide Surface Soil Background - Upper Limit of Means (Mean + 2 standard deviations)
Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, PR, Baker, October 2006
(2) Screening value for naphthalene used as a surrogate
(3) Screening value for pyrene used as a surrogate.
(4) Screening value for chromium VI used as a surrogate.
(5) Screening value retained from the April 2005 version of the RBCs
(6) Action level for lead.
(7) Screening value for mercuric chloride used as a surrogate.

U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NJ - Presumptive evidence for the presence of the material at an estimated value
NA - Not Analyzed
ND - Not Detected
NE - Not Established

RBC - Risk Based Concentration
NAPR - Naval Activity Puerto Rico

TABLE 5-3

Revised: March 23, 2007

SUMMARY OF DETECTED RESULTS - SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

				2006 RFI						
	USEPA Region III Residential Soil RBCs	USEPA Region III Industrial Soil RBCs	NAPR [1] Basewide Background	14SB01-06 03-06-2006 11.0 - 13.0	14SB01-11 03-06-2006 21.0 - 23.0	14SB02-03 03-07-2006 5.0 - 7.0	14SB02-08 03-07-2006 15.0 - 17.0	14SB03-06 03-06-2006 11.0 - 13.0	14SB03-11 03-06-2006 21.0 - 23.0	14SB04-01 03-06-2006 1.5 - 3.0
Volatiles (ug/kg)										
2-Butanone (MEK)	46,928,571	613,200,000	NA	14 UJ	710 UJ	12 UJ	12 UJ	12 UJ	13 UJ	540 UJ
Benzene	11,613	52,029	NA	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U
Carbon Disulfide	7,821,429	102,200,000	NA	5.7 U	280 U	1.3 J	4.9 U	4.8 U	5.3 U	220 U
Ethylbenzene	7,821,429	102,200,000	NA	170	280 U	14	4.9 U	4.8 U	5.3 U	740
Xylenes, total	15,642,857	204,400,000	NA	17 U	280 U	22	15 U	14 U	16 U	130 J
Semivolatiles (ug/kg)										
Dibenzofuran	156,429 [2]	2,044,000 [2]	NA	57 J	480 U	440 U	430 U	470 U	480 U	380 U
PAHs (ug/kg)										
1-Methylnaphthalene	1,564,286 [3]	20,440,000 [3]	NA	9.6 U	230 J	930 J	150 J	9.6 UJ	9.7 UJ	NA
2-Methylnaphthalene	312,857	4,088,000	NA	9.6 U	250 J	910	180	9.6 UJ	9.7 UJ	1700
Benzo(g,h,i)perylene	2,346,429 [4]	30,660,000 [4]	NA	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	16 J
Fluorene	3,128,571	40,880,000	NA	43	17	28	9.4	9.6 U	9.7 U	380 U
Indeno(1,2,3-cd)pyrene	220	3,920	NA	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U
Naphthalene	1,564,286	20,440,000	NA	9.6 U	140 J	580	120	9.6 U	9.7 U	480
Phenanthrene	2,346,429 [4]	30,660,000 [4]	NA	9.6 U	6.5 J	8.9 U	8.8 U	9.6 U	9.7 U	45 J
Pyrene	2,346,429	30,660,000	NA	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	62 J
Dioxins / Furans (ug/kg)										
HpCDD, 1,2,3,4,6,7,8-	0.0000426 [5]	0.000191 [5]	NA	NA	NA	NA	NA	NA	NA	**1.27 J**
OCDD	0.00000426 [6]	0.0000191 [6]	NA	NA	NA	NA	NA	NA	NA	**11.6**
TPH (mg/kg)										
Diesel Range Organics (DRO)	NE	NE	NA	690	140 J	1100	41	14 U	14 U	2400
Gasoline Range Organics (GRO)	NE	NE	NA	55	31 J	2.9	0.91	0.71 U	0.72 U	5.4

TABLE 5-3 (Continued)

Revised: March 23, 2007

SUMMARY OF DETECTED RESULTS - SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

				2006 RFI						
	USEPA Region III Residential Soil RBCs	USEPA Region III Industrial Soil RBCs	NAPR [1] Basewide Background	14SB01-06 03-06-2006 11.0 - 13.0	14SB01-11 03-06-2006 21.0 - 23.0	14SB02-03 03-07-2006 5.0 - 7.0	14SB02-08 03-07-2006 15.0 - 17.0	14SB03-06 03-06-2006 11.0 - 13.0	14SB03-11 03-06-2006 21.0 - 23.0	14SB04-01 03-06-2006 1.5 - 3.0
Inorganics (mg/kg)										
Antimony	31.3	409	NE	0.74 UJ	1 UJ	0.99 UJ	1.5 J	1.3 J	0.73 UJ	1 UJ
Arsenic	0.426	1.91	1.59	0.25 J	**2 J**	**1.8 J**	**0.75 J**	**1.1 J**	0.2 J	**0.79 J**
Barium	15,643	204,400	220	31.5 J	338 R	4.7 U	35.4 J	14.4 U	5.2 U	64.4 J
Cadmium	39.1	511	0.54	0.2 U	0.28 U	0.3 U	0.59 U	0.43 U	0.17 U	0.84
Chromium	235 [7]	3,066 [7]	114.5	29 J	39 J	25.4 J	44.7 J	32.1 J	19.7 J	20.8 J
Cobalt	1,564	20,440	26.9	2.4 J	10 J	0.84 J	7.6 J	4.2 J	11.5 J	12.8 J
Lead	400	NE	6.3	3.6 J	3.1 J	4 J	9.1 J	2.6 J	1.1 J	39.8 J
Mercury	23.5	307	0.108	0.021 U	0.024 U	0.022 U	0.02 U	0.021 U	0.024 U	0.017 U
Nickel	1,564	20,440	24.7	2.6 J	11.1 J	1.2 J	7.2 J	4.7 J	6.4 J	7.7 J
Selenium	391	5,110	5.94	1.3 J	1.6 J	2.7 J	2.4 J	3 J	0.81 J	0.54 J
Thallium	5.48	71.5	0.92	0.51 UJ	0.88 J	0.5 UJ	0.51 UJ	0.52 UJ	0.54 UJ	0.42 UJ
Vanadium	78.2	1,022	434	**178 J**	**180 J**	**267 J**	**222 J**	**243 J**	**123 J**	**98.8 J**
Zinc	23,464	306,600	88	11.1 J	31.2 J	4.6 J	31.2 J	9.8 J	10.5 J	68 J

TABLE 5-3 (Continued)

Revised: March 23, 2007

SUMMARY OF DETECTED RESULTS - SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

				2006 RFI						
	USEPA Region III Residential Soil RBCs	USEPA Region III Industrial Soil RBCs	NAPR [1] Basewide Background	14SB04-10 03-06-2006 19.0 - 21.0	14SB05-02 03-07-2006 3.5 - 5.0	14SB05-09 03-07-2006 17.0 - 19.0	14SB06-01 03-07-2006 1.5 - 3.0	14SB06-07 03-07-2006 13.0 -15.0	14SB07-06 03-06-2006 11.0 - 13.0	14SB07-08 03-06-2006 15.0 - 17.0
Volatiles (ug/kg)										
2-Butanone (MEK)	46,928,571	613,200,000	NA	680 UJ	7.8 J	13 UJ	8.7 J	12 UJ	13 UJ	14 UJ
Benzene	11,613	52,029	NA	270 UJ	4.6 U	31	4 U	4.9 U	5.3 U	5.5 U
Carbon Disulfide	7,821,429	102,200,000	NA	270 UJ	4.6 U	5.2 U	0.9 J	4.9 U	5.3 U	5.5 U
Ethylbenzene	7,821,429	102,200,000	NA	270 UJ	4.6 U	2.1 J	4 U	4.9 U	5.3 U	5.5 U
Xylenes, total	15,642,857	204,400,000	NA	270 UJ	14 U	1.7 J	12 U	15 U	16 U	16 U
Semivolatiles (ug/kg)										
2-Methylnaphthalene	312,857	4,088,000	NA	460 U	420 U	470 U	400 U	460 U	500 U	500 U
Dibenzofuran	156,429 [2]	2,044,000 [2]	NA	460 U	420 U	470 U	400 U	460 U	500 U	500 U
PAHs (ug/kg)										
1-Methylnaphthalene	1,564,286 [3]	20,440,000 [3]	NA	19 J	8.6 UJ	9.6 UJ	8.2 UJ	9.3 UJ	10 UJ	10 UJ
2-Methylnaphthalene	312,857	4,088,000	NA	9.4 UJ	8.6 UJ	9.6 UJ	8.2 UJ	9.3 U	10 U	10 U
Benzo(g,h,i)perylene	2,346,429 [4]	30,660,000 [4]	NA	9.4 U	8.6 U	9.6 U	7.7 J	5.8 J	10 U	10 U
Fluorene	3,128,571	40,880,000	NA	22	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	220	3,920	NA	9.4 U	8.6 U	9.6 U	5.6 J	4.3 J	10 U	10 U
Naphthalene	1,564,286	20,440,000	NA	9.4 U	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Phenanthrene	2,346,429 [4]	30,660,000 [4]	NA	9.4 U	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Pyrene	2,346,429	30,660,000	NA	9.4 U	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Dioxins / Furans (ug/kg)										
HpCDD, 1,2,3,4,6,7,8-	0.0000426 [5]	0.000191 [5]	NA	NA	NA	0.291 U	NA	0.308 U	NA	NA
OCDD	0.00000426 [6]	0.0000191 [6]	NA	NA	NA	0.583 U	NA	0.615 U	NA	NA
TPH (mg/kg)										
Diesel Range Organics (DRO)	NE	NE	NA	260	13 U	16 U	29	31 J	20 U	17 U
Gasoline Range Organics (GRO)	NE	NE	NA	9.5	0.19 J	0.87	0.61 U	0.69 U	0.76 U	0.76 U

TABLE 5-3 (Continued)

Revised: March 23, 2007

SUMMARY OF DETECTED RESULTS - SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

				2006 RFI						
	USEPA Region III Residential Soil RBCs	USEPA Region III Industrial Soil RBCs	NAPR [1] Basewide Background	14SB04-10 03-06-2006 19.0 - 21.0	14SB05-02 03-07-2006 3.5 - 5.0	14SB05-09 03-07-2006 17.0 - 19.0	14SB06-01 03-07-2006 1.5 - 3.0	14SB06-07 03-07-2006 13.0 -15.0	14SB07-06 03-06-2006 11.0 - 13.0	14SB07-08 03-06-2006 15.0 - 17.0
Inorganics (mg/kg)										
Antimony	31.3	409	NE	1.6 J	1.3 J	0.79 UJ	1.4 J	0.92 UJ	0.86 UJ	0.55 UJ
Arsenic	0.426	1.91	1.59	**2.8 J**	**4.2 J**	**4.2 J**	**1.2 J**	**2 J**	0.39 J	**0.57 J**
Barium	15,643	204,400	220	22.5 U	57.8 J	11 U	63.8 J	39 J	134 J	372 J
Cadmium	39.1	511	0.54	0.61 U	1.1	0.2 U	1	0.25 U	0.26 U	0.23 U
Chromium	235 [7]	3,066 [7]	114.5	60 J	36.5 J	32.9 J	31.9 J	21 J	10.9 J	16.4 J
Cobalt	1,564	20,440	26.9	7.6 J	9.4 J	7.5 J	24.5 J	2.8 J	18.3 J	65.3 J
Lead	400	NE	6.3	7.4 J	29.7 J	3.9 J	14.8 J	3.5 J	0.8 J	4.9 J
Mercury	23.5	307	0.108	0.023 U	0.086	0.024 U	0.019 U	0.023 U	0.025 U	0.025 U
Nickel	1,564	20,440	24.7	8.8 J	4.3 J	8.2 J	13.5 J	2.8 J	21.2 J	13.8 J
Selenium	391	5,110	5.94	2.6 J	3.7 J	1.3 J	1.1 J	1.5 J	1.2 J	0.84 J
Thallium	5.48	71.5	0.92	0.51 UJ	0.49 UJ	0.52 UJ	0.46 UJ	0.51 UJ	0.58 UJ	0.54 UJ
Vanadium	78.2	1,022	434	**320 J**	**227 J**	**152 J**	**178 J**	**151 J**	**126 J**	**86.8 J**
Zinc	23,464	306,600	88	31.8 J	46.5 J	18.7 J	75.9 J	14.4 J	45.6 J	62.4 J

Notes:

(1) NAPR Basewide Subsurface Soil (Clay) Background - Upper Limit of Means (Mean + 2 standard deviations)
Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, PR, Baker, October 2006
(2) Screening value retained from the April 2005 version of the RBCs
(3) Screening value for naphthalene used as a surrogate
(4) Screening value for pyrene used as a surrogate.
(5) Screening value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994).
(6) Screening value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994).
(7) Screening value for chromium VI used as a surrogate.

U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
R - Result is rejected and unusable
N - The spiked sample recovery is not within control limits.
NA - Not Analyzed
ND - Not Detected
NE - Not Established

RBC - Risk Based Concentration
NAPR - Naval Activity Puerto Rico

TABLE 5-4

Revised: March 23, 2007

SUMMARY OF DETECTED RESULTS - GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	USEPA Region III Tap Water RBCs	Federal MCLs	NAPR Basewide Background	2006 RFI 14TW01 03-08-2006	14TW02 03-08-2006	14TW07 03-08-2006
Volatiles (ug/L)						
1,2-Dichloroethane	0.116	5.0	NA	**4.1**	0.5 U	0.5 U
2-Butanone (MEK)	6,968	NE	NA	16	7.2	2.5 R
Acetone	5,475	NE	NA	72	58	2.5 U
Benzene	0.336	5.0	NA	**220**	**0.41 J**	0.5 U
Carbon Disulfide	1,043	NE	NA	0.13 J	0.22 J	0.5 U
Ethylbenzene	1,340	700	NA	1.3	0.56	0.5 U
Iodomethane	NE	NE	NA	0.5 U	0.58 J	0.5 UJ
Xylene, m/p-	213 (2)	10,000 (2)	NA	0.28 J	0.35 J	1 U
Xylene, o-	213 (2)	10,000 (2)	NA	1	0.53	0.5 U
Xylenes, total	213	10,000	NA	1.3	0.91	0.5 U
Semivolatiles (ug/L)						
2-Methylnaphthalene	24.3	NE	NA	6.9 J	4.3 J	10 U
Acetophenone	608	NE	NA	0.33 J	10 U	10 U
Butyl Benzyl Phthalate	7,300	NE	NA	10 U	10 U	0.3 J
Dibenzofuran	12.2 (3)	NE	NA	0.43 J	10 U	10 U
Diethyl Phthalate (DEP)	29,200	NE	NA	0.89 J	10 U	1.3 J
Di-n-butyl Phthalate (DBP)	3,650	NE	NA	10 U	10 U	0.48 J
PAHs (ug/L)						
1-Methylnaphthalene	6.51 (4)	NE	NA	1.4 J	1.9 J	0.2 UJ
Acenaphthene	365	NE	NA	0.081 J	0.079 J	0.2 U
Benzo(a)anthracene	0.03	NE	NA	**0.095 J**	0.2 U	0.2 U
Benzo(a)pyrene (BaP)	0.003	0.2	NA	**0.084 J**	0.2 U	0.2 U
Benzo(b)fluoranthene	0.03	NE	NA	**0.083 J**	0.2 U	0.2 U
Benzo(g,h,i)perylene	183 (5)	NE	NA	0.088 J	0.2 U	0.2 U
Benzo(k)fluoranthene	0.3	NE	NA	0.093 J	0.2 U	0.2 U
Chrysene	3.00	NE	NA	0.078 J	0.2 U	0.2 U
Dibenz(a,h)anthracene	0.003	NE	NA	**0.097 J**	0.2 U	0.2 U
Fluoranthene	1,460	NE	NA	0.078 J	0.2 U	0.2 U
Fluorene	243	NE	NA	0.25	0.11 J	0.066 J
Indeno(1,2,3-cd)pyrene	0.03	NE	NA	**0.11 J**	0.2 U	0.2 U
Naphthalene	6.51	NE	NA	**14**	3	0.34
Pyrene	183	NE	NA	0.087 J	0.2 U	0.2 U

TABLE 5-4 (Continued)

SUMMARY OF DETECTED RESULTS - GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PR

	USEPA Region III Tap Water RBCs	Federal MCLs	NAPR Basewide Background	2006 RFI 14TW01 03-08-2006	14TW02 03-08-2006	14TW07 03-08-2006
TPH (mg/L)						
Diesel Range Organics (DRO)	NE	NE	NA	1.8	1.4	1.5
Gasoline Range Organics (GRO)	NE	NE	NA	0.86	0.15 J	0.5 U
Metals (ug/L)						
Chromium	110 (6)	100	162	NA	16.5 J	27.8 J
Cobalt	730 (3)	NE	633	NA	5	28.2
Copper	1,460	1,300 (7)	324	NA	24.8 R	74.3 J
Lead	15.0 (7)	15.0 (7)	26.2	NA	6.1	1.9 J
Nickel	730	NE	95.7	NA	4.1 J	11.1 J
Vanadium	36.5	NE	485	NA	**59.2**	**74**
Zinc	10,950	5,000	548	NA	12.7 U	50.8

Notes:

(1) NAPR Basewide Groundwater Background - Upper Limit of Means (Mean + 2 standard deviations)
Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, PR, Baker, October 2006
(2) Screening value for xylenes (total) used as a surrogate.
(3) Screening value retained from the April 2005 version of the RBCs
(4) Screening value for naphthalene used as a surrogate
(5) Screening value for pyrene used as a surrogate.
(6) Screening value for chromium VI used as a surrogate.
(7) Action level for copper and lead.

U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
R - Result is rejected and unusable
N - The spiked sample recovery is not within control limits.
NA - Not Analyzed
NE - Not Established

RBC - Risk Based Concentration
MCL - Maximum Contaminant Level
NAPR - Naval Activity Puerto Rico

TABLE 5-5

SUMMARY OF DETECTED RESULTS - QUALITY ASSURANCE / QUALITY CONTROL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01 (SS Spoon) 03-07-2006	14ER02 (Acetate Liner) 03-07-2006	14ER03 (Tubing) 03-09-2006	14FB01 (Lab Grade DI) 03-08-2006	14FB02 (Potable Water) 03-08-2006	14TB01 03-06-2006	14TB02 03-08-2006
Volatiles (ug/L)							
Acetone	2.5 U	2.5 U	2.5 U	2.5 U	4.2	2.5 U	2.5 U
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.11 J	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5	0.5 U	0.5 U
Chloroform	0.5 U	0.5 U	0.5 U	0.5 U	1.7	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.28 J	0.5 U	0.5 U
Methylene Chloride	1.6	1.2	1.3	1.5	0.5 U	0.5 U	0.5 U
Toluene	0.76	0.52	0.34 J	0.55	0.15 J	0.5 U	0.5 U
PAHs (ug/L)							
1-Methylnaphthalene	0.0068 J	0.0051 J	0.0059 J	0.0048 J	0.0036 J	NA	NA
2-Methylnaphthalene	0.013 J	0.0064 J	0.0086 J	0.0093 J	0.0057 J	NA	NA
Acenaphthene	0.011 J	0.011 J	0.0091 J	0.0092 J	0.023 J	NA	NA
Acenaphthylene	0.2 UJ	0.021 J	0.2 UJ	0.0054 J	0.2 UJ	NA	NA
Anthracene	0.2 U	0.2 U	0.2 U	0.0054 J	0.0058 J	NA	NA
Chrysene	0.2 U	0.0056 J	0.0063 J	0.2 U	0.0076 J	NA	NA
Fluoranthene	0.2 U	0.0052 J	0.2 U	0.2 U	0.01 J	NA	NA
Fluorene	0.0094 J	0.008 J	0.0079 J	0.0084 J	0.0079 J	NA	NA
Phenanthrene	0.045 J	0.041 J	0.044 J	0.04 J	0.046 J	NA	NA
Pyrene	0.2 U	0.2 U	0.2 U	0.2 U	0.012 J	NA	NA
TPH (mg/L)							
Diesel Range Organics (DRO)	0.5 U	0.5 U	0.24 J	0.21 J	0.5 U	NA	NA
Metals (ug/L)							
Antimony	1.8 J	1.2 U	1.2 U	1.2 U	1.2 U	NA	NA
Barium	0.1 U	0.18 J	0.22 J	0.24 J	41.3 J	NA	NA
Chromium	0.57 J	1.3 J	1.1 J	1.1 J	1 J	NA	NA
Copper	0.3 U	0.37 J	0.33 J	0.3 U	42.1	NA	NA
Lead	1.3 J	2 J	1.8 J	2.2 J	1.8 J	NA	NA
Silver	0.5 U	0.89 J	1 J	0.53 J	0.5 U	NA	NA
Vanadium	0.3 U	0.55 J	0.54 J	0.77 J	4 J	NA	NA
Zinc	0.93 J	1.1 J	1.5 J	0.86 J	18.9 J	NA	NA

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed

Revised: March 23, 2007

TABLE 6-1

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Contaminant	Criteria [1]	Contaminant Frequency / Range / Location			Background [2]	COPC Selection		Exposure Concentration Selection		
	Region III Residential Soil RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	ULM	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL [3] (ProUCL)	Exposure Concentration	Rationale for Concentration Selection
Volatiles (ug/kg)										
2-Butanone (MEK)	4,692,857 N	3/9	23 J - 36 J	14SB01-00	NA	NO	BSL	NA	NA	NA
2-Hexanone (MBK)	NE	2/9	2.3 J - 3 J	14SB02-00	NA	YES	NSC	6.12 (NP)	6.12	95% Student's-t UCL
Benzene	11,613 C	1/9	9.5	14SB01-00	NA	NO	BSL	NA	NA	NA
Bromomethane	10,950 N	1/9	0.7 J	14SB01-00	NA	NO	BSL	NA	NA	NA
Ethylbenzene	782,143 N	2/9	1.5 J - 1.6 J	14SB02-00	NA	NO	BSL	NA	NA	NA
Xylenes, total	1,564,286 N	2/9	2.3 J - 2.7 J	14SB02-00	NA	NO	BSL	NA	NA	NA
Semivolatiles (ug/kg)										
Bis(2-ethylhexyl) Phthalate (BEHP)	45,623 C	1/9	97 J	14SS06	NA	NO	BSL	NA	NA	NA
Diethyl Phthalate (DEP)	6,257,143 N	1/9	54 J	14SS06	NA	NO	BSL	NA	NA	NA
PAHs (ug/kg)										
1-Methylnaphthalene	156,429 N [4]	1/4	6 J	14SB02-00	NA	NO	BSL	NA	NA	NA
2-Methylnaphthalene	31,286 N	1/4	7.4 J	14SB02-00	NA	NO	BSL	NA	NA	NA
Anthracene	2,346,429 N	1/9	110 J	14SS07	NA	NO	BSL	NA	NA	NA
Benzo(a)anthracene	220 C	3/9	45 J - 3400	14SS07	NA	YES	ASL	2,967 (G)	2,967	95% Adjusted Gamma UCL
Benzo(a)pyrene (BaP)	22.0 C	3/9	45 J - 5000	14SS07	NA	YES	ASL	5,737 (G)	5,737	95% Adjusted Gamma UCL
Benzo(b)fluoranthene	220 C	3/9	5.8 J - 7600	14SS07	NA	YES	ASL	9,000 (G)	9,000	95% Adjusted Gamma UCL
Benzo(g,h,i)perylene	234,643 N [5]	6/9	5.5 J - 3600	14SS07	NA	NO	BSL	NA	NA	NA
Benzo(k)fluoranthene	2,200 C	3/9	5.7 J - 2400	14SS07	NA	YES	ASL	2,273 (G)	2,273	95% Adjusted Gamma UCL
Chrysene *	22,000 C	4/9	5 J - 3800	14SS07	NA	YES	CHEM	3,572 (G)	3,572	95% Adjusted Gamma UCL
Dibenz(a,h)anthracene	22.0 C	2/9	210 J - 920	14SS07	NA	YES	ASL	888 (G)	888	95% Adjusted Gamma UCL
Fluoranthene	312,857 N	5/9	6.5 J - 230 J	14SS06	NA	NO	BSL	NA	NA	NA
Indeno(1,2,3-cd)pyrene	220 C	5/9	4.8 J - 3800	14SS07	NA	YES	ASL	3,947 (G)	3,947	95% Adjusted Gamma UCL
Phenanthrene	234,643 N [5]	2/9	39 J - 58 J	14SS07	NA	NO	BSL	NA	NA	NA
Pyrene	234,643 N	5/9	6.6 J - 650	14SS06	NA	NO	BSL	NA	NA	NA
PCBs (ug/kg)										
Aroclor-1260	319 C	7/9	6 NJ - 28	14SS04	NA	NO	BSL	NA	NA	NA
TPH (mg/kg)										
Diesel Range Organics (DRO)	NE	4/9	120 - 560	14SS04	ND	YES	NSC	280 (NP)	280	95% Hall's Bootstrap UCL
Gasoline Range Organics (GRO)	NE	5/9	0.032 - 3.8	14SS05	ND	YES	NSC	3.43 (G)	3.43	95% Approximate Gamma UCL

TABLE 6-1 (Continued)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Contaminant	Criteria (1)	Contaminant Frequency / Range / Location			Background (2)	COPC Selection		Exposure Concentration Selection		
	Region III Residential Soil RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	ULM	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL (3) (ProUCL)	Exposure Concentration	Rationale for Concentration Selection
Inorganics (mg/kg)										
Antimony	3.13 N	4/4	1.4 J - 1.9 J	14SB03-00	2.46	NO	BSL	NA	NA	NA
Arsenic	0.426 C	4/4	1.4 J - 2.9 J	14SB03-00	2.65	YES	ASL	3.12 (N)	3.12	95% Student's-t UCL
Barium	1,564 N	4/4	26.5 J - 155 J	14SB03-00	199	NO	BSL	NA	NA	NA
Cadmium	3.91 N	3/4	1.1 - 1.6	14SB03-00	5.76	NO	BSL	NA	NA	NA
Chromium	23.5 N (6)	4/4	33.8 J - 75.1 J	14SB03-00	49.8	YES	ASL	69.7 (N)	69.7	95% Student's-t UCL
Cobalt	156 N (7)	4/4	5.8 J - 46.9 J	14SB03-00	46.2	NO	BSL	NA	NA	NA
Lead	400 N (8)	4/4	4.9 J - 85.3 J	14SB01-00	22.0	NO	BSL	NA	NA	NA
Mercury	2.35 N (9)	4/4	0.031 J - 0.077	14SB02-00	0.109	NO	BSL	NA	NA	NA
Nickel	156 N	4/4	4.1 J - 14.4 J	14SB02-00	20.7	NO	BSL	NA	NA	NA
Selenium	39.1 N	4/4	2.1 J - 4.7 J	14SB07-00	1.18	NO	BSL	NA	NA	NA
Thallium	0.548 N	1/4	0.65 J	14SB03-00	--	YES	ASL	0.794 (NP)	0.794	95% Chebyshev (Mean, Sd) UCL
Vanadium	7.82 N	4/4	187 J - 323 J	14SB03-00	287	YES	ASL	328 (N)	328	95% Student's-t UCL
Zinc	2,346 N	4/4	17.9 J - 87.8 J	14SB01-00	115	NO	BSL	NA	NA	NA

Notes:

NA - Not Applicable
ND - Not Detected
NE - Not Established
UCL - Upper Confidence Limit
PRG - Preliminary Remediation Goal
COPC - Chemical of Potential Concern
ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
C = Carcinogenic
N = Non-Carcinogenic
J - Analyte present - Reported value is estimated
NJ - Presumptive evidence for the presence of the material at an estimated value
Shaded constituents were identified as COPCs for quantitative risk evaluation.

Rationale Codes:

(ASL) Above Screening Level
(CHEM) Same Chemical Class
(NSC) No Screening Criteria

* These compounds were retained because one or more of its related carcinogenic PAHs were retained, and these compounds are known to exist together in mixtures
(1) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemicals.
USEPA Region III Residential Soil COC Screening Value (derived from USEPA Region III RBC Table - October, 2006)
(2) Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2006): ULM
(3) ProUCL was used to calculate the 95% UCL and distribution:
(N) - Normal distribution
(NP) - Nonparametric distribution
(G) - Gamma distribution
(4) Screening value for naphthalene used as a surrogate
(5) Screening value for pyrene used as a surrogate.
(6) Screening value for chromium VI used as a surrogate.
(7) Screening value retained from the April 2005 version of the RBCs
(8) Action level for lead.
(9) Screening value for mercuric chloride used as a surrogate.

Revised: March 23, 2007

TABLE 6-2

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Contaminant	Criteria [1]		Contaminant Frequency / Range / Location			Background [2]	COPC Selection		Exposure Concentration Selection		
	Region III Residential Soil RBC Values		No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	ULM	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL [3] (ProUCL)	Exposure Concentration	Rationale for Concentration Selection
Volatiles (ug/kg)											
2-Butanone (MEK)	4,692,857	N	2/4	7.8 J - 8.7 J	14SB06-01	NA	NO	BSL	NA	NA	NA
Carbon Disulfide	782,143	N	2/4	0.9 J - 1.3 J	14SB02-03	NA	NO	BSL	NA	NA	NA
Ethylbenzene	782,143	N	2/4	14 - 740	14SB04-01	NA	NO	BSL	NA	NA	NA
Xylenes, total	1,564,286	N	2/4	22 - 130 J	14SB04-01	NA	NO	BSL	NA	NA	NA
PAHs (ug/kg)											
1-Methylnaphthalene	156,429	N [4]	1/3	930 J	14SB02-03	NA	NO	BSL	NA	NA	NA
2-Methylnaphthalene	31,286	N	2/4	910 - 1700	14SB04-01	NA	NO	BSL	NA	NA	NA
Benzo(g,h,i)perylene	234,643	N [5]	2/4	7.7 J - 16 J	14SB04-01	NA	NO	BSL	NA	NA	NA
Fluorene	312,857	N	1/4	28	14SB02-03	NA	NO	BSL	NA	NA	NA
Indeno(1,2,3-cd)pyrene	220	C	1/4	5.6 J	14SB06-01	NA	NO	BSL	NA	NA	NA
Naphthalene	156,429	N	2/4	480 - 580	14SB02-03	NA	NO	BSL	NA	NA	NA
Phenanthrene	234,643	N [5]	1/4	45 J	14SB04-01	NA	NO	BSL	NA	NA	NA
Pyrene	234,643	N	1/4	62 J	14SB04-01	NA	NO	BSL	NA	NA	NA
Dioxins / Furans (ug/kg)											
HpCDD, 1,2,3,4,6,7,8-	0.0000426	C [6]	1/1	1.27 J	14SB04-01	NA	YES	ASL	ND	1.27	Max
OCDD	0.00000426	C [7]	1/1	11.6	14SB04-01	NA	YES	ASL	ND	11.6	Max
TPH (mg/kg)											
Diesel Range Organics (DRO)	NE		3/4	29 - 2400	14SB04-01	ND	YES	NSC	2,216 (N)	2,216	95% Student's-t UCL
Gasoline Range Organics (GRO)	NE		3/4	0.19 J - 5.4	14SB04-01	ND	YES	NSC	5.11 (N)	5.11	95% Student's-t UCL

TABLE 6-2 (Continued)

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Contaminant	Criteria (1)	Contaminant Frequency / Range / Location			Background (2)	COPC Selection		Exposure Concentration Selection		
	Region III Residential Soil RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	ULM	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL (3) (ProUCL)	Exposure Concentration	Rationale for Concentration Selection
Inorganics (mg/kg)										
Antimony	3.13 N	2/4	1.3 J - 1.4 J	14SB06-01	--	NO	BSL	NA	NA	NA
Arsenic	0.426 C	4/4	0.79 J - 4.2 J	14SB05-02	1.59	YES	ASL	3.79 (N)	3.79	95% Student's-t UCL
Barium	1,564 N	3/4	57.8 J - 64.4 J	14SB04-01	220	NO	BSL	NA	NA	NA
Cadmium	3.91 N	3/4	0.84 - 1.1	14SB05-02	0.539	NO	BSL	NA	NA	NA
Chromium	23 N (8)	4/4	20.8 J - 36.5 J	14SB05-02	114	YES	ASL	36.8 (N)	36.8	95% Student's-t UCL
Cobalt	156 N (9)	4/4	0.84 J - 24.5 J	14SB06-01	26.9	NO	BSL	NA	NA	NA
Lead	400 N (10)	4/4	4 J - 39.8 J	14SB04-01	6.29	NO	BSL	NA	NA	NA
Mercury	2.35 N (11)	1/4	0.086	14SB05-02	0.108	NO	BSL	NA	NA	NA
Nickel	156 N	4/4	1.2 J - 13.5 J	14SB06-01	24.7	NO	BSL	NA	NA	NA
Selenium	39.1 N	4/4	0.54 J - 3.7 J	14SB05-02	5.94	NO	BSL	NA	NA	NA
Vanadium	7.82 N	4/4	98.8 J - 267 J	14SB02-03	434	YES	ASL	278 (N)	278	95% Student's-t UCL
Zinc	2,346 N	4/4	4.6 J - 75.9 J	14SB06-01	88.1	NO	BSL	NA	NA	NA

Notes:

NA - Not Applicable
ND - Not Detected
NE - Not Established

UCL - Upper Confidence Limit
PRG - Preliminary Remediation Goal
COPC - Chemical of Potential Concern

ug/kg - microgram per kilogram
mg/kg - milligram per kilogram

C = Carcinogenic
N = Non-Carcinogenic

Rationale Codes:

(ASL) Above Screening Level
(NSC) No Screening Criteria
(BSL) Below Screening Level

J - Analyte present - Reported value is estimated

Shaded constituents were identified as COPCs for quantitative risk evaluation.

(1) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemicals.
USEPA Region III Residential Soil COC Screening Value (derived from USEPA Region III RBC Table - October, 2006)
(2) Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2006): ULM
(3) ProUCL was used to calculate the 95% UCL and distribution:
(N) - Normal distribution
(4) Screening value for naphthalene used as a surrogate
(5) Screening value for pyrene used as a surrogate.
(6) Screening value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994).
(7) Screening value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994).
(8) Screening value for chromium VI used as a surrogate.
(9) Screening value retained from the April 2005 version of the RBCs
(10) Action level for lead.
(11) Screening value for mercuric chloride used as a surrogate.

Revised: March 23, 2007

TABLE 6-3

GROUNDWATER DATA AND COPC SELECTION SUMMARY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Contaminant	Criteria [1]	Contaminant Frequency / Range / Location			Background [2]	COPC Selection		Exposure Concentration Selection		
	Region III Tap Water RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	ULM	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL [3] (ProUCL)	Exposure Concentration	Rationale for Concentration Selection
Volatiles (ug/L)										
1,2-Dichloroethane	0.116 C	1/3	4.1	14TW01	NA	YES	ASL	NC	4.1	Max - Conservative Estimate
2-Butanone (MEK)	697 N	2/2	7.2 - 16	14TW01	NA	NO	BSL	NA	NA	NA
Acetone	548 N	2/3	58 - 72	14TW01	NA	NO	BSL	NA	NA	NA
Benzene	0.336 C	2/3	0.41 J - 220	14TW01	NA	YES	ASL	NC	220	Max - Conservative Estimate
Carbon Disulfide	104 N	2/3	0.13 J - 0.22 J	14TW02	NA	NO	BSL	NA	NA	NA
Ethylbenzene	134 N	2/3	0.56 - 1.3	14TW01	NA	NO	BSL	NA	NA	NA
Iodomethane	NE	1/3	0.58 J	14TW02	NA	YES	NSC	NC	0.58	Max - Conservative Estimate
Xylene, m/p-	21.3 N [4]	2/3	0.28 J - 0.35 J	14TW02	NA	NO	BSL	NA	NA	NA
Xylene, o-	21.3 N [4]	2/3	0.53 - 1	14TW01	NA	NO	BSL	NA	NA	NA
Xylenes, total	21.3 N	2/3	0.91 - 1.3	14TW01	NA	NO	BSL	NA	NA	NA
Semivolatiles (ug/L)										
Acetophenone	60.8 N	1/3	0.33 J	14TW01	NA	NO	BSL	NA	NA	NA
Butyl Benzyl Phthalate	730 N	1/3	0.3 J	14TW07	NA	NO	BSL	NA	NA	NA
Dibenzofuran	1.22 N [5]	1/3	0.43 J	14TW01	NA	NO	BSL	NA	NA	NA
Diethyl Phthalate (DEP)	2,920 N	2/3	0.89 J - 1.3 J	14TW07	NA	NO	BSL	NA	NA	NA
Di-n-butyl Phthalate (DBP)	365 N	1/3	0.48 J	14TW07	NA	NO	BSL	NA	NA	NA
PAHs (ug/L)										
1-Methylnaphthalene	0.651 N [6]	2/3	1.4 J - 1.9 J	14TW02	NA	YES	ASL	NC	1.9	Max - Conservative Estimate
2-Methylnaphthalene	2.43 N	2/3	1.8 J - 2 J	14TW01	NA	NO	BSL	NA	NA	NA
Acenaphthene	36.5 N	2/3	0.079 J - 0.081 J	14TW01	NA	NO	BSL	NA	NA	NA
Benzo(a)anthracene	0.0300 C	1/3	0.095 J	14TW01	NA	YES	ASL	NC	0.095	Max - Conservative Estimate
Benzo(a)pyrene (BaP)	0.00300 C	1/3	0.084 J	14TW01	NA	YES	ASL	NC	0.084	Max - Conservative Estimate
Benzo(b)fluoranthene	0.0300 C	1/3	0.083 J	14TW01	NA	YES	ASL	NC	0.083	Max - Conservative Estimate
Benzo(g,h,i)perylene	18.3 N [7]	1/3	0.088 J	14TW01	NA	NO	BSL	NA	NA	NA
Benzo(k)fluoranthene *	0.300 C	1/3	0.093 J	14TW01	NA	YES	CHEM	NC	0.093	Max - Conservative Estimate
Chrysene *	3.00 C	1/3	0.078 J	14TW01	NA	YES	CHEM	NC	0.078	Max - Conservative Estimate
Dibenz(a,h)anthracene	0.00300 C	1/3	0.097 J	14TW01	NA	YES	ASL	NC	0.097	Max - Conservative Estimate
Fluoranthene	146 N	1/3	0.078 J	14TW01	NA	NO	BSL	NA	NA	NA
Fluorene	24.3 N	3/3	0.066 J - 0.25	14TW01	NA	NO	BSL	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.0300 C	1/3	0.11 J	14TW01	NA	YES	ASL	NC	0.11	Max - Conservative Estimate
Naphthalene	0.651 N	3/3	0.34 - 14	14TW01	NA	YES	ASL	NC	14	Max - Conservative Estimate
Pyrene	18.3 N	1/3	0.087 J	14TW01	NA	NO	BSL	NA	NA	NA

TABLE 6-3 (Continued)

GROUNDWATER DATA AND COPC SELECTION SUMMARY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Contaminant	Criteria (1)	Contaminant Frequency / Range / Location			Background (2)	COPC Selection		Exposure Concentration Selection		
	Region III Tap Water RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	ULM	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL (3) (ProUCL)	Exposure Concentration	Rationale for Concentration Selection
TPH (mg/L)										
Diesel Range Organics (DRO)	NE	3/3	1.4 - 1.8	14TW01	ND	YES	NSC	NC	1.8	Max - Conservative Estimate
Gasoline Range Organics (GRO)	NE	2/3	0.15 J - 0.86	14TW01	ND	YES	NSC	NC	0.86	Max - Conservative Estimate
Inorganics (ug/L)										
Chromium	11.0 N (8)	2/2	16.5 J - 27.8 J	14TW07	162	YES	ASL	NC	27.8	Max - Conservative Estimate
Cobalt	73.0 N (5)	2/2	5 - 28.2	14TW07	633	NO	BSL	NA	NA	NA
Copper	146 N	1/1	74.3 J	14TW07	324	NO	BSL	NA	NA	NA
Lead	15.0 N (9)	2/2	1.9 J - 6.1	14TW02	26.2	NO	BSL	NA	NA	NA
Nickel	73.0 N	2/2	4.1 J - 11.1 J	14TW07	95.7	NO	BSL	NA	NA	NA
Vanadium	3.65 N	2/2	59.2 - 74	14TW07	485	YES	ASL	NC	74	Max - Conservative Estimate
Zinc	1,095 N	1/2	50.8	14TW07	548	NO	BSL	NA	NA	NA

Notes:

NA - Not Applicable
ND - Not Detected
NE - Not Established

UCL - Upper Confidence Limit
PRG - Preliminary Remediation Goal
COPC - Chemical of Potential Concern

ug/L - microgram per liter
NC - Not Calculated

C = Carcinogenic
N = Non-Carcinogenic

Rationale Codes:

(ASL) Above Screening Level
(CHEM) Same Chemical Class
(NSC) No Screening Criteria
(BSL) Below Screening Level

J - Analyte present - Reported value is estimated

Shaded constituents were identified as COPCs for quantitative risk evaluation.

* These compounds were retained because one or more of its related carcinogenic PAHs were retained, and these compounds are known to exist together in mixtures

(1) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemicals.
USEPA Region III Tap Water COC Screening Value (derived from USEPA Region III RBC Table - October, 2006)
(2) Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2006): ULM
(3) ProUCL was not calculated (NC) since the maximum was used as a conservative estimate.
(4) Screening value for xylenes (total) used as a surrogate.
(5) Screening value retained from the April 2005 version of the RBCs
(6) Screening value for naphthalene used as a surrogate
(7) Screening value for pyrene used as a surrogate.
(8) Screening value for chromium VI used as a surrogate.
(9) Action level for lead.

Revised: March 23, 2007

TABLE 6-4

SUMMARY OF EXPOSURE PARAMETERS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

		Current Adult Trespassers	Current Adolescent Trespassers	Current and Future Adult On-Site Workers		Future Adult Residents		Future Young Child Residents		Future Adult Construction Workers	
Parameter	Units	RME	RME	RME	CT	RME	CT	RME	CT	RME	CT
Soil											
Ingestion Rate of Soil (IR-S)	mg/day	100 USEPA, 1993	100 USEPA, 1993	100 USEPA, 1997	50 USEPA, 1993	100 USEPA, 1991	50 USEPA, 1993	200 USEPA, 1991	100 USEPA, 1993	480 USEPA, 1997	240 Prof Judge
Fraction Ingested from Source (Fi)	NA	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge
Exposure Frequency (EF)	days/year	52 Prof Judge	52 Prof Judge	250 USEPA, 1991	219 USEPA, 1991	350 USEPA, 1991	234 USEPA, 1993	350 USEPA, 1991	234 USEPA, 1993	180 Prof Judge	90 Prof Judge
Exposure Duration (ED)	years	24 USEPA, 1991	9 USEPA, 1991	25 USEPA, 2004	9 USEPA, 2004	24 USEPA, 1997	7 USEPA, 1993	6 USEPA, 1997	2 USEPA, 1993	1 Prof Judge	1 Prof Judge
Exposure Time (ET)	hours/day	2 USEPA, 1997	2 USEPA, 1997	8 Prof Judge	8 Prof Judge	24 Prof Judge	24 Prof Judge	24 Prof Judge	24 Prof Judge	8 Prof Judge	8 Prof Judge
Surface Area Available for Contact (SA)	cm2/day	5,700 USEPA, 1997	3,200 USEPA, 1997	5,700 USEPA, 1997	5,000 USEPA, 1997	5,700 USEPA, 1997	5,000 USEPA, 1997	2,800 USEPA, 1997	2,000 USEPA, 1997	3,300 USEPA, 1997	3,230 USEPA, 1992
Respiration Rate (RR)	m3/hour	1.27 USEPA, 1997	0.69 USEPA, 1997	1.27 USEPA, 1997	1.27 USEPA, 1997	1.27 USEPA, 1997	1.27 USEPA, 1997	0.69 USEPA, 1997	0.69 USEPA, 1997	2 USEPA, 1997	2 USEPA, 1997
Conversion Factor (CF)	kg/mg	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989
Averaging Time (Non-Cancer) (AT-N)	days	8,760 USEPA, 1989	3,285 USEPA, 1989	9,125 USEPA, 1989	3,285 USEPA, 1989	8,760 USEPA, 1989	2,555 USEPA, 1989	2,190 USEPA, 1989	730 USEPA, 1989	365 USEPA, 1989	365 USEPA, 1989
Groundwater											
Ingestion Rate of Groundwater (IR-W)	L/day	--	--	--	--	2 USEPA, 1989	1.4 USEPA, 1993	1 USEPA, 1989	1 USEPA, 1993	--	--
Exposure Frequency (EF)	days/year	--	--	--	--	350 USEPA, 1991	234 USEPA, 1993	350 USEPA, 1993	234 USEPA, 1993	180 Prof Judge	90 Prof Judge
Exposure Duration (ED)	years	--	--	--	--	24 USEPA, 1997	7 USEPA, 1993	6 USEPA, 1997	2 USEPA, 1993	1 Prof Judge	1 Prof Judge
Exposure Time (ET)	hours/day	--	--	--	--	0.58 USEPA, 2004	0.25 USEPA, 2004	1 USEPA, 2004	0.33 USEPA, 2004	8 Prof Judge	8 Prof Judge
Surface Area Available for Contact (SA)	cm2	--	--	--	--	18,000 USEPA, 2004	18,000 USEPA, 2004	6,600 USEPA, 2004	6,600 USEPA, 2004	3,300 USEPA, 1997	3,230 USEPA, 1992
Respiration Rate (RR)	m3/hour	--	--	--	--	1.27 USEPA, 1997	1.27 USEPA, 1997	--	--	--	--
Conversion Factor (CF)	L/cm3	--	--	--	--	1.00E-03 USEPA, 1989	1.00E-03 USEPA, 1989	1.00E-03 USEPA, 1989	1.00E-03 USEPA, 1989	1.00E-03 USEPA, 1989	1.00E-03 USEPA, 1989
Averaging Time (Non-Cancer) (AT-N)	days	--	--	--	--	8,760 USEPA, 1989	2,555 USEPA, 1989	2,190 USEPA, 1989	730 USEPA, 1989	365 USEPA, 1989	365 USEPA, 1989

TABLE 6-4 (Continued)

SUMMARY OF EXPOSURE PARAMETERS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

		Current Adult Trespassers	Current Adolescent Trespassers	Current and Future Adult On-Site Workers		Future Adult Residents		Future Young Child Residents		Future Adult Construction Workers	
Parameter	Units	RME	RME	RME	CT	RME	CT	RME	CT	RME	CT
Other Parameters											
Body Weight (BW)	kg	70 USEPA, 1997	45 USEPA, 1997	70 USEPA, 1997	70 USEPA, 1997	70 USEPA, 1997	70 USEPA, 1997	15 USEPA, 1997	15 USEPA, 1997	70 USEPA, 1997	70 USEPA, 1997
Soil to Skin Adherence Factor (AF)	mg/cm2	0.07 USEPA, 1997	0.2 USEPA, 1997	0.2 USEPA, 1997	0.2 USEPA, 1997	0.07 USEPA, 1997	0.07 USEPA, 1997	0.2 USEPA, 1997	0.2 USEPA, 1997	0.2 USEPA, 1997	0.2 USEPA, 1997
Particulate Emission Factor (PEF)	m3/kg	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995
Averaging Time (Cancer) (AT-C)	days	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989

Notes:

RME - Reasonalble Maximum Exposure
CT - Central Tendency

ABS - Absorption Factors
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.
The following USEPA Region III default absorbance factors will be applied in the absence of reference values from USEPA, 2001 to estimate dermal intake of COPCs in soil and sediment (USEPA, 1995):

0.05% and 3.0% - VOAs (chemical specific)	3.2% - Arsenic	10% - SVOAs, Pesticides, Explosives, Herbicides, TPH
1.0% - Inorganics	14% - PCBs	13% - PAHs
3.0% - Dioxins / Furans		

Prof Judge - Professional Judgment

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989. Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Part A) Interim Final.
USEPA, 1991. Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual Supplemental Gudiance. "Standard Default Exposure Factors."
USEPA, 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure - Draft.
USEPA, 1997. Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004. Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 6-5

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Constituents	Oral CSF $(mg/kg/day)^{-1}$	Inhalation CSF $(mg/kg/day)^{-1}$	Oral RfD $(mg/kg/day)^{-1}$	Inhalation RfD $(mg/kg/day)^{-1}$	Oral Absorption Factors (1)	Oral to (2) Dermal Adjustment	WOE	Target Organ (Systemic Toxicity)	Critical Effect (Systemic Toxicity)
Volatiles									
1,2-Dichloroethane	9.10E-02	9.10E-02	NA	7.00E-01	0.03	100%	B2	(i) GIS / Liver / Kidney	(i) Increased incidence of gastrointestinal disturbances and liver and gallbladder disease
2-Hexanone (MBK)	NA	NA	NA	NA	0.03	100%	D	NA	NA
Benzene	5.50E-02	2.70E-02	4.00E-03	8.60E-03	0.03	100%	A	CVS	Decreased lymphocyte count - decreased lymphocyte count, WBC, RBC, hematocri, can platelets significantly decreased; MCV significantly increased
Iodomethane	NA	NA	NA	NA	0.0005	100%	D	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	0.1	100%	D	NA	NA
Benzo(a)anthracene	7.30E-01	NA	NA	NA	0.13	100%	(o) B2, (i) D	NA	NA
Benzo(a)pyrene (BaP)	7.30E+00	3.10E+00	NA	NA	0.13	100%	B2	NA	NA
Benzo(b)fluoranthene	7.30E-01	NA	NA	NA	0.13	100%	B2	NA	NA
Benzo(k)fluoranthene	7.30E-02	NA	NA	NA	0.13	100%	B2	NA	NA
Chrysene	7.30E-03	NA	NA	NA	0.13	100%	B2	NA	NA
Dibenz(a,h)anthracene	7.30E+00	NA	NA	NA	0.13	100%	(o) B2, (i) D	NA	NA
Indeno(1,2,3-cd)pyrene	7.30E-01	NA	NA	NA	0.13	100%	B2	NA	NA
Naphthalene	NA	NA	2.00E-02	9.00E-04	0.1	100%	(o) D, (i) C	(o) Whole Body, (i) RsS	(o) Decreased mean terminal body weight in males, (i) Nasal effects: Hyperplasia and metaplasia in respiratory and olfactory epithelium, respectively
HpCDD, 1,2,3,4,6,7,8-	1.50E+03	1.50E+03	NA	NA	0.03	100%	B2	NA	NA
OCDD	1.50E+02	1.50E+02	NA	NA	0.03	100%	B2	NA	NA
Diesel Range Organics (DRO)	NA	NA	NA	NA	0.1	100%	(o) D, (i) B2	NA	NA
Gasoline Range Organics (GRO)	NA	NA	NA	NA	0.1	100%	D	NA	NA
Arsenic	1.50E+00	1.51E+01	3.00E-04	NA	0.03	100%	A	(o) Skin / CVS	(o) Hyperpigmentation, keratosis, possible vascular complications
Chromium	NA	4.10E+01	3.00E-03	3.00E-05	0.01	100%	(o) D, (i) A	(o) NOEL, (i) RsS	(o) NOEL, (i) Nasal septum atrophy (aerosols), lactate dehydrogenase in bronchioalveolar lavage fluid (particulates)
Thallium	NA	NA	7.00E-05	NA	0.01	100%	D	(o) Liver / CVS / Skin	(o) Increased levels of SGOT and LDH in blood
Vanadium	NA	NA	1.00E-03	NA	0.01	100%	D	(o) GIS / Kidney	(o) Gastrointestinal disturbances, Discoloration of mouth and tongue

Notes:

CSF = Cancer Slope Factor
RfD = Reference Dose
WOE = Weight of Evidence

NA = Not Available
(o) = Toxicty due to oral exposure
(i) = Toxicity due to inhalation exposure

WOE / EPA Group:

A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen — Known/Likely (EPA classes A, B1, B2, C)
D - Not classifiable as a human carcinogen — Cannot be Determined (EPA class D)
E - Evidence of noncarcinogenicity — Not Likely (EPA class E)

Target Organ Abbreviations:

CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

(1) - ABS - Absorption Factors
The following USEPA Region III default absorbance factors will be applied in the absence of reference values from USEPA, 2001 to estimate dermal intake of COPCs in soil and sediment in the absence of chemical-specific information (USEPA, 1995):

0.05% and 3.0% - VOAs (chemical specific)
1.0% - Inorganics
3.0% - Dioxins / Furans
3.2% - Arsenic
6.0% - PCBs
10% - SVOAs, Pesticides, Explosives, Herbicides, TPH

(2) - Oral to dermal adjustment taken from RAGS Part E (USEPA, 2004)

TABLE 6-6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.5E-07	--	7.8E-08	--	2.30E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.9E-06	--	1.5E-06	--	4.44E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	4.6E-07	--	2.4E-07	--	6.96E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	1.2E-08	--	6.0E-09	--	1.76E-08	NA	--	--	--	--
			Chrysene	1.8E-09	--	9.4E-10	--	2.76E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	4.5E-07	--	2.3E-07	--	6.87E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2.0E-07	--	1.0E-07	--	3.05E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	3.3E-07	--	3.9E-08	--	3.66E-07	Skin / CVS	0.00	--	0.00	0.00
			Chromium	--	--	--	--	--	NOEL	0.00	--	0.01	0.01
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.00	--	0.00	0.00
			Vanadium	--	--	--	--	--	GIS / Kidney	0.07	--	0.10	0.17
			Chemical Total	4.5E-06	--	2.2E-06		6.74E-06		0.08	--	0.11	0.19
		Exposure Point Total						6.74E-06					0.19
	Exposure Medium Total							6.74E-06					0.19

TABLE 6-6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (Cont)	Air	Fugative Dust	2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	9.2E-10	--	--	9.19E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	6.3E-11	--	--	6.33E-11	NA	--	--	--	--
			Chromium	--	3.8E-09	--	--	3.84E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	4.8E-09	--		4.82E-09		--	0.00	--	0.00
		Exposure Point Total						4.82E-09					0.00
	Exposure Medium Total							4.82E-09					0.00
Surface Soil Total								**6.75E-06**					**0.19**
Adult Trespassers Total								**6.75E-06**					**0.19**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	6.7E-06
Total Risk Across All Media and All Exposure Routes	6.7E-06

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Total Hazard Index Across Surface Soil	0.2
Total Hazard Index Across All Media and All Exposure Routes	0.2

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.2
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	0.2
Oral / Dermal Liver HI =	0.0

TABLE 6-7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	8.8E-08	--	7.3E-08	--	1.62E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	1.7E-06	--	1.4E-06	--	3.12E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	2.7E-07	--	2.2E-07	--	4.90E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	6.8E-09	--	5.6E-09	--	1.24E-08	NA	--	--	--	--
			Chrysene	1.1E-09	--	8.8E-10	--	1.94E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	2.6E-07	--	2.2E-07	--	4.83E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.2E-07	--	9.8E-08	--	2.15E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	1.9E-07	--	3.7E-08	--	2.27E-07	Skin / CVS	0.00	--	0.00	0.00
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.02	0.03
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.00	--	0.00	0.00
			Vanadium	--	--	--	--	--	GIS / Kidney	0.10	--	0.26	0.36
			Chemical Total	2.6E-06	--	2.1E-06		4.71E-06		0.12	--	0.28	0.39
		Exposure Point Total						4.71E-06					0.39
	Exposure Medium Total							4.71E-06					0.39

TABLE 6-7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (Cont)	Air	Fugative Dust	2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	2.9E-10	--	--	2.91E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	2.0E-11	--	--	2.01E-11	NA	--	--	--	--
			Chromium	--	1.2E-09	--	--	1.22E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.5E-09	--		1.53E-09		--	0.00	--	0.00
		Exposure Point Total						1.53E-09					0.00
	Exposure Medium Total							1.53E-09					0.00
Surface Soil Total								**4.72E-06**					**0.39**
Adolescent Trespassers Total								**4.72E-06**					**0.39**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	4.7E-06
Total Risk Across All Media and All Exposure Routes	4.7E-06

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Total Hazard Index Across Surface Soil	0.4
Total Hazard Index Across All Media and All Exposure Routes	0.4

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.4
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	0.4
Oral / Dermal Liver HI =	0.0

TABLE 6-8
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	7.6E-07	--	1.1E-06	--	1.88E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	1.5E-05	--	2.2E-05	--	3.63E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	2.3E-06	--	3.4E-06	--	5.70E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	5.8E-08	--	8.6E-08	--	1.44E-07	NA	--	--	--	--
			Chrysene	9.1E-09	--	1.4E-08	--	2.26E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	2.3E-06	--	3.4E-06	--	5.62E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.0E-06	--	1.5E-06	--	2.50E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	1.6E-06	--	5.6E-07	--	2.20E-06	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.02	--	0.10	0.13
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.01	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.32	--	1.41	**1.73**
			Chemical Total	2.3E-05	--	3.2E-05		5.44E-05		0.36	--	1.52	**1.88**
		Exposure Point Total						5.44E-05					**1.88**
	Exposure Medium Total							5.44E-05					**1.88**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	1.8E-08	--	--	1.84E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.3E-09	--	--	1.27E-09	NA	--	--	--	--
			Chromium	--	7.7E-08	--	--	7.68E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	9.7E-08	--		9.65E-08		--	0.00	--	0.00
		Exposure Point Total						9.65E-08					0.00
	Exposure Medium Total							9.65E-08					0.00
Surface Soil Total								**5.45E-05**					**1.88**

TABLE 6-8
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	6.7E-07	--	2.3E-07	--	8.93E-07	NA	--	--	--	--
			OCDD	6.1E-07	--	2.1E-07	--	8.16E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.0E-06	--	6.8E-07	--	2.67E-06	Skin / CVS	0.01	--	0.00	0.02
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.05	0.07
			Vanadium	--	--	--	--	--	GIS / Kidney	0.27	--	1.19	**1.46**
			Chemical Total	3.3E-06	--	1.1E-06		4.38E-06		0.30	--	1.25	**1.55**
		Exposure Point Total						4.38E-06					**1.55**
	Exposure Medium Total							4.38E-06					**1.55**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	5.1E-11	--	--	5.12E-11	NA	--	--	--	--
			OCDD	--	4.7E-11	--	--	4.68E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.5E-09	--	--	1.54E-09	NA	--	--	--	--
			Chromium	--	4.1E-08	--	--	4.06E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	4.2E-08	--		4.22E-08		--	0.00	--	0.00
		Exposure Point Total						4.22E-08					0.00
	Exposure Medium Total							4.22E-08					0.00
Subsurface Soil Total								**4.42E-06**					**1.55**
On-Site Workers Total								**5.89E-05**					**3.43**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	5.4E-05
Total Risk Across Subsurface Soil	4.4E-06
Total Risk Across All Media and All Exposure Routes	5.9E-05

Total Hazard Index Across Surface Soil	**1.9**
Total Hazard Index Across Subsurface Soil	**1.5**
Total Hazard Index Across All Media and All Exposure Routes	**3.4**

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**3.2**
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	**3.2**
Oral / Dermal Liver HI =	0.0

TABLE 6-9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.2E-07	--	3.1E-07	--	4.30E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.3E-06	--	6.0E-06	--	8.31E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	3.6E-07	--	9.4E-07	--	1.30E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	9.1E-09	--	2.4E-08	--	3.29E-08	NA	--	--	--	--
			Chrysene	1.4E-09	--	3.7E-09	--	5.17E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.6E-07	--	9.3E-07	--	1.29E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.6E-07	--	4.1E-07	--	5.72E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.6E-07	--	1.5E-07	--	4.13E-07	Skin / CVS	0.00	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.08	0.09
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.00	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.14	--	1.08	**1.22**
			Chemical Total	3.6E-06	--	8.8E-06		1.23E-05		0.16	--	1.16	**1.32**
		Exposure Point Total						1.23E-05					**1.32**
	Exposure Medium Total							1.23E-05					**1.32**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	5.8E-09	--	--	5.80E-09	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	4.0E-10	--	--	4.00E-10	NA	--	--	--	--
			Chromium	--	2.4E-08	--	--	2.42E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3.0E-08	--		3.04E-08		--	0.00	--	0.00
		Exposure Point Total						3.04E-08					0.00
	Exposure Medium Total							3.04E-08					0.00
Surface Soil Total								**1.24E-05**					**1.32**

TABLE 6-9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	1.0E-07	--	6.3E-08	--	1.68E-07	NA	--	--	--	--
			OCDD	9.6E-08	--	5.8E-08	--	1.53E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	3.1E-07	--	1.9E-07	--	5.02E-07	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.04	0.05
			Vanadium	--	--	--	--	--	GIS / Kidney	0.12	--	0.92	**1.04**
			Chemical Total	5.1E-07	--	3.1E-07		8.23E-07		0.13	--	0.96	**1.09**
		Exposure Point Total						8.23E-07					**1.09**
	Exposure Medium Total							8.23E-07					**1.09**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	1.6E-11	--	--	1.62E-11	NA	--	--	--	--
			OCDD	--	1.5E-11	--	--	1.48E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	4.9E-10	--	--	4.86E-10	NA	--	--	--	--
			Chromium	--	1.3E-08	--	--	1.28E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.3E-08	--		1.33E-08		--	0.00	--	0.00
		Exposure Point Total						1.33E-08					0.00
	Exposure Medium Total							1.33E-08					0.00
Subsurface Soil Total								**8.36E-07**					**1.09**
On-Site Workers Total								**1.32E-05**					**2.42**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	1.2E-05	Total Hazard Index Across Surface Soil	**1.3**
Total Risk Across Subsurface Soil	8.4E-07	Total Hazard Index Across Subsurface Soil	**1.1**
Total Risk Across All Media and All Exposure Routes	1.3E-05	Total Hazard Index Across All Media and All Exposure Routes	**2.4**

Inhalation Exposure Routes:
Inhalation Respiratory System HI = 0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**2.3**
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	**2.3**
Oral / Dermal Liver HI =	0.0

TABLE 6-10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.0E-06	--	5.3E-07	--	1.54E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.0E-05	--	1.0E-05	--	2.99E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	3.1E-06	--	1.6E-06	--	4.69E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	7.8E-08	--	4.0E-08	--	1.18E-07	NA	--	--	--	--
			Chrysene	1.2E-08	--	6.4E-09	--	1.86E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.0E-06	--	1.6E-06	--	4.62E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.4E-06	--	7.0E-07	--	2.06E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.2E-06	--	2.6E-07	--	2.46E-06	Skin / CVS	0.01	--	0.00	0.02
			Chromium	--	--	--	--	--	NOEL	0.03	--	0.05	0.08
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.02	--	0.00	0.02
			Vanadium	--	--	--	--	--	GIS / Kidney	0.45	--	0.69	**1.14**
			Chemical Total	3.0E-05	--	1.5E-05		4.54E-05		0.51	--	0.74	**1.25**
		Exposure Point Total						4.54E-05					**1.25**
	Exposure Medium Total							4.54E-05					**1.25**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	7.4E-08	--	--	7.42E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	5.1E-09	--	--	5.11E-09	NA	--	--	--	--
			Chromium	--	3.1E-07	--	--	3.10E-07	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3.9E-07	--		3.89E-07		--	0.00	--	0.00
		Exposure Point Total						3.89E-07					0.00
	Exposure Medium Total							3.89E-07					0.00
Surface Soil Total								**4.58E-05**					**1.25**

TABLE 6-10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	8.9E-07	--	1.1E-07	--	1.00E-06	NA	--	--	--	--
			OCDD	8.2E-07	--	9.8E-08	--	9.15E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.7E-06	--	3.2E-07	--	2.99E-06	Skin / CVS	0.02	--	0.00	0.02
			Chromium	--	--	--	--	--	NOEL	0.02	--	0.03	0.04
			Vanadium	--	--	--	--	--	GIS / Kidney	0.38	--	0.58	0.96
			Chemical Total	4.4E-06	--	5.2E-07		4.91E-06		0.41	--	0.61	**1.03**
		Exposure Point Total						4.91E-06					**1.03**
	Exposure Medium Total							4.91E-06					**1.03**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	2.1E-10	--	--	2.07E-10	NA	--	--	--	--
			OCDD	--	1.9E-10	--	--	1.89E-10	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	6.2E-09	--	--	6.21E-09	NA	--	--	--	--
			Chromium	--	1.6E-07	--	--	1.64E-07	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.7E-07	--		1.70E-07		--	0.00	--	0.00
		Exposure Point Total						1.70E-07					0.00
	Exposure Medium Total							1.70E-07					0.00
Subsurface Soil Total								**5.08E-06**					**1.03**

TABLE 6-10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	3.5E-06	--	1.7E-07	--	3.68E-06	NA	--	--	--	--
			Benzene	1.1E-04	--	1.7E-05	--	**1.31E-04**	CVS	1.51	--	0.23	**1.74**
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	6.5E-07	--	8.3E-06	--	8.92E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	5.8E-06	--	1.3E-04	--	**1.31E-04**	NA	--	--	--	--
			Benzo(b)fluoranthene	5.7E-07	--	1.3E-05	--	1.31E-05	NA	--	--	--	--
			Benzo(k)fluoranthene	6.4E-08	--	1.4E-06	--	1.45E-06	NA	--	--	--	--
			Chrysene	5.3E-09	--	6.8E-08	--	7.32E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	6.7E-06	--	3.7E-04	--	**3.79E-04**	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	7.5E-07	--	2.8E-05	--	2.85E-05	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.02	--	0.01	0.03
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.25	--	0.04	0.30
			Vanadium	--	--	--	--	--	GIS / Kidney	2.03	--	0.33	**2.36**
			Chemical Total	1.3E-04	--	5.7E-04		**6.97E-04**		3.81	--	0.62	**4.43**
		Exposure Point Total						**6.97E-04**					**4.43**
	Exposure Medium Total							**6.97E-04**					**4.43**

TABLE 6-10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater (Cont)	Air	Water Vapors from Showerhead	1,2-Dichloroethane	--	3.4E-06	--	--	3.43E-06	GIS / Liver / Kidney	--	0.00	--	0.00
			Benzene	--	7.3E-05	--	--	7.31E-05	CVS	--	0.92	--	0.92
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	7.7E-05	--		7.66E-05		--	0.92	--	0.92
		Exposure Point Total						7.66E-05					0.92
	Exposure Medium Total							7.66E-05					0.92
Groundwater Total								**7.73E-04**					**5.35**
Adult Residents Total								**8.24E-04**					**7.63**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	4.6E-05	Total Hazard Index Across Surface Soil	**1.3**
Total Risk Across Subsurface Soil	5.1E-06	al Hazard Index Across Subsurface Soil	**1.0**
Total Risk Across Groundwater	**7.7E-04**	Total Hazard Index Across Groundwater	**5.3**
Total Risk Across All Media and All Exposure Routes	**8.2E-04**	cross All Media and All Exposure Routes	**7.6**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	**2.7**

Inhalation Exposure Routes:

Inhalation Gastrointestinal System HI =	0.0
Inhalation Kidney HI =	0.0
Inhalation Liver HI =	0.0
Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**4.5**
Oral / Dermal Cardiovascular System HI =	0.1
Oral / Dermal Skin HI =	0.1
Oral / Dermal Kidney HI =	**4.5**
Oral / Dermal Liver HI =	0.0

TABLE 6-11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	9.9E-08	--	9.0E-08	--	1.89E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	1.9E-06	--	1.7E-06	--	3.66E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	3.0E-07	--	2.7E-07	--	5.75E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	7.6E-09	--	6.9E-09	--	1.45E-08	NA	--	--	--	--
			Chrysene	1.2E-09	--	1.1E-09	--	2.28E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.0E-07	--	2.7E-07	--	5.67E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.3E-07	--	1.2E-07	--	2.52E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.1E-07	--	4.5E-08	--	2.59E-07	Skin / CVS	0.00	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.03	0.04
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.01	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.15	--	0.40	0.55
			Chemical Total	3.0E-06	--	2.6E-06		5.52E-06		0.17	--	0.44	0.61
		Exposure Point Total						5.52E-06					0.61
	Exposure Medium Total							5.52E-06					0.61
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	1.4E-08	--	--	1.45E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.0E-09	--	--	9.97E-10	NA	--	--	--	--
			Chromium	--	6.0E-08	--	--	6.04E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	7.6E-08	--		7.59E-08		--	0.00	--	0.00
		Exposure Point Total						7.59E-08					0.00
	Exposure Medium Total							7.59E-08					0.00
Surface Soil Total								**5.60E-06**					**0.61**

TABLE 6-11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	8.7E-08	--	1.8E-08	--	1.06E-07	NA	--	--	--	--
			OCDD	8.0E-08	--	1.7E-08	--	9.64E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.6E-07	--	5.5E-08	--	3.15E-07	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.02	0.02
			Vanadium	--	--	--	--	--	GIS / Kidney	0.13	--	0.34	0.47
			Chemical Total	4.3E-07	--	9.0E-08		5.17E-07		0.14	--	0.36	0.50
		Exposure Point Total						5.17E-07					0.50
	Exposure Medium Total							5.17E-07					0.50
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	4.0E-11	--	--	4.03E-11	NA	--	--	--	--
			OCDD	--	3.7E-11	--	--	3.68E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.2E-09	--	--	1.21E-09	NA	--	--	--	--
			Chromium	--	3.2E-08	--	--	3.19E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3.3E-08	--		3.32E-08		--	0.00	--	0.00
		Exposure Point Total						3.32E-08					0.00
	Exposure Medium Total							3.32E-08					0.00
Subsurface Soil Total								**5.50E-07**					**0.50**

TABLE 6-11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	4.8E-07	--	2.2E-08	--	5.00E-07	NA	--	--	--	--
			Benzene	1.6E-05	--	2.2E-06	--	1.77E-05	CVS	0.71	--	0.10	0.81
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	8.9E-08	--	1.1E-06	--	1.15E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	7.9E-07	--	1.6E-05	--	1.68E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	7.8E-08	--	1.6E-06	--	1.69E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	8.7E-09	--	1.8E-07	--	1.86E-07	NA	--	--	--	--
			Chrysene	7.3E-10	--	8.7E-09	--	9.42E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	9.1E-07	--	4.8E-05	--	4.86E-05	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.0E-07	--	3.6E-06	--	3.66E-06	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.01	--	0.01	0.01
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.12	--	0.01	0.13
			Vanadium	--	--	--	--	--	GIS / Kidney	0.95	--	0.10	**1.05**
			Chemical Total	1.8E-05	--	7.2E-05		9.03E-05		1.78	--	0.22	**2.00**
		Exposure Point Total						9.03E-05					**2.00**
	Exposure Medium Total							9.03E-05					**2.00**

TABLE 6-11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater (Cont)	Air	Water Vapors from Showerhead	1,2-Dichloroethane	--	1.1E-07	--	--	1.14E-07	GIS / Liver / Kidney	--	0.00	--	0.00
			Benzene	--	2.4E-06	--	--	2.44E-06	CVS	--	0.11	--	0.11
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.6E-06	--		2.56E-06		--	0.11	--	0.11
		Exposure Point Total						2.56E-06					0.11
	Exposure Medium Total							2.56E-06					0.11
Groundwater Total								**9.29E-05**					**2.10**
Adult Residents Total								**9.90E-05**					**3.21**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	5.6E-06	Total Hazard Index Across Surface Soil	0.6
Total Risk Across Subsurface Soil	5.5E-07	al Hazard Index Across Subsurface Soil	0.5
Total Risk Across Groundwater	9.3E-05	Total Hazard Index Across Groundwater	**2.1**
Total Risk Across All Media and All Exposure Routes	9.9E-05	cross All Media and All Exposure Routes	**3.2**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	0.9

Inhalation Exposure Routes:

Inhalation Gastrointestinal System HI =	0.0
Inhalation Kidney HI =	0.0
Inhalation Liver HI =	0.0
Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**2.1**
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	**2.1**
Oral / Dermal Liver HI =	0.0

TABLE 6-12
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	2.4E-06	--	8.6E-07	--	3.24E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	4.6E-05	--	1.7E-05	--	6.26E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	7.2E-06	--	2.6E-06	--	9.82E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	1.8E-07	--	6.6E-08	--	2.48E-07	NA	--	--	--	--
			Chrysene	2.9E-08	--	1.0E-08	--	3.90E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	7.1E-06	--	2.6E-06	--	9.69E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.2E-06	--	1.1E-06	--	4.31E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	5.1E-06	--	4.3E-07	--	5.56E-06	Skin / CVS	0.13	--	0.01	0.14
			Chromium	--	--	--	--	--	NOEL	0.30	--	0.33	0.63
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.15	--	0.00	0.15
			Vanadium	--	--	--	--	--	GIS / Kidney	4.19	--	4.52	**8.71**
			Chemical Total	7.1E-05	--	2.4E-05		9.55E-05		4.77	--	4.86	**9.63**
		Exposure Point Total						9.55E-05					**9.63**
	Exposure Medium Total							9.55E-05					**9.63**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	4.7E-08	--	--	4.70E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	3.2E-09	--	--	3.24E-09	NA	--	--	--	--
			Chromium	--	2.0E-07	--	--	1.96E-07	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.5E-07	--		2.47E-07		--	0.00	--	0.00
		Exposure Point Total						2.47E-07					0.00
	Exposure Medium Total							2.47E-07					0.00
Surface Soil Total								**9.58E-05**					**9.63**

TABLE 6-12
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	2.1E-06	--	1.8E-07	--	2.26E-06	NA	--	--	--	--
			OCDD	1.9E-06	--	1.6E-07	--	2.07E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	6.2E-06	--	5.2E-07	--	6.76E-06	Skin / CVS	0.16	--	0.01	0.18
			Chromium	--	--	--	--	--	NOEL	0.16	--	0.18	0.33
			Vanadium	--	--	--	--	--	GIS / Kidney	3.55	--	3.83	**7.38**
			Chemical Total	1.0E-05	--	8.6E-07		1.11E-05		3.87	--	4.02	**7.89**
		Exposure Point Total						1.11E-05					**7.89**
	Exposure Medium Total							1.11E-05					**7.89**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	1.3E-10	--	--	1.31E-10	NA	--	--	--	--
			OCDD	--	1.2E-10	--	--	1.20E-10	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	3.9E-09	--	--	3.94E-09	NA	--	--	--	--
			Chromium	--	1.0E-07	--	--	1.04E-07	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.1E-07	--		1.08E-07		--	0.00	--	0.00
		Exposure Point Total						1.08E-07					0.00
	Exposure Medium Total							1.08E-07					0.00
Subsurface Soil Total								**1.12E-05**					**7.89**

TABLE 6-12
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	2.0E-06	--	1.0E-07	--	2.14E-06	NA	--	--	--	--
			Benzene	6.6E-05	--	1.0E-05	--	7.64E-05	CVS	3.52	--	0.54	**4.05**
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	3.8E-07	--	4.6E-06	--	5.02E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	3.4E-06	--	7.0E-05	--	7.37E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	3.3E-07	--	7.1E-06	--	7.39E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	3.7E-08	--	7.8E-07	--	8.16E-07	NA	--	--	--	--
			Chrysene	3.1E-09	--	3.8E-08	--	4.12E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.9E-06	--	2.1E-04	--	**2.13E-04**	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4.4E-07	--	1.6E-05	--	1.60E-05	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.04	--	0.03	0.07
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.59	--	0.13	0.72
			Vanadium	--	--	--	--	--	GIS / Kidney	4.73	--	0.99	**5.72**
			Chemical Total	7.7E-05	--	3.2E-04		**3.95E-04**		8.88	--	1.68	**10.56**
		Exposure Point Total						**3.95E-04**					**10.56**
	Exposure Medium Total							**3.95E-04**					**10.56**
Groundwater Total								**3.95E-04**					**10.56**
Young Child Residents Total								**5.02E-04**					**28.08**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	9.6E-05	Total Hazard Index Across Surface Soil	**9.6**
Total Risk Across Subsurface Soil	1.1E-05	al Hazard Index Across Subsurface Soil	**7.9**
Total Risk Across Groundwater	**3.9E-04**	Total Hazard Index Across Groundwater	**10.6**
Total Risk Across All Media and All Exposure Routes	**5.0E-04**	cross All Media and All Exposure Routes	**28.1**

All Exposure Routes:

Total Whole Body HI =	0.1
Total Cardiovascular System HI =	**4.1**

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**21.8**
Oral / Dermal Cardiovascular System HI =	0.5
Oral / Dermal Skin HI =	0.5
Oral / Dermal Kidney HI =	**21.8**
Oral / Dermal Liver HI =	0.1

TABLE 6-13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	2.6E-07	--	1.4E-07	--	4.02E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	5.1E-06	--	2.7E-06	--	7.77E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	8.0E-07	--	4.2E-07	--	1.22E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	2.0E-08	--	1.1E-08	--	3.08E-08	NA	--	--	--	--
			Chrysene	3.2E-09	--	1.7E-09	--	4.84E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	7.9E-07	--	4.1E-07	--	1.20E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.5E-07	--	1.8E-07	--	5.35E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	5.7E-07	--	6.9E-08	--	6.40E-07	Skin / CVS	0.04	--	0.01	0.05
			Chromium	--	--	--	--	--	NOEL	0.10	--	0.16	0.26
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.05	--	0.00	0.05
			Vanadium	--	--	--	--	--	GIS / Kidney	1.40	--	2.16	**3.56**
			Chemical Total	7.9E-06	--	3.9E-06		1.18E-05		1.59	--	2.32	**3.92**
		Exposure Point Total						1.18E-05					**3.92**
	Exposure Medium Total							1.18E-05					**3.92**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	1.0E-08	--	--	1.05E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	7.2E-10	--	--	7.22E-10	NA	--	--	--	--
			Chromium	--	4.4E-08	--	--	4.38E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	5.5E-08	--		5.50E-08		--	0.00	--	0.00
		Exposure Point Total						5.50E-08					0.00
	Exposure Medium Total							5.50E-08					0.00
Surface Soil Total								**1.19E-05**					**3.92**

TABLE 6-13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	2.3E-07	--	2.8E-08	--	2.61E-07	NA	--	--	--	--
			OCDD	2.1E-07	--	2.5E-08	--	2.38E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	6.9E-07	--	8.3E-08	--	7.78E-07	Skin / CVS	0.05	--	0.01	0.06
			Chromium	--	--	--	--	--	NOEL	0.05	--	0.08	0.14
			Vanadium	--	--	--	--	--	GIS / Kidney	1.19	--	1.83	**3.02**
			Chemical Total	1.1E-06	--	1.4E-07		1.28E-06		1.29	--	1.92	**3.21**
		Exposure Point Total						1.28E-06					**3.21**
	Exposure Medium Total							1.28E-06					**3.21**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	2.9E-11	--	--	2.92E-11	NA	--	--	--	--
			OCDD	--	2.7E-11	--	--	2.67E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	8.8E-10	--	--	8.77E-10	NA	--	--	--	--
			Chromium	--	2.3E-08	--	--	2.31E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.4E-08	--		2.41E-08		--	0.00	--	0.00
		Exposure Point Total						2.41E-08					0.00
	Exposure Medium Total							2.41E-08					0.00
Subsurface Soil Total								**1.30E-06**					**3.21**

TABLE 6-13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	4.6E-07	--	1.2E-08	--	4.68E-07	NA	--	--	--	--
			Benzene	1.5E-05	--	1.3E-06	--	1.60E-05	CVS	2.35	--	0.20	**2.55**
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	8.5E-08	--	5.9E-07	--	6.79E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	7.5E-07	--	9.0E-06	--	9.76E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	7.4E-08	--	9.0E-07	--	9.77E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	8.3E-09	--	1.0E-07	--	1.08E-07	NA	--	--	--	--
			Chrysene	7.0E-10	--	4.9E-09	--	5.57E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	8.6E-07	--	2.7E-05	--	2.76E-05	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	9.8E-08	--	2.0E-06	--	2.10E-06	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.03	--	0.01	0.04
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.40	--	0.03	0.42
			Vanadium	--	--	--	--	--	GIS / Kidney	3.16	--	0.22	**3.38**
			Chemical Total	1.7E-05	--	4.1E-05		5.78E-05		5.94	--	0.46	**6.40**
		Exposure Point Total						5.78E-05					**6.40**
	Exposure Medium Total							5.78E-05					**6.40**
Groundwater Total								**5.78E-05**					**6.40**
Young Child Residents Total								**7.09E-05**					**13.53**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	1.2E-05	Total Hazard Index Across Surface Soil	**3.9**
Total Risk Across Subsurface Soil	1.3E-06	al Hazard Index Across Subsurface Soil	**3.2**
Total Risk Across Groundwater	5.8E-05	Total Hazard Index Across Groundwater	**6.4**
Total Risk Across All Media and All Exposure Routes	7.1E-05	cross All Media and All Exposure Routes	**13.5**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	**2.5**

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**10.0**
Oral / Dermal Cardiovascular System HI =	0.2
Oral / Dermal Skin HI =	0.2
Oral / Dermal Kidney HI =	**10.0**
Oral / Dermal Liver HI =	0.1

TABLE 6-14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.0E-07	--	1.9E-08	--	1.23E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.0E-06	--	3.6E-07	--	2.38E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	3.2E-07	--	5.7E-08	--	3.74E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	8.0E-09	--	1.4E-09	--	9.45E-09	NA	--	--	--	--
			Chrysene	1.3E-09	--	2.3E-10	--	1.48E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.1E-07	--	5.6E-08	--	3.69E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.4E-07	--	2.5E-08	--	1.64E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.3E-07	--	9.3E-09	--	2.36E-07	Skin / CVS	0.04	--	0.00	0.04
			Chromium	--	--	--	--	--	NOEL	0.08	--	0.04	0.12
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.04	--	0.00	0.04
			Vanadium	--	--	--	--	--	GIS / Kidney	1.11	--	0.59	**1.70**
			Chemical Total	3.1E-06	--	5.3E-07		3.66E-06		1.26	--	0.63	**1.89**
		Exposure Point Total						3.66E-06					**1.89**
	Exposure Medium Total							3.66E-06					**1.89**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	8.3E-10	--	--	8.35E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	5.8E-11	--	--	5.75E-11	NA	--	--	--	--
			Chromium	--	3.5E-09	--	--	3.49E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	4.4E-09	--		4.38E-09		--	0.00	--	0.00
		Exposure Point Total						4.38E-09					0.00
	Exposure Medium Total							4.38E-09					0.00
Surface Soil Total								**3.67E-06**					**1.89**

TABLE 6-14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	9.2E-08	--	3.8E-09	--	9.58E-08	NA	--	--	--	--
			OCDD	8.4E-08	--	3.5E-09	--	8.75E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.7E-07	--	1.1E-08	--	2.86E-07	Skin / CVS	0.04	--	0.00	0.04
			Chromium	--	--	--	--	--	NOEL	0.04	--	0.02	0.06
			Vanadium	--	--	--	--	--	GIS / Kidney	0.94	--	0.50	**1.44**
			Chemical Total	4.5E-07	--	1.9E-08		4.70E-07		1.02	--	0.52	**1.55**
		Exposure Point Total						4.70E-07					**1.55**
	Exposure Medium Total							4.70E-07					**1.55**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	2.3E-12	--	--	2.32E-12	NA	--	--	--	--
			OCDD	--	2.1E-12	--	--	2.12E-12	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	7.0E-11	--	--	6.99E-11	NA	--	--	--	--
			Chromium	--	1.8E-09	--	--	1.84E-09	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.9E-09	--		1.92E-09		--	0.00	--	0.00
		Exposure Point Total						1.92E-09					0.00
	Exposure Medium Total							1.92E-09					0.00
Subsurface Soil Total								**4.71E-07**					**1.55**

TABLE 6-14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	--	--	4.5E-09	--	4.55E-09	NA	--	--	--	--
			Benzene	--	--	4.8E-07	--	4.76E-07	CVS	--	--	0.15	0.15
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	1.2E-07	--	1.21E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	--	1.8E-06	--	1.83E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	1.8E-07	--	1.83E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	2.0E-08	--	2.02E-08	NA	--	--	--	--
			Chrysene	--	--	9.9E-10	--	9.90E-10	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	5.4E-06	--	5.43E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	4.1E-07	--	4.05E-07	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	--	--	0.01	0.01
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	--	--	0.06	0.06
			Vanadium	--	--	--	--	--	GIS / Kidney	--	--	0.43	0.43
			Chemical Total	--	--	8.5E-06		8.47E-06		--	--	0.65	0.65
		Exposure Point Total						8.47E-06					0.65
	Exposure Medium Total							8.47E-06					0.65
Groundwater Total								**8.47E-06**					**0.65**
Construction Workers Total								**1.26E-05**					**4.09**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	3.7E-06
Total Risk Across Subsurface Soil	4.7E-07
Total Risk Across Groundwater	8.5E-06
Total Risk Across All Media and All Exposure Routes	1.3E-05

Total Hazard Index Across Surface Soil	**1.9**
al Hazard Index Across Subsurface Soil	**1.5**
Total Hazard Index Across Groundwater	0.6
cross All Media and All Exposure Routes	**4.1**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	0.2

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**3.6**
Oral / Dermal Cardiovascular System HI =	0.1
Oral / Dermal Skin HI =	0.1
Oral / Dermal Kidney HI =	**3.6**
Oral / Dermal Liver HI =	0.0

TABLE 6-15
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	2.6E-08	--	9.2E-09	--	3.53E-08	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	5.1E-07	--	1.8E-07	--	6.83E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	7.9E-08	--	2.8E-08	--	1.07E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	2.0E-09	--	7.0E-10	--	2.71E-09	NA	--	--	--	--
			Chrysene	3.1E-10	--	1.1E-10	--	4.25E-10	NA	--	--	--	--
			Dibenz(a,h)anthracene	7.8E-08	--	2.7E-08	--	1.06E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.5E-08	--	1.2E-08	--	4.70E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	5.7E-08	--	4.6E-09	--	6.11E-08	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.02	--	0.02	0.04
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.01	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.28	--	0.29	0.56
			Chemical Total	7.8E-07	--	2.6E-07		1.04E-06		0.32	--	0.31	0.62
		Exposure Point Total						1.04E-06					0.62
	Exposure Medium Total							1.04E-06					0.62
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	4.2E-10	--	--	4.17E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	2.9E-11	--	--	2.88E-11	NA	--	--	--	--
			Chromium	--	1.7E-09	--	--	1.74E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.2E-09	--		2.19E-09		--	0.00	--	0.00
		Exposure Point Total						2.19E-09					0.00
	Exposure Medium Total							2.19E-09					0.00
Surface Soil Total								**1.04E-06**					**0.62**

TABLE 6-15
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	2.3E-08	--	1.9E-09	--	2.49E-08	NA	--	--	--	--
			OCDD	2.1E-08	--	1.7E-09	--	2.27E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	6.9E-08	--	5.5E-09	--	7.43E-08	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.01	0.02
			Vanadium	--	--	--	--	--	GIS / Kidney	0.23	--	0.24	0.48
			Chemical Total	1.1E-07	--	9.1E-09		1.22E-07		0.26	--	0.26	0.51
		Exposure Point Total						1.22E-07					0.51
	Exposure Medium Total							1.22E-07					0.51
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	1.2E-12	--	--	1.16E-12	NA	--	--	--	--
			OCDD	--	1.1E-12	--	--	1.06E-12	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	3.5E-11	--	--	3.49E-11	NA	--	--	--	--
			Chromium	--	9.2E-10	--	--	9.21E-10	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	9.6E-10	--		9.58E-10		--	0.00	--	0.00
		Exposure Point Total						9.58E-10					0.00
	Exposure Medium Total							9.58E-10					0.00
Subsurface Soil Total								**1.23E-07**					**0.51**

TABLE 6-15
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	--	--	2.2E-09	--	2.23E-09	NA	--	--	--	--
			Benzene	--	--	2.3E-07	--	2.33E-07	CVS	--	--	0.07	0.07
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	5.9E-08	--	5.90E-08	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	--	8.9E-07	--	8.95E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	9.0E-08	--	8.97E-08	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	9.9E-09	--	9.91E-09	NA	--	--	--	--
			Chrysene	--	--	4.8E-10	--	4.85E-10	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	2.7E-06	--	2.66E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	2.0E-07	--	1.98E-07	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	--	--	0.00	0.00
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	--	--	0.03	0.03
			Vanadium	--	--	--	--	--	GIS / Kidney	--	--	0.21	0.21
			Chemical Total	--	--	4.1E-06		4.15E-06		--	--	0.32	0.32
		Exposure Point Total						4.15E-06					0.32
	Exposure Medium Total							4.15E-06					0.32
Groundwater Total								**4.15E-06**					**0.32**
Construction Workers Total								**5.31E-06**					**1.45**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	1.0E-06	Total Hazard Index Across Surface Soil	0.6
Total Risk Across Subsurface Soil	1.2E-07	al Hazard Index Across Subsurface Soil	0.5
Total Risk Across Groundwater	4.1E-06	Total Hazard Index Across Groundwater	0.3
Total Risk Across All Media and All Exposure Routes	5.3E-06	cross All Media and All Exposure Routes	**1.5**

All Exposure Routes:		**Oral and Dermal Exposure Routes:**	
Total Whole Body HI =	0.0	Oral / Dermal Gastrointestinal System HI =	**1.3**
Total Cardiovascular System HI =	0.1	Oral / Dermal Cardiovascular System HI =	0.0
		Oral / Dermal Skin HI =	0.0
Inhalation Exposure Routes:		Oral / Dermal Kidney HI =	**1.3**
Inhalation Respiratory System HI =	0.0	Oral / Dermal Liver HI =	0.0

TABLE 6-16

SUMMARY OF UNCERTAINTIES IN THE RESULTS OF THE HUMAN HEALTH RISK ASSESSMENT SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA RCRA FACILITY INVESTIGATION NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Potential Magnitude for Over-Estimation of Risks	Potential Magnitude for Under-Estimation of Risks	Potential Magnitude for Over or Under-Estimation of Risks
Environmental Sampling and Analysis			
Sufficient samples may not have been taken to characterize the media being evaluated.			Moderate
Systematic or random errors in the chemical analysis may yield erroneous data.			Low
Selection of COPCs			
The use of site-specific background and USEPA Region III COPC screening concentrations in selecting COPCs in all media of concern.		Low	
Exposure Assessment			
The standard assumptions regarding body weight, exposure period, life expectancy, population characteristics, and lifestyle may not be representative of the actual exposure situations.			Moderate
The use of the 95th percentile upper confidence level data for the normal or lognormal distribution in the estimation of the RME.			Low
The amount of media intake is assumed to be constant and representative of any actual exposure.			Low
Toxicological Assessment			
Toxicological indices derived from high dose animal studies, extrapolated to low dose human exposure.	Moderate		
Risk Characterization			
Assumption of additivity in the quantitation of cancer risks without consideration of synergism, antagonism, promotion and initiation.			Moderate
Assumption of additivity in the estimation of systemic health effects without consideration of synergism, antagonism, etc.			Moderate
Additivity of risks by individual exposure pathways (dermal and ingestion and inhalation).			Low

Notes:

Low - Assumptions categorized as “low” may effect risk estimates by less than one order of magnitude.
Moderate - Assumptions categorized as “moderate” may effect estimates of risk by between one and two orders of magnitude.
High - Assumptions categorized as “high” may effect estimates of risk by more than two orders of magnitude.

Source: Risk Assessment Guidance for Superfund, Volume 1, Part A: Human Health Evaluation Manual. USEPA, 1989.

TABLE 7-1

LIST OF BIRDS REPORTED FROM NAVAL ACTIVITY PUERTO RICO
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Common Name [(1)]		
Pied-billed grebe	Red-billed tropicbird	Brown pelican [(2)]
Brown booby	Magnificent frigatebird	Great blue heron
Louisiana heron	Snowy egret	Great egret
Striated heron	Little blue heron	Cattle egret
Least bittern	Yellow-crowned night heron	Black-crowned night heron
White-cheeked pintail	Blue-winged teal	American widgeon
Red-tailed hawk	Osprey	Merlin
Clapper rail	American coot	Caribbean coot
Common gallinule	Piping plover [(3)]	Semipalmated plover
Black-bellied plover	Wilson's plover	Killdeer
Ruddy turnstone	Black-necked stilt	Whimbrel
Spotted sandpiper	Semipalmated sandpiper	Short-billed dowitcher
Greater yellowlegs	Lesser yellowlegs	Willet
Stilt sandpiper	Pectoral sandpiper	Laughing gull
Royal tern	Sandwich tern	Bridled tern
Least tern	Brown noddy	White-winged dove
Zenaida dove	White-crowned pigeon	Mourning dove
Red-necked pigeon	Common ground dove	Bridled quail dove
Ruddy quail dove	Caribbean parakeet	Smooth-billed ani
Yellow-billed cuckoo	Mangrove cuckoo	Short-eared owl
Chuck-will's-widow	Common nighthawk	Antillean crested hummingbird
Green-throated carib	Antillean mango	Belted kingfisher

TABLE 7-1

LIST OF BIRDS REPORTED FROM NAVAL ACTIVITY PUERTO RICO
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RIO, CEIBA, PUERTO RICO

Common Name [1]		
Gray kingbird	Loggerhead kingbird	Stolid flycatcher
Caribbean elaenia	Purple martin	Cave swallow
Barn swallow	Northern mockingbird	Pearly-eyed thrasher
Red-legged thrush	Black-whiskered vireo	American redstart
Parula warbler	Prairie warbler	Yellow warbler
Magnolia warbler	Cape May warbler	Black-throated blue warbler
Adelaide's warbler	Palm warbler	Black and white warbler
Ovenbird	Northern water thrush	Bananaquit
Striped-headed tanager	Shiny cowbird	Black-cowled oriole
Greater Antillean grackle	Yellow-shouldered blackbird [2]	Hooded mannikin
Yellow-faced grassquit	Black-faced grassquit	Least sandpiper
Western sandpiper	Puerto Rican woodpecker	Rock dove
Puerto Rican emerald	Puerto Rican flycatcher	Pin-tailed whydah
Spice finch	Ruddy duck	Peregrine falcon
Marbled godwit	Puerto Rican lizard cuckoo	Prothonotary warbler
Green-winged teal	Orange-cheeked waxbill	Roseate tern [3][4]
Least grebe	West Indian whistling duck	Puerto Rican screech owl
Puerto Rican tody		

Notes:

[1] List of birds taken from Geo-Marine, Inc. (1998).
[2] Federally-designated endangered species.
[3] Federally-designated threatened species.
[4] Species has the potential to occur at Naval Activity Puerto Rico.

TABLE 7-2

PRELIMINARY ASSESSMENT ENDPOINTS, RISK QUESTIONS, AND MEASUREMENT ENDPOINTS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Assessment Endpoints	Risk Questions	Measurement Endpoints
Terrestrial Habitat: Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related chemical concentrations in surface and subsurface soil sufficient to adversely affect terrestrial soil invertebrate communities?	Comparison of maximum chemical concentrations in surface and subsurface soil with surface soil screening values.
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface and subsurface soil concentrations sufficient to adversely affect terrestrial plant communities?	Comparison of maximum chemical concentrations in surface and subsurface soil with surface soil screening values.
Survival, growth, and reproduction of terrestrial avian herbivores.	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume terrestrial plants from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in surface and subsurface soil.
Survival, growth, and reproduction of terrestrial avian omnivores.	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume terrestrial plants and soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in surface and subsurface soil.
Survival, growth, and reproduction of terrestrial avian carnivores.	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in surface and subsurface soil.
Survival, growth, and reproduction of terrestrial reptile communities.	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptiles?	Qualitative examination of exposures and risks to ecological receptors occupying similar trophic levels.
Survival, growth, and reproduction of terrestrial amphibian communities.	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptiles?	Qualitative examination of exposures and risks to ecological receptors occupying similar trophic levels.

TABLE 7-3

LOG K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (1) (L/Kg)	Bioaccumulative Chemical (2)
Volatile Organics:					
1,1,1,2-Tetrachloroethane	2.63 to 3.03	2.63	USEPA 1995	385	Yes
1,1,1-Trichloroethane	2.47 to 2.51	2.48	USEPA 1995	274	No
1,1,2,2-Tetrachloroethane	2.31 to 2.64	2.39	USEPA 1995	224	No
1,1,2-Trichloroethane	2.03 to 2.07	2.05	USEPA 1995	104	No
1,1-Dichloroethane	1.78 to 1.85	1.79	USEPA 1995	57.5	No
1,1-Dichloroethene	2.13 to 2.37	2.13	USEPA 1995	124	No
1,2,3-Trichloropropane	1.98 to 2.63	2.25	USEPA 1995	163	No
1,2-Dibromo-3-chloropropane	2.26 to 2.41	2.34	USEPA 1995	200	No
1,2-Dibromoethane (EDB)	Not Reported	2.00	USEPA 1996	92.5	No
1,2-Dichloroethane	1.4 to 1.48	1.47	USEPA 1995	27.9	No
1,2-Dichloropropane	1.94 to 1.99	1.97	USEPA 1995	86.5	No
2-Butanone (Methyl ethyl ketone)	0.28 to 0.69	0.28	USEPA 1995	1.89	No
2-Hexanone	Not Reported	1.38	USEPA 1996	22.7	No
3-Chloropropene (Ally chloride)	Not Reported	1.93	SRC 1998	79.0	No
4-Methyl-2-pentanone (MIBK)	Not Reported	1.31	SRC 1998	19.4	No
Acetone	-0.21 to -0.24	-0.24	USEPA 1995	0.58	No
Acetonitrile	-0.34 to -0.39	-0.34	USEPA 1995	0.46	No
Acrolein (Propenal)	-0.01 to 0.90	-0.01	USEPA 1995	0.98	No
Acrylonitrile	-0.92 to 1.20	0.25	USEPA 1995	1.76	No
Benzene	1.83 to 2.50	2.13	USEPA 1995	124	No
Bromodichloromethane	1.88 to 2.14	2.10	USEPA 1995	116	No
Bromoform	2.30 to 2.38	2.35	USEPA 1995	204	No
Bromomethane (Methyl bromide)	Not Reported	1.19	USEPA 1996	14.8	No
Carbon disulfide	1.84 to 2.16	2.00	USEPA 1995	92.5	No
Carbon tetrachloride	2.03 to 3.10	2.73	USEPA 1995	483	Yes
Chlorobenzene	2.56 to 3.79	2.86	USEPA 1995	648	Yes
Chloroethane	Not Reported	1.43	USEPA 1996	25.5	No
Chloroform	1.81 to 3.04	1.92	USEPA 1995	77.2	Yes
Chloromethane (Methyl chloride)	Not Reported	0.91	USEPA 1996	7.85	No
Chloroprene	2.03 to 2.13	2.08	USEPA 1995	111	No
cis-1,3-Dichloropropene	Not Reported	2.06	SRC 1998	106	No
Dibromochloromethane	2.13 to 2.24	2.17	USEPA 1995	136	No
Dibromomethane (Methylene bromide)	Not Reported	1.53	USEPA 1996	31.9	No
Dichlorodifluoromethane	2.0 to 2.37	2.16	USEPA 1995	133	No
Ethylbenzene	3.07 to 3.57	3.14	USEPA 1995	1,222	Yes
Ethyl methacrylate	1.59 to 1.65	1.59	USEPA 1996	36.6	No
Iodomethane (Methyl iodide)	Not Reported	1.51	SRC 1998	30.5	No
Isobutanol (Isobutyl alcohol)	0.65 to 0.76	0.75	USEPA 1995	5.46	No
Methacrylonitrile	0.54 to 0.70	-0.54	USEPA 1996	0.29	No
Methylene chloride (Dichloromethane)	1.22 to 1.40	1.25	USEPA 1995	16.9	No
Methyl methacrylate	1.11 to 1.38	1.38	USEPA 1995	22.7	No
Pentachloroethane	Not Reported	3.06	USEPA 1996	1,019	Yes
Propionitrile (ethyl cyanide)	Not Reported	0.16	SRC 1998	1.44	No
Styrene	2.76 to 3.16	2.94	USEPA 1995	777	Yes
Tetrachloroethene	2.53 to 2.98	2.67	USEPA 1995	422	No
Toluene	2.21 to 3.13	2.75	USEPA 1995	505	Yes
trans-1,2-Dichloroethene	1.77 to 2.10	2.07	USEPA 1995	108	No
trans-1,3-Dichloropropene	Not Reported	2.03	SRC 1998	99.0	No
trans-1,4-Dichloro-2-butene	Not Reported	2.60	SRC 1998	360	No
Trichloroethene	2.42 to 3.14	2.71	USEPA 1995	462	Yes
Trichlorofluoromethane	2.44 to 2.58	2.53	USEPA 1995	307	No

TABLE 7-3

LOG K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} [1] (L/Kg)	Bioaccumulative Chemical [2]
Volatile Organics:					
Vinyl acetate	0.21 to 0.83	0.73	USEPA 1995	5.22	No
Vinyl chloride	1.23 to 1.52	1.50	USEPA 1995	29.8	No
Xylene [3]	2.77 to 3.54	3.13	USEPA 1995	1,194	Yes
Semi-Volatile Organics:					
1,2,4,5-Tetrachlorobenzene	4.51 to 4.83	4.64	USEPA 1995	36,425	Yes
1,2,4-Trichlorobenzene	3.89 to 4.23	4.01	USEPA 1995	8,752	Yes
1,3,5-Trinitrobenzene	1.18 to 1.37	1.18	USEPA 1995	14.5	No
1,2-Dichlorobenzene (o-Dichlorobenzene)	3.20 to 3.61	3.43	USEPA 1995	2,355	Yes
1,3-Dichlorobenzene (m-Dichlorobenzene)	Not Reported	3.60	USEPA 1996	3,460	Yes
1,4,-Dichlorobenzene (p-Dichlorobenzene)	3.26 to 3.78	3.42	USEPA 1995	2,302	Yes
1,4-Dioxane	Not Reported	-0.27	USEPA 1996	0.54	No
1,4-Naphthoquinone	Not Reported	1.71	SRC 1998	48.0	No
1,4-Phenylenediamine (p-Phenylenediamine)	Not Reported	-0.30	SRC 1998	0.51	No
1-Naphthylamine	2.09 to 2.40	2.24	USEPA 1995	159	No
2,3,4,6-Tetrachlorophenol	Not Reported	4.45	USEPA 1996	23,694	Yes
2,4,5-Trichlorophenol	Not Reported	3.72	USEPA 1996	4,540	Yes
2,4,6-Trichlorophenol	3.29 to 4.05	3.70	USEPA 1995	4,339	Yes
2,2'-Oxybis(1-Chloropropane)	Not Reported	2.48	USEPA 1996	274	No
2,4-Dichlorophenol	2.80 to 3.30	3.08	USEPA 1995	1,066	Yes
2,4-Dinitrotoluene	1.98 to 2.05	2.01	USEPA 1995	94.6	No
2,4-Dimethylphenol	1.99 to 2.49	2.36	USEPA 1995	209	No
2,4-Dinitrophenol	1.40 to 1.79	1.55	USEPA 1995	33.4	No
2,6-Dichlorophenol	Not Reported	2.75	SRC 1998	505	No
2,6-Dinitrotoluene	1.72 to 2.03	1.87	USEPA 1995	68.9	No
2-Acetylaminofluorene	Not Reported	3.12	SRC 1998	1,167	Yes
2-Chloronaphthalene	Not Reported	3.38	USEPA 1996	2,103	Yes
2-Chlorophenol	0.83 to 2.32	2.15	USEPA 1995	130	No
2-Naphthylamine	2.09 to 2.42	2.28	USEPA 1995	174	No
2-Nitroaniline (o-Nitroaniline)	Not Reported	1.85	USEPA 1996	65.9	No
2-Nitrophenol (o-Nitrophenol)	Not Reported	1.79	USEPA 1996	57.5	No
2-Picoline	Not Reported	1.11	SRC 1998	12.3	No
3,3'-Dichlorobenzidine	3.51 to 3.95	3.51	USEPA 1995	2,822	Yes
3,3'-Dimethylbenzidine	2.34 to 3.01	2.68	USEPA 1995	431	Yes
3-Methylcholanthrene	6.42 to 6.76	6.42	USEPA 1995	2,047,104	Yes
3-Nitroaniline (m-nitroaniline)	Not Reported	1.37	USEPA 1996	22.2	No
4,6-Dinitro-2-methylphenol (4,6-Dinitro-o-cresol)	Not Reported	2.12	USEPA 1996	121	No
4-Aminobiphenyl	Not Reported	2.86	SRC 1998	648	No
4-Bromophenylphenyl ether	4.89 to 5.24	5.00	USEPA 1995	82,277	Yes
4-Chloro-3-methylphenol	Not Reported	3.10	SRC 1998	1,116	Yes
4-Chloroaniline	1.57 to 2.02	1.85	USEPA 1995	65.9	No
4-Chlorophenylphenyl ether	4.08 to 5.09	4.95	USEPA 1995	73,473	Yes
4-Nitroaniline (p-Nitroaniline)	Not Reported	1.39	USEPA 1996	23.3	No
4-Nitrophenol (p-Nitrophenol)	Not Reported	1.91	SRC 1998	75.5	No
4-Nitroquinoline-1-oxide	Not Reported	1.09	SRC 1998	11.8	No
5-Nitro-o-toluidine	Not Reported	1.87	SRC 1998	68.9	No
7,12-Dimethylbenz(a)anthracene	5.98 to 6.66	6.62	USEPA 1995	3,219,141	Yes
Acetophenone	1.55 to 1.72	1.64	USEPA 1995	41.0	No
A, A-Dimethylphenethylamine	Not Reported	1.90	USEPA 1996	73.8	No
Aniline	0.78 to 1.24	0.98	USEPA 1995	9.20	No
Aramite	Not Reported	4.82	SRC 1998	54,744	Yes
Benzyl alcohol	0.87 to 1.22	1.11	USEPA 1995	12.3	No

TABLE 7-3

LOG K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (1) (L/Kg)	Bioaccumulative Chemical (2)
Semi-Volatile Organics:					
bis(2-Chloroethoxy)methane	Not Reported	0.75	USEPA 1996	5.46	No
bis(2-Chloroethyl)ether	1.0 to 1.29	1.21	USEPA 1995	15.5	No
bis(2-Chloroisopropyl)ether	2.4 to 2.58	2.58	USEPA 1995	344	No
bis(2-Ethylhexyl)phthalate	4.20 to 8.61	7.30	USEPA 1995	15,003,065	Yes
Butylbenzylphthalate	3.57 to 5.02	4.84	USEPA 1995	57,280	Yes
Diallate	3.79 to 5.23	4.49	USEPA 1995	25,939	Yes
Dibenzofuran	Not Reported	4.20	USEPA 1996	13,455	Yes
Diethylphthalate	1.40 to 3.00	2.50	USEPA 1995	287	Yes
Dimethylphthalate	1.34 to 1.90	1.57	USEPA 1995	35.0	No
Di-n-butylphthalate	3.74 to 4.79	4.61	USEPA 1995	34,034	Yes
Di-n-octylphthalate	8.03 to 9.49	8.06	USEPA 1995	83,803,084	Yes
Dinoseb (2-sec-butyl-4,6-Dinitrophenol)	Not Reported	3.69	USEPA 1996	4,242	Yes
Ethyl methanesulfonate	0.01 to 0.05	0.05	USEPA 1995	1.12	No
Hexachlorobenzene	5.00 to 7.42	5.89	USEPA 1995	616,808	Yes
Hexachlorobutadiene	4.74 to 5.16	4.81	USEPA 1995	53,519	Yes
Hexachlorocyclopentadiene	5.04 to 5.51	5.39	USEPA 1995	198,907	Yes
Hexachloroethane	3.82 to 4.14	4.00	USEPA 1995	8,556	Yes
Hexachlorophene	7.08 to 7.60	7.54	USEPA 1995	25,828,548	Yes
Hexachloropropene	Not Reported	4.38	SRC 1998	20,222	Yes
Isophorone	1.67 to 1.90	1.70	USEPA 1995	46.9	No
Isosafrole	Not Reported	3.37	SRC 1998	2,056	Yes
m-Cresol (3-Methylphenol)	1.92 to 2.05	1.97	USEPA 1995	86.5	No
m-Dinitrobenzene (1,3-Dinitrobenzene)	1.49 to 1.63	1.50	USEPA 1995	29.8	No
Methapyrilene	Not Reported	2.87	SRC 1998	663	No
Methyl methanesulfonate	Not Reported	-0.66	SRC 1998	0.22	No
n-Nitrosodiethylamine	0.29 to 0.56	0.48	USEPA 1995	2.97	No
n-Nitrosodimethylamine	-0.77 to -0.48	-0.57	USEPA 1995	0.28	No
n-Nitroso-di-n-butylamine	2.41 to 2.45	2.41	USEPA 1995	234	No
n-Nitroso-di-n-propylamine	1.31 to 1.45	1.40	USEPA 1995	23.8	No
n-Nitrosodiphenylamine	3.13 to 3.45	3.16	USEPA 1995	1,278	Yes
n-Nitrosomethylethylamine	-0.24 to 1.35	-0.12	USEPA 1995	0.76	No
n-Nitrosomorpholine	Not Reported	-0.44	SRC 1998	0.37	No
n-Nitrosopiperidine	0.25 to 0.63	0.63	USEPA 1995	4.16	No
n-Nitrosopyrrolidine	-0.29 to -0.19	-0.19	USEPA 1995	0.65	No
Nitrobenzene	Not Reported	1.84	USEPA 1996	64.4	No
o-Cresol (2-Methylphenol)	1.90 to 2.04	1.99	USEPA 1995	90.5	No
o-Toluidine	1.34 to 1.63	1.34	USEPA 1995	20.8	No
p-Cresol (4-Methylphenol)	1.38 to 2.04	1.95	USEPA 1995	82.6	No
p-Dimethylaminoazobenzene	Not Reported	4.58	SRC 1998	31,799	Yes
Pentachlorobenzene	4.88 to 6.12	5.26	USEPA 1995	148,204	Yes
Pentachloronitrobenzene	4.18 to 4.64	4.64	USEPA 1995	36,425	Yes
Pentachlorophenol	3.29 to 5.24	5.09	USEPA 1995	100,867	Yes
Phenacetin	Not Reported	1.58	SRC 1998	35.8	No
Phenol	0.79 to 1.55	1.48	USEPA 1995	28.5	No
Pronamide	3.26 to 3.86	3.51	USEPA 1995	2,822	Yes
Pryridine	0.62 to 1.28	0.67	USEPA 1995	4.56	No
Safrole	2.66 to 2.88	2.66	USEPA 1995	412	No
PAHs:					
1-Methylnaphthalene	Not Reported	3.87	SRC 1998	6,375	Yes
2-Methylnaphthalene	Not Reported	3.90	USEPA 1996	6,823	Yes
Acenaphthene	3.77 to 4.49	3.92	USEPA 1995	7,139	Yes

TABLE 7-4

SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Soil Screening Value	Reference	Comment
Volatile Organics (ug/kg):			
1,1,1,2-Tetrachloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1,1-Trichloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1,2,2-Tetrachloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1,2-Trichloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1-Dichloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1-Dichloroethene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,2,3-Trichloropropane	NA	---	---
1,2-Dibromo-3-chloropropane	NA	---	---
1,2-Dibromoethane (EDB)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,2-Dichloroethane	402 (1)	MHSPE 2000	---
1,2-Dichloropropane	700,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
2-Butanone (Methyl ethyl ketone)	NA	---	---
2-Hexanone	NA	---	---
3-Chloropropene (Allyl chloride)	NA	---	---
4-Methyl-2-pentanone (MIBK)	NA	---	---
Acetone	NA	---	---
Acetonitrile	NA	---	---
Acrolein (Propenal)	NA	---	---
Acrylonitrile	1,000,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Benzene	101 (1)	MHSPE 2000	---
Bromodichloromethane	NA	---	---
Bromoform	NA	---	---
Bromomethane (Methyl bromide)	NA	---	---
Carbon disulfide	NA	---	---
Carbon tetrachloride	1,000,000	Efroymson et al. 1997a	Toxicological threshold for microbial processes
Chlorobenzene	40,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Chloroethane	NA	---	---
Chloroform	1,002 (1)	MHSPE 2000	---
Chloromethane (Methyl chloride)	NA	---	---
Chloroprene	NA	---	---

TABLE 7-4

SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Soil Screening Value	Reference	Comment
Volatile Organics (ug/kg):			
cis-1,3-Dichloropropene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
Dibromochloromethane	NA	---	---
Dibromomethane (Methylene bromide)	NA	---	---
Dichlorodifluoromethane	NA	---	---
Ethylbenzene	5,003 (1)	MHSPE 2000	---
Ethyl methacrylate	NA	---	---
Iodomethane (Methyl iodide)	NA	---	---
Isobutanol (Isobutyl alcohol)	NA	---	---
Methacrylonitrile	NA	---	---
Methylene chloride (Dichloromethane)	1,004 (1)	MHSPE 2000	---
Methyl methacrylate	NA	---	---
Pentachloroethane	NA	---	---
Propionitrile	NA	---	---
Styrene	10,030 (1)	MHSPE 2000	---
Tetrachloroethene	400 (1)	MHSPE 2000	---
Toluene	13,001 (1)	MHSPE 2000	---
1,2-Dichloroethene (total)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
trans-1,2-Dichloroethene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
trans-1,3-Dichloropropene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
trans-1,4-Dichloro-2-butene	1,000,000	Efroymson et al. 1997a	Toxicological threshold for microbial processess
Trichloroethene	6,010 (1)	MHSPE 2000	---
Trichlorofluoromethane	NA	---	---
Vinyl acetate	NA	---	---
Vinyl chloride	11 (1)	MHSPE 2000	---
Xylene	2,501 (1)	MHSPE 2000	---
Semi-Volatile Organics (ug/kg):			
1,2,4,5-Tetrachlorobenzene	50.0	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,2,4-Trichlorobenzene	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
1,3,5-Trinitrobenzene	40,000	---	Value for nitrobenzene used as a surrogate

TABLE 7-4

SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Soil Screening Value	Reference	Comment
Semi-Volatile Organics (ug/kg):			
1,2-Dichlorobenzene (o-Dichlorobenzene)	3,003 (1)	MHSPE 2000	Value for total chlorobenzenes (2)
1,3-Dichlorobenzene (m-Dichlorobenzene)	3,003 (1)	MHSPE 2000	Value for total chlorobenzenes (2)
1,3-Dinitrobenzene (m-Dinitrobenzene)	40,000	---	Value for nitrobenzene used as a surrogate
1,4-Dichlorobenzene (p-Dichlorobenzene)	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
1,4-Dioxane	NA	---	---
1,4-Naphthoquinone	NA	---	---
1,4-Phenylenediamine (p-phenylenediamine)	NA	---	---
1-Naphthylamine	NA	---	---
2,3,4,6-Tetrachlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2,4,5-Trichlorophenol	4,000	Efroymson et al. 1997b	Toxicological threshold for plants
2,4,6-Trichlorophenol	10,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
2,2'-Oxybis(1-chloropropane)	NA	---	---
2,4-Dichlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2,4-Dimethylphenol	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
2,4-Dinitrophenol	20,000	Efroymson et al. 1997b	Toxicological threshold for plants
2,4-Dinitrotoluene	NA	---	---
2,6-Dichlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2,6-Dinitrotoluene	NA	---	---
2-Acetylaminofluorene	NA	---	---
2-Chloronaphthalene	NA	---	---
2-Chlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2-Naphthylamine	NA	---	---
2-Nitroaniline (o-Nitroaniline)	NA	---	---
2-Nitrophenol (o-Nitrophenol)	7,000	---	Value for 4-nitrophenol used as a surrogate
2-Picoline	NA	---	---
3,3'-Dichlorobenzidine	NA	---	---
3,3'-Dimethylbenzidine	NA	---	---
3-Methylcholanthrene	NA	---	---
3-Nitroaniline (m-Nitroaniline)	NA	---	---
4,6-Dinitro-2-methylphenol (4,6-Dinitro-o-cresol)	NA	---	---

TABLE 7-4

SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Soil Screening Value	Reference	Comment
Semi-Volatile Organics (ug/kg):			
4-Aminobiphenyl	NA	---	---
4-Bromophenylphenyl ether	NA	---	---
4-Chloro-3-methylphenol	NA	---	---
4-Chloroaniline	NA	---	---
4-Chlorophenylphenyl ether	NA	---	---
4-Nitroaniline (p-Nitroaniline)	NA	---	---
4-Nitrophenol (p-nitrophenol)	7,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
4-Nitroquinoline-1-oxide	NA	---	---
5-Nitro-o-toluidine	NA	---	---
7,12-Dimethylbenz(a)anthracene	NA	---	---
Acetophenone	NA	---	---
A,A-Dimethylphenethylamine	NA	---	---
Aniline	NA	---	---
Aramite	NA	---	---
Benzyl alcohol	NA	---	---
bis(2-Chloroethoxy)methane	NA	---	---
bis(2-Chloroethyl)ether	NA	---	---
bis(2-Ethylhexyl)phthalate	6,010 (1)	MHSPE 2000	Value for total phthalates (4)
Butylbenzylphthalate	6,010 (1)	MHSPE 2000	Value for total phthalates (4)
Diallate	NA	---	---
Dibenzofuran	NA	---	---
Diethylphthalate	100,000	Efroymson et al. 1997b	Toxicological threshold for plants
Dimethylphthalate	200,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Di-n-butylphthalate	200,000	Efroymson et al 1997b	Toxicological threshold for plants
Di-n-octylphthalate	6,010 (1)	MHSPE 2000	Value for total phthalates (4)
Dinoseb (2-sec-butyl-4,6-Dinitrophenol)	NA	---	---
Ethyl methanesulfonate	NA	---	---
Hexachlorobenzene	1,000,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Hexachlorobutadiene	NA	---	---
Hexachlorocyclopentadiene	10,000	Efroymson et al. 1997b	Toxicological threshold for plants

TABLE 7-4

SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Soil Screening Value	Reference	Comment
Semi-Volatile Organics (ug/kg):			
Hexachloroethane	NA	---	---
Hexachlorophene	NA	---	---
Hexachloropropene	NA	---	---
Isophorone	NA	---	---
Isosafrole	NA	---	---
m-Dinitrobenzene (1,3-Dinitrobenzene)	NA	---	---
m-Cresol (3-Methylphenol)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
Methapyrilene	NA	---	---
Methyl methanesulfonate	NA	---	---
N-Nitrosodiethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitrosodimethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitroso-di-n-butylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitroso-di-n-propylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitrosodiphenylamine	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
N-Nitrosomethylethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitrosomorpholine	NA	---	---
N-Nitrosopiperidine	NA	---	---
N-Nitrosopyrrolidine	NA	---	---
Nitrobenzene	40,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
o-Cresol (2-Methylpheneol)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
o-Toluidine	NA	---	---
p-Cresol (4-Methylphenol)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
p-(Dimethylamino)azobenzene	NA	---	---
Pentachlorobenzene	1,150	USEPA 1999	Toxicological threshold for earthworms
Pentachloronitrobenzene	NA	---	---
Pentachlorophenol	1,730	USEPA 1999	Toxicological threshold for plants
Phenacetin	NA	---	---
Phenol	30,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Pronamide	NA	---	---
Pryridine	NA	---	---
Safrole	NA	---	---

TABLE 7-4

SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Soil Screening Value	Reference	Comment
PAHs (ug/kg):			
1-Methylnaphthalene	1,200	---	Value for benzo(a)pyrene used as a surrogate
2-Methylnaphthalene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Acenaphthene	20,000	Efroymson et al. 1997b	Toxicological Threshold for plants
Acenaphthylene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Anthracene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Benzo(a)anthracene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Benzo(a)pyrene	1,200	USEPA 1999	Toxicological threshold for plants
Benzo(b)fluoranthene	1,200	USEPA 1999	Toxicological threshold for plants
Benzo(g,h,i)perylene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Benzo(k)fluoranthene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Chrysene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Dibenzo(a,h)anthracene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Fluoranthene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Fluorene	30,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Indeno(1,2,3-cd)pyrene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Naphthalene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Phenanthrene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Pyrene	1,200	---	Value for benzo(a)pyrene used as a surrogate
PCBs (ug/kg):			
Aroclor-1016	2,510	USEPA 1999	Toxicological threshold for earthworms
Aroclor-1221	2,510	---	Value for Aroclor-1016 and Aroclor-1254 used as a surrogate
Aroclor-1232	2,510	---	Value for Aroclor-1016 and Aroclor-1254 used as a surrogate
Aroclor-1242	2,510	---	Value for Aroclor-1016 and Aroclor-1254 used as a surrogate
Aroclor-1248	2,510	---	Value for Aroclor-1016 and Aroclor-1254 used as a surrogate
Aroclor-1254	2,510	USEPA 1999	Toxicological threshold for earthworms
Aroclor-1260	2,510	---	Value for Aroclor-1016 and Aroclor-1254 used as a surrogate
Dioxins/furans (ug/kg):			
2,3,7,8-TCDD	500	USEPA 1999	Toxicological threshold for earthworms
Inorganics (mg/kg):			
Antimony	78	USEPA 2005a	Ecological soil screening level for invertebrates
Arsenic	18	USEPA 2005b	Ecological soil screening level for plants

TABLE 7-4

SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Soil Screening Value	Reference	Comment
Inorganics (mg/kg):			
Barium	330	USEPA 2005c	Ecological soil screening level for invertebrates
Beryllium	40	USEPA 2005d	Ecological soil screening level for invertebrates
Cadmium	32	USEPA 2005e	Ecological soil screening level for plants
Chromium (total)	0.4	Efroymson et al. 1997a	Toxicological threshold for earthworms
Cyanide	0.9	CCME 2006	Canadian soil quality guideline based on agricultural land uses
Cobalt	13	USEPA 2005f	Ecological soil screening level for plants
Copper	70	USEPA 2006b	Toxicological threshold for earthworms
Lead	120	USEPA 2005g	Ecological soil screening level for plants
Mercury	0.1	Efroymson et al. 1997a	Toxicological threshold for earthworms
Nickel	30	Efroymson et al. 1997b	Toxicological threshold for plants
Selenium	1	Efroymson et al. 1997b	Toxicological threshold for plants
Silver	560	USEPA 2006c	Ecoloigcal soil screening level for plants
Thallium	1	Efroymson et al. 1997b	Toxicological threshold for plants
Tin	50	Efroymson et al. 1997b	Toxicological threshold for plants
Vanadium	2	Efroymson et al. 1997b	Toxicological threshold for plants
Zinc	50	Efroymson et al. 1997b	Toxicological threshold for plants

Notes:

NA = Not Available
MHSPE = Ministry of Housing, Spatial Planning and Environment
CCME = Canadian Council of Ministers of the Environment
USEPA = United States Environmental Protection Agency

(1) The screening value shown is an average of the target and intervention soil standards. The value is based on a default organic carbon content of 0.02 (2 percent), which represents a minimum value (adjustment range is 2 to 30 percent).

(2) The value represents a total concentration for chlorobenzenes (mono, di, tri, tetra, penta, and hexachlorobenzene).

(3) The value represents a total concentration for all chlorophenols (mono, di, tri, tetra, and pentachlorophenol).

(4) The value represents a total concentration for all phthalates.

TABLE 7-5

INGESTION-BASED SCREENING VALUES FOR BIRDS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference	Ecological Receptors
Volatile Organics:										
1,1,1,2-Tetrachloroethane	---	---	---	---	---	---	NA	NA	---	---
Carbon tetrachloride	---	---	---	---	---	---	NA	NA	---	---
Chlorobenzene	---	---	---	---	---	---	NA	NA	---	---
Chloroform	---	---	---	---	---	---	NA	NA	---	---
Ethylbenzene	---	---	---	---	---	---	NA	NA	---	---
Pentachloroethane	---	---	---	---	---	---	NA	NA	---	---
Styrene	---	---	---	---	---	---	NA	NA	---	---
Toluene	---	---	---	---	---	---	NA	NA	---	---
Trichloroethene	---	---	---	---	---	---	NA	NA	---	---
Xylene	Quail	0.191	Subacute	?	"Toxicity"	---	405	40.5	Hill and Camardese 1986	Amercian robin, mourning dove, and red-tailed hawk
Semi-Volatile Organics:										
1,2,4,5-Tetrachlorobenzene	---	---	---	---	---	---	NA	NA	---	---
1,2,4-Trichlorobenzene	---	---	---	---	---	---	NA	NA	---	---
1,2-Dichlorobenzene (o-Dichlorobenzene)	Northern bobwhite	0.157	14 days	Oral (gavage)	Growth/mortality	?	2,500	250	Grimes and Jaber 1989	American robin, mourning dove, and red-tailed hawk
1,3-Dichlorobenzene (m-Dichlorobenzne)	Northern bobwhite	0.157	14 days	Oral (gavage)	Growth/mortality	?	2,500	250	Grimes and Jaber 1989	American robin, mourning dove, and red-tailed hawk
1,4-Dichlorobenzene (p-Dichlorobenzne)	Northern bobwhite	0.157	14 days	Oral (gavage)	Growth/mortality	?	2,500	250	Grimes and Jaber 1989	American robin, mourning dove, and red-tailed hawk
2,3,4,6-Tetrachlorophenol	---	---	---	---	---	---	NA	NA	---	---
2,4,5-Trichlorophenol	---	---	---	---	---	---	NA	NA	---	---
2,4,6-Trichlorophenol	---	---	---	---	---	---	NA	NA	---	---
2,4-Dichlorophenol	---	---	---	---	---	---	NA	NA	---	---
2-Acetylaminofluorene	---	---	---	---	---	---	NA	NA	---	---
2-Chloronaphthalene	---	---	---	---	---	---	NA	NA	---	---
3,3'-Dichlorobenzidine	---	---	---	---	---	---	NA	NA	---	---
3,3-Dimethylbenzidine	---	---	---	---	---	---	NA	NA	---	---
3-Methylcholanthrene	---	---	---	---	---	---	NA	NA	---	---
4-Bromophenylphenyl ether	---	---	---	---	---	---	NA	NA	---	---
4-Chloro-3-methylphenol	---	---	---	---	---	---	NA	NA	---	---
4-Chlorophenylphenyl ether	---	---	---	---	---	---	NA	NA	---	---
7-12-Dimethyl benz(a)anthracene	---	---	---	---	---	---	NA	NA	---	---
Aramite	---	---	---	---	---	---	NA	NA	---	---
bis(2-Ethylhexyl)phthalate	Ringed dove	0.155	4 weeks	Oral in diet	Reproduction	Not Applicable	11.0	1.10	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Butylbenzylphthalate	---	---	---	---	---	---	NA	NA	---	---
Diallate	---	---	---	---	---	---	NA	NA	---	---
Dibenzofuran	---	---	---	---	---	---	NA	NA	---	---
Diethylphthalate	---	---	---	---	---	---	NA	NA	---	---
Di-n-butylphthalate	Ringed dove	0.155	4 weeks	Oral in diet	Reproduction	Not Applicable	1.10	0.11	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Di-n-octylphthalate	Ring-necked pheasant	1.00	?	?	Mortality	Not Applicable	500	50.0	TERRTOX 1998	American robin, mourning dove, and red-tailed hawk
Dinoseb (2-sec-butyl-4,6-Dintrophenol)	Ring-necked pheasant	?	14 days	Oral (gavage)	Mortality	Not Applicable	2.64	0.264	USEPA 2004	American robin, mourning dove, and red-tailed hawk
Hexachlorobenzene	Japanese quail	0.19	90 days	Oral	Reproduction	Not Applicable	0.80	0.08	Coulston and Kolbye 1994	American robin, mourning dove, and red-tailed hawk
Hexachlorobutadiene	Japanese quail	0.19	?	Oral	Reproduction	Not Applicable	8.00	2.50	Coulston and Kolbye 1994	American robin, mourning dove, and red-tailed hawk
Hexachlorocyclopentadiene	---	---	---	---	---	---	NA	NA	---	---
Hexachloroethane	---	---	---	---	---	---	NA	NA	---	---
Hexachlorophene	---	---	---	---	---	---	NA	NA	---	---
Hexachloropropene	---	---	---	---	---	---	NA	NA	---	---
Isosafrole	---	---	---	---	---	---	---	---	---	---
N-Nitrosodiphenylamine	---	---	---	---	---	---	NA	NA	---	---

TABLE 7-5

INGESTION-BASED SCREENING VALUES FOR BIRDS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference	Ecological Receptors
Semi-Volatile Organics:										
p-Dimethylaminoazobenzene	---	---	---	---	---	---	NA	NA	---	---
Pentachlorobenzene	---	---	---	---	---	---	NA	NA	---	---
Pentachloronitrobenzene	Chicken	1.50	35 weeks	Oral in diet	Reproduction	Not Applicable	70.7	7.07	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Pentachlorophenol	Chicken	1.50	8 weeks	Oral	Growth	Not Applicable	200	100	Eisler 1989	American robin, mourning dove, and red-tailed hawk
Pronamide	---	---	---	---	---	---	NA	NA	---	---
PAHs:										
1-Methylnaphthalene	Mallard duck	1.04	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980	American robin, mourning dove, and red-tailed hawk
2-Methylnaphthalene	Mallard duck	1.04	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980	American robin, mourning dove, and red-tailed hawk
Acenaphthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Acenaphthylene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Anthracene	Mallard duck	1.043	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980	American robin, mourning dove, and red-tailed hawk
Benzo(a)anthracene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Benzo(a)pyrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Benzo(b)fluoranthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Benzo(g,h,i)perylene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Benzo(k)fluoranthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Chrysene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Dibenz(a,h)anthracene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Fluoranthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Fluorene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Indeno(1,2,3-cd)pyrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Naphthalene	Mallard duck	1.04	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980	American robin, mourning dove, and red-tailed hawk
Phenanthrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, and red-tailed hawk
Pyrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963	American robin, mourning dove, nad red-tailed hawk
PCBs:										
Aroclor-1016	Screech owl	0.181	2 generations	Oral in diet	Reproduction	Not Applicable	4.10	0.41	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Aroclor-1221	Screech owl	0.181	2 generations	Oral in diet	Reproduction	Not Applicable	4.10	0.41	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Aroclor-1232	Screech owl	0.181	2 generations	Oral in diet	Reproduction	Not Applicable	4.10	0.41	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Aroclor-1242	Screech owl	0.181	2 generations	Oral in diet	Reproduction	Not Applicable	4.10	0.41	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Aroclor-1248	Ring-necked pheasant	1.00	17 weeks	Oral	Reproduction	Not Applicable	1.80	0.18	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Aroclor-1254	Ring-necked pheasant	1.00	17 weeks	Oral	Reproduction	Not Applicable	1.80	0.18	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Aroclor-1260	Ring-necked pheasant	1.00	17 weeks	Oral	Reproduction	Not Applicable	1.80	0.18	Sample et al. 1996	American robin, mourning dove, nad red-tailed hawk
Dioxins/Furans:										
2,3,7,8-TCDD	Ring-necked pheasant	1.00	10 weeks	Intraperitoneal injection	Mortality/weight gain	Not Applicable	0.00001	0.000001	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Inorganics:										
Antimony	Northern bobwhite	0.19	6 weeks	Oral	?	Not Applicable	47,400	4,740	Opresko et al. 1993	American robin, mourning dove, and red-tailed hawk
Arsenic	Chicken	Unknown	19 days	Oral in diet	Mortality	Unknown	22.4	2.24	USEPA 2005b	American robin, mourning dove, and red-tailed hawk
Barium	One-day old chicks	0.121	4 weeks	Oral in diet	Mortality	Barium hydroxide	41.7	20.8	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Beryllium	---	---	---	---	---	---	NA	NA	---	---
Cadmium	Multiple species	Unknown	Various	Oral in diet	Reproduction/growth	Unknown	11.47	1.47 (1)	USEPA 2005e	American robin, mourning dove, and red-tailed hawk
Chromium	Multiple species	Unknown	Various	Oral in diet	Reproduction/growth	Trivalent chromium	26.6	2.66 (1)(2)	USEPA 2005h	American robin, mourning dove, and red-tailed hawk
Cobalt	Multiple species	Unknown	Various	Oral in diet	Growth	Unknown	76.1	7.61 (1)	USEPA 2005f	American robin, mourning dove, and red-tailed hawk
Copper	Chicken	Unknown	84 days	Oral in diet	Reproduction	Unknown	12.1	4.05	USEPA 2006b	American robin, mourning dove, and red-tailed hawk
Lead	Chicken	Unknown	4 weeks	Oral in diet	Reproduction	Unknown	3.26	1.63	USEPA 2005g	American robin, mourning dove, and red-tailed hawk
Mercury	Mallard duck	1.00	3 generations	Oral in diet	Reproduction	Methyl mercury dicyandiamide	0.064	0.0064	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk

TABLE 7-5

INGESTION-BASED SCREENING VALUES FOR BIRDS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference	Ecological Receptors
Inorganics:										
Nickel	Mallard duckling	0.782	90 days	Oral in diet	Growth/mortality	Nickel sulfate	107	77.4	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Selenium	Mallard duck	1.00	100 days	Oral in diet	Reproduction	Selanomethionine	0.80	0.40	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Silver	Turkey	Unknown	5 weeks	Oral in diet	Growth	Unknown	20	2.02	USEPA 2006c	American robin, mourning dove, and red-tailed hawk
Thallium	European starling	Unknown	acute	Oral	Unknown	Unknown	3.50	0.35	USEPA 1999	American robin, mourning dove, and red-tailed hawk
Tin	Japanese quail	0.15	6 weeks	Oral in diet	Reproduction	bis(Tributyltin)-oxide	16.9	6.80	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk
Vanadium	Chicken	Unknown	5 weeks	Oral in diet	Growth	Unknown	0.688	0.344	USEPA 2005i	American robin, mourning dove, and red-tailed hawk
Zinc	White leghorn hen	1.935	44 weeks	Oral in diet	Reproduction	Zinc sulfate	131	14.5	Sample et al. 1996	American robin, mourning dove, and red-tailed hawk

Notes:

NA = Not Available
NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse Effect Level
USEPA = United States Environmental Protection Agency

(1) The NOAEL value represents a geometric mean of NOAEL values for growth and/or reproduction. The NOAEL value was used in the derivation of the avian ecological soil screening level.
(2) The NOAEL value shown is for trivalent chromium.

TABLE 7-6

CALCULATION OF 2,3,7,8-TCDD EQUIVALENTS FOR SUBSURFACE SOIL SAMPLE 14SB04-01
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Reporting Limit (ug/kg)	Detected Concentration (ug/kg)	Toxicity Equivalence Factor [1]	2,3,7,8-TCDD Equivalent (ug/kg)
2,3,7,8-tetrachlorodibenzo-p-dioxin	0.113	ND	1	0.113
1,2,3,7,8-pentachlorodebenzo-p-dioxin	0.113	ND	1	0.113
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	0.283	ND	0.05	0.01415
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	0.283	ND	0.01	0.00283
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	0.283	ND	0.1	0.0283
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	1.27J	<0.001	0.00127 [2]
Octachlorodibenzo-p-dioxin	NA	11.6	0.0001	0.00116
2,3,7,8-tetrachchlorodibenzofuran	0.113	ND	1	0.113
1,2,3,7,8-pentachlorodibenzofuran	0.113	ND	0.1	0.0113
2,3,4,7,8-pentchchlorodibenzofuran	0.113	ND	1	0.113
1,2,3,4,7,8-hexachlorodibenzofuran	0.283	ND	0.1	0.0283
1,2,3,6,7,8-hexachlorodibenzofuran	0.283	ND	0.1	0.0283
2,3,4,6,7,8-hexachlorodibenzofuran	0.283	ND	0.1	0.0283
1,2,3,7,8,9-hexachlorodibenzofuran	0.283	ND	0.1	0.0283
1,2,3,4,6,7,8-heptachlorodibenzofuran	0.283	ND	0.01	0.00283
1,2,3,4,7,8,9-heptachchlorodibenzofuran	0.283	ND	0.01	0.00283
Octachlorodibenzofuran	0.566	ND	0.0001	0.0000566
			Sum of 2,3,7,8-TCDD Equivalents (ug/kg):	**0.6287**

Notes:

2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
ug/kg = micrograms per kilogram
NA = Not Applicable
ND = Not Detected

[1] The toxicity equivalent factors (TEQs) shown are those reported by Van den Berg et al. (1998) for birds.

[2] The 1,2,3,6,7,8-Heachlorodibenzo-p-dioxin TEQ is reported as <0.001. As a measure of conservatism, the 2,3,7,8-TCDD equivalent concentration was derived using a TEQ value of 0.001.

TABLE 7-7

SOIL BIOCONCENTRATION FACTORS USED FOR TERRESTRIAL PLANTS AND SOIL BIOACCUMULATION FACTORS USED FOR TERRESTRIAL INVERTEBRATES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Volatile Organics:				
1,1,1,2-Tetrachloroethane	1.1691	Travis and Arms 1988	1.00	Assumed
Carbon Tetrachloride	1.0234	Travis and Arms 1988	1.00	Assumed
Chlorobenzene	0.8608	Travis and Arms 1988	1.00	Assumed
Chloroform	3.0077	Travis and Arms 1988	1.00	Assumed
Ethylbenzene	0.5930	Travis and Arms 1988	1.00	Assumed
Pentachloroethane	0.6597	Travis and Arms 1988	1.00	Assumed
Styrene	0.7739	Travis and Arms 1988	1.00	Assumed
Toluene	0.9966	Travis and Arms 1988	1.00	Assumed
Trichloroethene	1.0510	Travis and Arms 1988	1.00	Assumed
Xylene	0.6010	Travis and Arms 1988	1.00	Assumed
Semi-Volatile Organics:				
1,2,4,5-Tetrachlorobenzene	0.0806	Travis and Arms 1988	1.00	Assumed
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene (o-Dichlorobenzene)	0.4031	Travis and Arms 1988	1.00	Assumed
1,3-Dichlorobenzene (m-Dichlorobenzene)	0.3215	Travis and Arms 1988	1.00	Assumed
1,4,-Dichlorobenzene (p-Dichlorobenzne)	0.4085	Travis and Arms 1988	1.00	Assumed
2,3,4,6-Tetrachlorophenol	0.1051	Travis and Arms 1988	1.00	Assumed
2,4,5-Trichlorophenol	0.2157	Travis and Arms 1988	8.40	van Gestel and Ma 1988
2,4,6-Trichlorophenol	0.2814	Travis and Arms 1988	1.00	Assumed
2,4-Dichlorophenol	0.6423	Travis and Arms 1988	1.00	Assumed
2-Acetylaminofluorene	0.6090	Travis and Arms 1988	1.00	Assumed
2-Chloronaphthalene	0.1567	Travis and Arms 1988	1.00	Assumed
3,3'-Dichlorobenzidine	0.3624	Travis and Arms 1988	1.00	Assumed
3,3'-Dimethylbenzidine	1.0939	Travis and Arms 1988	1.00	Assumed
3-Methylcholanthrene	0.0075	Travis and Arms 1988	1.00	Assumed
4-Bromophenylphenyl ether	0.0499	Travis and Arms 1988	1.00	Assumed
4-Chloro-3-methylphenol	0.6255	Travis and Arms 1988	1.00	Assumed
4-Chlorophenylphenyl ether	0.0533	Travis and Arms 1988	1.00	Assumed
7,12-Dimethylbenz(a)anthracene	0.0058	Travis and Arms 1988	1.00	Assumed
Aramite	0.0634	Travis and Arms 1988	1.00	Assumed
Bis(2-ethylhexyl)phthalate	0.0023	Travis and Arms 1988	1.00	Assumed

TABLE 7-7

SOIL BIOCONCENTRATION FACTORS USED FOR TERRESTRIAL PLANTS AND SOIL BIOACCUMULATION FACTORS USED FOR TERRESTRIAL INVERTEBRATES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Semi-Volatile Organics:				
Butylbenzylphthalate	0.0617	Travis and Arms 1988	1.00	Assumed
Diallate	0.0984	Travis and Arms 1988	1.00	Assumed
Dibenzofuran	0.1447	Travis and Arms 1988	1.00	Assumed
Diethylphthalate	1.3900	Travis and Arms 1988	1.00	Assumed
Di-n-butylphthalate	0.0838	Travis and Arms 1988	1.00	Assumed
Di-n-octylphthalate	0.0008	Travis and Arms 1988	1.00	Assumed
Dinoseb (2-sec-butyl-4,6-Dinitrophenol)	0.2852	Travis and Arms 1988	1.00	Assumed
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1.00	Assumed
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1.00	Assumed
Hexachloroethane	0.1888	Travis and Arms 1988	1.00	Assumed
Hexachlorophene	0.0017	Travis and Arms 1988	1.00	Assumed
Hexachloropropene	0.1139	Travis and Arms 1988	1.00	Assumed
Isosafrole	0.4367	Travis and Arms 1988	1.00	Assumed
n-Nitrosodiphenylamine	0.5775	Travis and Arms 1988	1.00	Assumed
p-Dimethylaminoazobenzene	0.0872	Travis and Arms 1988	1.00	Assumed
Pentachlorobenzene	0.0353	Travis and Arms 1988	1.00	Assumed
Pentachloronitrobenzene	0.0806	Travis and Arms 1988	1.00	Assumed
Pentachlorophenol	0.0443	Travis and Arms 1988	8.00	van Gestel and Ma 1988
Pronamide	0.3624	Travis and Arms 1988	1.00	Assumed
PAHs:				
1-Methylnaphthalene	0.2245	Travis and Arms 1988	0.23	Beyer and Stafford 1993
2-Methylnaphthalene	0.2157	Travis and Arms 1988	0.20	Beyer and Stafford 1993
Acenaphthene	0.21	Travis and Arms 1988	0.30	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.0908	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0197	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0114	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993

TABLE 7-7

SOIL BIOCONCENTRATION FACTORS USED FOR TERRESTRIAL PLANTS AND SOIL BIOACCUMULATION FACTORS USED FOR TERRESTRIAL INVERTEBRATES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
PAHs:				
Chrysene	0.0197	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenzo(a,h)anthracene	0.0053	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Fluoranthene	0.0425	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1428	Travis and Arms 1988	0.20	Beyer and Stafford 1993
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Naphthalene	0.4425	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Phenanthrene	0.0908	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0056	Travis and Arms 1988	0.39	Beyer and Stafford 1993
PCBs:				
Aroclor-1016	0.0219	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1221	0.0933	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1232	0.0933	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1242	0.0090	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1248	0.0084	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1254	0.0046	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1260	0.0006	Travis and Arms 1988	15.91	Sample et al. 1998a
Dioxins/Furans:				
2,3,7,8-TCDD	0.002	Travis and Arms 1988	1.00	Assumed
Inorganics:				
Antimony	0.20	Baes et al. 1984	1.00	Assumed
Arsenic	1.103	Bechtel Jacobs 1998	0.523	Sample et al. 1998a
Barium	0.15	Baes et al. 1984	0.36	Beyer and Stafford 1993
Beryllium	0.01	Baes et al. 1984	1.00	Assumed
Cadmium	3.25	Bechtel Jacobs 1998	40.69	Sample et al. 1998a
Chromium (total)	0.0075	Baes et al. 1984	3.162	Sample et al. 1998a
Cobalt	0.02	Baes et al. 1984	1.00	Assumed
Copper	0.625	Bechtel Jacobs 1998	1.531	Sample et al. 1998a
Lead	0.468	Bechtel Jacobs 1998	1.522	Sample et al. 1998a
Mercury	5.00	Bechtel Jacobs 1998	20.63	Sample et al. 1998a
Nickel	1.411	Bechtel Jacobs 1998	4.73	Sample et al. 1998a
Selenium	3.012	Bechtel Jacobs 1998	1.34	Sample et al. 1998a
Silver	0.40	Baes et al. 1984	1.00	Assumed

TABLE 7-7

SOIL BIOCONCENTRATION FACTORS USED FOR TERRESTRIAL PLANTS AND SOIL BIOACCUMULATION FACTORS USED FOR TERRESTRIAL INVERTEBRATES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics:				
Thallium	0.004	Baes et al. 1984	1.00	Assumed
Tin	0.03	Baes et al. 1984	1.00	Assumed
Vanadium	0.0055	Baes et al. 1984	0.088	Sample et al. 1998a
Zinc	1.82	Bechtel Jacobs 1998	12.89	Sample et al. 1998a

Notes:

BCF = Bioconcentration Factor
BAF = Bioaccumulation Factor

TABLE 7-8

SOIL BIOACCUMULATION FACTORS USED FOR SMALL MAMMAL PREY ITEMS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Omnivore BAF (dry weight)	
	Value	Reference
Volatile Organics:		
1,1,1,2-Tetrachloroethane	---	see text
Carbon Tetrachloride	---	see text
Chlorobenzene	---	see text
Chloroform	---	see text
Ethylbenzene	---	see text
Pentachloroethane	---	see text
Styrene	---	see text
Toluene	---	see text
Trichloroethene	---	see text
Xylene	---	see text
Semi-Volatile Organics:		
1,2,4,5-Tetrachlorobenzene	---	see text
1,2,4-Trichlorobenzene	---	see text
1,2-Dichlorobenzene (o-Dichlorobenzene)	---	see text
1,3-Dichlorobenzene (m-Dichlorobenzene)	---	see text
1,4,-Dichlorobenzene (p-Dichlorobenzne)	---	see text
2,3,4,6-Tetrachlorophenol	---	see text
2,4,5-Trichlorophenol	---	see text
2,4,6-Trichlorophenol	---	see text
2,4-Dichlorophenol	---	see text
2-Acetylaminofluorene	---	see text
2-Chloronaphthalene	---	see text
3,3'-Dichlorobenzidine	---	see text
3,3'-Dimethylbenzidine	---	see text
3-Methylcholanthrene	---	see text
4-Bromophenylphenyl ether	---	see text
4-Chloro-3-methylphenol	---	see text
4-Chlorophenylphenyl ether	---	see text
7,12-Dimethylbenz(a)anthracene	---	see text
Aramite	---	see text

TABLE 7-8

SOIL BIOACCUMULATION FACTORS USED FOR SMALL MAMMAL PREY ITEMS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Omnivore BAF (dry weight)	
	Value	Reference
Semi-Volatile Organics:		
Bis(2-ethylhexyl)phthalate	---	see text
Butylbenzylphthalate	---	see text
Diallate	---	see text
Dibenzofuran	---	see text
Diethylphthalate	---	see text
Di-n-butylphthalate	---	see text
Di-n-octylphthalate	---	see text
Dinoseb (2-sec-butyl-4,6-Dinitrophenol)	---	see text
Hexachlorobenzene	---	see text
Hexachlorobutadiene	---	see text
Hexachlorocyclopentadiene	---	see text
Hexachloroethane	---	see text
Hexachlorophene	---	see text
Hexachloropropene	---	see text
Isosafrole	---	see text
n-Nitrosodiphenylamine	---	see text
p-Dimethylaminoazobenzene	---	see text
Pentachlorobenzene	---	see text
Pentachloronitrobenzene	---	see text
Pentachlorophenol	---	see text
Pronamide	---	see text
PAHs:		
1-Methylnaphthalene	---	see text
2-Methylnaphthalene	---	see text
Acenaphthene	---	see text
Acenaphthylene	---	see text
Anthracene	---	see text
Benzo(a)anthracene	---	see text
Benzo(a)pyrene	---	see text
Benzo(b)fluoranthene	---	see text

TABLE 7-8

SOIL BIOACCUMULATION FACTORS USED FOR SMALL MAMMAL PREY ITEMS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Omnivore BAF (dry weight)	
	Value	Reference
PAHs:		
Benzo(g,h,i)perylene	---	see text
Benzo(k)fluoranthene	---	see text
Chrysene	---	see text
Dibenzo(a,h)anthracene	---	see text
Fluoranthene	---	see text
Fluorene	---	see text
Indeno(1,2,3-cd)pyrene	---	see text
Naphthalene	---	see text
Phenanthrene	---	see text
Pyrene	---	see text
PCBs:		
Aroclor-1016	---	see text
Aroclor-1221	---	see text
Aroclor-1232	---	see text
Aroclor-1242	---	see text
Aroclor-1248	---	see text
Aroclor-1254	---	see text
Aroclor-1260	---	see text
Dioxins/Furans:		
2,3,7,8-TCDD	2.20	Sample et al. 1998b
Inorganics:		
Antimony	---	see text
Arsenic	0.014	Sample et al. 1998b
Barium	0.069	Sample et al. 1998b
Beryllium	---	see text
Cadmium	0.462	Sample et al. 1998b
Chromium (total)	0.349	Sample et al. 1998b
Cobalt	0.025	Sample et al. 1998b
Copper	0.554	Sample et al. 1998b
Lead	0.286	Sample et al. 1998b

TABLE 7-8

SOIL BIOACCUMULATION FACTORS USED FOR SMALL MAMMAL PREY ITEMS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Omnivore BAF (dry weight)	
	Value	Reference
Inorganics:		
Mercury	0.13	Sample et al. 1998b
Nickel	0.589	Sample et al. 1998b
Selenium	1.263	Sample et al. 1998b
Silver	---	see text
Thallium	0.1227	Sample et al. 1998b
Tin	---	see text
Vanadium	---	see text
Zinc	2.7822	Sample et al. 1998b

Notes:

BAF = Bioaccumulation Factor

TABLE 7-9

CONSERVATIVE EXPOSURE PARAMETERS FOR UPPER TROPHIC LEVEL RECEPTORS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Receptor	Habitat	Body Weight (kg)		Food Ingestion Rate (kg/day - dry)		Area Use Factor
		Value	Reference	Value	Reference	
Birds: American robin	Terrestrial	0.0635	USEPA 1993	0.00567	Levey and Karasov 1989	1.00
Mourning dove	Terrestrial	0.105	Tomlinson et al. 1994	0.01787	Allometric equation from Nagy 1987 for all birds	1.00
Red-tailed hawk	Terrestrial	0.957	USEPA 1993	0.03952	Sample and Suter II 1994	1.00
Mammals: Small mammal omnivore (prey item)	Terrestrial	0.175	Jackson 1992	0.01760	Allometric equation from Nagy 1987 for rodents	1.00

Notes:

kg = kilograms
kg/day - dry = Dry weight (kilograms) of food ingested per individual per day.
USEPA = United States Environmental Protection Agency

TABLE 7-10

DIETARY COMPOSITION FOR UPPER TROPHIC LEVEL RECEPTORS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Receptor	Dietary Composition (percent)							Soil Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds:									
American robin	12.0	78.9 [(1)]	0	0	0	0	Martin et al. 1951	9.1	Sample and Suter II 1994
Mourning dove	95.0	0	0	0	0	0	Tomlinson et al. 1994	5.0	Assumed
Red-tailed hawk	0	0	97.5	0	0	0	USEPA 1993b; Sample and Suter II 1994	2.5	Assumed
Mammals:									
Small Mammal Omnivore (prey item)	49.0	49.0	0	0	0	0	Assumed	2.0	Assumed

Notes:

USEPA = United States Environmental Protection Agency

[(1)] Dietary compositions were available for spring, summer, winter, and fall. For conservatism, the percentage of soil invertebrates shown represents the highest percentage of terrestrial insects reported for a given season (spring).

TABLE 7-11

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Volatiles (ug/kg)										
1,1,1,2-Tetrachloroethane	0/9	ND	4.3U - 12U	4.34	12.00	100	CCME 2006	0.12	No	Below SSSV
1,1,1-Trichloroethane (TCA)	0/9	ND	4.3U - 6U	2.68	6.00	100	CCME 2006	0.06	No	Below SSSV
1,1,2,2-Tetrachloroethane	0/9	ND	4.3U - 6U	2.68	6.00	100	CCME 2006	0.06	No	Below SSSV
1,1,2-Trichloroethane	0/9	ND	4.3U - 6U	2.68	6.00	100	CCME 2006	0.06	No	Below SSSV
1,1-Dichloroethane	0/9	ND	4.3U - 6U	2.68	6.00	100	CCME 2006	0.06	No	Below SSSV
1,1-Dichloroethene	0/9	ND	4.3U - 6U	2.68	6.00	100	CCME 2006	0.06	No	Below SSSV
1,2,3-Trichloropropane	0/9	ND	4.3U - 12U	4.34	12.00	NA	---	NA	Yes	
1,2-Dibromo-3-chloropropane (DBCP)	0/9	ND	4.3UJ - 25UJ	7.68	25.00	NA	---	NA	Yes	
1,2-Dibromoethane (EDB)	0/9	ND	4.3U - 25UJ	7.68	25.00	100	CCME 2006	0.25	No	Below SSSV
1,2-Dichloroethane	0/9	ND	4.3U - 6U	2.68	6.00	402	MHSPE 2000	0.01	No	Below SSSV
1,2-Dichloroethene (trans)	0/4	ND	4.3U - 5.4U	2.40	5.40	100	CCME 2006	0.05	No	Below SSSV
1,2-Dichloropropane	0/9	ND	4.3U - 6U	2.68	6.00	700,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
1,3-Dichloropropene (cis)	0/9	ND	4.3U - 6U	2.68	6.00	100	CCME 2006	0.06	No	Below SSSV
1,3-Dichloropropene (trans)	0/9	ND	4.3U - 6U	2.68	6.00	100	CCME 2006	0.06	No	Below SSSV
1,4-Dichloro-2-butene (trans)	0/9	ND	22U - 110U	28.00	110	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
2-Butanone (MEK)	3/9	23J - 36J	11UJ - 12U	13.89	36.00	NA	---	NA	Yes	
2-Chloro-1,3-butadiene (Chloroprene)	0/9	ND	4.3U - 120U	33.84	120	NA	---	NA	Yes	
2-Hexanone (MBK)	2/9	2.3J - 3J	11UJ - 13UJ	5.20	3.00	NA	---	NA	Yes	
3-Chloropropene (Allyl Chloride)	0/9	ND	4.3U - 25UJ	7.68	25.00	NA	---	NA	Yes	
4-Methyl-2-pentanone (MIBK)	0/9	ND	11U - 13U	5.89	13.00	NA	---	NA	Yes	
Acetone	0/9	ND	11UJ - 240U	34.00	240	NA	---	NA	Yes	
Acetonitrile	0/5	ND	110U - 120U	59.00	120	NA	---	NA	Yes	
Acrolein	0/9	ND	43U - 630UJ	176	630	NA	---	NA	Yes	
Acrylonitrile	0/9	ND	43U - 120U	43.44	120	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Benzene	1/9	9.5 - 9.5	4.3U - 6U	3.50	9.50	402	MHSPE 2000	0.02	No	Below SSSV
Bromodichloromethane	0/9	ND	4.3U - 6U	2.68	6.00	NA	---	NA	Yes	
Bromoform	0/9	ND	4.3U - 6U	2.68	6.00	NA	---	NA	Yes	
Bromomethane	1/9	0.7J - 0.7J	4.3U - 12U	4.17	0.70	NA	---	NA	Yes	
Carbon Disulfide	0/9	ND	4.3U - 6U	2.68	6.00	NA	---	NA	Yes	
Carbon Tetrachloride	0/9	ND	4.3U - 6U	2.68	6.00	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Chlorobenzene	0/9	ND	4.3U - 6U	2.68	6.00	40,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Chloroethane	0/9	ND	4.3U - 12U	4.34	12.00	NA	---	NA	Yes	
Chloroform	0/9	ND	4.3U - 6U	2.68	6.00	1,002	MHSPE 2000	<0.01	No	Below SSSV
Chloromethane	0/9	ND	4.3U - 12U	4.34	12.00	NA	---	NA	Yes	
Dibromochloromethane	0/9	ND	4.3U - 6U	2.68	6.00	NA	---	NA	Yes	
Dibromomethane	0/9	ND	4.3U - 12UJ	4.34	12.00	NA	---	NA	Yes	
Dichlorodifluoromethane (Freon-12)	0/9	ND	4.3U - 25UJ	7.68	25.00	NA	---	NA	Yes	
Ethyl Methacrylate	0/9	ND	4.3U - 25UJ	7.68	25.00	NA	---	NA	Yes	
Ethylbenzene	2/9	1.5J - 1.6J	4.3U - 6UJ	2.49	1.60	5,003	MHSPE 2000	<0.01	No	Below SSSV
Iodomethane	0/9	ND	4.3U - 12U	4.34	12.00	NA	---	NA	Yes	
Methyl Acrylonitrile	0/9	ND	4.3UJ - 25UJ	7.68	25.00	NA	---	NA	Yes	
Methyl Methacrylate	0/9	ND	22U - 54U	17.28	54.00	NA	---	NA	Yes	
Methylene Chloride	0/9	ND	4.3U - 6U	2.68	6.00	1,004	MHSPE 2000	<0.01	No	Below SSSV
Pentachloroethane	0/9	ND	4.3U - 25UJ	7.68	25.00	NA	---	NA	Yes	
Propionitrile (Ethyl Cyanide)	0/4	ND	210U - 270U	120	270	NA	---	NA	Yes	
Styrene (Ethenylbenzene)	0/9	ND	4.3U - 6U	2.68	6.00	10,030	MHSPE 2000	<0.01	No	Below SSSV
Tetrachloroethene (PCE)	0/9	ND	4.3U - 6U	2.68	6.00	400	MHSPE 2000	0.02	No	Below SSSV

TABLE 7-11

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Volatiles (ug/kg)										
Toluene	0/9	ND	4.3U - 9.1U	3.06	9.10	13,001	MHSPE 2000	<0.01	No	Below SSSV
Trichloroethene (TCE)	0/9	ND	4.3U - 6U	2.68	6.00	6,010	MHSPE 2000	<0.01	No	Below SSSV
Trichlorofluoromethane	0/9	ND	4.3U - 12UJ	4.34	12.00	NA	---	NA	Yes	
Vinyl Acetate	0/9	ND	4.3U - 12U	4.34	12.00	NA	---	NA	Yes	
Vinyl Chloride	0/9	ND	4.3U - 12U	4.34	12.00	11	MHSPE 2000	1.09	Yes	
Xylenes, total	2/9	2.3J - 2.7J	5U - 16U	3.78	2.70	2,501	MHSPE 2000	<0.01	No	Below SSSV
Semivolatiles (ug/kg)										
1,2,4,5-Tetrachlorobenzene	0/9	ND	360U - 420U	197	420	50	CCME 2006	8.40	Yes	
1,2,4-Trichlorobenzene	0/9	ND	360U - 420U	197	420	20,000	Efroymson et al. 1997a	0.02	No	Below SSSV
1,2-Dichlorobenzene (o-)	0/9	ND	360U - 420U	197	420	3,003	MHSPE 2000	0.14	No	Below SSSV
1,3,5-Trinitrobenzene	0/9	ND	380U - 4100U	1172	4100	40,000	---	0.10	No	Below SSSV
1,3-Dichlorobenzene (m-)	0/9	ND	360U - 420U	197	420	3,003	MHSPE 2000	0.14	No	Below SSSV
1,3-Dinitrobenzene (m-)	0/9	ND	380U - 820U	303	820	40,000	---	0.02	No	Below SSSV
1,4-Dichlorobenzene (p-)	0/9	ND	360U - 420U	197	420	20,000	Efroymson et al. 1997a	0.02	No	Below SSSV
1,4-Naphthoquinone	0/9	ND	380U - 2100UJ	627	2100	NA	---	NA	Yes	
1,4-Phenylenediamine	0/9	ND	380UJ - 820UJ	303	820	NA	---	NA	Yes	
1-Naphthylamine	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
2,3,4,6-Tetrachlorophenol	0/9	ND	360UJ - 420U	197	420	1,001	MHSPE 2000	0.42	No	Below SSSV
2,4,5-Trichlorophenol	0/9	ND	380U - 2100U	627	2100	4,000	Efroymson et al. 1997b	0.53	No	Below SSSV
2,4,6-Trichlorophenol	0/9	ND	360U - 420U	197	420	10,000	Efroymson et al. 1997a	0.04	No	Below SSSV
2,4-Dichlorophenol	0/9	ND	360U - 420U	197	420	1,001	MHSPE 2000	0.42	No	Below SSSV
2,4-Dimethylphenol	0/9	ND	360U - 420U	197	420	100	CCME 2006	4.20	Yes	
2,4-Dinitrophenol	0/9	ND	750U - 2100UJ	715	2100	20,000	Efroymson et al. 1997b	0.11	No	Below SSSV
2,4-Dinitrotoluene	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
2,6-Dichlorophenol	0/9	ND	360U - 420U	197	420	1,001	MHSPE 2000	0.42	No	Below SSSV
2,6-Dinitrotoluene	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
2-Acetylaminofluorene	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
2-Chloronaphthalene	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
2-Chlorophenol	0/9	ND	360U - 420U	197	420	1,001	MHSPE 2000	0.42	No	Below SSSV
2-Methylnaphthalene	0/9	ND	360UJ - 420U	197	420	1,200	---	0.35	No	Below SSSV
2-Methylphenol (o-Cresol)	0/9	ND	360U - 420U	197	420	100	CCME 2006	4.20	Yes	
2-Naphthylamine	0/9	ND	380U - 1000U	357	1000	NA	---	NA	Yes	
2-Nitroaniline	0/9	ND	750U - 2100U	715	2100	NA	---	NA	Yes	
2-Nitrophenol	0/9	ND	360U - 420U	197	420	7,000	---	0.06	No	Below SSSV
2-Picoline	0/4	ND	380U - 420U	199	420	NA	---	NA	Yes	
3,3'-Dichlorobenzidine	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
3,3'-Dimethylbenzidine	0/9	ND	380U - 2100U	627	2100	NA	---	NA	Yes	
3-Methylcholanthrene	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
3-Methylphenol (m-Cresol)	0/4	ND	380U - 420U	199	420	100	CCME 2006	4.20	Yes	
3-Nitroaniline	0/9	ND	750U - 2100U	715	2100	NA	---	NA	Yes	
4,6-Dinitro-2-methylphenol	0/9	ND	750U - 2100UJ	715	2100	NA	---	NA	Yes	
4-Aminobiphenyl	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
4-Bromophenyl-phenylether	0/4	ND	380U - 420U	199	420	NA	---	NA	Yes	
4-Chloro-3-methylphenol	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
4-Chloroaniline	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
4-Chlorophenyl-phenylether	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
4-Dimethylaminoazobenzene (p-)	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	

TABLE 7-11

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Semivolatiles (ug/kg)										
4-Methylphenol (p-Cresol)	0/4	ND	380U - 420U	199	420	100	CCME 2006	4.20	Yes	
4-Nitroaniline	0/9	ND	750U - 2100U	715	2100	NA	---	NA	Yes	
4-Nitrophenol	0/9	ND	750UJ - 2100U	715	2100	7,000	Efroymson et al. 1997a	0.30	No	Below SSSV
4-Nitroquinoline-1-Oxide	0/9	ND	380U - 2100UJ	627	2100	NA	---	NA	Yes	
5-Nitro-o-toluidine	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
7,12-Dimethylbenz(a)anthracene	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
a,a-Dimethylphenethylamine	0/9	ND	1800U - 85000UJ	18428	85000	NA	---	NA	Yes	
Acetophenone	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Aniline	0/9	ND	380U - 2100UJ	627	2100	NA	---	NA	Yes	
Aramite	0/9	ND	380U - 820UJ	303	820	NA	---	NA	Yes	
Benzyl Alcohol	0/9	ND	360UJ - 420U	197	420	NA	---	NA	Yes	
Bis(2-chloroethoxy)methane	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Bis(2-chloroisopropyl)ether	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Bis(2-chloroethyl)ether	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Bis(2-ethylhexyl) Phthalate (BEHP)	1/9	97J - 97J	360U - 420U	186	97	6,010	MHSPE 2000	0.02	No	Below SSSV
Butyl Benzyl Phthalate	0/9	ND	360U - 420U	197	420	6,010	MHSPE 2000	0.07	No	Below SSSV
Diallate (cis)	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Diallate (trans)	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Dibenzofuran	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Diethyl Phthalate (DEP)	1/9	54J - 54J	360U - 420U	181	54	100,000	Efroymson et al. 1997b	<0.01	No	Below SSSV
Dimethyl Phthalate	0/9	ND	360U - 420U	197	420	200,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Di-n-butyl Phthalate (DBP)	0/9	ND	360U - 420U	197	420	200,000	Efroymson et al 1997b	<0.01	No	Below SSSV
Di-n-octyl Phthalate	0/9	ND	360U - 420U	197	420	6,010	MHSPE 2000	0.07	No	Below SSSV
Dinoseb	0/9	ND	380U - 820UJ	303	820	NA	---	NA	Yes	
Ethyl Methanesulfonate (EMS)	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Hexachlorobenzene	0/9	ND	360U - 420U	197	420	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Hexachlorobutadiene	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Hexachlorocyclopentadiene	0/9	ND	360U - 420U	197	420	10,000	Efroymson et al. 1997b	0.04	No	Below SSSV
Hexachloroethane	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Hexachloropropene	0/9	ND	380U - 2100U	627	2100	NA	---	NA	Yes	
Isophorone	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Isosafrole	0/9	ND	360UJ - 420U	197	420	NA	---	NA	Yes	
Methapyrilene	0/9	ND	380U - 1000UJ	357	1000	NA	---	NA	Yes	
Methyl Methane Sulfonate	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Nitrobenzene	0/9	ND	360U - 420U	197	420	40,000	Efroymson et al. 1997a	0.01	No	Below SSSV
n-Nitrosodiethylamine	0/9	ND	360U - 420UJ	197	420	20,000	---	0.02	No	Below SSSV
n-Nitrosodimethylamine	0/9	ND	360U - 420U	197	420	20,000	---	0.02	No	Below SSSV
n-Nitroso-di-n-butylamine	0/9	ND	360UJ - 420UJ	197	420	20,000	---	0.02	No	Below SSSV
n-Nitrosodi-n-propylamine	0/9	ND	360U - 420UJ	197	420	20,000	---	0.02	No	Below SSSV
n-Nitrosodiphenylamine	0/9	ND	360U - 420U	197	420	20,000	Efroymson et al. 1997a	0.02	No	Below SSSV
n-Nitrosomethylethylamine	0/9	ND	360UJ - 420UJ	197	420	20,000	---	0.02	No	Below SSSV
n-Nitrosomorpholine	0/9	ND	380UJ - 820UJ	303	820	NA	---	NA	Yes	
n-Nitrosopiperidine	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
n-Nitrosopyrrolidine	0/9	ND	380UJ - 2100UJ	627	2100	NA	---	NA	Yes	
o-Toluidine	0/4	ND	380U - 420U	199	420	NA	---	NA	Yes	
Pentachlorobenzene	0/9	ND	360U - 420U	197	420	1,150	USEPA 1999	0.37	No	Below SSSV
Pentachloronitrobenzene	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Pentachlorophenol	0/9	ND	750U - 2100U	715	2100	1,730	USEPA 1999	1.21	Yes	

TABLE 7-11

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Semivolatiles (ug/kg)										
Phenacetin	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Phenol	0/9	ND	360U - 420U	197	420	30,000	Efroymson et al. 1997a	0.01	No	Below SSSV
Pronamide	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
Pyridine	0/9	ND	380U - 820U	303	820	NA	---	NA	Yes	
Safrole	0/9	ND	360U - 420U	197	420	NA	---	NA	Yes	
PAHs (ug/kg)										
1-Methylnaphthalene	1/4	6J - 6J	7.6U - 8.5UJ	4.49	6.00	1,200	---	<0.01	No	Below SSSV
2-Methylnaphthalene	0/9	ND	360UJ - 420U	197	420	1,200	---	0.35	No	Below SSSV
Acenaphthene	0/9	ND	7.6U - 410U	110	410	20,000	Efroymson et al. 1997b	0.02	No	Below SSSV
Acenaphthylene	0/9	ND	7.6U - 410U	110	410	1,200	---	0.34	No	Below SSSV
Anthracene	1/9	110J - 110J	7.6U - 410U	101	110	1,200	---	0.09	No	Below SSSV
Benzo(a)anthracene	3/9	45J - 3400	7.6U - 400U	460	3400	1,200	USEPA 1999	2.83	Yes	
Benzo(a)pyrene (BaP)	3/9	45J - 5000	7.6U - 400U	805	5000	1,200	USEPA 1999	4.17	Yes	
Benzo(b)fluoranthene	3/9	5.8J - 7600	7.8U - 410U	1223	7600	1,200	USEPA 1999	6.33	Yes	
Benzo(g,h,i)perylene	6/9	5.5J - 3600	7.8U - 360U	574	3600	1,200	---	3.00	Yes	
Benzo(k)fluoranthene	3/9	5.7J - 2400	7.8U - 410U	405	2400	1,200	USEPA 1999	2.00	Yes	
Chrysene	4/9	5J - 3800	7.8U - 400U	549	3800	1,200	USEPA 1999	3.17	Yes	
Dibenz(a,h)anthracene	2/9	210J - 920	7.6U - 410U	192	920	1,200	USEPA 1999	0.77	No	Below SSSV
Fluoranthene	5/9	6.5J - 230J	7.8U - 360U	77.09	230	1,200	---	0.19	No	Below SSSV
Fluorene	0/9	ND	7.6U - 410U	110	410	30,000	Efroymson et al. 1997a	0.01	No	Below SSSV
Indeno(1,2,3-cd)pyrene	5/9	4.8J - 3800	7.8U - 400U	618	3800	1,200	---	3.17	Yes	
Naphthalene	0/9	ND	7.6U - 410U	110	410	1,200	---	0.34	No	Below SSSV
Phenanthrene	2/9	39J - 58J	7.6U - 410U	77.57	58.00	1,200	---	0.05	No	Below SSSV
Pyrene	5/9	6.6J - 650	7.8U - 360U	154	650	1,200	---	0.54	No	Below SSSV
PCBs (ug/kg)										
Aroclor-1016	0/9	ND	35U - 49U	21.06	49.00	2,510	USEPA 1999	0.02	No	Below SSSV
Aroclor-1221	0/9	ND	42U - 53U	24.06	53.00	2,510	---	0.02	No	Below SSSV
Aroclor-1232	0/9	ND	35U - 49U	21.06	49.00	2,510	---	0.02	No	Below SSSV
Aroclor-1242	0/9	ND	24U - 49U	18.44	49.00	2,510	---	0.02	No	Below SSSV
Aroclor-1248	0/9	ND	24U - 49U	18.44	49.00	2,510	---	0.02	No	Below SSSV
Aroclor-1254	0/9	ND	24U - 98U	31.44	98.00	2,510	USEPA 1999	0.04	No	Below SSSV
Aroclor-1260	7/9	6NJ - 28	36U - 39U	18.83	28.00	2,510	---	0.01	No	Below SSSV
Inorganics (mg/kg)										
Antimony	4/4	1.4J - 1.9J	ND	1.60	1.90	78	USEPA 2005a	0.02	No	Below SSSV
Arsenic	4/4	1.4J - 2.9J	ND	2.35	2.90	18	USEPA 2005b	0.16	No	Below SSSV
Barium	4/4	26.5J - 155J	ND	99.38	155	330	USEPA 2005c	0.47	No	Below SSSV
Beryllium	0/4	ND	0.01U - 0.05U	0.01	0.05	40	USEPA 2005d	<0.01	No	Below SSSV
Cadmium	3/4	1.1 - 1.6	0.58U - 0.58U	1.07	1.60	32	USEPA 2005e	0.05	No	Below SSSV
Chromium	4/4	33.8J - 75.1J	ND	47.73	75.10	0.4	Efroymson et al. 1997a	187.75	Yes	
Cobalt	4/4	5.8J - 46.9J	ND	27.00	46.90	13	USEPA 2005f	3.61	Yes	
Lead	4/4	4.9J - 85.3J	ND	52.53	85.30	120	USEPA 2005g	0.71	No	Below SSSV
Mercury	4/4	0.031J - 0.077	ND	0.05	0.08	0.10	Efroymson et al. 1997a	0.77	No	Below SSSV
Nickel	4/4	4.1J - 14.4J	ND	9.93	14.40	30	Efroymson et al. 1997b	0.48	No	Below SSSV
Selenium	4/4	2.1J - 4.7J	ND	3.53	4.70	1.0	Efroymson et al. 1997b	4.70	Yes	
Silver	0/4	ND	0.06U - 0.09U	0.03	0.09	560	USEPA 2006c	<0.01	No	Below SSSV

TABLE 7-11

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ [2]	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen [1]					
Inorganics (mg/kg)										
Thallium	1/4	0.65J - 0.65J	0.43UJ - 0.47UJ	0.33	0.65	1.0	Efroymson et al. 1997b	0.65	No	Below SSSV
Vanadium	4/4	187J - 323J	ND	246	323	2.0	Efroymson et al. 1997b	161.50	Yes	
Zinc	4/4	17.9J - 87.8J	ND	63.83	87.80	50.00	Efroymson et al. 1997b	1.76	Yes	

Notes:

COPC = Chemical of Potential Concern
SSV = Soil Screening Value
ND = Not Detected
NA = Not Available
HQ = Hazard Quotient

µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
J = Estimated Value
U = Not Detected
UJ = Not Detected, Estimated Value

[1] Maximum detected concentration (or maximum reporting limit for non-detected chemicals).

[2] For a given chemical, the Hazard Quotient (HQ) is the maximum detected concentration (or maximum reporting limit for non-detected chemicals) divided by the screening value.

TABLE 7-12

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Volatiles (ug/kg)										
1,1,1,2-Tetrachloroethane	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,1,1-Trichloroethane (TCA)	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,1,2,2-Tetrachloroethane	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,1,2-Trichloroethane	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,1-Dichloroethane	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,1-Dichloroethene	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,2,3-Trichloropropane	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
1,2-Dibromo-3-chloropropane (DBCP)	0/2	ND	4UJ - 220U	56.00	220	NE	---	NA	Yes	
1,2-Dibromoethane (EDB)	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,2-Dichloroethane	0/2	ND	4U - 220U	56.00	220	402	MHSPE 2000	0.55	No	Below SSSV
1,2-Dichloroethene (trans)	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,2-Dichloropropane	0/2	ND	4U - 220U	56.00	220	700,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
1,3-Dichloropropene (cis)	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,3-Dichloropropene (trans)	0/2	ND	4U - 220U	56.00	220	100	CCME 2006	2.20	Yes	
1,4-Dichloro-2-butene (trans)	0/2	ND	80U - 870U	238	870	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
2-Butanone (MEK)	1/2	8.7J - 8.7J	540UJ - 540UJ	139	8.70	NE	---	NA	Yes	
2-Chloro-1,3-butadiene (Chloroprene)	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
2-Hexanone (MBK)	0/2	ND	10UJ - 540U	138	540	NE	---	NA	Yes	
3-Chloropropene (Allyl Chloride)	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
4-Methyl-2-pentanone (MIBK)	0/2	ND	10U - 540U	138	540	NE	---	NA	Yes	
Acetone	0/2	ND	30U - 540UJ	143	540	NE	---	NA	Yes	
Acetonitrile	0/1	ND	220U - 220U	110	220	NE	---	NA	Yes	
Acrolein	0/1	ND	40U - 40U	20.00	40	NE	---	NA	Yes	
Acrylonitrile	0/2	ND	40U - 2200UJ	560	2200	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Benzene	0/2	ND	4U - 220U	56.00	220	101	MHSPE 2000	2.18	Yes	
Bromodichloromethane	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Bromoform	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Bromomethane	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Carbon Disulfide	1/2	0.9J - 0.9J	220U - 220U	55.45	0.90	NE	---	NA	Yes	
Carbon Tetrachloride	0/2	ND	4U - 220U	56.00	220	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Chlorobenzene	0/2	ND	4U - 220U	56.00	220	40,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Chloroethane	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Chloroform	0/2	ND	4U - 220U	56.00	220	1,002	MHSPE 2000	0.22	No	Below SSSV
Chloromethane	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Dibromochloromethane	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Dibromomethane	0/2	ND	4U - 220UJ	56.00	220	NE	---	NA	Yes	
Dichlorodifluoromethane (Freon-12)	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Ethyl Methacrylate	0/2	ND	4U - 2200U	551	2200	NE	---	NA	Yes	
Ethylbenzene	1/2	740 - 740	4U - 4U	371	740	5,003	MHSPE 2000	0.15	No	Below SSSV
Iodomethane	0/2	ND	4U - 220UJ	56	220	NE	---	NA	Yes	
Methyl Acrylonitrile	0/2	ND	4UJ - 2200UJ	551	2200	NE	---	NA	Yes	
Methyl Methacrylate	0/2	ND	40U - 2200UJ	560	2200	NE	---	NA	Yes	
Methylene Chloride	0/2	ND	4U - 220U	56.00	220	1,004	MHSPE 2000	0.22	No	Below SSSV
Pentachloroethane	0/2	ND	4U - 220UJ	56.00	220	NE	---	NA	Yes	
Propionitrile (Ethyl Cyanide)	0/1	ND	200U - 200U	100	200	NE	---	NA	Yes	
Styrene (Ethenylbenzene)	0/2	ND	4U - 220U	56.00	220	10,030	MHSPE 2000	0.02	No	Below SSSV
Tetrachloroethene (PCE)	0/2	ND	4U - 220UJ	56.00	220	400	MHSPE 2000	0.55	No	Below SSSV

TABLE 7-12

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Volatiles (ug/kg)										
Toluene	0/2	ND	4U - 220U	56.00	220	13,001	MHSPE 2000	0.02	No	Below SSSV
Trichloroethene (TCE)	0/2	ND	4U - 220U	56.00	220	6,010	MHSPE 2000	0.04	No	Below SSSV
Trichlorofluoromethane	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Vinyl Acetate	0/2	ND	4U - 220U	56.00	220	NE	---	NA	Yes	
Vinyl Chloride	0/2	ND	4U - 220U	56.00	220	11	MHSPE 2000	20.00	Yes	
Xylenes, total	1/2	130J - 130J	12U - 12U	68.00	130	2,501	MHSPE 2000	0.05	No	Below SSSV
Semivolatiles (ug/kg)										
1,2,4,5-Tetrachlorobenzene	0/2	ND	380U - 400U	195	400	50	CCME 2006	8.00	Yes	
1,2,4-Trichlorobenzene	0/2	ND	380U - 400U	195	400	20,000	Efroymson et al. 1997a	0.02	No	Below SSSV
1,2-Dichlorobenzene (o-)	0/2	ND	380U - 400U	195	400	3,003	MHSPE 2000	0.13	No	Below SSSV
1,3,5-Trinitrobenzene	0/2	ND	380U - 400U	195	400	40,000	---	0.01	No	Below SSSV
1,3-Dichlorobenzene (m-)	0/2	ND	380U - 400U	195	400	3,003	MHSPE 2000	0.13	No	Below SSSV
1,3-Dinitrobenzene (m-)	0/2	ND	380U - 400U	195	400	40,000	---	0.01	No	Below SSSV
1,4-Dichlorobenzene (p-)	0/2	ND	380U - 400U	195	400	20,000	Efroymson et al. 1997a	0.02	No	Below SSSV
1,4-Naphthoquinone	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
1,4-Phenylenediamine	0/2	ND	380UJ - 400UJ	195	400	NE	---	NA	Yes	
1-Naphthylamine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
2,3,4,6-Tetrachlorophenol	0/2	ND	380U - 400U	195	400	1,001	MHSPE 2000	0.40	No	Below SSSV
2,4,5-Trichlorophenol	0/2	ND	380U - 400U	195	400	4,000	Efroymson et al. 1997b	0.10	No	Below SSSV
2,4,6-Trichlorophenol	0/2	ND	380U - 400U	195	400	10,000	Efroymson et al. 1997a	0.04	No	Below SSSV
2,4-Dichlorophenol	0/2	ND	380U - 400U	195	400	1,001	MHSPE 2000	0.40	No	Below SSSV
2,4-Dimethylphenol	0/2	ND	380U - 400U	195	400	100	CCME 2006	4.00	Yes	
2,4-Dinitrophenol	0/2	ND	760UJ - 800UJ	390	800	20,000	Efroymson et al. 1997b	0.04	No	Below SSSV
2,4-Dinitrotoluene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
2,6-Dichlorophenol	0/2	ND	380U - 400U	195	400	1,001	MHSPE 2000	0.40	No	Below SSSV
2,6-Dinitrotoluene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
2-Acetylaminofluorene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
2-Chloronaphthalene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
2-Chlorophenol	0/2	ND	380U - 400U	195	400	1,001	MHSPE 2000	0.40	No	Below SSSV
2-Methylphenol (o-Cresol)	0/2	ND	380U - 400U	195	400	100	CCME 2006	4.00	Yes	
2-Naphthylamine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
2-Nitroaniline	0/2	ND	760U - 800U	390	800	NE	---	NA	Yes	
2-Nitrophenol	0/2	ND	380U - 400U	195	400	7,000	---	0.06	No	Below SSSV
2-Picoline	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
3,3'-Dichlorobenzidine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
3,3'-Dimethylbenzidine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
3-Methylcholanthrene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
3-Methylphenol (m-Cresol)	0/2	ND	380U - 400U	195	400	100	CCME 2006	4.00	Yes	
3-Nitroaniline	0/2	ND	760U - 800U	390	800	NE	---	NA	Yes	
4,6-Dinitro-2-methylphenol	0/2	ND	760U - 800U	390	800	NE	---	NA	Yes	
4-Aminobiphenyl	0/2	ND	380U - 400U	195	400	NE	60	NA	Yes	
4-Bromophenyl-phenylether	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
4-Chloro-3-methylphenol	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
4-Chloroaniline	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
4-Chlorophenyl-phenylether	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
4-Dimethylaminoazobenzene (p-)	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
4-Methylphenol (p-Cresol)	0/2	ND	380U - 400U	195	400	100	CCME 2006	4.00	Yes	

TABLE 7-12

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Semivolatiles (ug/kg)										
4-Nitroaniline	0/2	ND	760U - 800U	390	800	NE	---	NA	Yes	
4-Nitrophenol	0/2	ND	760UJ - 800UJ	390	800	7,000	Efroymson et al. 1997a	0.11	No	Below SSSV
4-Nitroquinoline-1-Oxide	0/2	ND	380UJ - 400UJ	195	400	NE	---	NA	Yes	
5-Nitro-o-toluidine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
7,12-Dimethylbenz(a)anthracene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
a,a-Dimethylphenethylamine	0/2	ND	77000UJ - 82000UJ	39750	82000	NE	---	NA	Yes	
Acetophenone	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Aniline	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Aramite	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Benzyl Alcohol	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Bis(2-chloroethoxy)methane	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Bis(2-chloroisopropyl)ether	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Bis(2-chloroethyl)ether	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Bis(2-ethylhexyl) Phthalate (BEHP)	0/2	ND	380U - 400U	195	400	6,010	MHSPE 2000	0.07	No	Below SSSV
Butyl Benzyl Phthalate	0/2	ND	380U - 400U	195	400	6,010	MHSPE 2000	0.07	No	Below SSSV
Diallate (cis)	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Diallate (trans)	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Dibenzofuran	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Diethyl Phthalate (DEP)	0/2	ND	380U - 400U	195	400	100,000	Efroymson et al. 1997b	<0.01	No	Below SSSV
Dimethyl Phthalate	0/2	ND	380U - 400U	195	400	200,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Di-n-butyl Phthalate (DBP)	0/2	ND	380U - 400U	195	400	200,000	Efroymson et al 1997b	<0.01	No	Below SSSV
Di-n-octyl Phthalate	0/2	ND	380U - 400U	195	400	6,010	MHSPE 2000	0.07	No	Below SSSV
Dinoseb	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Ethyl Methanesulfonate (EMS)	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Hexachlorobenzene	0/2	ND	380U - 400U	195	400	1,000,000	Efroymson et al. 1997a	<0.01	No	Below SSSV
Hexachlorobutadiene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Hexachlorocyclopentadiene	0/2	ND	380U - 400U	195	400	10,000	Efroymson et al. 1997b	0.04	No	Below SSSV
Hexachloroethane	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Hexachloropropene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Isophorone	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Isosafrole	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Methapyrilene	0/2	ND	380UJ - 400UJ	195	400	NE	---	NA	Yes	
Methyl Methane Sulfonate	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Nitrobenzene	0/2	ND	380U - 400U	195	400	40,000	Efroymson et al. 1997a	0.01	No	Below SSSV
n-Nitrosodiethylamine	0/2	ND	380UJ - 400UJ	195	400	20,000	---	0.02	No	Below SSSV
n-Nitrosodimethylamine	0/2	ND	380U - 400U	195	400	20,000	---	0.02	No	Below SSSV
n-Nitroso-di-n-butylamine	0/2	ND	380UJ - 400UJ	195	400	20,000	---	0.02	No	Below SSSV
n-Nitrosodi-n-propylamine	0/2	ND	380UJ - 400UJ	195	400	20,000	---	0.02	No	Below SSSV
n-Nitrosodiphenylamine	0/2	ND	380U - 400U	195	400	20,000	Efroymson et al. 1997a	0.02	No	Below SSSV
n-Nitrosomethylethylamine	0/2	ND	380UJ - 400UJ	195	400	20,000	---	0.02	No	Below SSSV
n-Nitrosomorpholine	0/2	ND	380UJ - 400UJ	195	400	NE	---	NA	Yes	
n-Nitrosopiperidine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
n-Nitrosopyrrolidine	0/2	ND	380UJ - 400UJ	195	400	NE	---	NA	Yes	
o-Toluidine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Pentachlorobenzene	0/2	ND	380U - 400U	195	400	1,150	USEPA 1999	0.35	No	Below SSSV
Pentachloronitrobenzene	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Pentachlorophenol	0/2	ND	760U - 800U	390	800	1,730	USEPA 1999	0.46	No	Below SSSV
Phenacetin	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	

TABLE 7-12

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ (2)	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen (1)					
Semivolatiles (ug/kg)										
Phenol	0/2	ND	380U - 400U	195	400	30,000	Efroymson et al. 1997a	0.01	No	Below SSSV
Pronamide	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Pyridine	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
Safrole	0/2	ND	380U - 400U	195	400	NE	---	NA	Yes	
PAHs (ug/kg)										
1-Methylnaphthalene	0/1	ND	8.2UJ - 8.2UJ	4.10	8.20	1,200	---	<0.01	No	Below SSSV
2-Methylnaphthalene	1/2	1700 - 1700	8.2UJ - 8.2UJ	852	1700	1,200	---	1.42	Yes	
Acenaphthene	0/2	ND	8.2U - 380U	97.05	380	20,000	Efroymson et al. 1997b	0.02	No	Below SSSV
Acenaphthylene	0/2	ND	8.2UJ - 380U	97.05	380	1,200	---	0.32	No	Below SSSV
Anthracene	0/2	ND	8.2U - 380U	97.05	380	1,200	---	0.32	No	Below SSSV
Benzo(a)anthracene	0/2	ND	8.2U - 380U	97.05	380	1,200	USEPA 1999	0.32	No	Below SSSV
Benzo(a)pyrene (BaP)	0/2	ND	8.2U - 380U	97.05	380	1,200	USEPA 1999	0.32	No	Below SSSV
Benzo(b)fluoranthene	0/2	ND	8.2U - 380U	97.05	380	1,200	USEPA 1999	0.32	No	Below SSSV
Benzo(g,h,i)perylene	2/2	7.7J - 16J	NA	11.85	16.00	1,200	---	0.01	No	Below SSSV
Benzo(k)fluoranthene	0/2	ND	8.2U - 380U	97.05	380	1,200	USEPA 1999	0.32	No	Below SSSV
Chrysene	0/2	ND	8.2U - 380U	97.05	380	1,200	USEPA 1999	0.32	No	Below SSSV
Dibenz(a,h)anthracene	0/2	ND	8.2U - 380U	97.05	380	1,200	USEPA 1999	0.32	No	Below SSSV
Fluoranthene	0/2	ND	8.2U - 380U	97.05	380	1,200	---	0.32	No	Below SSSV
Fluorene	0/2	ND	8.2U - 380U	97.05	380	30,000	Efroymson et al. 1997a	0.01	No	Below SSSV
Indeno(1,2,3-cd)pyrene	1/2	5.6J - 5.6J	380U - 380U	97.80	5.60	1,200	---	<0.01	No	Below SSSV
Naphthalene	1/2	480 - 480	8.2U - 8.2U	242	480	1,200	---	0.40	No	Below SSSV
Phenanthrene	1/2	45J - 45J	8.2U - 8.2U	24.55	45.00	1,200	---	0.04	No	Below SSSV
Pyrene	1/2	62J - 62J	8.2U - 8.2U	33.05	62.00	1,200	---	0.05	No	Below SSSV
PCBs (ug/kg)										
Aroclor-1016	0/2	ND	36UJ - 38U	18.50	38.00	2,510	USEPA 1999	0.02	No	Below SSSV
Aroclor-1221	0/2	ND	48UJ - 51U	24.75	51.00	2,510	---	0.02	No	Below SSSV
Aroclor-1232	0/2	ND	36UJ - 38U	18.50	38.00	2,510	---	0.02	No	Below SSSV
Aroclor-1242	0/2	ND	24UJ - 26U	12.50	26.00	2,510	---	0.01	No	Below SSSV
Aroclor-1248	0/2	ND	24UJ - 26U	12.50	26.00	2,510	---	0.01	No	Below SSSV
Aroclor-1254	0/2	ND	24UJ - 26U	12.50	26.00	2,510	USEPA 1999	0.01	No	Below SSSV
Aroclor-1260	0/2	ND	36UJ - 38U	18.50	38.00	2,510	---	0.02	No	Below SSSV
Dioxins / Furans (ug/kg)										
TCDD, 2,3,6,8-	0/1	ND	0.113U	0.06	0.113	500	USEPA 1999	<0.01	No	Below SSSV
PeCDD, 1,2,3,7,8-	0/1	ND	0.113U	0.06	0.113	500	---	<0.01	No	Below SSSV
HxCDD, 1,2,3,4,7,8-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HxCDD, 1,2,3,6,7,8-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HxCDD, 1,2,3,7,8,9-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HpCDD, 1,2,3,4,6,7,8-	1/1	1.27J	NA	1.27	1.27	500	---	<0.01	No	Below SSSV
OCDD	1/1	11.6	NA	11.60	11.60	500	---	0.02	No	Below SSSV
TCDF, 2,3,7,8-	0/1	ND	0.113U	0.06	0.113	500	---	<0.01	No	Below SSSV
PeCDF, 1,2,3,7,8-	0/1	ND	0.113U	0.06	0.113	500	---	<0.01	No	Below SSSV
PeCDF, 2,3,4,7,8-	0/1	ND	0.113U	0.06	0.113	500	---	<0.01	No	Below SSSV
HxCDF, 1,2,3,4,7,8-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HxCDF, 1,2,3,6,7,8-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HxCDF, 2,3,4,6,7,8-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HxCDF, 1,2,3,7,8,9-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HpCDF, 1,2,3,4,6,7,8-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
HpCDF, 1,2,3,4,7,8,9-	0/1	ND	0.283U	0.14	0.283	500	---	<0.01	No	Below SSSV
OCDF	0/1	ND	0.566U	0.28	0.566	500	---	<0.01	No	Below SSSV

TABLE 7-12

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SURFACE SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range					Surface Soil Screening Values (SSSV)	Reference	Max. HQ [2]	Ecological COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Step 2 Screen [1]					
Inorganics (mg/kg)										
Antimony	1/2	1.4J - 1.4J	1UJ - 1UJ	0.95	1.40	78	USEPA 2005a	0.02	No	Below SSSV
Arsenic	2/2	0.79J - 1.2J	NA	1.00	1.20	18	USEPA 2005b	0.07	No	Below SSSV
Barium	2/2	63.8J - 64.4J	NA	64.10	64.40	330	USEPA 2005c	0.20	No	Below SSSV
Beryllium	0/2	ND	0.01U - 0.01U	0.01	0.01	40	USEPA 2005d	<0.01	No	Below SSSV
Cadmium	2/2	0.84 - 1	NA	0.92	1.00	32	USEPA 2005e	0.03	No	Below SSSV
Chromium	2/2	20.8J - 31.9J	NA	26.35	31.90	0.4	Efroymson et al. 1997a	79.75	Yes	
Cobalt	2/2	12.8J - 24.5J	NA	18.65	24.50	13	USEPA 2005f	1.88	Yes	
Lead	2/2	14.8J - 39.8J	NA	27.30	39.80	120	USEPA 2005g	0.33	No	Below SSSV
Mercury	0/2	ND	0.017U - 0.019U	0.01	0.02	0.10	Efroymson et al. 1997a	0.19	No	Below SSSV
Nickel	2/2	7.7J - 13.5J	NA	10.60	13.50	30	Efroymson et al. 1997b	0.45	No	Below SSSV
Selenium	2/2	0.54J - 1.1J	NA	0.82	1.10	1.0	Efroymson et al. 1997b	1.10	Yes	
Silver	0/2	ND	0.05U - 0.06U	0.03	0.06	560	USEPA 2006c	<0.01	No	Below SSSV
Thallium	0/2	ND	0.42UJ - 0.46UJ	0.22	0.46	1.0	Efroymson et al. 1997b	0.46	No	Below SSSV
Vanadium	2/2	98.8J - 178J	NA	138.40	178.00	2.0	Efroymson et al. 1997b	89.00	Yes	
Zinc	2/2	68J - 75.9J	NA	71.95	75.90	50	Efroymson et al. 1997b	1.52	Yes	

Notes:

COPC = Chemical of Potential Concern
SSV = Soil Screening Value
ND = Not Detected
NA = Not Applicable

NE = Not Established
HQ = Hazard Quotient
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram

J = Estimated Value
U = Not Detected
UJ = Not Detected, Estimated Value

[1] Maximum detected concentration (or maximum reporting limit for non-detected chemicals).

[2] For a given chemical, the Hazard Quotient (HQ) is the maximum detected concentration (or maximum reporting limit for non-detected chemicals) divided by the screening value.

TABLE 7-13

Revised March 23, 2007

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Volatiles									
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Semivolatiles									
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 7-13

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Semivolatiles									
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	0.30	0.03	0.10	0.08	<0.01	0.03	0.03	<0.01	<0.01
Di-n-octylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dinoseb (2-sec-butyl-4,6-Dinitrophenol)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	0.67	0.07	0.21	0.06	<0.01	0.02	0.06	<0.01	0.02
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs									
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 7-13

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
PAHs									
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PCBs:									
Aroclor-1016	0.13	0.01	0.04	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aroclor-1221	0.15	0.01	0.05	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aroclor-1232	0.14	0.01	0.04	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aroclor-1242	0.13	0.01	0.04	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aroclor-1248	0.31	0.03	0.10	<0.01	<0.01	<0.01	0.03	<0.01	<0.01
Aroclor-1254	0.61	0.06	0.19	<0.01	<0.01	<0.01	0.05	<0.01	0.02
Aroclor-1260	0.18	0.02	0.06	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Inorganics									
Antimony	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	0.07	<0.01	0.02	0.24	0.02	0.08	<0.01	<0.01	<0.01
Barium	0.26	0.13	0.18	0.24	0.12	0.17	0.03	0.01	0.02
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.17	0.41	1.13	0.58	0.07	0.21	0.02	<0.01	<0.01
Chromium	6.52	0.65	2.06	0.27	0.03	0.09	0.43	0.04	0.13
Cobalt	0.49	0.05	0.15	0.07	<0.01	0.02	0.01	<0.01	<0.01

TABLE 7-13

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Inorganics									
Lead	6.30	3.15	4.45	4.40	2.20	3.11	0.66	0.33	0.46
Mercury	18.23	1.82	5.77	9.83	0.98	3.11	0.08	<0.01	0.02
Nickel	0.07	0.05	0.06	0.04	0.03	0.04	<0.01	<0.01	<0.01
Selenium	1.58	0.79	1.12	5.82	2.91	4.12	0.61	0.30	0.43
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	0.15	0.01	0.05	0.02	<0.01	<0.01	0.01	<0.01	<0.01
Vanadium	13.51	6.75	9.55	8.82	4.41	6.24	1.75	0.88	1.24
Zinc	5.67	0.63	1.89	1.83	0.20	0.61	0.68	0.08	0.23

Notes:

NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse Effect Level
MATC = maximum Acceptable Toxicant Concentration

TABLE 7-14

Revised March 23, 2007

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SUBSURFACE SOILS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PR

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Volatiles									
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Semivolatiles									
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 7-14

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SUBSURFACE SOILS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PR

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Semivolatiles									
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	0.29	0.03	0.09	0.08	<0.01	0.03	0.03	<0.01	<0.01
Di-n-octylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dinoseb (2-sec-butyl-4,6-Dinitrophenol)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	0.64	0.06	0.20	0.05	<0.01	0.02	0.06	<0.01	0.02
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Dimethylaminoazobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs									
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 7-14

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SUBSURFACE SOILS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PR

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
PAHs									
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PCBs:									
Aroclor-1016	0.10	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor-1221	0.14	0.01	0.04	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aroclor-1232	0.10	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor-1242	0.07	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor-1248	0.16	0.02	0.05	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aroclor-1254	0.16	0.02	0.05	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aroclor-1260	0.24	0.02	0.08	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Inorganics									
Antimony	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Barium	0.11	0.05	0.08	0.10	0.05	0.07	0.01	<0.01	<0.01
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1.98	0.25	0.71	0.36	0.05	0.13	0.01	<0.01	<0.01
Chromium	2.77	0.28	0.88	0.12	0.01	0.04	0.18	0.02	0.06

TABLE 7-14

Revised March 23, 2007

SUMMARY OF HAZARD QUOTIENTS FOR FOOD WEB EXPOSURES: SUBSURFACE SOILS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PR

Chemical	American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Inorganics									
Cobalt	0.25	0.03	0.08	0.04	<0.01	0.01	<0.01	<0.01	<0.01
Lead	2.94	1.47	2.08	2.06	1.03	1.45	0.31	0.15	0.22
Mercury	4.50	0.45	1.42	2.42	0.24	0.77	0.02	<0.01	<0.01
Nickel	0.06	0.04	0.05	0.04	0.03	0.04	<0.01	<0.01	<0.01
Selenium	0.37	0.19	0.26	1.36	0.68	0.96	0.14	0.07	0.10
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	0.10	0.01	0.03	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	7.44	3.72	5.26	4.86	2.43	3.44	0.97	0.48	0.68
Zinc	4.90	0.54	1.63	1.58	0.18	0.53	0.59	0.07	0.20
Dioxins/Furans:									
2,3,7,8-TCDD (TEQ)	70.71	7.07	22.36	0.40	0.04	0.13	4.02	0.40	1.27

Notes:

TEQ = Toxicity Equivalents
NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse effect Level
MATC = Maximum Acceptable Toxicant Concentration

TABLE 7-15

Revised: March 23, 2007

SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Volatiles				
1,1,1,2-Tetrachloroethane		HQ > 1.0	No SV	No SV
1,1,1-Trichloroethane (TCA)		HQ > 1.0		
1,1,2,2-Tetrachloroethane		HQ > 1.0		
1,1,2-Trichloroethane		HQ > 1.0		
1,1-Dichloroethane		HQ > 1.0		
1,1-Dichloroethene		HQ > 1.0		
1,2,3-Trichloropropane	No SSV	No SSV		
1,2-Dibromo-3-chloropropane (DBCP)	No SSV	No SSV		
1,2-Dibromoethane (EDB)		HQ > 1.0		
1,2-Dichloroethane				
1,2-Dichloroethene (trans)		HQ > 1.0		
1,2-Dichloropropane				
1,3-Dichloropropene (cis)		HQ > 1.0		
1,3-Dichloropropene (trans)		HQ > 1.0		
1,4-Dichloro-2-butene (trans)				
2-Butanone (MEK)	No SSV	No SSV		
2-Chloro-1,3-butadiene (Chloroprene)	No SSV	No SSV		
2-Hexanone (MBK)	No SSV	No SSV		
3-Chloropropene (Allyl Chloride)	No SSV	No SSV		
4-Methyl-2-pentanone (MIBK)	No SSV	No SSV		
Acetone	No SSV	No SSV		
Acetonitrile	No SSV	No SSV		
Acrolein	No SSV	No SSV		
Acrylonitrile				
Benzene		HQ > 1.0		
Bromodichloromethane	No SSV	No SSV		
Bromoform	No SSV	No SSV		
Bromomethane	No SSV	No SSV		
Carbon Disulfide	No SSV	No SSV		
Carbon Tetrachloride			No SV	No SV
Chlorobenzene			No SV	No SV
Chloroethane	No SSV	No SSV		
Chloroform			No SV	No SV
Chloromethane	No SSV	No SSV		
Dibromochloromethane	No SSV	No SSV		
Dibromomethane	No SSV	No SSV		
Dichlorodifluoromethane (Freon-12)	No SSV	No SSV		
Ethyl Methacrylate	No SSV	No SSV		
Ethylbenzene			No SV	No SV
Iodomethane	No SSV	No SSV		
Isobutyl Alcohol	No SSV	No SSV		
Methyl Acrylonitrile	No SSV	No SSV		
Methyl Methacrylate	No SSV	No SSV		
Methylene Chloride				
Pentachloroethane	No SSV	No SSV	No SV	No SV
Propionitrile (Ethyl Cyanide)	No SSV	No SSV		

TABLE 7-15

Revised: March 23, 2007

SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Volatiles				
Styrene (Ethenylbenzene)			No SV	No SV
Tetrachloroethene (PCE)				
Toluene			No SV	No SV
Trichloroethene (TCE)			No SV	No SV
Trichlorofluoromethane	No SSV	No SSV		
Vinyl Acetate	No SSV	No SSV		
Vinyl Chloride	HQ > 1.0	HQ > 1.0		
Xylenes, total				
Semivolatiles				
1,2,4,5-Tetrachlorobenzene	HQ > 1.0	HQ > 1.0	No SV	No SV
1,2,4-Trichlorobenzene			No SV	No SV
1,2-Dichlorobenzene (o-)				
1,3,5-Trinitrobenzene				
1,3-Dichlorobenzene (m-)				
1,3-Dinitrobenzene (m-)				
1,4-Dichlorobenzene (p-)				
1,4-Dioxane (p-)	No SSV	No SSV		
1,4-Naphthoquinone	No SSV	No SSV		
1,4-Phenylenediamine	No SSV	No SSV		
1-Naphthylamine	No SSV	No SSV		
2,3,4,6-Tetrachlorophenol			No SV	No SV
2,4,5-Trichlorophenol			No SV	No SV
2,4,6-Trichlorophenol			No SV	No SV
2,4-Dichlorophenol			No SV	No SV
2,4-Dimethylphenol	HQ > 1.0	HQ > 1.0		
2,4-Dinitrophenol				
2,4-Dinitrotoluene	No SSV	No SSV		
2,6-Dichlorophenol				
2,6-Dinitrotoluene	No SSV	No SSV		
2-Acetylaminofluorene	No SSV	No SSV	No SV	No SV
2-Chloronaphthalene	No SSV	No SSV	No SV	No SV
2-Chlorophenol				
2-Methylphenol (o-Cresol)	HQ > 1.0	HQ > 1.0		
2-Naphthylamine	No SSV	No SSV		
2-Nitroaniline	No SSV	No SSV		
2-Nitrophenol				
2-Picoline	No SSV	No SSV		
3,3'-Dichlorobenzidine	No SSV	No SSV	No SV	No SV
3,3'-Dimethylbenzidine	No SSV	No SSV	No SV	No SV
3-Methylcholanthrene	No SSV	No SSV	No SV	No SV
3-Methylphenol (m-Cresol)	HQ > 1.0	HQ > 1.0		
3-Nitroaniline	No SSV	No SSV		
4,6-Dinitro-2-methylphenol	No SSV	No SSV		
4-Aminobiphenyl	No SSV	No SSV		
4-Bromophenyl-phenylether	No SSV	No SSV	No SV	No SV
4-Chloro-3-methylphenol	No SSV	No SSV	No SV	No SV

TABLE 7-15

Revised: March 23, 2007

SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Semivolatiles				
4-Chloroaniline	No SSV	No SSV		
4-Chlorophenyl-phenylether	No SSV	No SSV	No SV	No SV
4-Dimethylaminoazobenzene (p-)	No SSV	No SSV		
4-Methylphenol (p-Cresol)	HQ > 1.0	HQ > 1.0		
4-Nitroaniline	No SSV	No SSV		
4-Nitrophenol				
4-Nitroquinoline-1-Oxide	No SSV	No SSV		
5-Nitro-o-toluidine	No SSV	No SSV		
7,12-Dimethylbenz(a)anthracene	No SSV	No SSV	No SV	No SV
a,a-Dimethylphenethylamine	No SSV	No SSV		
Acetophenone	No SSV	No SSV		
Aniline	No SSV	No SSV		
Aramite	No SSV	No SSV	No SV	No SV
Benzyl Alcohol	No SSV	No SSV		
Bis(2-chloroethoxy)methane	No SSV	No SSV		
Bis(2-chloroisopropyl)ether	No SSV	No SSV		
Bis(2-chloroethyl)ether	No SSV	No SSV		
Bis(2-ethylhexyl) Phthalate (BEHP)				
Butyl Benzyl Phthalate			No SV	No SV
Diallate (cis)	No SSV	No SSV	No SV	No SV
Diallate (trans)	No SSV	No SSV		
Dibenzofuran	No SSV	No SSV	No SV	No SV
Diethyl Phthalate (DEP)			No SV	No SV
Dimethyl Phthalate				
Di-n-butyl Phthalate (DBP)				
Di-n-octyl Phthalate				
Dinoseb	No SSV	No SSV	No SV	No SV
Ethyl Methanesulfonate (EMS)	No SSV	No SSV		
Hexachlorobenzene				
Hexachlorobutadiene	No SSV	No SSV		
Hexachlorocyclopentadiene			No SV	No SV
Hexachloroethane	No SSV	No SSV	No SV	No SV
Hexachlorophene	No SSV	No SSV	No SV	No SV
Hexachloropropene	No SSV	No SSV		
Isophorone	No SSV	No SSV		
Isosafrole	No SSV	No SSV	No SV	No SV
Methapyrilene	No SSV	No SSV		
Methyl Methane Sulfonate	No SSV	No SSV		
Nitrobenzene				
n-Nitrosodiethylamine				
n-Nitrosodimethylamine				
n-Nitroso-di-n-butylamine				
n-Nitrosodi-n-propylamine				
n-Nitrosodiphenylamine			No SV	No SV
n-Nitrosomethylethylamine				
n-Nitrosomorpholine	No SSV	No SSV		

TABLE 7-15

Revised: March 23, 2007

SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Semivolatiles				
n-Nitrosopiperidine	No SSV	No SSV		
n-Nitrosopyrrolidine	No SSV	No SSV		
o-Toluidine	No SSV	No SSV		
Pentachlorobenzene			No SV	No SV
Pentachloronitrobenzene	No SSV	No SSV		
Pentachlorophenol	HQ > 1.0			
Phenacetin	No SSV	No SSV		
Phenol				
Pronamide	No SSV	No SSV	No SV	No SV
Pyridine	No SSV	No SSV		
Safrole	No SSV	No SSV		
PAHs				
1-Methylnaphthalene	HQ > 1.0 (1)	HQ > 1.0 (1)		
2-Methylnaphthalene	HQ > 1.0 (1)	HQ > 1.0 (1)(2)		
Acenaphthene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Acenaphthylene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Anthracene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Benzo(a)anthracene	HQ > 1.0 (1)(2)	HQ > 1.0 (1)		
Benzo(a)pyrene (BaP)	HQ > 1.0 (1)(2)	HQ > 1.0 (1)		
Benzo(b)fluoranthene	HQ > 1.0 (1)(2)	HQ > 1.0 (1)		
Benzo(g,h,i)perylene	HQ > 1.0 (1)(2)	HQ > 1.0 (1)		
Benzo(k)fluoranthene	HQ > 1.0 (1)(2)	HQ > 1.0 (1)		
Chrysene	HQ > 1.0 (1)(2)	HQ > 1.0 (1)		
Dibenz(a,h)anthracene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Fluoranthene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Fluorene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Indeno(1,2,3-cd)pyrene	HQ > 1.0 (1)(2)	HQ > 1.0 (1)		
Naphthalene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Phenanthrene	HQ > 1.0 (1)	HQ > 1.0 (1)		
Pyrene	HQ > 1.0 (1)	HQ > 1.0 (1)		
PCBs				
Aroclor-1016				
Aroclor-1221				
Aroclor-1232				
Aroclor-1242				
Aroclor-1248				
Aroclor-1254				
Aroclor-1260				
Dioxins/Furans (ug/kg)				
TCDD, 2,3,7,8-	---		---	---
PeCDD, 1,2,3,7,8-	---		---	---
HxCDD, 1,2,3,4,7,8-	---		---	---
HxCDD, 1,2,3,6,7,8-	---		---	---

TABLE 7-15

Revised: March 23, 2007

SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Dioxins/Furans (ug/kg)				
HxCDD, 1,2,3,7,8,9-	---		---	---
HpCDD, 1,2,3,4,6,7,8-	---		---	---
OCDD	---		---	---
TCDF, 2,3,7,8-	---		---	---
PeCDF, 1,2,3,7,8-	---		---	---
PeCDF, 2,3,4,7,8-	---		---	---
HxCDF, 1,2,3,4,7,8-	---		---	---
HxCDF, 1,2,3,6,7,8-	---		---	---
HxCDF, 2,3,4,6,7,8-	---		---	---
HxCDF, 1,2,3,7,8,9-	---		---	---
HpCDF, 1,2,3,4,6,7,8-	---		---	---
HpCDF, 1,2,3,4,7,8,9-	---		---	---
OCDF	---		---	---
Total dioxins/furans (TEQ)	---		---	HQ > 1.0
Inorganics				
Antimony				
Arsenic				
Barium				
Beryllium			No SV	No SV
Cadmium			HQ > 1.0	HQ > 1.0
Chromium	HQ > 1.0	HQ > 1.0	HQ > 1.0	HQ > 1.0
Cobalt	HQ > 1.0	HQ > 1.0		
Copper	No Usable Data	No Useable Data	No Useable Data	No Useable Data
Lead			HQ > 1.0	HQ > 1.0
Mercury			HQ > 1.0	HQ > 1.0
Nickel				
Selenium	HQ > 1.0	HQ > 1.0	HQ > 1.0	HQ > 1.0
Silver				
Thallium				
Vanadium	HQ > 1.0	HQ > 1.0	HQ > 1.0	HQ > 1.0
Zinc	HQ > 1.0	HQ > 1.0	HQ > 1.0	HQ > 1.0

Notes:

(1) The maximum concentration of this PAH compound is less than the screening value; however, the total PAH concentration (sum of the eighteen individual PAH compounds analyzed for in SWMU 14 soil) exceeds a total PAH soil screening value.

(2) The maximum concentration of this PAH compound is greater than the screening value. The total PAH concentration (sum of the eighteen individual PAH compounds analyzed for in SWMU 14 soil) also exceeds a total PAH soil screening value.

Shaded cell indicates that the chemical was detected
Blank cells indicate acceptable risk (Maximum HQ < 1.0)

--- = Chemical was not analyzed for
HQ = Hazard Quotient
TEQ = Toxicity Equivalents
SSV = Soil Screening Value
SV = Ingestion-Based Screening Value

FIGURES

Baker

LEGEND

SWMU 14

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000

1000 0 1000 1000

1 inch = 1000 ft.

FIGURE 1-1
SWMU 14 LOCATION MAP

NAVAL ACTIVITY PUERTO RICO
PUERTO RICO

2099203RF

150 0 75 150

1 inch = 150 ft.

Baker

Baker Environmental, Inc.

LEGEND

- 1996 SURFACE SOIL SAMPLE
- 2006 SUBSURFACE SOIL SAMPLE
- 2006 SURFACE & SUBSURFACE SOIL SAMPLES
- 2006 SURFACE & SUBSURFACE SOIL AND GROUNDWATER SAMPLES

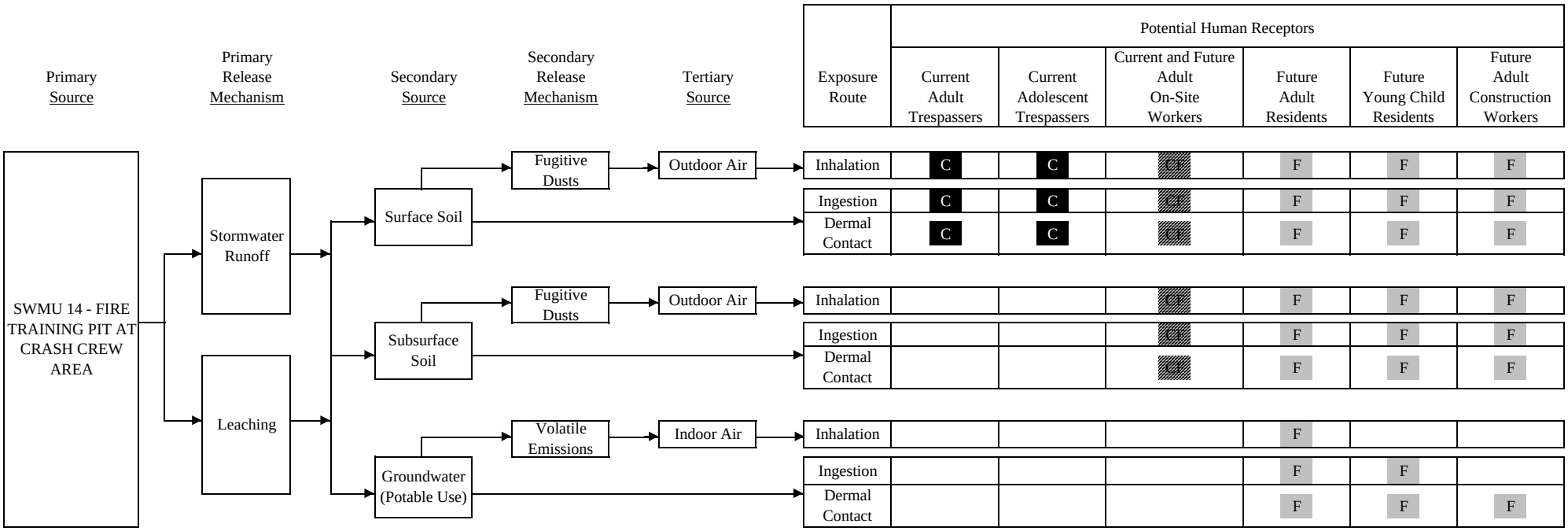
SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000

FIGURE 2-1
RFI SOIL AND GROUNDWATER SAMPLING LOCATIONS
SWMU 14
FIRE TRAINING AREA

NAVAL ACTIVITY PUERTO RICO
PUERTO RICO

Revised: March 23, 2007

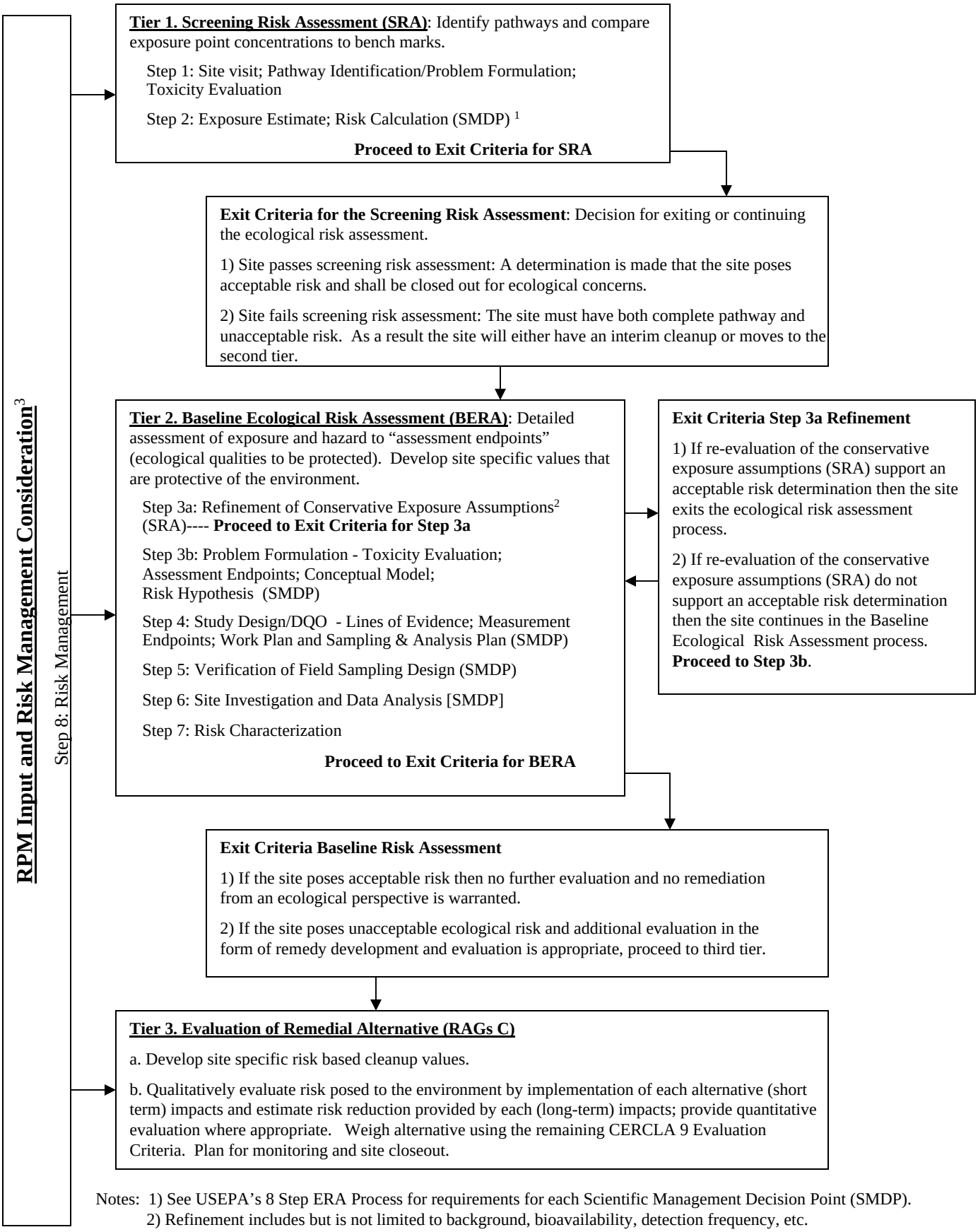
FIGURE 6-1
CONCEPTUAL SITE MODEL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO



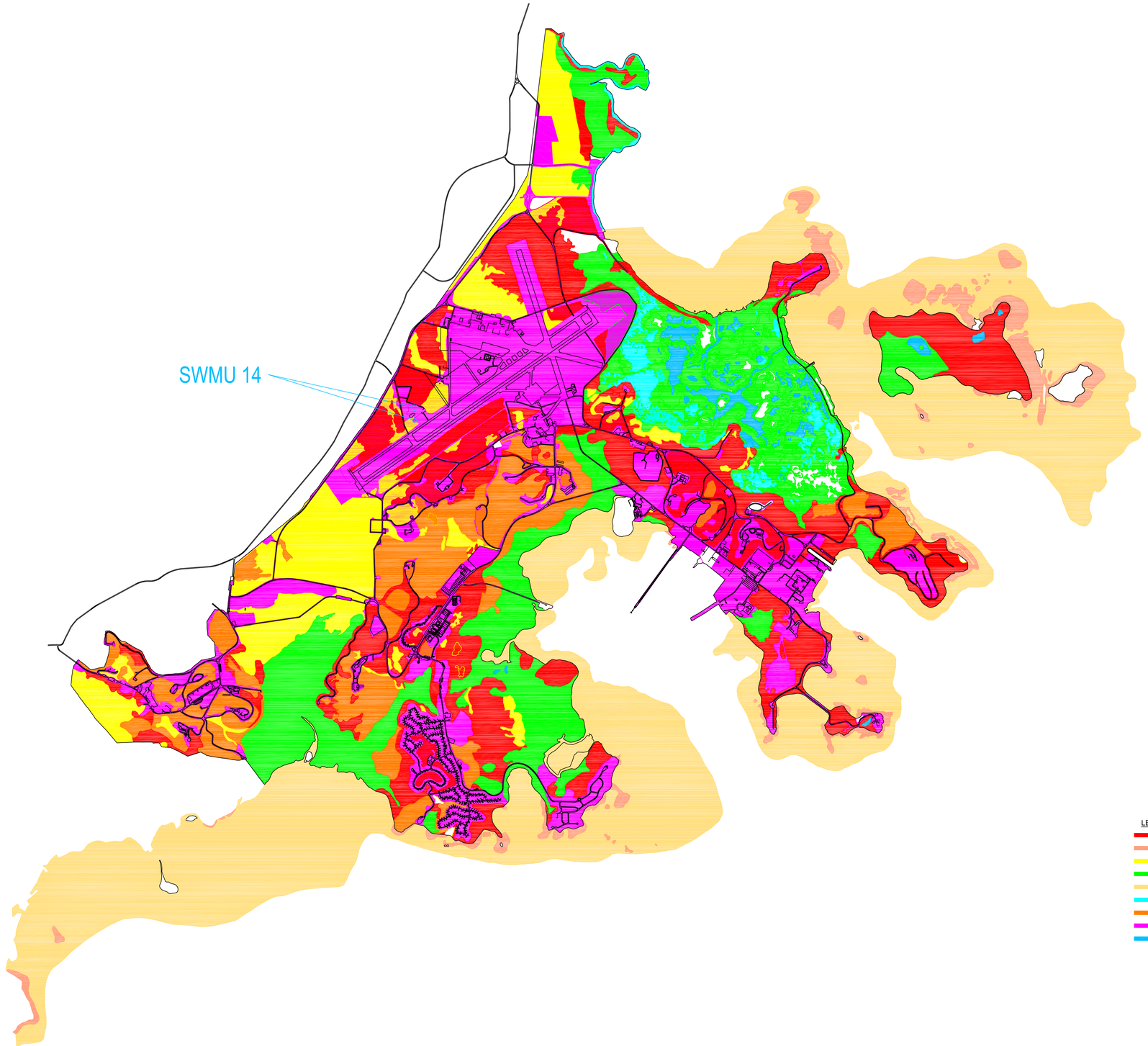
Legend

C	Current Exposure Pathway	→	Complete Exposure Pathway
F	Future Exposure Pathway	-·-·-→	Incomplete Exposure Pathway
CF	Current and Future Exposure Pathway		

Figure 7-1: Navy Ecological Risk Assessment Tiered Approach



Notes: 1) See USEPA's 8 Step ERA Process for requirements for each Scientific Management Decision Point (SMDP).
2) Refinement includes but is not limited to background, bioavailability, detection frequency, etc.
3) Risk Management is incorporated throughout the tiered approach.

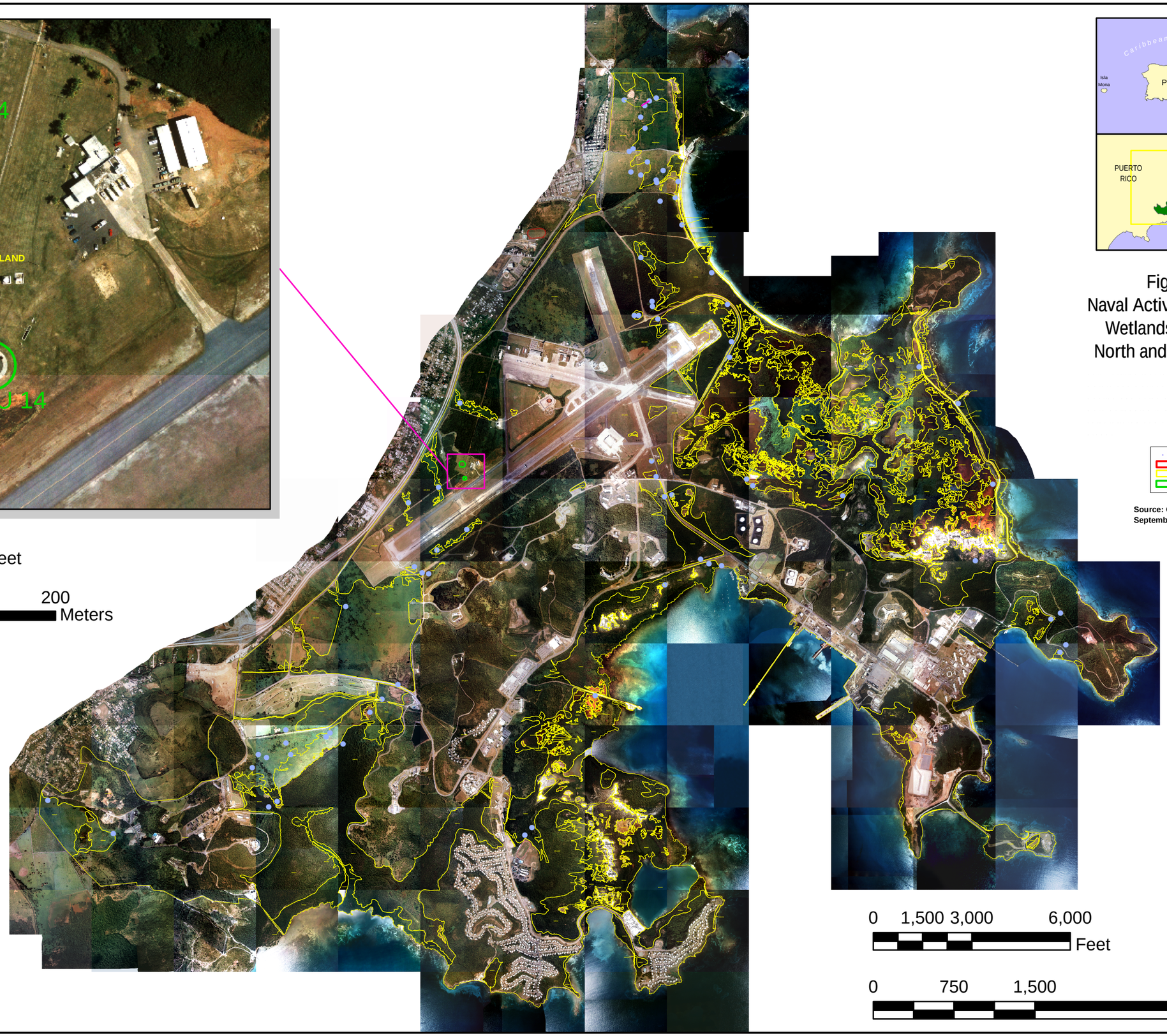


SOURCE: GEO-MARINE, INC.

REVISIONS		NORTH					FIGURE
	DRAWN GLB/RRR REVIEWED MEK S.O.# 107229 CADD# Figure 7-2 (Habitats).dwg			NAVAL ACTIVITY PUERTO RICO CIEBA, PUERTO RICO BAKER ENVIRONMENTAL, Inc. Moon Township, Pennsylvania	Baker	TERRESTRIAL AND AQUATIC HABITATS OCCURRING AT NAVAL ACTIVITY PUERTO RICO SCALE 1" = 600' DATE JUNE 2006	7-2

0 125 250 500 Feet

0 50 100 200 Meters



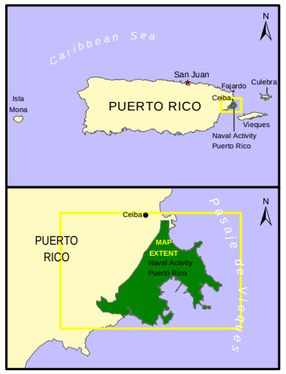


Figure 7-3
Naval Activity Puerto Rico
Wetlands Delineation
North and East Sections

Data form locations
Roosevelt Roads base boundary
Wetland boundaries
SWMU's

N

Source: Geo-Marine, Inc., September 6, 2000

0 1,500 3,000 6,000 Feet

0 750 1,500 3,000 Meters

FIGURE 7-4
THE COWARDIN WETLAND CLASSIFICATION SYSTEM
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
SWMU 14 - FIRE TRAINING AREA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

SYSTEM: M - MARINE

SUBSYSTEM	1 - SUBTIDAL					2 - INTERTIDAL			
CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	RF - Reef	OW - Open Water (unknown bottom)	AB - Aquatic Bed	RF - Reef	RS - Rocky Shore	US - Unconsolidated Shore
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 3 Rooted Vasc 5 Unknown	1 Coral 3 Worm		1 Algal 3 Rooted Vasc 5 Unknown	1 Coral 3 Worm	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic

SYSTEM: E - ESTUARINE

SUBSYSTEM	1 - SUBTIDAL					2 - INTERTIDAL						
CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	RF - Reef	OW - Open Water *(unknown bottom)*	AB - Aquatic Bed	RF - Reef	SB - Streambed	RS - Rocky Shore	US - Unconsolidated Shore	EM - Emergent	SS - Scrub-Shrub	FO - Forested
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	2 Mollusk 3 Worm		1 Algal 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	2 Mollusk 3 Worm	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic 5 Dead	1 Persistent 2 Nonpersistent	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*

SYSTEM: R - RIVERINE

SUBSYSTEM	1 - TIDAL		2 - LOWER PERENNIAL	3 - UPPER PERENNIAL		4 INTERMITTENT	5 - UNKNOWN PERENNIAL	
CLASS	RB - Rock	UB - Unconsolidated Bottom	SB - Streambed	AB - Aquatic Bed	RS - Rocky Shore	US - Unconsolidated Shore	OW - Open Water *(unknown bottom)*	**EM - Emergent
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Bedrock 2 Rubble 3 Cobble - Gravel 4 Sand 5 Mud 6 Organic 7 Vegetated	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic		2 Nonpersistent

SYSTEM: L - LACUSTRINE

SUBSYSTEM	1 - LIMNETIC					2 - LITTORAL				
CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	OW - Open Water *(unknown bottom)*	RB - Rock Bottom	RS - Rocky Shore	UB - Unconsolidated Bottom	AB - Aquatic Bed	US - Unconsolidated Shore	EM - Emergent	OW - Open Water *(unknown bottom)*
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*		1 Bedrock 2 Rubble	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic 5 Vegetated	2 Nonpersistent	

SYSTEM: P - PALUSTRINE

CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	US - Unconsolidated Shore	ML - Moss-Lichen	EM - Emergent	SS - Scrub-Shrub	FO - Forested	OW - Open Water *(unknown bottom)*
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic 5 Vegetated	1 Moss 2 Lichen	1 Persistent 2 Nonpersistent	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*	

MODIFIERS

WATER REGIME

Non-Tidal		Tidal	
A Temp. Flooded	H Permanently Flooded	K Artificially Flooded	*S Temporary-Tidal
B Saturated	J Intermittently Flooded	L Subtidal	*R Seasonal-Tidal
C Seasonally Flooded	K Artificially Flooded	M Irregularly Flooded	*T Semipermanent- Tidal
D Seasonally Flooded/ Well Drained	W Intermittently Flooded/ Temporary	N Regularly Flooded	*V Permanent-Tidal
E Seasonally Flooded/ Saturated	Y Saturated/Semipermanent/ Seasonal	P Irregularly Flooded	U Unknown
F Semipermanently Flooded	Z Intermittently Exposed Permanent		
G Intermittently Exposed	U Unknown		

* These water regimes are only used in tidally influenced, freshwater systems.

WATER CHEMISTRY

Coastal Halinity	Inland Salinity	pH (fresh water)
1 Hyperhaline	7 Hypersaline	a Acid
2 Euhaline	8 Eusaline	t circumneutral
3 Mixohaline	9 Mixosaline	i Alkaline
4 Polyhaline	0 Fresh	
5 Mesohaline		
6 Oligohaline		
0 Fresh		

SOIL

g Organic
n Mineral

SPECIAL

b Beaver
d partially drained/ditched
f Farmed
h Diked/Impounded
r Artificial Substrate
s Spoil
x Excavated

SOURCE: UNITED STATES, FISH AND WILDLIFE SERVICE. CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES, 1985

2099203RF

150 0 75 150

1 inch = 150 ft.

Baker

Baker Environmental, Inc.

LEGEND

- 1996 SURFACE SOIL SAMPLE
- 2006 SUBSURFACE SOIL SAMPLE
- 2006 SURFACE & SUBSURFACE SOIL SAMPLES

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000

FIGURE 7-5
SURFACE AND SUBSURFACE SOIL SAMPLING LOCATIONS
SWMU 14
FIRE TRAINING AREA

NAVAL ACTIVITY PUERTO RICO
PUERTO RICO

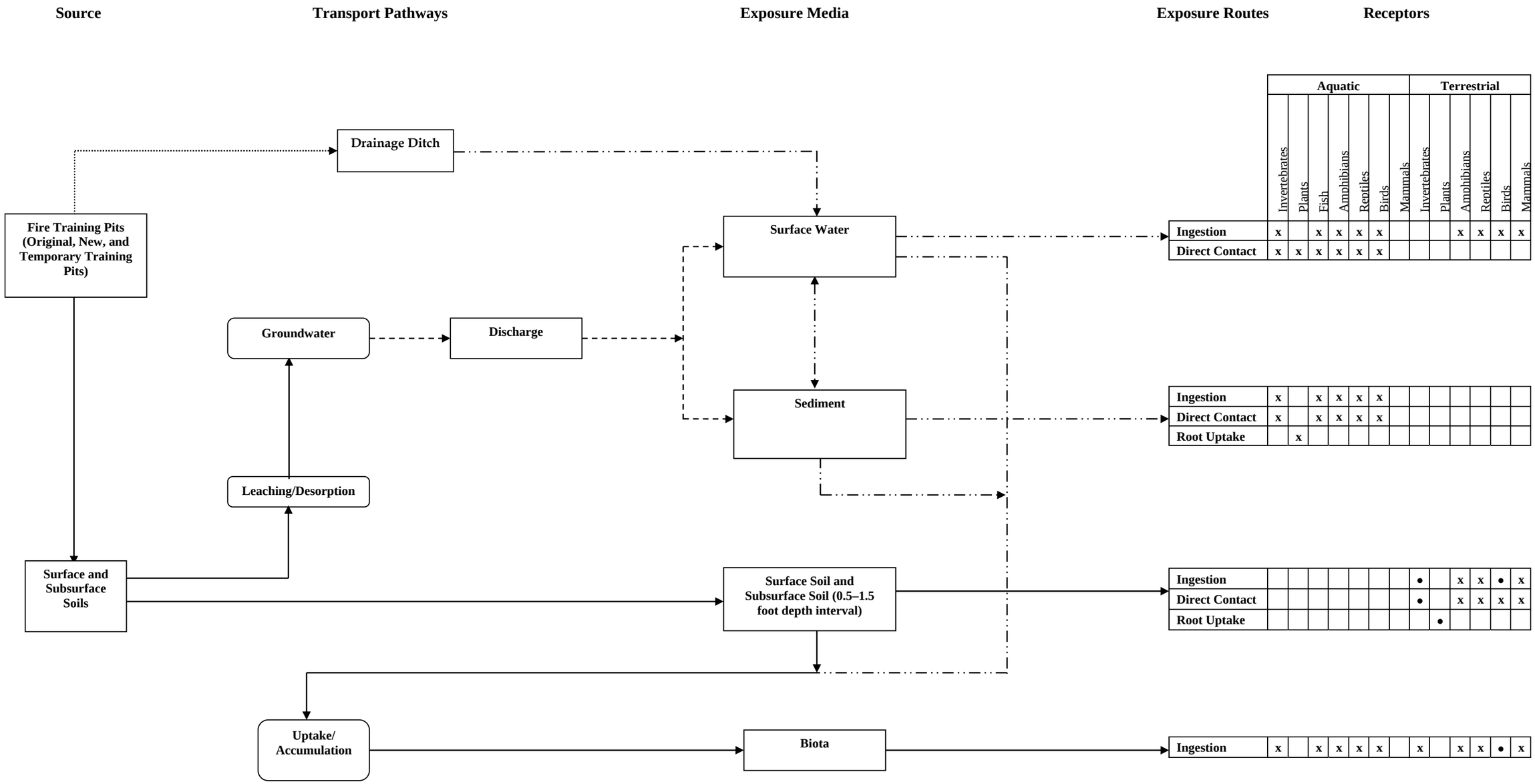


FIGURE 7-6
PRELIMINARY CONCEPTUAL MODEL
SWMU 14 (FIRE TRAINING PIT AREA)
RFI REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

K:\CH2M Hill CLEAN III\CTO 110 (107229)\SWMU 14 RFI Report\Draft Report\Screening-Level ERA\Figures\Figure 7-6 (Conceptual Model)

Revised: March 23, 2007

APPENDIX A
2006 FIELD ACTIVITIES

APPENDIX A.1
SWMU 14 FIELD LOG BOOK NOTES

SWMU 14

Sunday Mar. 5, 2006. Todays Tasks-
Travel to Puerto Rico

0710 Arrive at PIT
0850 Depart for SJU
1320 [AST] Arrive at SJU. Get luggage & car rental.
1430 Depart for Palmas Del Mar
1530 Arrive at Palmas. Check in
1600 into town for supplies
1630 Done for the day.

3/5/2006

Monday Mar. 6, 2006. Today's Tasks -
SWMU 14 setup & soil sampling
Weather Conditions -
AM: M. Sunny, sl. breezy, low 80s
PM: M. Sunny, breezy, mid 80's

0640 Arrive at Gate 1. obtain pass
0655 Meet w/ Pedro. Go over schedule & get digging permit. No utilities, though we need to watchout for fuel feeder lines. Should be empty
0705 KMU & I prepare soil sample bottles and sampling equipment
0807 Meet Geo EnviroTech at Gate 1. Get vehicle pass for the crew.
0850 Setup at 14SB07.
0858 Begin boring 14SB07.
0940 Install 14TW03 to 22-ft w/ 5' 10-slot screen
1036 Relocate to fire pit within area field area.
1058 Located the six borings using GPS. Error was ~2.77'
1101 Drillers setup at 14SB01
1108 Rig's (DT66) hydraulic line blew. sprayed oil on rig & equip. They

need (cont.) need to replace rigs. About 3 hrs of down-time. They don't have parts or tools to fix here.
1120 KMU & I depart base for supplies & lunch.
1330 Back at Pit Area. Juan just called. Abraham & William have a new hose & should be on site shortly to repair.
1353 DT66 is up and running again.
1458 Did not encounter water at SB01. Relocate to 14SB04. Crew readjusting hydraulic line
1525 Juan & Jessie back on site w/ the 5400 rig. They setup at SB03 while 66DT is being re-adjusted.
1600 other rig is running again. Had to offset boring due to drain. 66DT crew now boring through concrete.

SWMU 14

14-SB07

Time	Depth	ID	Recovery (ft)	PID PS	PID BG
0900	0-5	S-1	5.0	2.9	0
~~1458~~	14SS07 (0-1')			1.3	0
				2.4	0
				0	0
				0	0
0906	5-10	S-2	5.0	0	0
				0	0
				0	0
				0	0
				0	0
0912	10-14	S-3	4.0	4.9	0
				5.4	0
14SB07-06 (11-13')				4.9	0
				0.6	0
0920	14-17	S-4	3.0	1.5	0
				1.6	0
14SB07-08 (15-17')				1.0	0
0925	17-20	S-5	3.0	0	0
				0	0
				0	0
				0	0
0935	20-22	D-N	–	–	–

MRD

Description

1 ROCK FRAG, little clay; dk brn; damp — 0.7
2 1.4-1.7 ROCK FRAG, tr. f sand; gray
3 CLAY, little silt, trace f. sand; red
4 ; brn; mottled
5 red; gray-mottled w/yell-brn
6 weathered zone (gray; red)
7
8 gray; yellow
9
10
11 slight fuel odor
12
13
14 CLAY, some silt, little f/m sand, brn, yell-
brn; gray
15 little silt; red, gray; brown
16 — 14.9
17 SILT, some clay, trace f sand; lt green w/gray
18 16-16.6 CLAY, litt silt; brn
19 17-18.4 CLAY, little silt; brn soft WATER ~ 18.'
20 SILT, some clay, tr f sand; green w/
21 black; brn flecks
22

MRD

SWMU 14

145B01

Time	Depth (Ft. bgs)	ID	Recovery (Ft)	PID PS	PID BG	Description
1358	0-5	S-1	4.0	0.7	0	F/C SAND, some rock frag; brown; damp
145501	(0-1')			3.4	0	inc clay content to "AND CLAY" (FILL)
				3.5	0	2.6
				0.7	0	CLAY, little silt; red; brn-mottled; damp
1404	5-10	S-2	5.0	8.0	0	some gray color (secondary from petro contam); strong fuel odor
				46.2	0	
				32.5	0	
				69.7	0	
				55.5	0	
1412	10-14	S-3	4.0	—		
				516	0.5	CLAY, little silt; red; brown w/ significant gray (staining); damp; strong petro odor
145501-06	(11-13')			179		
				482		
				226		weathered looking zone
1420	14-17	S-4	3.0	230		
				211		less gray mottling
				65.5		
1426	17-20	S-5	3.0	729		CLAY, little silt; brown; red, trace gray mottling; damp
				218		
				406		
				70	0.5	

MKD

SWMU 14

MKD

145B01 - Cont.

Time	Depth	ID	Recovery	PID 95	PID BG		Description
1441	20-23	5-6	3.0	38.4	0	20	CLAY, little silt; yell-brn & gray
				78	0	21	mottles (trace red); damp
145B01-11 (21-23')				81.8	0	22	
Dup & MS/MSD						23	

1703 Drilling completed. Clean up time.
1729 Drill crew off site.
1745 Gauge TWO ~~X~~ 7
17.19 ft T/PVC
1756 Depart site - done for the day. No water in boreholes 5B01, 5B03 or 5B04. Will gauge tomorrow AM to see if moist zones product water.

SWMU 14

145BOX3

Time	Depth (ft bgs)	ID	Recovery (ft)	PID PS	PID BG		Description
1542	0-4	S-1	3.5	0	0	1	F SAND, some c. sand, little clay; brn; damp (FILL) 0.9
145B03-00		(0-1')		0	0	2	CLAY, some silt; red, gray; brn - mottled;
				0.6	0	3	damp
				0	0	4	
1549	4-8	S-2	4.0	0	0	5	red; gray mottles; damp
				0	0	6	
				0	0	7	
				0	0	8	
1554	8-12	S-3	4.0	0	0	9	
				0	0	10	
				0	0	11	
				0	0	12	weathered zones; mainly red; damp
1609	12-16	S-4	4.0	0	0	13	CLAY, little silt; gray; off-white w/
145B03-06		(11-13')		0	0	14	red mottles; damp
				0	0	15	
				0	0	16	15.2 weathered zone w/ yellow-brn coloring
1631	16-20	S-5	4.0	0	0	17	
				0	0	18	trace silt; red; damp
				0	0	19	
				0	0	20	19.4 gray moist zone
1655	20-23	S-6	3.0	0	0		purple-red w/ gray stipples
145B03-11		(21-23')	(1720)	0	0		
MKD		3/6		0	0		

SWMU 14

3/6 MKD

SWMU 14

145B04

Time	Depth (ft-bgs)	ID	Recovery (ft)	PID PS	PID BG		Description
1621	0.5	0-1	3.3/3.5	–	–		GRAVEL; gray 0.5
				–	–		CONCRETE 1.5
145B04-02 (1.5-3')				76.2	0	2	CLAY, little silt, tr f sand; dk gray;
				34.2	0	3	damp st petro odor
				22.8	0	4	trace silt; gray; yell. brn mottled
1628	5-10	S-2	5.0	109	0	5	trace silt; lt gray; red; damp
				7.1	0	6	7.6-7.9 GRAVEL, some f sand; gray; dry
				5.5	0	7	
				3.5	0	8	
				0.9	0	9	
1633	10-14	S-3	5.0	9.1	0	10	trace silt; lt gray; red
				14.6	0	11	
				1.2	0	12	
				0.8	0	13	
1640	14-17	S-4		1.9	0	14	
				20.8		15	
				17.6		16	moist zone
1648	17-20	S-5		9.5 12.4	0	17	red
				2.5 16.6	0	18	18.2-18.5 ROCK FRAG; gray
145B04-10 (19-21')				12.4 15.3		19	
1657	20-23	S-6		16		20	red w/ yell-brn moist zone 22.2-23
				6.9		21	
				1.8		22	
						23	

MAD 3/6

SWMU 14

sl petro thru entire boring

3/6/2006

3/6 MAD

SWMU 14

Tuesday Mar. 7, 2006. Today's Tasks - SWMU 14 soil sampling
Weather Conditions -
AM: P. Sunny, sl. breezy, low 80's
PM:

0710 Arrive at Public works. Find extra soil jars and prep an equip. rinsate

0745 Collect 14ER01 From stainless steel spoon for VOC, SVOC, LL PAH, DRO, GRO, PCB, and metals

0809 At fire pit now. Driller's already on site

0818 Water in SB01 at 14.4' collapsed at 15'

0821 SB04 TD ~16.4' DTW ~ 16.4'
Begin ~~cont~~ concrete drilling at 14SB05

0947 SB05 open to ~ 20.5' bgs; no water yet.

0955 Set up rig at 14SB06. Installed well at SB01 to ~21' bgs.

0958 Well at SB01 blocked @ 20' T/PVC. Driller to over drill w/ 2.5" casing at SB01 and re-install

1012 Re-installed well at SB01

MKD

(cont.) to 22 ft bgs. ~~AK~~ 1" OD w/ 10-ft of 10-slot screen due to uncertainty of DTW. TD ≈ 22.0'

1022 Back at 14SB06

1025 Begin concrete core. (14SB06)

1145 Lunchbreak & ice resupply

1250 Return to fire pit area.

1257 Begin 14SB02

1400 Installed ~~at~~ a well at SB02. 10 ft (14-24 ft) of 10-slot screen & 15 ft of riser (1" OD)

1417 Installed ~~at~~ back up temp. well at 14SB05 in open bore hole w/ 5 ft of 10-slot screen (17.7 - 12.7 ft) & 15 ft of riser because there is water in the hole
Complete tasks.

1430 KMU & I collect ER02 (Geoprobe Liner) for VOC, SVOC, PCB, Diox/Furan, PAH, DRO, GRO, & metals.
Drillers cleanup.

1455 KMU & I depart fire training area to prep samples for shipping.
Drillers to leave shortly.

MKD

SWMU 14

145B05

Time	Depth (ft-bgs)	ID	Recovery (ft)	PID PS	PID BG		Description
0840	0-5	S-1	3.5/3.5	–	–		ROCKS 0.5
				–	–		CONCRETE 1.5
				10.0	0.5	1	CLAY, some silt; rock frag; gray; damp
145B05-02 (3.5-5.0')				9.1	0.5	2	some silt; trace f sand; red & gray; damp sl petro odor
				5.0	0.5	3	
0845	5-10	S-2	4.2	3.8	0	4	some silt; gray; red mottles; damp; sl petro odor
				1.4	0	5	
				5.0	0	6	
				6.5	0	7	
				3.8	0	8	
0850	10-15	S-3	5.0	2.9	0	9	little silt; red w/ gray mottles
				3.6	0	10	
				0.0	0	11	
				5.6	0	12	14.5 weathered zone w/ yell-brn, red & gray
				23.3	0	13	
0856	15-20	S-4		3.4	0	14	trace silt & fine sand; red & gray
				3.8	0	15	
				33.7	0	16	
145B05-09 (17-19')				18.8	0	17	18.9 moist zone w/ trace yell-brn staining; sl petro odor
				32.6	0	18	
						19	
						20	

MKD 3/7

SWMU 14

3/7 MKD

SWMU 14

145B05 Cont.

Time	Depth	ID	Recovery	PS	BG
0914	20-24	5-5	4.0	13.6	0
				4.5	0
				24.6	0
				15.5	0

Description

21.1

.1 CLAY, zone of some silt; brown
.2 (>1 yellow) w/ gray mottles, trace red;
.3 damp
.4
.5

MKD 3/7

3/7 MKD

145B06

Time	Depth (ft-bgs)	ID	Recovery (ft)	PID PS	PID BG		Description	
1045	0-5	S-1	3.3/3.5	–			GRAVEL	0.5
145B06-01 (1.5-3')				–			CONCRETE	1.5
				0	0	2	CLAY, some silt, little f/c sand; dk gray; damp; strong fuel odor	
				2.6	0	3		
				0	0	4	little silt; red & dk gray mottled; damp slodor	
1050	5-10	S-2	5.0	0	0	5		
				0	0	6	trace silt w/ zones of little silt; gray & red mottles; damp; no odor	
				0	0	7		
				0	0	8		
				0	0	9		
1056	10-15	S-3	5.0	0	0	10		
				0	0	11	little silt, trace f/c sand; gray & red mottled; damp	
				0	0	12		
145B06-07 (+Dup)				0	0	13	13.5' yell-brn weathering zones heavier @ 14'	
				0	0	14		
1103	15-20	S-4		0	0	15		
(liner stuck in casing)				0	0	16	little silt; red w/ gray mottles; damp	
				0	0	17		
				0	0	18		
				0	0	19		
				0	0	20		

SWMU 14

145B02

Time	Depth (ft bgs)	ID	Recovery (ft)	PID PS	PID BG		Description
1300	0-5	S-1	2.5	–	–		
				–	–		
				0	0		CLAY, some silt, trace F/C sand; red & gray mottles; damp
				112	0		
1304	5-10	S-2	5.0	144	0		
145B02-03 (5-7')				107	0		little silt; red w/ gray mottles; damp
				56.2	0		
				23.3	0		
				36.6	0		
1309	10-15	S-3	5.0	16	0		
				12	0		
				1	0		weathered zone w/ yell-brn stain
				3.6	0		
				0	0		
1315	15-20	S-4	5.0	0	0		16-16.3 F/C SAND, brown; moist
145B02-08 (15-17')				0	0		
				0	0		weathered zone w/ yell-brn staining
				2.5	0		
				1.8	0		heavy yell-brn staining; moist

MKE

3/7

3/7

MKE

145B02 Cont.

Time	Depth	ID	Recovery	PID PS	PID BG		Description
1342	20-25	5-6	4.0	5.2	0	.1	CLAY, little silt, trace F/c sand;
			5.0	0	0	.2	red; ~~moist~~ damp to moist
				0	0	.3	22.4 moist/wet zone (2")
				0	0	.4	white, gray, red & yell-brn mottles;
				0	0	.5	damp

1705 Depart Base - done for the day.

MKD 3/7/2006

Wednesday Mar. 8, 2006. Today's Tasks
Well Sampling
Weather Conditions
AM: M. Sunny, breezy, near 80°
PM: Cloudy, showers, mid 80's ↓

0630 Arrive at PWD. Prep. for ground water sampling
0713 Relocate to fire pit to gauge TWs
0717 TW01 TD: 25.05' (T/PVC)
DTW: 24.60' (T/PVC)
0720 TW05 TD: 17.60' (T/PVC)
DTW: 14.59' (T/PVC)
0722 TW02 TD: 24.94' (T/PVC)
DTW: 20.26' (T/PVC)
0728 Meter calibration.
0801 Relocate to ~~PWD~~ TW07 via PWD to give cal fluids to KMO. Note: KMO working w/ MEK on landfill sampling
0805 TW07 TD: 24.73' (T/PVC)
DTW: 14.35' (T/PVC)
0842 Only able to get ~1L of groundwater from TW07. Will not be able to collect duplicate, MS or MSD. We will need to consider minimum volume requirements as well as

MKD 3/8

(cont.) parameter priority at this well and other wells too.
0907 TW01 DTW: 23.30' (T/PVC)
0910 TW02 DTW: 18.71' (T/PVC)
0926 1 L SVOC } 3 L optimal
1 L PAH & PCB }
1/2 L Metals
>500 mL for DRO
4 L for all extractables
(Talked to lab about minimum volume requirements)
0945 Begin sample collection at TW 14TW01
0950 5 40 mL vials filled; well is dry (VOC/GRO)
1020 14TW02 DTW: 17.98' (T/PVC)
1030 Begin sampling at 14TW02
1037 5 40 mL vials (VOCs/GRO) plus 1 L (SVOCs). Go for sample ice.
1110 Lunchbreak
1145 Back at TW07
1203 Get about 120 mL (VOCs, GRO, & partial SVOC) in about 3 hrs.

3/8 MKD

1230 Collect ~400 mL for TPH-DRO in about 2 hrs (14TW2)

1239 Prep. to collect a Field blank of driller's decon. water

1300 Begin collection of 14FB02 (from Driller's water), but heavy rain interrupted effort.

1351 Completed FB collection (VOCs, GRO, SVOC, PCB, PAH, DRO, & metals)

1215 [Late entry] Collected about 100 mL from 14TW01 (SVOC) in about 2.5 hr

1400 Assist MEK/KMU while waiting for recharge.

1450 R7GW8R DTW = 11.15' (TOC)

1500 Begin purge at R7GW8R Flow rate at 400 mL/min w/ 0.5-Ft drawdown. Decreased to 26 mL/min

1540 Complete sampling. Return to PWD Bldg (MEK sampling that is).

1556 Prep. for SWMU 14 field blank

1020 Collect 14FB01 from lab-grade DI water (~~Complete~~) for VOC, GRO, SVOC, PCB, DRO, Dioxin/Fur, PAH, and metals

MA 3/8

1629 Ice run/sample maintenance

1731 I collect addt'l 250 mL from 14TW07

1744 Pickup MEK & JMU at fire pit. Collected ~700 mL from well 14TW02. They also got about 200 mL from ~~well~~ 14TW1

1800 All depart Base - done for the day

3/8 MA

SWMU 14

R7GW8R

Purge Parameters

Time	Vol Removed	Temp	pH	Sp. Cond
1500	0	28°C	6.92 su	26.6 mS/cm
1505	~2L	27.8	7.03	27.8
1510	~3L	27.6	7.06	27.8
1515	~4L	27.5	7.07	27.4
1520	~5L	27.6	7.07	27.6
1525	6.5	27.6	7.10	27.8

MKD 3/8

SWMU 14

MKD 3/8/2006

3/8 MKD

SWMU 14

Thursday March 9, 2006, Todays Tasks
Finish GW sampling / demob
Weather Conditions
AM: P. Sunny, windy, high 70's
PM:

0646 Fill 1st amber bottle at 14TW07 (~300 mL)
0658 Still working on 1st amber bottle at ~~PN~~ 14TW01 (total ~800 mL)
0708 Got about 1.5 L from 14TW02. Return to PWD for demob activities
0750 Begin collection of 14ER03 from GW sample tubing (VOCs, GRO, SVOC, PAH, PCB, DRO, and metals) sample time is "0845"
0830 KMU & I collect a round of water levels at the landfill
0935 Return to PWD. I prep. for GW sampling at SWMU 14
0953 ~250 mL from TW01 in ~3 hrs.
1000 ~500 mL from TW02 in ~3 hrs.
1030 ~200 mL from TW07 in ~3½ hrs
1115 Lunchbreak
1145 Return to PWD to pack samples
1250 Relocate to fire pit area

MKD 3/9

SWMU 14

1305 Driller (Abraham & William) on site to grout well borings, put cuttings back in boreholes, and cleanup.
1310 I collect ~200 mL from TW01. Relocate to TW07. ~~Tests called~~ Thepm.
1341 Got ~100 mL from TW07.
1350 Return to PWD. Help pack samples & equipment.
1450 Meet Drillers to store soil IDW (1 drum
1510 Driller departs NAPR - completed project. Return to PWD to complete demob.
1630 Depart base for San Juan.

1900 Arrive at San Juan.

3/9 MKD

Friday Mar 10, 2006. Today's Tasks
Travel to Pittsburgh

0545 Depart hotel for SJU
0730 Depart SJU for PHL
1020 [EST] Arrive in PHL. Called CompuChem about shippment. Some minor breakage in ERO2; 03 coolers. Maybe enough volume on TWO1 to run DRO, SVOC, PAH, & PCB/pest. Kathy needs to check (4 L). Probably not enough vol on TWO7 (only DRO, SVOC). Maybe run metals on 125 mL in 1L amber. Kathy & MEK need to discuss EDD, package delivery, & validation issues
1330 Depart PHL for PIT
1450 Arrive at PIT. Get luggage
1530 Depart PIT for home - done for the day

MKD 3/10/06

SWMU 14 3-6-06

M. DeJohn & K. Urban gather supplies at Public Works from 0615 - 0745

Located SB07 (temp burn area) at 0845

14SB07-00 @ 0920

14SB07-08 @ ~~09~~ 1000

14SB07-~~1241~~ 06 @ 0940

rig down from 1120 - 1400

14SB01-00 1415

14-SB01-06 1425

14-SB01-11 1430

14SB01-11 -DUP 1445

14SB01-11 -MS/MSD 1445

~~14SB01- -MSD 1445~~ KMU

Kelly M. Urban

SWMU 14 3-6-06

145B03-00 @ 1545

145B03-06 @ 1605

145B04-01 @ 1635
from 1.5-3 ft
Dioxin / Furan

145B04-10 @ 1710
from 19→21

145B03-11 @ 1720
from 21-23

Kelly Holleman
3-6-06

SWMU 14 3-7-06

Tuesday

leave hotel 0630
arrive at PWB 0700
organize bottles - located extra
soil sample bottles
collected equipment rinsate
from spoon

14ER01 @ 0745

brought bottles for acetate
sleave equipment rinsate

arrive at site 0815

14SB05-02 @ 0905
from 3.5 → 5ft

14SB05-09 @ 0930
from 17 → 19 ft
dioxin & furan

Kelly M. Clifton

SWMU 14 3-7-06

14SB06-01 @ 1100
1.5-3 ft

14SB06-07 @ 1120
13→15 ft
duplicate
dioxin/furan

14SB02-00 @ 1310
surface

14SB02-03 @ 1320
5→7 ft

14SB02-08 @ 1345
15-17 ft

14ER02 equipment rinsate
from acetate sleeve
collected @ 1430

Kelly M. Urban

3-7-06

Trip Blank 3-6-06 @ 0730
147801
for VOAs & GRO

arrive back at Public Works 1500

organize samples
prepare COC
prepare samples for shipping

leave base 1800

Kelly M. Urban

SWMU 14 3-8-06

TB02 @ 0730 3-8-06

Kelly M. Urban

APPENDIX A.2
CHAIN-OF CUSTODY FORMS

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page 1 of 9 — 10144

Courier: FedEx
Airbill No.: 8471 2283 3354
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Enviromental
Address: 100 Airside Dr
City: Moon Twp. State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N? If yes, which ID(s)?

Requested Analysis (include method and bottle type)

App IX Metals (Total) PL; App IX VOC 3-40 mL; App IX SVOC 2-AL; App IX PCB 2-AL; Low Level PAH 2-AL; Dioxins/Furans 2-AL; TPH-GRO 2-40 mL; TPH-DRO 2-AL

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other None	App IX Metals (Total)	App IX VOC	App IX SVOC	App IX PCB	Low Level PAH	Dioxins/Furans	TPH-GRO	TPH-DRO			Total Metals pH / Sample Info (Lab Use)
933501	14ER01	3/7	0745	O	1			1				X										<2
933502	14ER02	3/7	1430	O	1			1				X										<2
933503	14ER03	3/9	0845	O								X	X	X	X	X	933504	X	X			<2
933504	14FB01	3/8	1620	O	16	5			1		10	X	X	X	X	X	X	X	X			<2
933505	14FB02	3/8	1300	O	16	5			1		10	X	X	X	X	X	X	X	X			<2
933507	14TW01	3/8	0945	GW									X	X(2)				X	X(1)	SVOC Low volume ~175 mL		
933506	14TW02	3/8	1030	GW									X	X	X	X		X	X			
933508	14TW07	3/8	0840	GW								**	X	X(2)				X	X(1)	SVOC PAH Low level volume ~175 mL		
933510	14TB02			O									X					X				

recd metal containers → ; added TAL MTL per Mark DeJohn using 175 ml of unpres. amber volume ; 3/8/06 @ 0730 add vials

per Mark DeJohn take 175 ml and pres. w/ HNO3 to be used for metals

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: Kelly Dony
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

14TW01 - Follow COC for analyses
14TW07 - Follow COC for analyses
for 14ER02 recd 2 broken amber liters; for 14ER03 recd 2 broken amber liters; recd 1 broken amber liter (Dioxin) for both 14FB01 & 14FB02

Sample Custody

Relinquished by: Kelly M. Urban — Date/Time: 3/9/06 1400 — Received by: — Date/Time:
Relinquished by: — Date/Time: — Received by: Jennifer Dover — Date/Time: 3/10/06 9:15
Subcontract? Y or N If yes, where? Dioxin to Paracelsus — Custody Seal(s) intact? Y or N — On Ice? Y or N — Cooler Temp: 2.8, 2.7, 3.8, ~~2.7~~, 2.7, 4.9, 1.7

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

10143

Page 2 of 9

Courier: Fed Ex
Airbill No.: 8471 2283 3295
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Dr.
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N If yes, which ID(s)?

Requested Analysis (include method and bottle type)

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other None	App IX SVOC -2 AL	App IX PCB 2 AL	~~App IX~~ Low Level PAHs 2 AL	TPH-DRO 2-AL	Dioxin/Furan 2-AL						pH / Sample Info (Lab Use)
933502	14ER02	3/7	1430	O	10						10	X[1]	X[2]	X[1]	X[2]	X[2]	933703					

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [illegible] 3/7/06
Samples Received in Good Condition? Y or N
If no, explain:
Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Kelly M. Urban — Date/Time: 3-9-06 1400 — Received by: — Date/Time:
Relinquished by: — Date/Time: — Received by: Jennifer Dover — Date/Time: 3/10/06 9:15
Subcontract? Y or N If yes, where? Dioxin to Paradigm — Custody Seal(s) intact? Y or N — On Ice? Y or N — Cooler Temp: 2.8, 2.9 °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

10142

Page 3 of 9

Courier: FedEx
Airbill No.: 8471 2283 3295
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Dr
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other None	App IX SVOC - 2 AL	App IX PCB 2 AL	Low Level PAH 2 AL	App IX Metals	TPH-DRO 2 AL	pH / Sample Info (Lab Use)
933501	14ER01	3/7	0745	O	8						8	X 2	X 2	X 2		X 2	

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [illegible]
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Kelly M. Urban	Date/Time: 3-9-06 1400	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by: Jennifer Dover	Date/Time: 3/10/06 9:15
Subcontact? Y or N If yes, where?	Custody Seal(s) intact? Y or N	On Ice? Y or N	Cooler Temp: 2.3 °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

66 108

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page 4 of 9 10075

Courier Fed EX
Airbill No. 8471 2283 3295
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Drive
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N? If yes, which ID(s)?

Requested Analysis (include method and bottle type)

Matrices
GW - Ground water
WW - Waste water
SW - Surface water
SO - Soil/Sediment
TB - Trip Blank
RI - Rinsate
WP - Wipe
O - Other

CompuChem No. (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	APP IX VOCs 3-40mL	TPH GRO 4oz/2-40mL	Lab Sample Info (Lab Use)
933601	14SB01-11-MS/MSD	3-6-06	1445	solid	4	3						X	X	
933509	14TB01	3-6-06	0730	water	5	5						X	X	
933501	14ER01	3-7-06	0745	water	5	5						X	X	
933502	14ER02	3-7-06	1430	water	5	5						X	X	

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [illegible]
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Kelly M. Urban Date/Time: 3-9-06 1400 Received by: Date/Time:
Relinquished by: Date/Time: Received by: Jennifer Dover Date/Time: 3/10/06 9:15
Subcontact? Y or N If yes, where? Custody Seal(s) intact? Y or N On Ice? Y or N Cooler Temp: 3.3 4.9 °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

67

901 109

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page 4 of 9 10075

Courier Fed EX
Airbill No. 8471 2283 3295
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Drive
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N? If yes, which ID(s)?

Requested Analysis (include method and bottle type)

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No. (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	APP IX VOCs 3-40mL	TPH GRO 4oz/2-40mL																				
933601	14SB01-11-HS/MSD	3-6-06	1445	solid	4	3						X	X																				
933509	14TB01	3-6-06	0730	water	5	5						X	X																				
933501	14ER01	3-7-06	0745	water	5	5						X	X																				
933502	14ER02	3-7-06	1430	water	5	5						X	X																				

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [signature]
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Kelly M. Urban	Date/Time: 3-9-06 1400	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by: Jennifer Dover	Date/Time: 3/10/06 9:15

Subcontact? Y or N If yes, where?
Custody Seal(s) intact? Y or N
On Ice? Y or N
Cooler Temp: 3.3 4.9 °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

67

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Courier Fed EX
Airbill No. 8471 2283 3295
Sampling Complete? (Y) or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Drive
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or (N?) If yes, which ID(s)?

Requested Analysis (include method and bottle type): App IX VOCs 3-40 mL NaHSO4 MeOH; TPH GRO 4 oz

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

pH/Sample Info (Lab Use)

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	App IX VOCs	TPH GRO	
933603	14SB01-00	3-6-06	1415	solid	4	3						(X)	(X)	
933604	14SB01-06	3-6-06	1425	solid	4	3						X	X	
933601	14SB01-11	3-6-06	1445	solid	4	3						X	X	MS/MSD (2-4oz, 2-8oz, 2-4oz)
933605	14SB02-00	3-7-06	1310	solid	4	3						X	X	
933606	14SB02-03	3-7-06	1320	solid	4	3						X	X	
933607	14SB02-08	3-7-06	1345	solid	4	3						X	X	
933608	14SB03-00	3-6-06	1545	solid	4	3						X	X	
933609	14SB03-06	3-6-06	1605	solid	4	3						X	X	
933610	14SB03-11	3-6-06	1720	solid	4	3						X	X	
933611	14SB04-01	3-6-06	1635	solid	4	3						X	X	

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [signature]
Samples Received in Good Condition? (Y) or N
If no, explain:
Cyanide samples checked for sulfide & chlorine? Y or (NA)
625 & Phenol samples checked for chlorine? Y or (NA)
608 samples checked for pH between 5.0-9.0? Y or (NA)

Comments

Sample Custody

Relinquished by: Kelly M. Urban Date/Time: 3-9-06 1400 Received by: Date/Time:
Relinquished by: Date/Time: Received by: Jennifer Dover Date/Time: 3/10/06 9:15
Subcontact? Y or (N) If yes, where? Custody Seal(s) intact? (Y) or N On Ice? (Y) or N Cooler Temp: ~~3.8, 2.7, 2.8~~ 3.3 C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page 5 of 9 — 10074

Courier: Fed EX
Airbill No.: 8471 2283 3295
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Drive
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N? If yes, which ID(s)?

Requested Analysis (include method and bottle type): App IX VOCs, 3-40mL; TPH GRO 4oz

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No. (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	App IX VOCs	TPH GRO	Lab Sample Info (Lab Use)
933612	145B04-10	3-6-06	1710	solid	4	3						X	X	
933613	145B05-02	3-7-06	0905	solid	4	3						X	X	
933614	145B05-09	3-7-06	0930	solid	4	3						X	X	
933615	145B06-01	3-7-06	1100	solid	4	3						X	X	
933616	145B06-07	3-7-06	1120	solid	4	3						X	X	
933617	145B06-07-DUP	3-7-06	1120	solid	4	3						X	X	
933618	145B07-00	3-6-06	0920	solid	4	3						X	X	
933619	145B07-06	3-6-06	0940	solid	4	3						X	X	
933620	145B07-08	3-6-06	1000	solid	4	3						X	X	
933602	145B01-11-DUP	3-6-06	1445	solid	4	3						X	X	

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [illegible]
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Kelly M. Urban	Date/Time: 3-9-06 1400	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by: Jennifer Dover	Date/Time: 3/10/06 9:15
Subcontact? Y or N If yes, where?		Custody Seal(s) intact? Y or N	On Ice? Y or N — Cooler Temp: 3.3 °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

69

272

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

10148

Page 7 of 9

Courier: fed EX
Airbill No.: 8471 2283 3295
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Drive
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N? If yes, which ID(s)?

Requested Analysis (include method and bottle type)

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	App IX SVOCs	App IX PCBs	Low level PAHs (8 oz jar)	App IX Metals (Total) (1-4 oz jar)	TPH DRO	Dioxins/Furans	pH / Sample Info (Lab Use)
933601	12SB01-11-MS/MSD	3-6-06	1445	solid	2							X	X	X	X	X		

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [illegible]
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Kelly M. Urban — Date/Time: 3/9/06 1400 — Received by:
Relinquished by: — Date/Time: — Received by: Jennifer Dover — Date/Time: 3/10/06 9:15
Subcontact? Y or N If yes, where? — Custody Seal(s) intact? Y or N — On Ice? Y or N — Cooler Temp: 2.8, 4.6 °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page 9 of 9 10147

Courier Fed EX
Airbill No. 8471 2283 3295
Sampling Complete? Y or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Drive
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NA PR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N? If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	App IX SVOCs	App IX PCB (1-8oz jar)	low level PAH	App IX metals (total) (1-4oz jar)	TPH DRO	Dioxin/Furan (1-8oz jar)					pH / Sample Info (Lab Use)
933603	14SB01-00	3-6-06	1415	Solid	2							X	X	X	X	X						
933604	14SB01-06	3-6-06	1435	Solid	2							X	X	X	X	X						
933601	14SB01-11	3/6	1445	Solid	2							X	X	X	X	X						
933605	14SB02-00	3/7	1310	Solid	2							X	X	X	X	X						
933606	14SB02-03	3/7	1320	Solid	2							X	X	X	X	X						
933607	14SB02-08	3/7	1345	Solid	2							X	X	X	X	X						
933608	14SB03-00	3/6	1545	Solid	2							X	X	X	X	X						
933609	14SB03-06	3/6	1605	Solid	2							X	X	X	X	X						
933610	14SB03-11	3/6	1720	Solid	2							X	X	X	X	X						
933611	14SB04-01	3/6	1635	Solid	3							X	X	X	X	X	X	933704				

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: Kelly Dover
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Kelly M. Urban — Date/Time: 3-9-06 1400 — Received by: — Date/Time:
Relinquished by: — Date/Time: — Received by: Jennifer Dover — Date/Time: 3/10/06 9:15
Subcontact? Y or N If yes, where? Dioxin to Paradigm — Custody Seal(s) intact? Y or N — On Ice? Y or N — Cooler Temp: 3.8, 2.8, 2.7, 4.6 C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

3.3

CompuChem
a division of Liberty Analytical Corp.

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page 8 of 9 — 10077

Courier: Fed Ex
Airbill No. 8471 2283 3295
Sampling Complete? (Y) or N

Client/Reporting Information

Company Name: Baker Environmental
Address: 100 Airside Drive
City: Moon Twp State: PA Zip: 15108
Project Contact: Mark Kimes
Phone #: 412-269-2009
Sampler's Name: Mark DeJohn

Project Information

Project Name: SWMU 14
Sampling Location: NAPR
Turnaround time: Standard
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or (N)
Are high concentrations expected? Y or (N)? If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	App IX SVOCs	App IX PCBs (1-8 oz jar)	low level PAHs	App IX Metals (total) (1-4 oz jar)	TPH DRO	Dioxins/Furans (1-8 oz jar)						pH / Sample Info (Lab Use)
933612	14SB04-10	3-6-06	1710	Solid	2							X	X	X	X	X							
933613	14SB05-02	3-7-06	0905	Solid	2							X	X	X	X	X							
933614	14SB05-09	3-7-06	0930	Solid	3							X	X	X	X	X	(X)	933705					
933615	14SB06-01	3-7-06	1100	Solid	2							X	X	X	X	X							
933616	14SB06-07	3-7-06	1120	Solid	3							X	X	X	X	X	(X)	933706					
933617	14SB06-07-DUP	3-7-06	1120	Solid	3							X	X	X	X	X	(X)	933707					
933618	14SB07-00	3-6-06	0920	Solid	2							X	X	X	X	X							
933619	14SB07-06	3-6-06	0940	Solid	2							X	X	X	X	X							
933620	14SB07-08	3-6-06	1000	Solid	2							X	X	X	X	X							
933602	14SB01-11-DUP	3-6-06	1445	Solid	2							X	X	X	X	X							

Lab Use Only

Sample Unpacked By: Jennifer Dover
Sample Order Entry By: [illegible]
Samples Received in Good Condition? (Y) or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or (NA)
625 & Phenol samples checked for chlorine? Y or (NA)
608 samples checked for pH between 5.0-9.0? Y or (NA)

Comments

Sample Custody

Relinquished by: Kelly M. Urban — Date/Time: 3-9-06 1400 — Received by: — Date/Time:
Relinquished by: — Date/Time: — Received by: Jennifer Dover — Date/Time: 3/10/06 9:15
Subcontact? (Y) or N If yes, where? Dioxin to Paradigm — Custody Seal(s) intact? (Y) or N — On Ice? (Y) or N — Cooler Temp: 3.8, 2.8, 2.7, 2.9, 4.6

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

72
275

S 12270

SUBCONTRACT CHAIN-OF-CUSTODY RECORD

COMPUCHEM
a division of Liberty Analytical Corp.

501 Madison Avenue
Cary, NC 27513
1-800-833-5097

Project Name: CTO-110 SWMU14
TAT: 18 calendar day TAT
Report style: level IV w/ Terrabase EDD
Disk requirement:

Samples shipped to: Paradigm
Contact: Chris Cornwell / Reev
Address: 5560 Business Drive
Wilmington, NC 28405
Phone: (910) 350-1903
Project Locale (state): Puerto Rico

CompuChem point-of-contact: (4) CATHY DOVER
Phone: (919) 379-4100 X 4089
Fax: (919) 379-4040
Sampling complete? Y or N (see Note 1)
Project-specific (PS) or Batch (B) QC? _____

BOX #1: 1. Surface Water 2. Ground Water 3. Leachate 4. Rinsate 5. Soil / Sediment / Sludge 6. Trip Blank 7. Oil 8. Waste 9. Other field blk

BOX #2: A. HCl + Ice B. HNO_3 + Ice C. NaOH + Ice D. H_2SO_4 + Ice E. Unpreserved F. Ice Only G. Other _____ H. $NaHSO_4$ + Ice I. ZnAc+NaOH + Ice J. Methanol

BOX #3: F- Filtered U- Unfiltered

BOX #4: H- High M- Medium L- Low

BOX #5: C- CLP T- TCLP S- SW-846 W- CWA 600-series O- Other _____

Sample ID	Date / Year 2006	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered / Unfiltered	Box #4 Expected Conc.	Box #5 Method	# of Bottles	Use for Lab QC (MS or DUP)	PARAMETERS: DIOXIN/FURAN 8280				CCN	Remarks / Comments (see Notes 2 & 3)
14SB04-01	3/6	1635	5	F	U		S	1		✓				933704	
14SB05-09	3/7	0930	5	F	U		S	1		✓				933705	
14SB06-07	3/7	1120	5	F	U		S	1		✓				933706	
14SB06-07-DUP	3/7	1120	5	F	U		S	1		✓				933707	C349-146
~~14ER03~~ 14FB01	3/9	0845	9	F	U		S	1		✓				933701	
14FB02	3/8	1300	9	F	U		S	1		✓				933702	
14ER02	3/7	1430	4	F	U		S	1		✓				933703	

3/16/06

Clients Special Instructions:

Temperature _____ °C

Lab: Received in good condition? Y or N Describe any problems:

#1 Relinquished by:(sig) Jennifer Dove	Date: 3/16/06	#2 Relinquished by:(sig)	Date:	Relinquished by:(sig)	Date:
Company Name: CompuChem	Time: 1440	Company Name:	Time:	Company Name:	Time:
#1 Received by:(sig) Julie Glenn	Date: 3/17/06	#2 Received by:(sig)	Date:	#2 Received by:(sig)	Date:
Company Name: S&S Paradigm 23°C	Time: 1020	Company Name:	Time:	Company Name:	Time:

Note (1) If "N" lab should batch samples to await remainder of project - maximizing batch size and minimizing QC ratio; if "Y" lab should begin processing batches now.
Note (2) Samples should be stored 60 days after date report mailed at no extra charge.
Note (3) All lab copies of data should be retained for a minimum of 3 years.
Note (4) Please call point-of-contact to verify receipt of samples. Custody intact

Revision 0 2-10-99

025

APPENDIX A.3
SOIL BORING LOGS AND WELL CONSTRUCTION RECORDS

Baker

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

PROJ. NO.: CTO-0110 BORING NO.: 14TW01

COORDINATES: EAST: 927847.920 NORTH: 927847.920

ELEVATION: SURFACE: TOP OF PVC CASING:

Rig: Geoprobe 66DT	Macro Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)
Size (ID)	1.5-in	2-in	--	--	3/6/2006	0.0 - 23.0	M sunny, mid 80s	14.0 ?
Length	5-ft	4-ft	--	--				
Type	S steel	S steel	--	--				
Hammer Wt.	--	--	--	--				
Fall	--	--	--	--				

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Direct Push P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
PVC casing	1-in	0	12.6
0.01-in Slotted PVC Screen	1-in	12.6	22.6

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1	S-1	4.0 80%	--	-00	0.7 / 0	F/C SAND, some rock frag; brown; damp (FILL)		
2					3.4 / 0	increased clay content w/ depth		
3					3.5 / 0	2.6		
4					0.7 / 0	CLAY, little silt; red & brown-mottled; damp (RESIDUUM)		
5	5.0							
6	S-2	5.0 100%	--		8.0 / 0	some gray staining; strong petro odor		
7					46.2 / 0			
8					32.5 / 0			
9					69.7 / 0			
10	10.0				55.5 / 0			
					516	Match to Sheet 2		

DRILLING CO.: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14TW01 SHEET 1 OF 2

Baker

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

CTO NO.: CTO-0110 BORING NO.: 14TW01

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
ps/bg = point source/background

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Well Installation Detail		Elevation (Ft. MSL)
11						0	Continued from Sheet 1			
						179	CLAY, little silt; red & brown w/			
12		S-3	4.0	--	-06	0	significant gray staining; strong			
			100%			482	petro odor			
13						0			12.6	
						226				
14	14.0					0				
						211	weathered zone			
15						0				
		S-4	3.0	--		65.5	less gray staining			
16			100%			0				
						729				
17	17.0					0				
						218	trace gray staining; damp			
18						0				
		S-5	3.0	--		406				
19			100%			0				
						70				
20	20.0					0				
						38.4	little silt; yellow-brown & gray,			
21						0	trace red - mottled; damp; sl			
		S-6	3.0	--		78	petro odor			
22			100%		-11	0				
						81.8			22.6	
23	23.0					0	23.0		23.0	
							BOH at 23.0 feet			
24										
25										
26										
27										
28										
29										
30										

DRILLING CO.: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14TW01 SHEET 2 OF 2

Baker

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT:	SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico		
PROJ. NO.:	CTO-0110	BORING NO.:	14TW02
COORDINATES:	EAST: 927883.840	NORTH:	805509.260
ELEVATION:	SURFACE:	TOP OF PVC CASING:	

Rig: Geoprobe 66DT								
	Macro Spoon	**Casing**	**Augers**	**Core Barrel**	**Date**	**Progress (Ft.)**	**Weather**	**Depth to Water (Ft.)**
Size (ID)	1.5-in	2-in	--	--	3/7/2006	0.0 - 25.0	P sunny, mid 80s	16.0
Length	5-ft	4-ft	--	--				
Type	S steel	S steel	--	--				
Hammer Wt.	--	--	--	--				
Fall	--	--	--	--				

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Direct Push P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
PVC casing	1-in	0	14
0.01-in Slotted PVC Screen	1-in	14	24

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1				-00		F/C SAND, some rock frag; brown; damp (FILL)		
2						2.0		
		S-1	2.5 50%	--				
3					0	CLAY, some silt, trace f/c sand; red & gray mottles; damp (RESIDUUM)		
4					0			
					112			
5	5.0				0			
					144			
6				-03	0			
					107	little silt; red w/ gray mottles; damp; sl petro odor		
7					0			
		S-2	5.0 100%	--	56.2			
8					0			
					23.3			
9					0			
					36.6			
10	10.0				0			
					16	Match to Sheet 2		

DRILLING CO.:	GeoEnviroTech, Inc.	BAKER REP.:	Mark DeJohn
DRILLER:	Jesse Aviles	BORING NO.:	14TW02 SHEET 1 OF 2

Baker

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

CTO NO.: CTO-0110 BORING NO.: 14TW02

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
ps/bg = point source/background

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description		Well Installation Detail		Elevation (Ft. MSL)
11						0	Continued from Sheet 1				
						12					
12						0					
						1					
13		S-3	5.0 100%	--		0	weathered zone w/ yellow-brown staining				
						4					
14						0				14.0	
						0					
15	15.0					0					
						0					
16					-08	0		16.0			
						0	F/C SAND; brown; moist	16.3			
17						0					
		S-4	5.0 100%	--		0					
18						0					
						2.5	weathered zone w/ yellow-brown staining				
19						0					
						1.8	heavy yellow-brown staining; moist				
20	20.0					0					
						5.2					
21						0					
						0	llittle silt, trace f/c sand; red; damp to moist				
22						0					
		S-5	5.0 100%	--		0	2-in moist/wet zone				
23						0					
						0	white, gray, red & yellow-brown mottles; damp				
24						0				24.0	
						0					
25	25.0					0		25.0		25.0	
26							BOH at 25.0 feet				
27											
28											
29											
30											

DRILLING CO.: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14TW02 SHEET 2 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

PROJ. NO.: CTO-0110 BORING NO.: 14SB03

COORDINATES: EAST: 927871.580 NORTH: 805469.29

ELEVATION: SURFACE:

Rig: Geoprobe 66DT	Macro Core	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)
Size (ID)	1.5-in	2-in	--	--	3/6/06	0.0 - 23.0	M sunny, mid 80s	19.4
Length	5-ft	4-ft	--	--				
Type	S steel	S steel	--	--				
Hammer Wt.	--	--	--	--				
Fall	--	--	--	--				

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Direct Push P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source
ppm = parts per million

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Elevation (Ft. MSL)
					-00	0	F SAND, some c sand, little clay; brown;	
1						0	damp (FILL) 0.9	-0.90
						0		
2		S-1	3.5	--		0	CLAY, some silt; red, gray & brown mottles;	
			88%			0.6	damp (RESIDUUM)	
3						0		
						0		
4	4.0					0	red & gray mottles	
						0		
5						0		
						0		
6		S-2	4.0	--		0		
			100%			0		
7						0		
						0		
8	8.0					0		
						0		
9						0		
		S-3	4.0	--		0		
10			100%			0		
						0	Match to Sheet 2	

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB03 SHEET 1 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

CTO NO.: CTO-0110 BORING NO.: 14SB03

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
ps/bg = point source/background

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Elevation (Ft. MSL)
11						0	Continued from Sheet 1	
						0	weathered zone; mainly red; damp	
12	12.0				-06	0		
						0		
13						0	CLAY, little silt; gray, off-white w/ red mottles;	
						0	damp	
14		S-4	4.0	--		0		
			100%			0		
15						0		
						0	weathered zone w/ yellow-brown coloring	
16	16.0					0		
						0		
17						0		
						0	trace silt; red; damp	
18		S-5	4.0	--		0		
			100%			0		
19						0		
						0	gray; moist	
20	20.0					0		
						0	purple-red w gray stipples; damp	
21						0		
		S-6	3.0	--		0		
22			100%		-11	0		
						0		
23	23.0					0	23.0	
							BOH at 23.0 feet	
24								
25								
26								
27								
28								
29								
30								

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB03 SHEET 2 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

PROJ. NO.: CTO-0110 BORING NO.: 14SB04

COORDINATES: EAST: 927868.260 NORTH: 805532.04

ELEVATION: SURFACE:

Rig: Geoprobe 66DT	Macro Core	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)
Size (ID)	1.5-in	2-in	--	--	3/6/06	0.0 - 23.0	M sunny, mid 80s	16.0
Length	5-ft	4-ft	--	--				
Type	S steel	S steel	--	--				
Hammer Wt.	--	--	--	--				
Fall	--	--	--	--				

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Direct Push P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source
ppm = parts per million

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Elevation (Ft. MSL)
1	D-N	--	--		--	GRAVEL, gray; dry 0.5 CONCRETE 1.5	
2							
3	S-1	3.3 94%	--	-02	76.2 0 34.2 0 22.8 0	CLAY, little silt, trace f sand; dark gray; damp; sl petro odor (RESIDUUM)	
4							
5							
6	S-2	5.0 100%	--		109 0 7.1 0 5.5 0 3.5 0 0.9 0	trace silt; light gray & red; damp 7.6 GRAVEL, sone f sand; gray; dry 7.9	
7							
8							
9							
10							
					9.1	Match to Sheet 2	

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB04 SHEET 1 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

CTO NO.: CTO-0110 BORING NO.: 14SB04

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
ps/bg = point source/background

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Elevation (Ft. MSL)
11						0	Continued from Sheet 1	
						14.6		
12		S-3	4.0	--		0		
			100%			1.2		
13						0		
						0.8		
14	14.0					0		
						1.9		
15						0		
		S-4	4.0	--		20.8		
16			100%			0		
						17.6		
17	17.0					0		
						12.4		
18						0		
		S-5	4.0	--		16.6		
19			100%			0		
						15.3		
20	20.0				-10	0		
						16		
21						0		
		S-6	4.0	--		6.9		
22			100%			0		
						1.8		
23	23.0					0	23.0	
							BOH at 23.0 feet	
24								
25								
26								
27								
28								
29								
30								

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB04 SHEET 2 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

PROJ. NO.: CTO-0110 BORING NO.: 14SB05

COORDINATES: EAST: 927823.770 NORTH: 805532.04

ELEVATION: SURFACE:

Rig: Geoprobe 66DT	Macro Core	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)
Size (ID)	1.5-in	2-in	--	--	3/7/06	0.0 - 24.0	P sunny, low 80s	18.9
Length	5-ft	4-ft	--	--				
Type	S steel	S steel	--	--				
Hammer Wt.	--	--	--	--				
Fall	--	--	--	--				

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Direct Push P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source
ppm = parts per million

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description		Elevation (Ft. MSL)
1		D-N	--	--		--	GRAVEL, gray; dry	0.5	
	1.5						CONCRETE	1.5	
2									
						10.0	CLAY, some silt & rock frag; gray; damp		
3		S-1	3.5	--		0.5	(RESIDUUM)		
			100%			9.1	some silt; gray & red mottles; damp; sl petro		
4						0.5	odor		
					-02	5.0			
5	5.0					0.5			
						3.8			
6						0			
						1.4			
7						0			
		S-2	4.2	--		5.0			
8			84%			0			
						6.5			
9						0			
						3.8			
10	10.0					0	little silt; red w/ gray mottles; damp		
						2.9	Match to Sheet 2		

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB05 SHEET 1 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

CTO NO.: CTO-0110 BORING NO.: 14SB05

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
ps/bg = point source/background

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Elevation (Ft. MSL)
11					0	Continued from Sheet 1	
					3.6		
12					0		
		S-3	5.0	--	0		
13			100%		0		
					5.6		
14					0	weathered zone w/ yellow-brown, red & gray	
					23.3		
15	15.0				0		
					3.4		
16					0		
					3.8	CLAY, trace silt & f sand; red & gray; damp	
17					0		
		S-4	5.0	--	33.7		
18			100%	-09	0		
					18.8		
19					0	moist zone w/trace yellow-brown staining; sl	
					32.6	petro odor	
20	20.0				0		
					13.6		
21					0	21.1	-21.10
					4.5		
22		S-5	4.0	--	0	CLAY, zones of silt; brown w/ gray mottles, trace	
			100%		24.6	red; damp (color/texture distinction at 21.1 ft)	
23					0		
					15.5		
24	24.0				0	24.0	
25						BOH at 24.0 feet	
26							
27							
28							
29							
30							

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB05 SHEET 2 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

PROJ. NO.: CTO-0110 BORING NO.: 14SB06

COORDINATES: EAST: 927847.550 NORTH: 805502.86

ELEVATION: SURFACE:

Rig: Geoprobe 66DT	Macro Core	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)
Size (ID)	1.5-in	2-in	--	--	3/7/06	0.0 - 20.0	P sunny, low 80s	13.5
Length	5-ft	4-ft	--	--				
Type	S steel	S steel	--	--				
Hammer Wt.	--	--	--	--				
Fall	--	--	--	--				

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Direct Push P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source
ppm = parts per million

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Elevation (Ft. MSL)
1	D-N	--	--		--	GRAVEL, gray; dry 0.5 CONCRETE 1.5	
1.5							
2							
3	S-1	3.3 94%	--	-01	0 0 2.6	CLAY, some silt, little f/c sand; dark gray; damp; strong petro odor (RESIDUUM)	
4					0		
5					0 0	little silt; red & dark gray mottles; damp; sl petro odor	
5.0							
6	S-2	4.2 84%	--		0 0 0	trace silt w/ zones of little silt; gray & red mottles; damp	
7					0		
8					0 0		
9					0 0		
10					0		
10.0							
					0	Match to Sheet 2	

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB06 SHEET 1 OF 2

Baker

Baker Environmental

TEST BORING RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

CTO NO.: CTO-0110 BORING NO.: 14SB06

SAMPLE TYPE	DEFINITIONS
S = Split Spoon A = Auger	SPT = Standard Penetration Test (ASTM D1586)
T = Shelby Tube W = Wash	PID = Photo Ionization Detector Measurement
R = Air Rotary C = Core	MSL = Mean Sea Level
D = Denison P = Piston N = No Sample	ps/bg = point source/background

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Elevation (Ft. MSL)
11						0	Continued from Sheet 1	
						0	little silt, trace f/c sand; gray & red mottles; damp	
12						0		
		S-3	5.0	--		0		
13			100%			0		
						0	yellow-brown weathered zones	
14					-07	0		
						0	heavier weathering	
15	15.0					0		
						0	little silt; red w/ gray mottles; damp	
16						0		
						0		
17						0		
		S-4	5.0	--		0		
18			100%			0		
						0		
19						0		
						0		
20	20.0					0	20.0	
							BOH at 20.0 feet	
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING COMPANY: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14SB06 SHEET 2 OF 2

Baker

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

PROJ. NO.: CTO-0110 BORING NO.: 14TW07

COORDINATES: EAST: 927771.470 NORTH: 805942.140

ELEVATION: SURFACE: TOP OF PVC CASING:

Rig: Geoprobe 66DT	Macro Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)
Size (ID)	1.5-in	2-in	--	--	3/6/2006	0.0 - 22.0	M sunny, low 80s	18.0
Length	5-ft	4-ft	--	--				
Type	S steel	S steel	--	--				
Hammer Wt.	--	--	--	--				
Fall	--	--	--	--				

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Direct Push P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
PVC casing	1-in	0	17
0.01-in Slotted PVC Screen	1-in	17	22

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1				-00	2.9	ROCK FRAG, little clay; dark-brown; damp (FILL)		
					0			
2					1.3	trace f sand; gray		
					0	1.7		
3	S-1	5.0 100%	--		2.4	CLAY, little sitle, trace f sand; red & brown mottles;damp (RESIDUUM)		
					0			
4					0			
					0			
5	5.0				0	red & gray mottles w/ yellow-brown		
					0			
6					0	weathered zone (red & gray)		
					0			
7					0			
	S-2	5.0 100%	--		0			
8					0			
					0			
9					0			
					0			
10	10.0				0			
					4.9	Match to Sheet 2		

DRILLING CO.: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14TW07 SHEET 1 OF 2

Baker

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: SWMU 14 RCRA Facility Investigation - Naval Activity Puerto Rico

CTO NO.: CTO-0110 BORING NO.: 14TW07

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
ps/bg = point source/background

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab ID	PID (ppm) ps/bg	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11					0	Continued from Sheet 1		
					5.4	Sl petro odor		
12	S-3	4.0 100%	--	-06	0			
					4.9			
13					0	CLAY, some silt, little f/m sand;		
					0.6	brown, yellow-brown & gray;		
14	14.0				0	damp		
					1.5			
15					0	14.9		
		S-4	3.0 100%	--	1.6	SILT, some clay, trace f sand;		
16				-08	0	lt green & gray; damp 16.0		
					1.0	CLAY, little silt; brown 16.6		
17	17.0				0	SILT (as above) 17.0		17.0
					0	CLAY (as above) 17.4		
18					0	SILT, some clay, trace f sand;		
		S-5	3.0 100%	--	0.0	brown; wet (narrow zone)		
19					0			
					0.0			
20	20.0				0			
						green w/ black & brown flecks		
21		D-N	--	--	--			
22	22.0					22.0		22.0
						BOH at 22.0 feet		
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: GeoEnviroTech, Inc. BAKER REP.: Mark DeJohn

DRILLER: Jesse Aviles BORING NO.: 14TW07 SHEET 2 OF 2

APPENDIX B
SUMMARY OF ANALYTICAL RESULTS

APPENDIX B

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Volatiles (ug/kg)									
1,1,1,2-Tetrachloroethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
1,1,1-Trichloroethane (TCA)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1,2,2-Tetrachloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1,2-Trichloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1-Dichloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1-Dichloroethene	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,2,3-Trichloropropane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dibromo-3-chloropropane (DBCP)	25 UJ	25 UJ	23 UJ	24 U	22 U	4.5 UJ	5 UJ	5.4 UJ	4.3 UJ
1,2-Dibromoethane (EDB)	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloroethane	6 UJ	6 UJ	6 UJ	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloropropane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,3-Dichloropropene (cis)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,3-Dichloropropene (trans)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,4-Dichloro-2-butene (trans)	25 U	25 UJ	23 U	24 U	22 U	90 U	100 U	110 U	85 U
2-Butanone (MEK)	12 U	12 UJ	12 U	12 U	11 U	36 J	31 J	23 J	11 UJ
2-Chloro-1,3-butadiene (Chloroprene)	120 U	120 UJ	120 U	120 U	110 U	4.5 U	5 U	5.4 U	4.3 U
2-Hexanone (MBK)	12 UJ	12 UJ	12 UJ	12 U	11 U	2.3 J	3 J	13 UJ	11 UJ
3-Chloropropene (Allyl Chloride)	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
4-Methyl-2-pentanone (MIBK)	12 U	12 UJ	12 U	12 U	11 U	11 U	12 U	13 U	11 U
Acetone	12 UJ	12 UJ	12 UJ	12 UJ	11 UJ	240 U	95 U	200 U	18 U
Acetonitrile	120 U	120 UJ	120 U	120 U	110 U	4.5 R	5 R	5.4 R	4.3 R
Acrolein	620 U	630 UJ	590 U	590 U	540 U	45 U	50 U	54 U	43 U
Acrylonitrile	120 U	120 UJ	120 U	120 U	110 U	45 U	50 U	54 U	43 U
Benzene	6 U	6 UJ	6 U	6 U	5 U	9.5	5.3 U	5.4 U	4.3 U
Bromodichloromethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Bromoform	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Bromomethane	12 U	12 UJ	12 U	12 U	11 U	0.7 J	5 U	5.4 U	4.3 U
Carbon Disulfide	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Carbon Tetrachloride	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Volatiles (ug/kg) (Cont)									
Chlorobenzene	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Chloroethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Chloroform	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Chloromethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Dibromochloromethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Dibromomethane	12 U	12 UJ	12 U	12 UJ	11 UJ	4.5 U	5 U	5.4 U	4.3 U
Dichlorodifluoromethane (Freon-12)	25 U	25 UJ	23 U	24 UJ	22 UJ	4.5 U	5 U	5.4 U	4.3 U
Ethyl Methacrylate	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
Ethylbenzene	6 U	6 UJ	6 U	6 UJ	5 UJ	1.5 J	1.6 J	5.4 U	4.3 U
Iodomethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Isobutyl Alcohol	2500 R	2500 R	2300 R	2400 R	2200 R	230 R	250 R	270 R	210 R
Methyl Acrylonitrile	25 U	25 UJ	23 U	24 U	22 U	4.5 UJ	5 UJ	5.4 UJ	4.3 UJ
Methyl Methacrylate	25 U	25 UJ	23 U	24 U	22 U	45 U	50 U	54 U	43 U
Methylene Chloride	6 UJ	6 UJ	6 UJ	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Pentachloroethane	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
Propionitrile (Ethyl Cyanide)	62 R	63 R	59 R	59 R	54 R	230 U	250 U	270 U	210 U
Styrene (Ethenylbenzene)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Tetrachloroethene (PCE)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Toluene	6 U	6 UJ	6 U	6 U	5 U	9.1 U	7.2 U	5.4 U	4.3 U
Trichloroethene (TCE)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Trichlorofluoromethane	12 UJ	12 UJ	12 UJ	12 UJ	11 UJ	4.5 U	5 U	5.4 U	4.3 U
Vinyl Acetate	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Vinyl Chloride	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Xylenes, total	6 U	6 UJ	6 U	6 U	5 U	2.3 J	2.7 J	16 U	13 U
Semivolatiles (ug/kg)									
1,2,4,5-Tetrachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,2,4-Trichlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,2-Dichlorobenzene (o-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,3,5-Trinitrobenzene	4000 U	4100 U	3900 U	3900 U	3600 U	380 U	410 U	380 U	420 U
1,3-Dichlorobenzene (m-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
1,3-Dinitrobenzene (m-)	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
1,4-Dichlorobenzene (p-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,4-Dioxane (p-)	800 R	820 R	770 R	770 R	710 R	230 R	250 R	270 R	210 R
1,4-Naphthoquinone	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 U
1,4-Phenylenediamine	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 UJ	410 UJ	380 UJ	420 UJ
1-Naphthylamine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
2,3,4,6-Tetrachlorophenol	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
2,4,5-Trichlorophenol	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
2,4,6-Trichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dimethylphenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dinitrophenol	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	750 U	810 U	770 U	840 UJ
2,4-Dinitrotoluene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,6-Dichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,6-Dinitrotoluene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Acetylaminofluorene	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
2-Chloronaphthalene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Chlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Methylnaphthalene	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
2-Methylphenol (o-Cresol)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Naphthylamine	1000 U	1000 U	970 U	970 U	890 U	380 U	410 U	380 U	420 U
2-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
2-Nitrophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Picoline	400 R	410 R	390 R	390 R	360 R	380 U	410 U	380 U	420 U
3,3'-Dichlorobenzidine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
3,3'-Dimethylbenzidine	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
3-Methylcholanthrene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
3-Methylphenol (m-Cresol)	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
3-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
4,6-Dinitro-2-methylphenol	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	750 U	810 U	770 U	840 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
4-Aminobiphenyl	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
4-Chloro-3-methylphenol	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Chloroaniline	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Chlorophenyl-phenylether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
4-Dimethylaminoazobenzene (p-)	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Methylphenol (p-Cresol)	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
4-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
4-Nitrophenol	2000 U	2100 U	1900 U	1900 U	1800 U	750 UJ	810 UJ	770 UJ	840 UJ
4-Nitroquinoline-1-Oxide	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 UJ
5-Nitro-o-toluidine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
7,12-Dimethylbenz(a)anthracene	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
a,a-Dimethylphenethylamine	2000 U	2100 U	1900 U	1900 U	1800 U	76000 UJ	83000 UJ	78000 UJ	85000 UJ
Acetophenone	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Aniline	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 U
Aramite	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 U	410 U	380 U	420 U
Benzyl Alcohol	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
Bis(2-chloroethoxy)methane	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-chloroisopropyl)ether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-chloroethyl)ether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-ethylhexyl) Phthalate (BEHP)	400 U	410 U	97 J	390 U	360 U	380 U	410 U	380 U	420 U
Butyl Benzyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diallate (cis)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diallate (trans)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Dibenzofuran	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diethyl Phthalate (DEP)	400 U	410 U	54 J	390 U	360 U	380 U	410 U	380 U	420 U
Dimethyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Di-n-butyl Phthalate (DBP)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Di-n-octyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Dinoseb	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 U	410 U	380 U	420 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
Ethyl Methanesulfonate (EMS)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorobutadiene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorocyclopentadiene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachloroethane	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorophene	4000 R	4100 R	3900 R	3900 R	3600 R	NA	NA	NA	NA
Hexachloropropene	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
Isophorone	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Isosafrole	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
Methapyrilene	1000 UJ	1000 UJ	970 UJ	970 UJ	890 UJ	380 U	410 U	380 U	420 UJ
Methyl Methane Sulfonate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Nitrobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosodiethylamine	400 UJ	410 U	390 U	390 U	360 U	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodimethylamine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitroso-di-n-butylamine	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodi-n-propylamine	400 U	410 U	390 U	390 U	360 U	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodiphenylamine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosomethylethylamine	400 U	410 UJ	390 UJ	390 UJ	360 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosomorpholine	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosopiperidine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosopyrrolidine	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 UJ	410 UJ	380 UJ	420 UJ
o-Toluidine	400 R	410 R	390 R	390 R	360 R	380 U	410 U	380 U	420 U
Pentachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pentachloronitrobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pentachlorophenol	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
Phenacetin	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Phenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pronamide	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pyridine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
Safrole	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
PAHs (ug/kg)									
1-Methylnaphthalene	NA	NA	NA	NA	NA	7.6 U	6 J	7.8 UJ	8.5 UJ
2-Methylnaphthalene	NA	NA	NA	NA	NA	7.6 U	7.4 J	7.8 UJ	8.5 U
Acenaphthene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Acenaphthylene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 UJ	8.5 U
Anthracene	400 U	410 U	390 U	110 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)anthracene	400 U	45 J	300 J	3400	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)pyrene (BaP)	400 U	45 J	1800	5000	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(b)fluoranthene	400 U	410 U	2800	7600	360 U	5.8 J	8.3 U	7.8 U	8.5 U
Benzo(g,h,i)perylene	66 J	91 J	1200	3600	360 U	11	5.5 J	7.8 U	8.5 U
Benzo(k)fluoranthene	400 U	410 U	640	2400	360 U	5.7 J	8.3 U	7.8 U	8.5 U
Chrysene	400 U	50 J	690	3800	360 U	5 J	8.3 U	7.8 U	8.5 U
Dibenz(a,h)anthracene	400 U	410 U	210 J	920	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Fluoranthene	88 J	110 J	230 J	67 J	360 U	6.5 J	8.3 U	7.8 U	8.5 U
Fluorene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Indeno(1,2,3-cd)pyrene	400 U	58 J	1300	3800	360 U	9.6	4.8 J	7.8 U	8.5 U
Naphthalene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Phenanthrene	400 U	410 U	39 J	58 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Pyrene	170 J	270 J	650	100 J	360 U	6.6 J	8.3 U	7.8 U	8.5 U
PCBs (ug/kg)									
Aroclor-1016	48 U	49 U	46 U	46 U	42 U	35 U	38 U	36 U	39 U
Aroclor-1221	48 U	49 U	46 U	46 U	42 U	48 U	52 U	49 U	53 U
Aroclor-1232	48 U	49 U	46 U	46 U	42 U	35 U	38 U	36 U	39 U
Aroclor-1242	48 U	49 U	46 U	46 U	42 U	24 U	26 U	24 U	27 U
Aroclor-1248	48 U	49 U	46 U	46 U	42 U	24 U	26 U	24 U	27 U
Aroclor-1254	96 U	98 U	93 U	93 U	85 U	24 U	26 U	24 U	27 U
Aroclor-1260	28	17	12	19	6 NJ	23 J	27 J	36 U	39 U
TPH (mg/kg)									
Diesel Range Organics (DRO)	560	360	120	490	4.5 U	11 U	12 U	12 U	15 U
Gasoline Range Organics (GRO)	3.7	3.8	1.8	1.8	0.032	0.57 U	0.62 U	0.58 U	0.63 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Inorganics (mg/kg)									
Antimony	NA	NA	NA	NA	NA	1.6 J	1.5 J	1.9 J	1.4 J
Arsenic	NA	NA	NA	NA	NA	2.5 J	1.4 J	2.9 J	2.6 J
Barium	NA	NA	NA	NA	NA	110 J	106 J	155 J	26.5 J
Beryllium	NA	NA	NA	NA	NA	0.05 U	0.03 U	0.02 U	0.01 U
Cadmium	NA	NA	NA	NA	NA	1.3	1.1	1.6	0.58 U
Chromium	NA	NA	NA	NA	NA	38.7 J	43.3 J	75.1 J	33.8 J
Cobalt	NA	NA	NA	NA	NA	31.2 J	24.1 J	46.9 J	5.8 J
Copper	NA	NA	NA	NA	NA	88.5 R	124 R	107 R	71.1 R
Lead	NA	NA	NA	NA	NA	85.3 J	79.9 J	40 J	4.9 J
Mercury	NA	NA	NA	NA	NA	0.031 J	0.077	0.042	0.049
Nickel	NA	NA	NA	NA	NA	9.7 J	14.4 J	11.5 J	4.1 J
Selenium	NA	NA	NA	NA	NA	3 J	2.1 J	4.3 J	4.7 J
Silver	NA	NA	NA	NA	NA	0.09 U	0.06 U	0.06 U	0.06 U
Tin	NA	NA	NA	NA	NA				
Thallium	NA	NA	NA	NA	NA	0.43 UJ	0.46 UJ	0.65 J	0.47 UJ
Vanadium	NA	NA	NA	NA	NA	187 J	187 J	323 J	287 J
Zinc	NA	NA	NA	NA	NA	87.8 J	85 J	64.6 J	17.9 J

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NJ - Presumptive evidence for the presence of the material at an estimated value
R - Result is rejected and unusable
NA - Not Analyzed

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
Volatiles (ug/kg)								
1,1,1,2-Tetrachloroethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,1,1-Trichloroethane (TCA)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,1,2,2-Tetrachloroethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,1,2-Trichloroethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,1-Dichloroethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,1-Dichloroethene	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,2,3-Trichloropropane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,2-Dibromo-3-chloropropane (DBCP)	5.7 UJ	280 U	4.8 UJ	4.9 UJ	4.8 UJ	5.3 UJ	220 U	270 UJ
1,2-Dibromoethane (EDB)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,2-Dichloroethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,2-Dichloroethene (trans)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,2-Dichloropropane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,3-Dichloropropene (cis)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,3-Dichloropropene (trans)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
1,4-Dichloro-2-butene (trans)	110 U	1100 U	97 U	97 U	97 U	110 U	870 U	1100 UJ
2-Butanone (MEK)	14 UJ	710 UJ	12 UJ	12 UJ	12 UJ	13 UJ	540 UJ	680 UJ
2-Chloro-1,3-butadiene (Chloroprene)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
2-Hexanone (MBK)	14 UJ	710 U	12 UJ	12 UJ	12 UJ	13 UJ	540 U	680 UJ
3-Chloropropene (Allyl Chloride)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
4-Methyl-2-pentanone (MIBK)	14 U	710 U	12 U	12 U	12 U	13 U	540 U	680 UJ
Acetone	14 U	710 UJ	12 U	12 U	12 U	13 U	540 UJ	680 UJ
Acetonitrile	5.7 R	280 U	4.8 R	4.9 R	4.8 R	5.3 R	220 U	270 UJ
Acrolein	57 U	2800 R	48 U	49 U	48 U	53 U	2200 R	2700 R
Acrylonitrile	57 U	2800 UJ	48 U	49 U	48 U	53 U	2200 UJ	2700 UJ
Benzene	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Bromodichloromethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Bromoform	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Bromomethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Carbon Disulfide	5.7 U	280 U	1.3 J	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Carbon Tetrachloride	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
Volatiles (ug/kg) (Cont)								
Chlorobenzene	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Chloroethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Chloroform	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Chloromethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Dibromochloromethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Dibromomethane	5.7 U	280 UJ	4.8 U	4.9 U	4.8 U	5.3 U	220 UJ	270 UJ
Dichlorodifluoromethane (Freon-12)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Ethyl Methacrylate	5.7 U	2800 U	4.8 U	4.9 U	4.8 U	5.3 U	2200 U	2700 UJ
Ethylbenzene	170	280 U	14	4.9 U	4.8 U	5.3 U	740	270 UJ
Iodomethane	5.7 U	280 UJ	4.8 U	4.9 U	4.8 U	5.3 U	220 UJ	270 UJ
Isobutyl Alcohol	290 R	1400 R	240 R	240 R	240 R	270 R	1100 R	1400 R
Methyl Acrylonitrile	5.7 UJ	2800 UJ	4.8 UJ	4.9 UJ	4.8 UJ	5.3 UJ	2200 UJ	2700 UJ
Methyl Methacrylate	57 U	2800 UJ	48 U	49 U	48 U	53 U	2200 UJ	2700 UJ
Methylene Chloride	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Pentachloroethane	5.7 U	280 UJ	4.8 U	4.9 U	4.8 U	5.3 U	220 UJ	270 UJ
Propionitrile (Ethyl Cyanide)	290 U	14000 R	240 U	240 U	240 U	270 U	11000 R	14000 R
Styrene (Ethenylbenzene)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Tetrachloroethene (PCE)	5.7 U	280 UJ	4.8 U	4.9 U	4.8 U	5.3 U	220 UJ	270 UJ
Toluene	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Trichloroethene (TCE)	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Trichlorofluoromethane	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Vinyl Acetate	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Vinyl Chloride	5.7 U	280 U	4.8 U	4.9 U	4.8 U	5.3 U	220 U	270 UJ
Xylenes, total	17 U	280 U	22	15 U	14 U	16 U	130 J	270 UJ
Semivolatiles (ug/kg)								
1,2,4,5-Tetrachlorobenzene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
1,2,4-Trichlorobenzene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
1,2-Dichlorobenzene (o-)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
1,3,5-Trinitrobenzene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
1,3-Dichlorobenzene (m-)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
Semivolatiles (ug/kg) (Cont)								
1,3-Dinitrobenzene (m-)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
1,4-Dichlorobenzene (p-)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
1,4-Dioxane (p-)	290 R	14000 R	240 R	240 R	240 R	270 R	11000 R	14000 R
1,4-Naphthoquinone	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
1,4-Phenylenediamine	470 UJ	480 UJ	440 UJ	430 UJ	470 UJ	480 UJ	380 UJ	460 UJ
1-Naphthylamine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,3,4,6-Tetrachlorophenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,4,5-Trichlorophenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,4,6-Trichlorophenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,4-Dichlorophenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,4-Dimethylphenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,4-Dinitrophenol	940 U	960 U	880 U	870 U	940 UJ	960 UJ	760 UJ	930 UJ
2,4-Dinitrotoluene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,6-Dichlorophenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2,6-Dinitrotoluene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2-Acetylaminofluorene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2-Chloronaphthalene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2-Chlorophenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2-Methylphenol (o-Cresol)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2-Naphthylamine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2-Nitroaniline	940 U	960 U	880 U	870 U	940 U	960 U	760 U	930 U
2-Nitrophenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
2-Picoline	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
3,3'-Dichlorobenzidine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
3,3'-Dimethylbenzidine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
3-Methylcholanthrene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
3-Methylphenol (m-Cresol)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
3-Nitroaniline	940 U	960 U	880 U	870 U	940 U	960 U	760 U	930 U
4,6-Dinitro-2-methylphenol	940 U	960 U	880 U	870 U	940 U	960 U	760 U	930 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
Semivolatiles (ug/kg) (Cont)								
4-Aminobiphenyl	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
4-Bromophenyl-phenylether	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
4-Chloro-3-methylphenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
4-Chloroaniline	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
4-Chlorophenyl-phenylether	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
4-Dimethylaminoazobenzene (p-)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
4-Methylphenol (p-Cresol)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
4-Nitroaniline	940 U	960 U	880 U	870 U	940 U	960 U	760 U	930 U
4-Nitrophenol	940 UJ	960 UJ	880 UJ	870 UJ	940 UJ	960 UJ	760 UJ	930 UJ
4-Nitroquinoline-1-Oxide	470 U	480 U	440 U	430 U	470 UJ	480 UJ	380 UJ	460 UJ
5-Nitro-o-toluidine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
7,12-Dimethylbenz(a)anthracene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
a,a-Dimethylphenethylamine	96000 UJ	97000 UJ	89000 UJ	88000 UJ	96000 UJ	97000 UJ	77000 UJ	94000 UJ
Acetophenone	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Aniline	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Aramite	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Benzyl Alcohol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Bis(2-chloroethoxy)methane	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Bis(2-chloroisopropyl)ether	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Bis(2-chloroethyl)ether	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Bis(2-ethylhexyl) Phthalate (BEHP)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Butyl Benzyl Phthalate	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Diallate (cis)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Diallate (trans)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Dibenzofuran	57 J	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Diethyl Phthalate (DEP)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Dimethyl Phthalate	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Di-n-butyl Phthalate (DBP)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Di-n-octyl Phthalate	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Dinoseb	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
Semivolatiles (ug/kg) (Cont)								
Ethyl Methanesulfonate (EMS)	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Hexachlorobenzene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Hexachlorobutadiene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Hexachlorocyclopentadiene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Hexachloroethane	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Isophorone	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Isosafrole	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Methapyrilene	470 U	480 U	440 U	430 U	470 UJ	480 UJ	380 UJ	460 UJ
Methyl Methane Sulfonate	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Nitrobenzene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
n-Nitrosodiethylamine	470 UJ	480 UJ	440 UJ	430 UJ	470 UJ	480 UJ	380 UJ	460 UJ
n-Nitrosodimethylamine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
n-Nitroso-di-n-butylamine	470 UJ	480 UJ	440 UJ	430 UJ	470 UJ	480 UJ	380 UJ	460 UJ
n-Nitrosodi-n-propylamine	470 UJ	480 UJ	440 UJ	430 UJ	470 UJ	480 UJ	380 UJ	460 UJ
n-Nitrosodiphenylamine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
n-Nitrosomethylethylamine	470 UJ	480 UJ	440 UJ	430 UJ	470 UJ	480 UJ	380 UJ	460 UJ
n-Nitrosomorpholine	470 UJ	480 UJ	440 UJ	430 UJ	470 UJ	480 UJ	380 UJ	460 UJ
n-Nitrosopiperidine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
n-Nitrosopyrrolidine	470 UJ	480 UJ	440 UJ	430 UJ	470 UJ	480 UJ	380 UJ	460 UJ
o-Toluidine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Pentachlorobenzene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Pentachloronitrobenzene	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Pentachlorophenol	940 U	960 U	880 U	870 U	940 U	960 U	760 U	930 U
Phenacetin	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Phenol	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Pronamide	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Pyridine	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U
Safrole	470 U	480 U	440 U	430 U	470 U	480 U	380 U	460 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
PAHs (ug/kg)								
1-Methylnaphthalene	9.6 U	230 J	930 J	150 J	9.6 UJ	9.7 UJ	NA	19 J
2-Methylnaphthalene	9.6 U	250 J	910	180	9.6 UJ	9.7 UJ	1700	9.4 UJ
Acenaphthene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Acenaphthylene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 UJ	9.7 UJ	380 U	9.4 UJ
Anthracene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Benzo(a)anthracene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Benzo(a)pyrene (BaP)	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Benzo(b)fluoranthene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Benzo(g,h,i)perylene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	16 J	9.4 U
Benzo(k)fluoranthene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Chrysene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Dibenz(a,h)anthracene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Fluoranthene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Fluorene	43	17	28	9.4	9.6 U	9.7 U	380 U	22
Indeno(1,2,3-cd)pyrene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	380 U	9.4 U
Naphthalene	9.6 U	140 J	580	120	9.6 U	9.7 U	480	9.4 U
Phenanthrene	9.6 U	6.5 J	8.9 U	8.8 U	9.6 U	9.7 U	45 J	9.4 U
Pyrene	9.6 U	9.7 U	8.9 U	8.8 U	9.6 U	9.7 U	62 J	9.4 U
PCBs (ug/kg)								
Aroclor-1016	44 U	45 U	41 UJ	41 U	44 U	45 U	36 UJ	44 U
Aroclor-1221	60 U	61 U	56 UJ	55 U	60 U	61 U	48 UJ	59 U
Aroclor-1232	44 U	45 U	41 UJ	41 U	44 U	45 U	36 UJ	44 U
Aroclor-1242	30 U	30 U	28 UJ	28 U	30 U	30 U	24 UJ	30 U
Aroclor-1248	30 U	30 U	28 UJ	28 U	30 U	30 U	24 UJ	30 U
Aroclor-1254	30 U	30 U	28 UJ	28 U	30 U	30 U	24 UJ	30 U
Aroclor-1260	44 U	45 U	41 UJ	41 U	44 U	45 U	36 UJ	44 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
Dioxins / Furans (ug/kg)								
TCDD, 2,3,7,8-	NA	NA	NA	NA	NA	NA	0.113 U	NA
PeCDD, 1,2,3,7,8-	NA	NA	NA	NA	NA	NA	0.113 U	NA
HxCDD, 1,2,3,4,7,8-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HxCDD, 1,2,3,6,7,8-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HxCDD, 1,2,3,7,8,9-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HpCDD, 1,2,3,4,6,7,8-	NA	NA	NA	NA	NA	NA	1.27 J	NA
OCDD	NA	NA	NA	NA	NA	NA	11.6	NA
TCDF, 2,3,7,8-	NA	NA	NA	NA	NA	NA	0.113 U	NA
PeCDF, 1,2,3,7,8-	NA	NA	NA	NA	NA	NA	0.113 U	NA
PeCDF, 2,3,4,7,8-	NA	NA	NA	NA	NA	NA	0.113 U	NA
HxCDF, 1,2,3,4,7,8-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HxCDF, 1,2,3,6,7,8-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HxCDF, 2,3,4,6,7,8-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HxCDF, 1,2,3,7,8,9-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HpCDF, 1,2,3,4,6,7,8-	NA	NA	NA	NA	NA	NA	0.283 U	NA
HpCDF, 1,2,3,4,7,8,9-	NA	NA	NA	NA	NA	NA	0.283 U	NA
OCDF	NA	NA	NA	NA	NA	NA	0.566 U	NA
TPH (mg/kg)								
Diesel Range Organics (DRO)	690	140 J	1100	41	14 U	14 U	2400	260
Gasoline Range Organics (GRO)	55	31 J	2.9	0.91	0.71 U	0.72 U	5.4	9.5

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI							
	14SB01-06	14SB01-11	14SB02-03	14SB02-08	14SB03-06	14SB03-11	14SB04-01	14SB04-10
	03-06-2006	03-06-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006	03-06-2006	03-06-2006
	11.0 - 13.0	21.0 - 23.0	5.0 - 7.0	15.0 - 17.0	11.0 - 13.0	21.0 - 23.0	1.5 - 3.0	19.0 - 21.0
Inorganics (mg/kg)								
Antimony	0.74 UJ	1 UJ	0.99 UJ	1.5 J	1.3 J	0.73 UJ	1 UJ	1.6 J
Arsenic	0.25 J	2 J	1.8 J	0.75 J	1.1 J	0.2 J	0.79 J	2.8 J
Barium	31.5 J	338 R	4.7 U	35.4 J	14.4 U	5.2 U	64.4 J	22.5 U
Beryllium	0.01 U	0.19 U	0.01 U	0.02 U	0.01 U	0.06 U	0.01 U	0.16 U
Cadmium	0.2 U	0.28 U	0.3 U	0.59 U	0.43 U	0.17 U	0.84	0.61 U
Chromium	29 J	39 J	25.4 J	44.7 J	32.1 J	19.7 J	20.8 J	60 J
Cobalt	2.4 J	10 J	0.84 J	7.6 J	4.2 J	11.5 J	12.8 J	7.6 J
Copper	40.1 R	87.6 R	24.2 R	84.8 R	74.3 R	33.8 R	84 R	115 R
Lead	3.6 J	3.1 J	4 J	9.1 J	2.6 J	1.1 J	39.8 J	7.4 J
Mercury	0.021 U	0.024 U	0.022 U	0.02 U	0.021 U	0.024 U	0.017 U	0.023 U
Nickel	2.6 J	11.1 J	1.2 J	7.2 J	4.7 J	6.4 J	7.7 J	8.8 J
Selenium	1.3 J	1.6 J	2.7 J	2.4 J	3 J	0.81 J	0.54 J	2.6 J
Silver	0.07 U	0.07 U	0.06 U	0.07 U	0.07 U	0.07 U	0.05 U	0.07 U
Thallium	0.51 UJ	0.88 J	0.5 UJ	0.51 UJ	0.52 UJ	0.54 UJ	0.42 UJ	0.51 UJ
Tin								
Vanadium	178 J	180 J	267 J	222 J	243 J	123 J	98.8 J	320 J
Zinc	11.1 J	31.2 J	4.6 J	31.2 J	9.8 J	10.5 J	68 J	31.8 J

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed
R - Result is rejected and unusable

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
Volatiles (ug/kg)						
1,1,1,2-Tetrachloroethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,1,1-Trichloroethane (TCA)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,1,2,2-Tetrachloroethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,1,2-Trichloroethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,1-Dichloroethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,1-Dichloroethene	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,2,3-Trichloropropane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,2-Dibromo-3-chloropropane (DBCP)	4.6 UJ	5.2 UJ	4 UJ	4.9 UJ	5.3 UJ	5.5 UJ
1,2-Dibromoethane (EDB)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,2-Dichloroethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,2-Dichloroethene (trans)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,2-Dichloropropane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,3-Dichloropropene (cis)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,3-Dichloropropene (trans)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
1,4-Dichloro-2-butene (trans)	91 U	100 U	80 U	99 U	110 U	110 U
2-Butanone (MEK)	7.8 J	13 UJ	8.7 J	12 UJ	13 UJ	14 UJ
2-Chloro-1,3-butadiene (Chloroprene)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
2-Hexanone (MBK)	11 UJ	13 U	10 UJ	12 UJ	13 UJ	14 UJ
3-Chloropropene (Allyl Chloride)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
4-Methyl-2-pentanone (MIBK)	11 U	13 UJ	10 U	12 U	13 U	14 U
Acetone	22 U	13 U	30 U	12 U	13 U	14 U
Acetonitrile	4.6 R	5.2 R	4 R	4.9 R	5.3 R	5.5 R
Acrolein	46 U	52 U	40 U	49 U	53 U	55 U
Acrylonitrile	46 U	52 U	40 U	49 U	53 U	55 U
Benzene	4.6 U	31	4 U	4.9 U	5.3 U	5.5 U
Bromodichloromethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Bromoform	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Bromomethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Carbon Disulfide	4.6 U	5.2 U	0.9 J	4.9 U	5.3 U	5.5 U
Carbon Tetrachloride	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
Volatiles (ug/kg) (Cont)						
Chlorobenzene	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Chloroethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Chloroform	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Chloromethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Dibromochloromethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Dibromomethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Dichlorodifluoromethane (Freon-12)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Ethyl Methacrylate	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Ethylbenzene	4.6 U	2.1 J	4 U	4.9 U	5.3 U	5.5 U
Iodomethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Isobutyl Alcohol	230 R	260 R	200 R	250 R	270 R	270 R
Methyl Acrylonitrile	4.6 UJ	5.2 UJ	4 UJ	4.9 UJ	5.3 UJ	5.5 UJ
Methyl Methacrylate	46 U	52 U	40 U	49 U	53 U	55 U
Methylene Chloride	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Pentachloroethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Propionitrile (Ethyl Cyanide)	230 U	260 U	200 U	250 U	270 U	270 U
Styrene (Ethenylbenzene)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Tetrachloroethene (PCE)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Toluene	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Trichloroethene (TCE)	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Trichlorofluoromethane	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Vinyl Acetate	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Vinyl Chloride	4.6 U	5.2 U	4 U	4.9 U	5.3 U	5.5 U
Xylenes, total	14 U	1.7 J	12 U	15 U	16 U	16 U
Semivolatiles (ug/kg)						
1,2,4,5-Tetrachlorobenzene	420 U	470 U	400 U	460 U	500 U	500 U
1,2,4-Trichlorobenzene	420 U	470 U	400 U	460 U	500 U	500 U
1,2-Dichlorobenzene (o-)	420 U	470 U	400 U	460 U	500 U	500 U
1,3,5-Trinitrobenzene	420 U	470 U	400 U	460 U	500 U	500 U
1,3-Dichlorobenzene (m-)	420 U	470 U	400 U	460 U	500 U	500 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
Semivolatiles (ug/kg) (Cont)						
1,3-Dinitrobenzene (m-)	420 U	470 U	400 U	460 U	500 U	500 U
1,4-Dichlorobenzene (p-)	420 U	470 U	400 U	460 U	500 U	500 U
1,4-Dioxane (p-)	230 R	260 R	200 R	250 R	270 R	270 R
1,4-Naphthoquinone	420 U	470 U	400 U	460 U	500 U	500 U
1,4-Phenylenediamine	420 U	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
1-Naphthylamine	420 U	470 U	400 U	460 U	500 U	500 U
2,3,4,6-Tetrachlorophenol	420 U	470 U	400 U	460 U	500 U	500 U
2,4,5-Trichlorophenol	420 U	470 U	400 U	460 U	500 U	500 U
2,4,6-Trichlorophenol	420 U	470 U	400 U	460 U	500 U	500 U
2,4-Dichlorophenol	420 U	470 U	400 U	460 U	500 U	500 U
2,4-Dimethylphenol	420 U	470 U	400 U	460 U	500 U	500 U
2,4-Dinitrophenol	850 UJ	940 UJ	800 UJ	920 UJ	1000 UJ	1000 UJ
2,4-Dinitrotoluene	420 U	470 U	400 U	460 U	500 U	500 U
2,6-Dichlorophenol	420 U	470 U	400 U	460 U	500 U	500 U
2,6-Dinitrotoluene	420 U	470 U	400 U	460 U	500 U	500 U
2-Acetylaminofluorene	420 U	470 U	400 U	460 U	500 U	500 U
2-Chloronaphthalene	420 U	470 U	400 U	460 U	500 U	500 U
2-Chlorophenol	420 U	470 U	400 U	460 U	500 U	500 U
2-Methylphenol (o-Cresol)	420 U	470 U	400 U	460 U	500 U	500 U
2-Naphthylamine	420 U	470 U	400 U	460 U	500 U	500 U
2-Nitroaniline	850 U	940 U	800 U	920 U	1000 U	1000 U
2-Nitrophenol	420 U	470 U	400 U	460 U	500 U	500 U
2-Picoline	420 U	470 U	400 U	460 U	500 U	500 U
3,3'-Dichlorobenzidine	420 U	470 U	400 U	460 U	500 U	500 U
3,3'-Dimethylbenzidine	420 U	470 U	400 U	460 U	500 U	500 U
3-Methylcholanthrene	420 U	470 U	400 U	460 U	500 U	500 U
3-Methylphenol (m-Cresol)	420 U	470 U	400 U	460 U	500 U	500 U
3-Nitroaniline	850 U	940 U	800 U	920 U	1000 U	1000 U
4,6-Dinitro-2-methylphenol	850 U	940 U	800 U	920 U	1000 U	1000 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
Semivolatiles (ug/kg) (Cont)						
4-Aminobiphenyl	420 U	470 U	400 U	460 U	500 U	500 U
4-Bromophenyl-phenylether	420 U	470 U	400 U	460 U	500 U	500 U
4-Chloro-3-methylphenol	420 U	470 U	400 U	460 U	500 U	500 U
4-Chloroaniline	420 U	470 U	400 U	460 U	500 U	500 U
4-Chlorophenyl-phenylether	420 U	470 U	400 U	460 U	500 U	500 U
4-Dimethylaminoazobenzene (p-)	420 U	470 U	400 U	460 U	500 U	500 U
4-Methylphenol (p-Cresol)	420 U	470 U	400 U	460 U	500 U	500 U
4-Nitroaniline	850 U	940 U	800 U	920 U	1000 U	1000 U
4-Nitrophenol	850 UJ	940 UJ	800 UJ	920 UJ	1000 UJ	1000 UJ
4-Nitroquinoline-1-Oxide	420 UJ	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
5-Nitro-o-toluidine	420 U	470 U	400 U	460 U	500 U	500 U
7,12-Dimethylbenz(a)anthracene	420 U	470 U	400 U	460 U	500 U	500 U
a,a-Dimethylphenethylamine	86000 UJ	96000 UJ	82000 UJ	93000 UJ	100000 UJ	100000 UJ
Acetophenone	420 U	470 U	400 U	460 U	500 U	500 U
Aniline	420 U	470 U	400 U	460 U	500 U	500 U
Aramite	420 U	470 U	400 U	460 U	500 U	500 U
Benzyl Alcohol	420 U	470 U	400 U	460 U	500 U	500 U
Bis(2-chloroethoxy)methane	420 U	470 U	400 U	460 U	500 U	500 U
Bis(2-chloroisopropyl)ether	420 U	470 U	400 U	460 U	500 U	500 U
Bis(2-chloroethyl)ether	420 U	470 U	400 U	460 U	500 U	500 U
Bis(2-ethylhexyl) Phthalate (BEHP)	420 U	470 U	400 U	460 U	500 U	500 U
Butyl Benzyl Phthalate	420 U	470 U	400 U	460 U	500 U	500 U
Diallate (cis)	420 U	470 U	400 U	460 U	500 U	500 U
Diallate (trans)	420 U	470 U	400 U	460 U	500 U	500 U
Dibenzofuran	420 U	470 U	400 U	460 U	500 U	500 U
Diethyl Phthalate (DEP)	420 U	470 U	400 U	460 U	500 U	500 U
Dimethyl Phthalate	420 U	470 U	400 U	460 U	500 U	500 U
Di-n-butyl Phthalate (DBP)	420 U	470 U	400 U	460 U	500 U	500 U
Di-n-octyl Phthalate	420 U	470 U	400 U	460 U	500 U	500 U
Dinoseb	420 U	470 U	400 U	460 U	500 U	500 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
Semivolatiles (ug/kg) (Cont)						
Ethyl Methanesulfonate (EMS)	420 U	470 U	400 U	460 U	500 U	500 U
Hexachlorobenzene	420 U	470 U	400 U	460 U	500 U	500 U
Hexachlorobutadiene	420 U	470 U	400 U	460 U	500 U	500 U
Hexachlorocyclopentadiene	420 U	470 U	400 U	460 U	500 U	500 U
Hexachloroethane	420 U	470 U	400 U	460 U	500 U	500 U
Hexachlorophene	NA	NA	NA	NA	NA	NA
Hexachloropropene	420 U	470 U	400 U	460 U	500 U	500 U
Isophorone	420 U	470 U	400 U	460 U	500 U	500 U
Isosafrole	420 U	470 U	400 U	460 U	500 U	500 U
Methapyrilene	420 UJ	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
Methyl Methane Sulfonate	420 U	470 U	400 U	460 U	500 U	500 U
Nitrobenzene	420 U	470 U	400 U	460 U	500 U	500 U
n-Nitrosodiethylamine	420 UJ	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
n-Nitrosodimethylamine	420 U	470 U	400 U	460 U	500 U	500 U
n-Nitroso-di-n-butylamine	420 U	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
n-Nitrosodi-n-propylamine	420 UJ	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
n-Nitrosodiphenylamine	420 U	470 U	400 U	460 U	500 U	500 U
n-Nitrosomethylethylamine	420 UJ	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
n-Nitrosomorpholine	420 UJ	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
n-Nitrosopiperidine	420 U	470 U	400 U	460 U	500 U	500 U
n-Nitrosopyrrolidine	420 UJ	470 UJ	400 UJ	460 UJ	500 UJ	500 UJ
o-Toluidine	420 U	470 U	400 U	460 U	500 U	500 U
Pentachlorobenzene	420 U	470 U	400 U	460 U	500 U	500 U
Pentachloronitrobenzene	420 U	470 U	400 U	460 U	500 U	500 U
Pentachlorophenol	850 U	940 U	800 U	920 U	1000 U	1000 U
Phenacetin	420 U	470 U	400 U	460 U	500 U	500 U
Phenol	420 U	470 U	400 U	460 U	500 U	500 U
Pronamide	420 U	470 U	400 U	460 U	500 U	500 U
Pyridine	420 U	470 U	400 U	460 U	500 U	500 U
Safrole	420 U	470 U	400 U	460 U	500 U	500 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
PAHs (ug/kg)						
1-Methylnaphthalene	8.6 UJ	9.6 UJ	8.2 UJ	9.3 UJ	10 UJ	10 UJ
2-Methylnaphthalene	8.6 UJ	9.6 UJ	8.2 UJ	9.3 U	10 U	10 U
Acenaphthene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Acenaphthylene	8.6 UJ	9.6 UJ	8.2 UJ	9.3 U	10 U	10 U
Anthracene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Benzo(a)anthracene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Benzo(a)pyrene (BaP)	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Benzo(b)fluoranthene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Benzo(g,h,i)perylene	8.6 U	9.6 U	7.7 J	5.8 J	10 U	10 U
Benzo(k)fluoranthene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Chrysene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Dibenz(a,h)anthracene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Fluoranthene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Fluorene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	8.6 U	9.6 U	5.6 J	4.3 J	10 U	10 U
Naphthalene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Phenanthrene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
Pyrene	8.6 U	9.6 U	8.2 U	9.3 U	10 U	10 U
PCBs (ug/kg)						
Aroclor-1016	40 U	44 U	38 U	43 U	47 U	47 U
Aroclor-1221	54 U	60 U	51 U	58 U	64 U	64 U
Aroclor-1232	40 U	44 U	38 U	43 U	47 U	47 U
Aroclor-1242	27 U	30 U	26 U	29 U	32 U	32 U
Aroclor-1248	27 U	30 U	26 U	29 U	32 U	32 U
Aroclor-1254	27 U	30 U	26 U	29 U	32 U	32 U
Aroclor-1260	40 U	44 U	38 U	43 U	47 U	47 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
Dioxins / Furans (ug/kg)						
TCDD, 2,3,7,8-	NA	0.117 U	NA	0.123 U	NA	NA
PeCDD, 1,2,3,7,8-	NA	0.117 U	NA	0.123 U	NA	NA
HxCDD, 1,2,3,4,7,8-	NA	0.291 U	NA	0.308 U	NA	NA
HxCDD, 1,2,3,6,7,8-	NA	0.291 U	NA	0.308 U	NA	NA
HxCDD, 1,2,3,7,8,9-	NA	0.291 U	NA	0.308 U	NA	NA
HpCDD, 1,2,3,4,6,7,8-	NA	0.291 U	NA	0.308 U	NA	NA
OCDD	NA	0.583 U	NA	0.615 U	NA	NA
TCDF, 2,3,7,8-	NA	0.117 U	NA	0.123 U	NA	NA
PeCDF, 1,2,3,7,8-	NA	0.117 U	NA	0.123 U	NA	NA
PeCDF, 2,3,4,7,8-	NA	0.117 U	NA	0.123 U	NA	NA
HxCDF, 1,2,3,4,7,8-	NA	0.291 U	NA	0.308 U	NA	NA
HxCDF, 1,2,3,6,7,8-	NA	0.291 U	NA	0.308 U	NA	NA
HxCDF, 2,3,4,6,7,8-	NA	0.291 U	NA	0.308 U	NA	NA
HxCDF, 1,2,3,7,8,9-	NA	0.291 U	NA	0.308 U	NA	NA
HpCDF, 1,2,3,4,6,7,8-	NA	0.351 U	NA	0.308 U	NA	NA
HpCDF, 1,2,3,4,7,8,9-	NA	0.42 U	NA	0.308 U	NA	NA
OCDF	NA	0.75 U	NA	0.907 U	NA	NA
TPH (mg/kg)						
Diesel Range Organics (DRO)	13 U	16 U	29	31 J	20 U	17 U
Gasoline Range Organics (GRO)	0.19 J	0.87	0.61 U	0.69 U	0.76 U	0.76 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI					
	14SB05-02	14SB05-09	14SB06-01	14SB06-07	14SB07-06	14SB07-08
	03-07-2006	03-07-2006	03-07-2006	03-07-2006	03-06-2006	03-06-2006
	3.5 - 5.0	17.0 - 19.0	1.5 - 3.0	13.0 -15.0	11.0 - 13.0	15.0 - 17.0
Inorganics (mg/kg)						
Antimony	1.3 J	0.79 UJ	1.4 J	0.92 UJ	0.86 UJ	0.55 UJ
Arsenic	4.2 J	4.2 J	1.2 J	2 J	0.39 J	0.57 J
Barium	57.8 J	11 U	63.8 J	39 J	134 J	372 J
Beryllium	0.01 U	0.11 U	0.01 U	0.01 U	0.19 U	0.35 U
Cadmium	1.1	0.2 U	1	0.25 U	0.26 U	0.23 U
Chromium	36.5 J	32.9 J	31.9 J	21 J	10.9 J	16.4 J
Cobalt	9.4 J	7.5 J	24.5 J	2.8 J	18.3 J	65.3 J
Copper	52.4 R	96.7 R	143 R	65 R	122 R	176 R
Lead	29.7 J	3.9 J	14.8 J	3.5 J	0.8 J	4.9 J
Mercury	0.086	0.024 U	0.019 U	0.023 U	0.025 U	0.025 U
Nickel	4.3 J	8.2 J	13.5 J	2.8 J	21.2 J	13.8 J
Selenium	3.7 J	1.3 J	1.1 J	1.5 J	1.2 J	0.84 J
Silver	0.06 U	0.07 U	0.06 U	0.07 U	0.07 U	0.07 U
Thallium	0.49 UJ	0.52 UJ	0.46 UJ	0.51 UJ	0.58 UJ	0.54 UJ
Tin						
Vanadium	227 J	152 J	178 J	151 J	126 J	86.8 J
Zinc	46.5 J	18.7 J	75.9 J	14.4 J	45.6 J	62.4 J

Notes:
U - Not detected
UJ - Reported quantitation limit is quali
J - Analyte present - Reported value is e
NA - Not Analyzed
R - Result is rejected and unusable

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Volatiles (ug/L)			
1,1,1,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane (TCA)	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U
1,2,3-Trichloropropane	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane (DBCP)	0.5 UJ	0.5 UJ	0.5 U
1,2-Dibromoethane (EDB)	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	4.1	0.5 U	0.5 U
1,2-Dichloroethene (trans)	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U
1,4-Dichloro-2-butene (trans)	20 U	20 U	20 R
2-Butanone (MEK)	16	7.2	2.5 R
2-Chloro-1,3-butadiene (Chloroprene)	0.5 U	0.5 U	0.5 UJ
2-Hexanone (MBK)	2.5 U	2.5 U	2.5 U
3-Chloropropene (Allyl Chloride)	0.5 U	0.5 U	0.5 UJ
4-Methyl-2-pentanone (MIBK)	2.5 U	2.5 U	2.5 U
Acetone	72	58	2.5 U
Acetonitrile	0.5 R	0.5 R	0.5 R
Acrolein	5 R	5 R	5 R
Acrylonitrile	5 R	5 R	5 R
Benzene	220	0.41 J	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U
Carbon Disulfide	0.13 J	0.22 J	0.5 U
Carbon Tetrachloride	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 U	0.5 UJ
Chloroform	0.5 U	0.5 U	0.5 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01 03-08-2006	14TW02 03-08-2006	14TW07 03-08-2006
Volatiles (ug/L) (Cont)			
Chloromethane	0.5 U	0.5 U	0.5 UJ
Dibromochloromethane	0.5 U	0.5 U	0.5 U
Dibromomethane	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U
Ethyl Methacrylate	5 U	5 U	5 U
Ethylbenzene	1.3	0.56	0.5 U
Iodomethane	0.5 U	0.58 J	0.5 UJ
Isobutyl Alcohol	25 UJ	25 UJ	25 UJ
Methyl Acrylonitrile	5 UJ	5 UJ	5 UJ
Methyl Methacrylate	5 U	5 U	5 U
Methylene Chloride	0.5 U	0.5 U	0.5 U
Pentachloroethane	0.5 UJ	0.5 UJ	0.5 UJ
Propionitrile (Ethyl Cyanide)	25 R	25 R	25 R
Styrene (Ethenylbenzene)	0.5 U	0.5 U	0.5 U
Tetrachloroethene (PCE)	0.5 U	0.5 U	0.5 U
Toluene	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	0.5 U	0.5 U	0.5 U
Vinyl Acetate	1 U	1 U	1 U
Vinyl Chloride	0.5 U	0.5 U	0.5 U
Xylene, m/p-	0.28 J	0.35 J	1 U
Xylene, o-	1	0.53	0.5 U
Xylenes, total	1.3	0.91	0.5 U
Semivolatiles (ug/L)			
1,2,4,5-Tetrachlorobenzene	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U
1,2-Dichlorobenzene (o-)	10 U	10 U	10 U
1,3,5-Trinitrobenzene	10 U	10 U	10 U
1,3-Dichlorobenzene (m-)	10 U	10 U	10 U
1,3-Dinitrobenzene (m-)	10 U	10 U	10 U
1,4-Dichlorobenzene (p-)	10 U	10 U	10 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Semivolatiles (ug/L) (Cont)			
1,4-Dioxane (p-)	25 U	25 U	25 UJ
1,4-Naphthoquinone	10 U	10 U	10 U
1,4-Phenylenediamine	100 UJ	100 UJ	100 UJ
1-Naphthylamine	10 U	10 U	10 U
2,3,4,6-Tetrachlorophenol	10 U	10 U	10 U
2,4,5-Trichlorophenol	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U
2,4-Dinitrophenol	20 U	20 U	20 U
2,4-Dinitrotoluene	10 U	10 U	10 U
2,6-Dichlorophenol	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U
2-Acetylaminofluorene	10 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U
2-Methylphenol (o-Cresol)	10 U	10 U	10 U
2-Naphthylamine	10 U	10 U	10 U
2-Nitroaniline	20 U	20 U	20 U
2-Nitrophenol	10 U	10 U	10 U
2-Picoline	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U
3,3'-Dimethylbenzidine	10 U	10 U	10 U
3-Methylcholanthrene	10 U	10 U	10 U
3-Methylphenol (m-Cresol)	10 U	10 U	10 U
3-Nitroaniline	20 U	20 U	20 U
4,6-Dinitro-2-methylphenol	20 U	20 U	20 U
4-Aminobiphenyl	10 U	10 U	10 U
4-Bromophenyl-phenylether	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Semivolatiles (ug/L) (Cont)			
4-Chlorophenyl-phenylether	10 U	10 U	10 U
4-Dimethylaminoazobenzene (p-)	10 U	10 U	10 U
4-Methylphenol (p-Cresol)	10 U	10 U	10 U
4-Nitroaniline	20 U	20 U	20 U
4-Nitrophenol	20 U	20 U	20 U
4-Nitroquinoline-1-Oxide	10 U	10 U	10 U
5-Nitro-o-toluidine	10 U	10 U	10 U
7,12-Dimethylbenz(a)anthracene	10 U	10 U	10 U
a,a-Dimethylphenethylamine	2000 U	2000 U	2000 U
Acetophenone	0.33 J	10 U	10 U
Aniline	10 U	10 U	10 U
Aramite	10 U	10 U	10 U
Benzyl Alcohol	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	10 U	10 U	10 U
Bis(2-chloroisopropyl)ether	10 U	10 U	10 U
Bis(2-chloroethyl)ether	10 U	10 U	10 U
Bis(2-ethylhexyl) Phthalate (BEHP)	10 U	10 U	10 U
Butyl Benzyl Phthalate	10 U	10 U	0.3 J
Chrysene	10 U	10 U	10 U
Diallate (cis)	10 U	10 U	10 U
Diallate (trans)	10 U	10 U	10 U
Dibenzofuran	0.43 J	10 U	10 U
Diethyl Phthalate (DEP)	0.89 J	10 U	1.3 J
Dimethyl Phthalate	10 U	10 U	10 U
Di-n-butyl Phthalate (DBP)	10 U	10 U	0.48 J
Di-n-octyl Phthalate	10 U	10 U	10 U
Dinoseb	10 U	10 U	10 U
Ethyl Methanesulfonate (EMS)	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Semivolatiles (ug/L) (Cont)			
Hexachloroethane	10 U	10 U	10 U
Hexachloropropene	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U
Isosafrole	10 U	10 U	10 U
Methapyrilene	10 U	10 U	10 U
Methyl Methane Sulfonate	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U
n-Nitrosodiethylamine	10 U	10 U	10 U
n-Nitrosodimethylamine	10 UJ	10 UJ	10 UJ
n-Nitroso-di-n-butylamine	10 UJ	10 UJ	10 UJ
n-Nitrosodi-n-propylamine	10 UJ	10 UJ	10 UJ
n-Nitrosodiphenylamine	10 U	10 U	10 U
n-Nitrosomethylethylamine	10 U	10 U	10 U
n-Nitrosomorpholine	10 UJ	10 UJ	10 UJ
n-Nitrosopiperidine	10 U	10 U	10 U
n-Nitrosopyrrolidine	10 UJ	10 UJ	10 UJ
o-Toluidine	10 U	10 U	10 U
Pentachlorobenzene	10 U	10 U	10 U
Pentachloronitrobenzene	10 U	10 U	10 U
Pentachlorophenol	20 U	20 U	20 U
Phenacetin	10 U	10 U	10 U
Phenol	10 U	10 U	10 U
Pronamide	10 U	10 U	10 U
Pyridine	10 U	10 U	10 U
Safrole	10 U	10 U	10 U
PAHs (ug/L)			
1-Methylnaphthalene	1.4 J	1.9 J	0.2 UJ
2-Methylnaphthalene	2 J	1.8 J	0.2 U
Acenaphthene	0.081 J	0.079 J	0.2 U
Acenaphthylene	0.2 U	0.2 UJ	0.2 U
Anthracene	0.2 U	0.2 U	0.2 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
PAHs (ug/L) (Cont)			
Benzo(a)anthracene	0.095 J	0.2 U	0.2 U
Benzo(a)pyrene (BaP)	0.084 J	0.2 U	0.2 U
Benzo(b)fluoranthene	0.083 J	0.2 U	0.2 U
Benzo(g,h,i)perylene	0.088 J	0.2 U	0.2 U
Benzo(k)fluoranthene	0.093 J	0.2 U	0.2 U
Chrysene	0.078 J	0.2 U	0.2 U
Dibenz(a,h)anthracene	0.097 J	0.2 U	0.2 U
Fluoranthene	0.078 J	0.2 U	0.2 U
Fluorene	0.25	0.11 J	0.066 J
Indeno(1,2,3-cd)pyrene	0.11 J	0.2 U	0.2 U
Naphthalene	14	3	0.34
Phenanthrene	0.2 U	0.2 U	0.2 U
Pyrene	0.087 J	0.2 U	0.2 U
PCBs (ug/L)			
Aroclor-1016	NA	0.93 U	NA
Aroclor-1221	NA	1.3 U	NA
Aroclor-1232	NA	0.93 U	NA
Aroclor-1242	NA	0.63 U	NA
Aroclor-1248	NA	0.63 U	NA
Aroclor-1254	NA	0.63 U	NA
Aroclor-1260	NA	0.93 U	NA
TPH (mg/L)			
Diesel Range Organics (DRO)	1.8	1.4	1.5
Gasoline Range Organics (GRO)	0.86	0.15 J	0.5 U
Metals (ug/L)			
Antimony	NA	1.4 U	1.2 U
Arsenic	NA	1.4 U	1.4 U
Barium	NA	157 U	110 U
Beryllium	NA	0.1 U	0.34 U
Cadmium	NA	0.2 U	0.2 U
Chromium	NA	16.5 J	27.8 J

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Metals (ug/L) (Cont)			
Cobalt	NA	5	28.2
Copper	NA	24.8 R	74.3 J
Lead	NA	6.1	1.9 J
Mercury	NA	0.1 U	0.1 U
Nickel	NA	4.1 J	11.1 J
Selenium	NA	3.3 UJ	3.3 UJ
Silver	NA	0.5 U	0.5 U
Thallium	NA	3.9 U	3.9 U
Tin			
Vanadium	NA	59.2	74
Zinc	NA	12.7 U	50.8

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed
R - Result is rejected and unusable

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
Volatiles (ug/L)							
1,1,1,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane (TCA)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane (DBCP)	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
1,2-Dibromoethane (EDB)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (trans)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichloropropene (cis)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichloropropene (trans)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichloro-2-butene (trans)	20 U	20 U	20 U	20 U	20 U	20 U	20 U
2-Butanone (MEK)	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
2-Chloro-1,3-butadiene (Chloroprene)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone (MBK)	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
3-Chloropropene (Allyl Chloride)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
4-Methyl-2-pentanone (MIBK)	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	2.5 U	2.5 U	2.5 U	2.5 U	4.2	2.5 U	2.5 U
Acetonitrile	0.5 R	0.5 R	0.5 R	0.5 R	0.5 R	0.5 R	0.5 R
Acrolein	5 R	5 R	5 R	5 R	5 R	5 R	5 R
Acrylonitrile	5 R	5 R	5 R	5 R	5 R	5 R	5 R
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.11 J	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
Volatiles (ug/L) (Cont)							
Carbon Disulfide	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.5 U	0.5 U	0.5 U	0.5 U	1.7	0.5 U	0.5 U
Chloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.28 J	0.5 U	0.5 U
Dibromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethyl Methacrylate	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Iodomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Isobutyl Alcohol	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ
Methyl Acrylonitrile	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ
Methyl Methacrylate	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	1.6	1.2	1.3	1.5	0.5 U	0.5 U	0.5 U
Pentachloroethane	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Propionitrile (Ethyl Cyanide)	25 R	25 R	25 R	25 R	25 R	25 R	25 R
Styrene (Ethenylbenzene)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene (PCE)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	0.76	0.52	0.34 J	0.55	0.15 J	0.5 U	0.5 U
Trichloroethene (TCE)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl Acetate	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, m/p-	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, o-	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes, total	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
Semivolatiles (ug/L)							
1,2,4,5-Tetrachlorobenzene	10 U	10 U	10 U	10 U	10 U	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	NA	NA
1,2-Dichlorobenzene (o-)	10 U	10 U	10 U	10 U	10 U	NA	NA
1,3,5-Trinitrobenzene	10 U	10 U	10 U	10 U	10 U	NA	NA
1,3-Dichlorobenzene (m-)	10 U	10 U	10 U	10 U	10 U	NA	NA
1,3-Dinitrobenzene (m-)	10 U	10 U	10 U	10 U	10 U	NA	NA
1,4-Dichlorobenzene (p-)	10 U	10 U	10 U	10 U	10 U	NA	NA
1,4-Dioxane (p-)	25 U	25 U	25 U	25 U	25 U	25 U	25 U
1,4-Naphthoquinone	10 U	10 U	10 U	10 U	10 U	NA	NA
1,4-Phenylenediamine	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	NA	NA
1-Naphthylamine	10 U	10 U	10 U	10 U	10 U	NA	NA
2,3,4,6-Tetrachlorophenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2,4,5-Trichlorophenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2,4-Dinitrophenol	20 U	20 U	20 U	20 U	20 U	NA	NA
2,4-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	NA	NA
2,6-Dichlorophenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Acetylaminofluorene	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Methylphenol (o-Cresol)	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Naphthylamine	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Nitroaniline	20 U	20 U	20 U	20 U	20 U	NA	NA
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U	NA	NA
2-Picoline	10 U	10 U	10 U	10 U	10 U	NA	NA

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
Semivolatiles (ug/L) (Cont)							
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	10 U	NA	NA
3,3'-Dimethylbenzidine	10 U	10 U	10 U	10 U	10 U	NA	NA
3-Methylcholanthrene	10 U	10 U	10 U	10 U	10 U	NA	NA
3-Methylphenol (m-Cresol)	10 U	10 U	10 U	10 U	10 U	NA	NA
3-Nitroaniline	20 U	20 U	20 U	20 U	20 U	NA	NA
4,6-Dinitro-2-methylphenol	20 U	20 U	20 U	20 U	20 U	NA	NA
4-Aminobiphenyl	10 U	10 U	10 U	10 U	10 U	NA	NA
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	NA	NA
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	10 U	NA	NA
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U	NA	NA
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	NA	NA
4-Dimethylaminoazobenzene (p-)	10 U	10 U	10 U	10 U	10 U	NA	NA
4-Methylphenol (p-Cresol)	10 U	10 U	10 U	10 U	10 U	NA	NA
4-Nitroaniline	20 U	20 U	20 U	20 U	20 U	NA	NA
4-Nitrophenol	20 U	20 U	20 U	20 U	20 U	NA	NA
4-Nitroquinoline-1-Oxide	10 U	10 U	10 U	10 U	10 U	NA	NA
5-Nitro-o-toluidine	10 U	10 U	10 U	10 U	10 U	NA	NA
7,12-Dimethylbenz(a)anthracene	10 U	10 U	10 U	10 U	10 U	NA	NA
a,a-Dimethylphenethylamine	2000 U	2000 U	2000 U	2000 U	2000 U	NA	NA
Acetophenone	10 U	10 U	10 U	10 U	10 U	NA	NA
Aniline	10 U	10 U	10 U	10 U	10 U	NA	NA
Anthracene	10 U	10 U	10 U	10 U	10 U	NA	NA
Aramite	10 U	10 U	10 U	10 U	10 U	NA	NA
Benzyl Alcohol	10 U	10 U	10 U	10 U	10 U	NA	NA
Bis(2-chloroethoxy)methane	10 U	10 U	10 U	10 U	10 U	NA	NA
Bis(2-chloroisopropyl)ether	10 U	10 U	10 U	10 U	10 U	NA	NA
Bis(2-chloroethyl)ether	10 U	10 U	10 U	10 U	10 U	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	10 U	10 U	10 U	10 U	10 U	NA	NA
Butyl Benzyl Phthalate	10 U	10 U	10 U	10 U	10 U	NA	NA

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
Semivolatiles (ug/L) (Cont)							
Chrysene	10 U	10 U	10 U	10 U	10 U	NA	NA
Diallate (cis)	10 U	10 U	10 U	10 U	10 U	NA	NA
Diallate (trans)	10 U	10 U	10 U	10 U	10 U	NA	NA
Dibenzofuran	10 U	10 U	10 U	10 U	10 U	NA	NA
Diethyl Phthalate (DEP)	10 U	10 U	10 U	10 U	10 U	NA	NA
Dimethyl Phthalate	10 U	10 U	10 U	10 U	10 U	NA	NA
Di-n-butyl Phthalate (DBP)	10 U	10 U	10 U	10 U	10 U	NA	NA
Di-n-octyl Phthalate	10 U	10 U	10 U	10 U	10 U	NA	NA
Dinoseb	10 U	10 U	10 U	10 U	10 U	NA	NA
Ethyl Methanesulfonate (EMS)	10 U	10 U	10 U	10 U	10 U	NA	NA
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U	NA	NA
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U	NA	NA
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U	NA	NA
Hexachloroethane	10 U	10 U	10 U	10 U	10 U	NA	NA
Hexachloropropene	10 U	10 U	10 U	10 U	10 U	NA	NA
Isophorone	10 U	10 U	10 U	10 U	10 U	NA	NA
Isosafrole	10 U	10 U	10 U	10 U	10 U	NA	NA
Methapyrilene	10 U	10 U	10 U	10 U	10 U	NA	NA
Methyl Methane Sulfonate	10 U	10 U	10 U	10 U	10 U	NA	NA
Nitrobenzene	10 U	10 U	10 U	10 U	10 U	NA	NA
n-Nitrosodiethylamine	10 U	10 U	10 U	10 U	10 U	NA	NA
n-Nitrosodimethylamine	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	NA	NA
n-Nitroso-di-n-butylamine	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	NA	NA
n-Nitrosodi-n-propylamine	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	NA	NA
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U	NA	NA
n-Nitrosomethylethylamine	10 U	10 U	10 U	10 U	10 U	NA	NA
n-Nitrosomorpholine	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	NA	NA
n-Nitrosopiperidine	10 U	10 U	10 U	10 U	10 U	NA	NA
n-Nitrosopyrrolidine	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	NA	NA

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
Semivolatiles (ug/L) (Cont)							
o-Toluidine	10 U	10 U	10 U	10 U	10 U	NA	NA
Pentachlorobenzene	10 U	10 U	10 U	10 U	10 U	NA	NA
Pentachloronitrobenzene	10 U	10 U	10 U	10 U	10 U	NA	NA
Pentachlorophenol	20 U	20 U	20 U	20 U	20 U	NA	NA
Phenacetin	10 U	10 U	10 U	10 U	10 U	NA	NA
Phenol	10 U	10 U	10 U	10 U	10 U	NA	NA
Pronamide	10 U	10 U	10 U	10 U	10 U	NA	NA
Pyridine	10 U	10 U	10 U	10 U	10 U	NA	NA
Safrole	10 U	10 U	10 U	10 U	10 U	NA	NA
PAHs (ug/L)							
1-Methylnaphthalene	0.0068 J	0.0051 J	0.0059 J	0.0048 J	0.0036 J	NA	NA
2-Methylnaphthalene	0.013 J	0.0064 J	0.0086 J	0.0093 J	0.0057 J	NA	NA
Acenaphthene	0.011 J	0.011 J	0.0091 J	0.0092 J	0.023 J	NA	NA
Acenaphthylene	0.2 UJ	0.021 J	0.2 UJ	0.0054 J	0.2 UJ	NA	NA
Anthracene	0.2 U	0.2 U	0.2 U	0.0054 J	0.0058 J	NA	NA
Benzo(a)anthracene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Benzo(a)pyrene (BaP)	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Benzo(b)fluoranthene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Benzo(g,h,i)perylene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Benzo(k)fluoranthene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Chrysene	0.2 U	0.0056 J	0.0063 J	0.2 U	0.0076 J	NA	NA
Dibenz(a,h)anthracene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Fluoranthene	0.2 U	0.0052 J	0.2 U	0.2 U	0.01 J	NA	NA
Fluorene	0.0094 J	0.008 J	0.0079 J	0.0084 J	0.0079 J	NA	NA
Indeno(1,2,3-cd)pyrene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Naphthalene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Phenanthrene	0.045 J	0.041 J	0.044 J	0.04 J	0.046 J	NA	NA
Pyrene	0.2 U	0.2 U	0.2 U	0.2 U	0.012 J	NA	NA

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
PCBs (ug/L)						NA	NA
Aroclor-1016	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	NA	NA
Aroclor-1221	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	NA	NA
Aroclor-1232	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	NA	NA
Aroclor-1242	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	NA	NA
Aroclor-1248	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	NA	NA
Aroclor-1254	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	NA	NA
Aroclor-1260	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	NA	NA
Dioxins / Furans (ug/L)							
TCDD, 2,3,7,8-	NA	0.000982 U	NA	0.000963 U	0.00099 U	NA	NA
PeCDD, 1,2,3,7,8-	NA	0.000982 U	NA	0.000963 U	0.00099 U	NA	NA
HxCDD, 1,2,3,4,7,8-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HxCDD, 1,2,3,6,7,8-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HxCDD, 1,2,3,7,8,9-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HpCDD, 1,2,3,4,6,7,8-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
OCDD	NA	0.00491 U	NA	0.00482 U	0.00495 U	NA	NA
TCDF, 2,3,7,8-	NA	0.000982 U	NA	0.000963 U	0.00099 U	NA	NA
PeCDF, 1,2,3,7,8-	NA	0.000982 U	NA	0.000963 U	0.00099 U	NA	NA
PeCDF, 2,3,4,7,8-	NA	0.000982 U	NA	0.000963 U	0.00099 U	NA	NA
HxCDF, 1,2,3,4,7,8-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HxCDF, 1,2,3,6,7,8-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HxCDF, 2,3,4,6,7,8-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HxCDF, 1,2,3,7,8,9-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HpCDF, 1,2,3,4,6,7,8-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
HpCDF, 1,2,3,4,7,8,9-	NA	0.00246 U	NA	0.00241 U	0.00248 U	NA	NA
OCDF	NA	0.00491 U	NA	0.00482 U	0.00495 U	NA	NA
TPH (mg/L)							
Diesel Range Organics (DRO)	0.5 U	0.5 U	0.24 J	0.21 J	0.5 U	NA	NA
Gasoline Range Organics (GRO)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

APPENDIX B (Continued)

SUMMARY OF ANALYTICAL RESULTS, QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI						
	14ER01	14ER02	14ER03	14FB01	14FB02	14TB01	14TB02
	03-07-2006	03-07-2006	03-09-2006	03-08-2006	03-08-2006	03-06-2006	03-08-2006
Metals (ug/L)							
Antimony	1.8 J	1.2 U	1.2 U	1.2 U	1.2 U	NA	NA
Arsenic	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	NA	NA
Barium	0.1 U	0.18 J	0.22 J	0.24 J	41.3 J	NA	NA
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Chromium	0.57 J	1.3 J	1.1 J	1.1 J	1 J	NA	NA
Cobalt	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Copper	0.3 U	0.37 J	0.33 J	0.3 U	42.1	NA	NA
Lead	1.3 J	2 J	1.8 J	2.2 J	1.8 J	NA	NA
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Nickel	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	NA	NA
Selenium	3.3 UJ	3.3 UJ	3.3 UJ	3.3 UJ	3.3 UJ	NA	NA
Silver	0.5 U	0.89 J	1 J	0.53 J	0.5 U	NA	NA
Thallium	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	NA	NA
Vanadium	0.3 U	0.55 J	0.54 J	0.77 J	4 J	NA	NA
Zinc	0.93 J	1.1 J	1.5 J	0.86 J	18.9 J	NA	NA

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed
R - Result is rejected and unusable

APPENDIX C
2006 RFI DATA VALIDATION SUMMARIES

APPENDIX C.1
COMPUCHEM SDG 9335

Michael Baker, Jr., Inc.
5261 Fountain Drive, Suite A
Crown Point, IN 46307

May 9, 2006
SDG# 9335, CompuChem
Naval Activity Puerto Rico, Ceiba, Puerto Rico

Dear Mr. Kimes,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG # 9335. The data validation was performed in accordance with the SW-846 methods utilized by the laboratory; the Region II Standard Operating Procedures for the Validation of Organic Data Acquired Using SW-846 Methods (for 8260B: Rev 1, June 1999-SOP #HW-24; for 8270C-Rev 2, June 2001-SOP #HW-22, for 8082A-Rev. 1.0, May 2002-SOP #HW-23B), and professional judgment. The analytical method used for the metals analysis in this SDG was SW-846 6010B. The Region II SOP HW-2 Rev. 13, September 2005 was written for the CLP SOW ILM05 and was used in the validation of these samples as a guide. For those methods that do not have an applicable Region II checklist SOP (SW-846 method 8015B for DRO and GRO), worksheets were provided. Specific method requirements, Region II flagging conventions and professional judgment were used to validate the metals, DRO and GRO results. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	App IX VOA	App IX SVOA	PAH	PCBs	Metals	DRO	GRO
14ER01	933501	water	X	X	X	X	X	X	X
14ER02	933502	water	X	X	X	X	X	X	X
14ER03	933503	water	X	X	X	X	X	X	X
14FB01	933504	water	X	X	X	X	X	X	X
14FB02	933505	water	X	X	X	X	X	X	X
14TB01	933509	water	X						X
14TB02	933510	water	X						X
14TW01	933507	water	X	X	X			X	X
14TW02	933506	water	X	X	X	X	X	X	X
14TW07	933508	water	X	X	X		X	X	X

The following quality control samples were provided with this SDG: Samples 14ER01, 14ER02 and 14ER03-equipment blanks; samples 14FB01 and 14FB02-field blanks; and samples 14TB01 and 14TB02-trip-blanks. For the purposes of data validation field QC blanks 14ER03, 14TB02, 14FB01 and 14FB02 were associated with the three field water samples in this SDG.

The samples were evaluated based on the following criteria:

• Data Completeness	*
• Technical Holding Times	*
• GC/MS Tuning	*
• GC Performance	
• Initial/Continuing Calibrations	
• CRI Standards	
• Blanks	
• Internal Standards	
• Interference Check Sample	*
• Surrogate Recoveries	*
• Laboratory Control Samples	*
• Matrix Spike Recoveries	NA
• Matrix Duplicate RPDs	NA
• Post Digestion Spike Recoveries	NA
• Serial Dilutions	NA
• Field Duplicates	NA
• Identification/Quantitation	
• Reporting Limits	*
• Tentatively Identified Compounds	NA

* - indicates that qualifications were not required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

A summary of qualifications applied to the sample results are noted below for the fractions validated. Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

VOA

The initial and continuing calibration exhibited some compounds with low RRF values, which resulted in qualifying non-detected values as rejected for these compounds. Due to high %D values some compounds were qualified as estimated.

Blank contamination was noted in the QC blanks associated with samples in this batch. Qualifications were added to the data.

A dilution was required for sample 14TW01, due to results that exceeded the calibration range in the initial analysis.

SVOA

The associated continuing calibrations exhibited high %D for several compounds, which resulted in qualifying these compounds as estimated.

PAH

The associated initial and continuing calibrations exhibited high %RSDs and %D for several compounds, which resulted in qualifying these compounds as estimated.

One sample exhibited high internal standard area recovery for acenaphthene-d10 that resulted in qualifying all associated compound positive results as estimated.

Blank contamination was noted in the method and QC blanks associated with samples in this batch. Qualifications were added to the data.

A dilution was required for sample 14TW01, due to results that exceeded the calibration range in the initial analysis.

Metals

The CRI check standard associated with the samples exhibited a recovery above the QC limit for chromium and below the QC limit for selenium. All reported positive results (up to 2X the CRDL) for chromium required qualification and should be considered usable but estimated J. All reported positive and non-detect results (up to 2X the CRDL) for selenium were qualified and should be considered usable but estimated UJ.

Blank contamination was noted in the calibration, preparation, and field QC blanks associated with samples in this batch. Qualifications were added to the data.

All analytes reported between the instrument detection limit (IDL) and the contract required detection limit (CRDL) are qualified as estimated, J.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were required for the SVOA fraction. The submitted Form III for the matrix spike and matrix spike duplicate listed incorrect percent recoveries, the laboratory was contacted and a corrected form and case narrative was submitted.

Technical Holding Times

According to chain of custody records, sampling was performed on 03/7-9/06 and samples were received at the laboratory 03/10/06. All sample preparation and analysis was performed within Region II holding time requirements.

Initial/Continuing Calibration

VOA

Calibration standards exhibited RRFs and %Ds that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag
IC 03/10/06	acrolein acetonitrile propionitrile	0.027 0.023 0.016	all samples	J/R
	iodomethane	43.486%	14TW02	J
CC 03/16/06 CC 03/17/06	acrolein acetonitrile acrylonitrile propionitrile	0.022, 0.021 0.014, 0.010 0.048, 0.046 0.012, 0.012	all samples	J/R
CC 03/16/06	methacrylonitrile isobutyl alcohol pentachloroethane 1,2-dibromo-3-chloropropane	23.18% 36.31% 35.94% 21.97%	all samples except 14TW07	J/UJ
CC 03/17/06	2-butanone trans-1,4-dichloro-2-butene	0.047 0.039	14TW07	J/R
CC 03/17/06	chloromethane chloroethane iodomethane 3-chloropropene methacrylonitrile isobutyl alcohol 1,4-dioxane pentachloroethane chloroprene	21.49% 21.16% 29.01% 29.85% 20.22% 36.31% 25.04% 30.93% 21.50%	14TW07	J/UJ

SVOA

Calibration standards exhibited %D values that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag
CC 03/16/06	n-nitrosodiethylamine n-nitrosopyrrolidine n-nitroso-di-n-propylamine n-nitrosomorpholine n-nitroso-di-n-butylamine p-phenylenediamine	20.41% 37.38% 31.41% 32.40% 35.24% 39.42%	all samples	J/UJ

PAH

Calibration standards exhibited %RSDs and %D values that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	**Compound(s)**	**RRF, %RSD, %D**	**Samples**	**Q Flag**
IC 04/10/06	1-methylnaphthalene fluoranthene	35.893% 15.288%	14TW01 and 14TW02	J
CC 04/11/06	2-methylnaphthalene 1-methylnaphthalene acenaphthylene	21.79% 33.54% 35.63%	14ER01, 14ER02, 14ER03, 14FB01, 14FB02, 14TW02	J/UJ
CC 04/11/06	1-methylnaphthalene	34.65%	14TW07	J/UJ
CC 04/12/06	1-methylnaphthalene	35.16%	14TW01	J/UJ

Metals

The associated CRDL standard exhibited recoveries outside the 70% - 130% QC limit. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	**Compound(s)**	**%R**	**Samples**	**Q Flag**
CRI	chromium	132.2%	all samples (↑ to 2X CRDL)	J+
	selenium	57.2%	all samples ((↑ to 2X CRDL)	J+, UJ-

Blanks

VOA

The associated method and/or QC blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table.

Blank ID	**Compound**	**Concentration**	**Reporting Limit**	**Action Level**
14ER03	methylene chloride	1.3 ug/L	0.50 ug/L	13 ug/L
	toluene	0.34J	0.50	1.7
14FB01	methylene chloride	1.5 ug/L	0.50ug/L	7.5 ug/L
	toluene	0.55	0.5	2.75
14FB02	acetone	4.2 ug/L	2.5 ug/L	42 ug/L
	chloroform	1.7	0.50	8.5
	bromodichloromethane	0.50	0.50	2.5
	toluene	0.15J	0.50	0.50
	dibromochloromethane	0.28J	0.50	1.4

Associated samples and required qualifications are noted in the following table.

Sample ID	**Compound**	**Q Flag**
14TW01, 14TW02	toluene	CRQL

PAH

The associated method and/or QC blanks exhibited contamination as noted in the following table. QC association for this SDG is: 14ER03, 14FB01 and 14FB02. Compounds for which there was no action required, are not included in the following table.

Blank ID	Compound	Concentration	Reporting Limit	Action Level
SBLKPG	2-methylnapthalene	0.041J ug/L	0.20 ug/L	0.205 ug/L
	1-methylnapthalene	0.046J	0.20	0.23
	acenaphthene	0.0088J	0.20	0.044
	fluorene	0.0085J	0.20	0.0425
	phenanthrene	0.043J	0.20	0.215
	fluoranthene	0.0072J	0.20	0.036
	chrysene	0.006J	0.20	0.03
14ER03	2-methylnapthalene	0.0086J ug/L	0.20 ug/L	0.043 ug/L
	1-methylnapthalene	0.0059J	0.20	0.0295
	acenaphthene	0.0091J	0.20	0.0455
	fluorene	0.0079J	0.20	0.0395
	phenanthrene	0.044J	0.20	0.22
	chrysene	0.0063J	0.20	0.0315
14FB01	acenaphthylene	0.054J ug/L	0.20 ug/L	0.27 ug/L
	anthracene	0.054J	0.20	0.27
	2-methylnapthalene	0.0093J	0.20	0.0465
	1-methylnapthalene	0.0048J	0.20	0.024
	acenaphthene	0.0092J	0.20	0.046
	fluorene	0.0084J	0.20	0.042
	phenanthrene	0.040J	0.20	0.2
14FB02	anthracene	0.0058J ug/L	0.20 ug/L	0.029 ug/L
	pyrene	0.012J	0.20	0.06
	2-methylnapthalene	0.0057J	0.20	0.0285
	1-methylnapthalene	0.0036J	0.20	0.018
	acenaphthene	0.023J	0.20	0.115
	fluorene	0.0079J	0.20	0.0395
	phenanthrene	0.046J	0.20	0.23
	fluoranthene	0.010J	0.20	0.05
	chrysene	0.0076J	0.20	0.038

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag
14TW07	2-methylnapthalene	CRQL
14TW07	1-methylnapthalene	CRQL
14TW07	acenaphthene	CRQL
14TW01, 14TW01, 14TW07	phenanthrene	CRQL
14TW02, 14TW07	fluoranthene	CRQL
14TW02, 14TW07	chrysene	CRQL
14TW01, 14TW02, 14TW07	anthracene	CRQL
14TW02, 14TW07	pyrene	CRQL

Metals

In establishing action limits for the metals analytes, the highest concentration reported in associated blanks is used. This is the concentration noted in the following table tabulating blank contamination. If an analyte was detected in a blank but no action was required, it is not listed in the following table. Qualifications were required due to calibration and field QC blank contamination. Based on Region II guidance and the conventions used by the laboratory in reporting the data, qualifications for results >IDL but ≤CRDL when blank result is >IDL but ≤CRDL are as follows: the results are flagged as non-detect at the reported concentration. This is because the laboratory reported non-detect values down to the analyte IDL rather than the CRDL. Other Region II blank flagging conventions were followed as noted in the Region II checklist worksheets.

Blank ID	**Analyte**	**Concentration**	**Action Level**
ICB/CCB	antimony	1.8B ug/L	U at reported concentration
	barium	0.4B ug/L	
	beryllium	0.4B ug/L	
	calcium	32.9B ug/L	
	magnesium	42.1B ug/L	
	potassium	26.6B ug/L	
	zinc	0.3B ug/L	
14FB02	calcium	31500 ug/L	J or R at reported concentration
	copper	42.1 ug/L	
	magnesium	9460 ug/L	
	sodium	13300 ug/L	

Associated samples and required qualifications are noted in the following table.

Sample ID	**Analyte**	**Q Flag**
14-TW02	antimony, zinc	U at reported conc.
14-TW02, 14-TW07	barium, potassium	
14-TW07	beryllium, calcium, magnesium,	
14-TW02	calcium, magnesium	J
14-TW07	copper, sodium	J
14-TW02	copper	R

Please note: field QC blanks are not qualified due to contamination in laboratory blanks.

Internal Standards

PAH

Sample 14TW01 exhibited high internal standard area recovery for acenaphthene-d10 that resulted in qualifying all associated compound positive results as estimated (J).

Compound Identification/Quantitation

VOA

A dilution was required for sample 14TW01, due to results that exceeded the calibration range in the initial analysis. Therefore, do not use the E-flagged compounds in the initial analysis in favor of the corresponding D-flagged result.

PAH

A dilution was required for sample 14TW01, due to results that exceeded the calibration range in the initial analysis. Therefore, do not use the E-flagged compounds in the initial analysis in favor of the corresponding D-flagged result.

Metals

All sample results reported at concentrations between the instrument detection limit (IDL) and the contract required detection limit (CRDL) are qualified as estimated, J.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff
President

Jacqueline Cleveland
Vice President

Summary of Data Qualifications

VOA

Sample ID	Compound	Results	Q-Flag
all samples	acrolein acetonitrile propionitrile	+/-	J/R
14TW02	iodomethane	+	J
all samples	acrolein acetonitrile acrylonitrile propionitrile	+/-	J/R
all samples except 14TW07	methacrylonitrile isobutyl alcohol pentachloroethane 1,2-dibromo-3-chloropropane	+/-	J/UJ
14TW07	2-butanone trans-1,4-dichloro-2-butene	+/-	J/R
14TW07	chloromethane chloroethane iodomethane 3-chloropropene methacrylonitrile isobutyl alcohol 1,4-dioxane pentachloroethane chloroprene	+/-	J/UJ
14TW01, 14TW02	toluene	+	CRQL
14TW01	all E-flagged compounds	+	R
14TW01 DL	all results except D-flagged compounds	+/-	R

SVOA

Sample ID	Compound	Results	Q-Flag
all samples	n-nitrosodiethylamine n-nitrosopyrrolidine n-nitroso-di-n-propylamine n-nitrosomorpholine n-nitroso-di-n-butylamine p-phenylenediamine	+/-	J/UJ

PAH

Sample ID	Compound	Results	Q-Flag
14TW01 and 14TW02	1-methylnaphthalene fluoranthene	+	J
14ER01, 14ER02, 14ER03, 14FB01, 14FB02, 14TW02	2-methylnaphthalene 1-methylnaphthalene acenaphthylene	+/-	J/UJ
14TW07	1-methylnaphthalene	+/-	J/UJ
14TW01	1-methylnaphthalene	+/-	J/UJ
14TW07	2-methylnapthalene	+	CRQL
14TW07	1-methylnapthalene	+	CRQL
14TW07	acenaphthene	+	CRQL
14TW01, 14TW01, 14TW07	phenanthrene	+	CRQL
14TW02, 14TW07	fluoranthene	+	CRQL
14TW02, 14TW07	chrysene	+	CRQL
14TW01, 14TW02, 14TW07	anthracene	+	CRQL
14TW02, 14TW07	pyrene	+	CRQL
14TW01	all compounds associated with: acenaphthene-d10	+	J
14TW01	all E-flagged compounds	+	R
14TW01 DL	all results except D-flagged compounds	+/-	R

Metals

Sample ID	Analyte	Results	Q flag
all samples	chromium	+ ↑ to 2X CRDL	J
all samples	selenium	+/- ↑ to 2X CRDL	J/UJ
14-TW02	antimony, zinc	+B	U at reported conc.
14-TW02, 14-TW07	barium, potassium		
14-TW07	beryllium, calcium, magnesium,		
14-TW02	calcium, magnesium	+	J
14-TW07	copper, sodium	+	J
14-TW02	copper	+B	R
All Samples	All > IDL < CRDL	+B	J

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high

Method/Preparation Blank Qualification Flags (Q-Flags)

Organic Methods

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
U	The sample result for the blank contaminant is greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value.
CRQL	The sample result for the blank contaminant is less than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value.

Inorganic Methods – Lab Blanks

NA	The sample result is >CRDL and >10X contamination level.
R	The lab blank result is >CRDL and sample result is > CRDL but < ICB/CCB result.
J	The lab blank result is >CRDL and sample result is > ICB/CCB result but <10x ICB/CCB result.
U	The lab blank result is > IDL but ≤CRDL and sample value is >IDL but ≤CRDL.

Inorganic Methods – Field/Rinse Blanks

R	The field/rinse blank result is >CRDL and sample value is >CRDL but < field blank contamination level.
J	The field/rinse blank result is >CRDL and the sample value is >CRDL and <10X the field blank result.
U	The field/rinse blank result is >CRDL and the sample value is >ID> and <CRDL.

Glossary of Qualification Flags and Abbreviations, continued

General Abbreviations

RL	reporting limit
IDL	instrument detection limit
CRDL	contract required detection limit
CRQL	contract required quantitation limit
+	positive result
-	non-detect result

APPENDIX C.2
COMPUCHEM SDG 9336

Michael Baker, Jr., Inc.
5261 Fountain Drive, Suite A
Crown Point, IN 46307

May 12, 2006
SDG# 9336, CompuChem
Naval Activity Puerto Rico, Ceiba, Puerto Rico

Dear Mr. Kimes,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG # 9336. The data validation was performed in accordance with the SW-846 methods utilized by the laboratory; the Region II Standard Operating Procedures for the Validation of Organic Data Acquired Using SW-846 Methods (for 8260B: Rev 1, June 1999-SOP #HW-24; for 8270C-Rev 2, June 2001-SOP #HW-22, for 8082A-Rev. 1.0, May 2002-SOP #HW-23B), and professional judgment. The analytical method used for the metals analysis in this SDG was SW-846 6010B. The Region II SOP HW-2 Rev. 13, September 2005 was written for the CLP SOW ILM05 and was used in the validation of these samples as a guide. For those methods that do not have an applicable Region II checklist SOP (SW-846 method 8015B for diesel and gasoline), worksheets were provided. Specific method requirements, Region II flagging conventions and professional judgment were used to validate the metals, DRO and GRO results. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	App IX VOA	App IX SVOA	PAH	PCBs	Metals	DRO	GRO
14SB01-00	933603	soil	X	X	X	X	X	X	X
14SB01-06	933604	soil	X	X	X	X	X	X	X
14SB01-11	933601	soil	X	X	X	X	X	X	X
14SB01-11 DUP	933602	soil	X	X	X	X	X	X	X
14SB02-00	933605	soil	X	X	X	X	X	X	X
14SB02-03	933606	soil	X	X	X	X	X	X	X
14SB02-08	933607	soil	X	X	X	X	X	X	X
14SB03-00	933608	soil	X	X	X	X	X	X	X
14SB03-06	933609	soil	X	X	X	X	X	X	X
14SB03-11	933610	soil	X	X	X	X	X	X	X
14SB04-01	933611	soil	X	X		X	X	X	X
14SB04-10	933612	soil	X	X	X	X	X	X	X
14SB05-02	933613	soil	X	X	X	X	X	X	X
14SB05-09	933614	soil	X	X	X	X	X	X	X
14SB06-01	933615	soil	X	X	X	X	X	X	X
14SB06-07	933616	soil	X	X	X	X	X	X	X
14SB06-07 DUP	933617	soil	X	X	X	X	X	X	X
14SB07-00	933618	soil	X	X	X	X	X	X	X
14SB07-06	933619	soil	X	X	X	X	X	X	X
14SB07-08	933620	soil	X	X	X	X	X	X	X
14SB01-11 MS	96154	soil	X	X	X	X	X	X	X
14SB01-11 MSD	96155	soil	X	X	X	X	X	X	X

The following quality control samples were provided with this SDG: sample 14SB01-11DUP-duplicate of field sample 14SB01-11; sample 14SB06-07DUP-duplicate of field sample 14SB06-07DUP. Associated field QC blanks 14FB01, 14FB02, 14ER01 and 14ER02 were analyzed in SDG 9335. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times
- GC/MS Tuning *
- Initial/Continuing Calibrations
- CRI Standards
- Blanks
- Internal Standards
- Interference Check Sample *
- Surrogate Recoveries
- Laboratory Control Samples *
- Matrix Spike Recoveries
- Matrix Duplicate RPDs
- Post Digestion Spike Recoveries *
- Serial Dilutions
- Field Duplicates
- Identification/Quantitation
- Reporting Limits *
- Tentatively Identified Compounds NA

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

A summary of qualifications applied to the sample results are noted below for the fractions validated. Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

VOA

One sample, 14SB04-10, exceeded the Region II holding time of 10 days by four days; all results were qualified as estimated.

The initial and continuing calibration exhibited some compounds with low RRF values, which resulted in qualifying non-detected values as rejected for these compounds. Due to high %D values some compounds were qualified as estimated.

Blank contamination was noted in the method and field QC blanks associated with samples in this batch. Qualifications were added to the data.

Four samples exhibited non-compliant surrogate recoveries that required qualifying the data as estimated.

The associated medium level matrix spike and matrix spike duplicate and medium level LCSs exhibited non-compliant recoveries for chloroethane. This resulted in all samples analyzed at medium level to have the compound results for chloroethane qualified as estimated.

SVOA

The associated continuing calibrations exhibited high %D for several compounds, which resulted in qualifying these compounds as estimated.

Sample 14SB01-11 and field duplicate 14SB01-11DUP did not exhibit comparable results for 2-methylnapthalene that resulted in qualifying the compound as estimated.

PAH

The associated initial and continuing calibrations exhibited high %RSDs and %D for several compounds, which resulted in qualifying these compounds as estimated.

Sample 14SB01-11 and field duplicate sample 14SB01-11DUP did not exhibit comparable results for naphthalene, 1-methylnapthalene and 2-methylnapthalene which resulted in qualifying these compounds as estimated.

A dilution was required for samples 14SB02-08, 14SB02-03 and 14SB01-11DUP, due to results that exceeded the calibration range in the initial analysis.

PCBs

Two samples exhibited non-compliant surrogate recoveries that required qualification of the reported sample results as estimated.

Metals

The CRI check standard associated with the samples exhibited a recovery above the QC limit for chromium and below the QC limit for selenium. All reported positive results (up to 2X the CRDL) for chromium required qualification and should be considered usable but estimated J. All reported positive and non-detect results (up to 2X the CRDL) for selenium were qualified and should be considered usable but estimated UJ.

Blank contamination was noted in the calibration, preparation, and field QC blanks associated with samples in this batch. Qualifications were added to the data.

Seven analytes were recovered outside the QC limits in the matrix spike and/or matrix spike duplicate associated with the soil samples. Based on Region II guidance and

professional judgment results were flagged J or R depending on the recovery. The post-digestion spike was analyzed as required by the method and exhibited acceptable recoveries for all analytes except selenium and thallium.

Eight analytes exhibited RPDs greater than the QC limit in the duplicate analysis associated with these soil samples. All reported positive results for the non-compliant analytes were qualified as estimated J.

Thirteen analytes exhibited %Ds greater than the 10% QC limit in the serial dilution analysis associated with these soil samples. All positive results for the non-compliant analytes were qualified as estimated J.

The field duplicate pairs submitted with this SDG exhibited non-compliant RPDs for one or more analytes. Based on Region II guidance analytes were flagged R or J depending on the RPD in the field sample and duplicate only.

All analytes reported between the instrument detection limit (IDL) and the contract required detection limit (CRDL) are qualified as estimated, J.

Diesel

One sample, 14SB06-07DUPRE, was extracted two days outside the extraction holding time for soil samples. The reported positive result in the sample was qualified as estimated J. The sample was re-extracted because the original extraction exhibited a low surrogate recovery (18%). The original extraction was rejected in favor of the data reported from the re-extraction analysis.

Blank contamination was noted in one field QC blank associated with samples in this batch. Qualifications were added to the data.

The MS/MSD pair of sample 14SB01-11 exhibited low recoveries for the target compound. The reported result was qualified as estimated J in the unspiked sample only.

Gasoline

One sample required a dilution to accurately quantitate the target fuel. The original analysis of the sample (14SB01-06) was rejected in favor of the dilution result.

The MS/MSD pair of sample 14SB01-11 exhibited low recoveries for the target compound. The reported result was qualified as estimated J in the unspiked sample only.

The field duplicate pair of samples 14SB01-11/14SB01-11DUP submitted with this SDG exhibited a non-compliant RPD for the target fuel. The results in the field duplicate pair were qualified as estimated J.

Specific Evaluation of Data

Data Completeness

Resubmissions were required for the SVOA fraction and for the metals fraction. For the SVOA fraction, the submitted Form III for the matrix spike and matrix spike duplicate listed incorrect percent recoveries, the laboratory was contacted and a corrected form and case narrative was submitted. For the metals fraction, one set of continuing calibration forms was missing from the data package. Raw data for these standards was present as required. The laboratory was contacted and the missing forms and a corrected form 14 were received. A copy of all e-mail correspondence is included in the validation worksheets.

Technical Holding Times

According to chain of custody records, sampling was performed on 03/6-7/06 and samples were received at the laboratory 03/10/06. All sample preparation and analysis was performed within Region II holding time requirements with the following exceptions.

VOA

Sample 14SB04-10 exceeded the Region II holding time for soils of 10 days by four days; all results were qualified as estimated (J/UJ).

Initial/Continuing Calibration

VOA

Calibration standards exhibited RRFs and %Ds that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag
IC 03/10/06	acetonitrile isobutyl alcohol 1,4-dioxane	0.0275 0.007 0.002	all low level samples	J/R
CC 03/11/06	acetonitrile isobutyl alcohol 1,4-dioxane	0.033 0.010 0.002	all low level samples	J/R
CC 03/11/06	2-butanone methacrylonitrile 2-hexanone 1,2-dibromo-3-chloropropane	21.67% 28.36% 21.46% 32.99%	all low level samples	J/UJ
IC 03/13/06	acrolein propionitrile isobutyl alcohol 1,4-dioxane	0.0215 0.0240 0.0068 0.0019	all medium level samples	J/R

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag
CC 03/15/06	acrolein propionitrile isobutyl alcohol 1,4-dioxane	0.0216 0.0299 0.0098 0.0028	14SB04-01, 14SB01-11DL, 14SB01-11DUP DL	J/R
CC 03/15/06	iodomethane acetone acrylonitrile 2-butanone methacrylonitrile dibromomethane methylmethacrylate tetrachloroethene pentachloroethane	22.32% 28.85% 20.62% 24.63% 20.76% 20.96% 25.31% 31.30% 24.03%	14SB04-01, 14SB01-11DL, 14SB01-11DUP DL	J/UJ
CC 03/20/06	acrolein propionitrile isobutyl alcohol 1,4-dioxane	0.017 0.038 0.012 0.003	14SB04-10	J/R
CC 03/20/06	bromomethane chloroethane acetone acrylonitrile vinyl acetate 2-butanone methacrylonitrile 1,2-dichloroethane methylmethacrylate 4-methyl-2-pentanone ethylmethacrylate 2-hexanone 1,2,3-trichloropropane trans-1,4-dichloro-2-butene 1,2-dibromo-3-chloropropane	30.26% 20.13% 68.99% 55.82% 23.84% 76.38% 49.92% 27.65% 41.90% 31.05% 23.33% 35.98% 20.18% 37.32% 23.48%	14SB04-10	J/UJ

SVOA

Calibration standards exhibited %D values that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag
CC 03/31/06 CC 04/01/06	nitrosomethylethylamine n-nitrosodiethylamine n-nitrosopyrrolidine n-nitroso-di-n-propylamine n-nitrosomorpholine n-nitroso-di-n-butylamine p-phenylenediamine 4-nitrophenol a,a-dimethylphenethylamine	24.82%, 24.81% 30.99%, 31.49% 45.19%, 45.98% 43.80%, 44.30% 41.82%, 42.42% 43.73%, 44.59% 52.68%, 48.67% 20.69%, 25.62% 52.96%, 52.72%	all samples	J/UJ

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag
CC 04/01/06	2,4-dinitrophenol 4-nitroquinoline-1-oxide methapyrilene	28.14% 28.20% 21.54%	14SB04-01, 14SB04-10, 14SB03-11, 14SB05-02, 14SB05-09, 14SB06-01, 14SB06-07, 14SB06-07DUP, 14SB07-00, 14SB07-06, 14SB07-08, 14SB03-06	J/UJ

PAH

Calibration standards exhibited %RSDs and %D values that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag
IC 04/10/06	1-methylnaphthalene fluoranthene	35.893% 15.288%	all samples	J
CC 04/11/06	2-methylnaphthalene 1-methylnaphthalene acenaphthylene	21.79% 33.54% 35.63%	14SB03-00, 14SB03-06, 14SB03-11, 14SB04-10, 14SB05-02, 14SB05-09, 14SB06-01, 14SB06-07	J/UJ
CC 04/11/06	1-methylnaphthalene	34.65%	14SB06-07DUP, 14SB07-00, 14SB07-06, 14SB07-08	J/UJ

Metals

The associated CRDL standard exhibited recoveries outside the 70% - 130% QC limit. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	%R	Samples	Q Flag
CRI	chromium	132.2%	all samples (↑ to 2X CRDL)	J+
	selenium	57.2%	all samples ((↑ to 2X CRDL)	J+, UJ-

Blanks

VOA

The associated method and/or QC blanks exhibited contamination as noted in the following table. QC association for this SDG is: 14TB01, 14ER01, 14ER02, 14FB01 and 14FB02.

Blank ID	Compound	Concentration	Reporting Limit	Action Level
VBLKDM	acetone	260J ug/Kg	630 ug/Kg	2600 ug/Kg
	trans-1,4-dichloro-2-butene	290J	1000	1450
14TB01	benzene	0.11J ug/L	0.5	5.5 ug/Kg

Blank ID	Compound	Concentration	Reporting Limit	Action Level
14ER01	methylene chloride	1.6 ug/L	0.50 ug/L	80 ug/Kg
	toluene	0.76 ug/L	0.5	38
14ER02	methylene chloride	1.2 ug/L	0.5 ug/L	60 ug/Kg
	toluene	0.52 ug/L	0.5	26
14FB01	methylene chloride	1.5 ug/L	0.50ug/L	75 ug/Kg
	toluene	0.55	0.5	27.5
14FB02	acetone	4.2 ug/L	2.5 ug/L	420 ug/Kg
	chloroform	1.7	0.50	85
	bromodichloromethane	0.50	0.50	25
	toluene	0.15J	0.50	5.0
	dibromochloromethane	0.28J	0.50	14

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag
14SB04-01, 14SB01-06, 14SB01-11DL, 14SB01-11DUPDL, 14SB02-08, 14SB07-06, 14SB07-08	acetone	CRQL
14SB01-00, 14SB02-00, 14SB03-00, 14SB05-02, 14SB06-01, 14SB07-00	acetone	U
14SB01-00, 14SB02-00	toluene	U
14SB02-03, 14SB02-08, 14SB03-00, 14SB03-11, 14SB05-02, 14SB06-01, 14SB06-07DUP, 14SB07-08	toluene	CRQL
14SB02-00	benzene	U
14SB02-03, 14SB05-02, 14SB06-01	benzene	CRQL

PAH

The associated QC blanks exhibited contamination as noted in the following table. QC association for this SDG is: 14ER01, 14ER02, 14FB01 and 14FB02. The associated method blanks exhibited no contamination

Blank ID	Compound	Concentration	Reporting Limit	Action Level
14ER01	2-methylnapthalene	0.013J ug/L	0.20 ug/L	0.065ug/L
	1-methylnapthalene	0.0068J	0.20	1.14
	acenaphthene	0.011J	0.20	1.84
	fluorene	0.0094J	0.20	1.57
	phenanthrene	0.045J	0.20	7.54
14ER02	2-methylnapthalene	0.0064J	0.20 ug/L	1.072 ug/Kg
	1-methylnapthalene	0.0051J	0.20	0.85
	acenaphthylene	0.021J	0.20	3.52
	acenaphthene	0.011J	0.20	1.84
	fluorene	0.0080J	0.20	1.34
	phenanthrene	0.041J	0.20	6.87
	fluoranthene	0.0052J	0.20	0.87
	chrysene	0.0056J	0.20	0.94

Blank ID	Compound	Concentration	Reporting Limit	Action Level
14FB01	acenaphthylene	0.054J ug/L	0.20 ug/L	9.045 ug/Kg
	anthracene	0.054J	0.20	9.045
	2-methylnapthalene	0.0093J	0.20	1.56
	1-methylnapthalene	0.0048J	0.20	0.804
	acenaphthene	0.0092J	0.20	1.54
	fluorene	0.0084J	0.20	1.407
	phenanthrene	0.040J	0.20	6.7
14FB02	anthracene	0.0058J ug/L	0.20 ug/L	0.97 ug/Kg
	pyrene	0.012J	0.20	2.01
	2-methylnapthalene	0.0057J	0.20	0.95
	1-methylnapthalene	0.0036J	0.20	0.603
	acenaphthene	0.023J	0.20	3.85
	fluorene	0.0079J	0.20	1.32
	phenanthrene	0.046J	0.20	7.71
	fluoranthene	0.010J	0.20	1.67
	chrysene	0.0076J	0.20	1.27

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag
14SB02-03, 14SB02-08, 14-SB06-01	phenanthrene	CRQL

Metals

In establishing action limits for the metals analytes, the highest concentration reported in associated blanks is used. This is the concentration noted in the following table tabulating blank contamination. If an analyte was detected in a blank but no action was required, it is not listed in the following table. Qualifications were required due to calibration and field QC blank contamination. Based on Region II guidance for calibration blank action and the conventions used by the laboratory in reporting the data, qualifications for results >IDL but ≤CRDL when blank result is >IDL but ≤CRDL are as follows: the results are flagged as non-detect at the reported concentration. This is because the laboratory reported non-detect values down to the analyte IDL rather than the CRDL. Other Region II blank flagging conventions were followed as noted in the Region II checklist worksheets.

Blank ID	Analyte	Concentration	Action Level
ICB/CCB	antimony	1.5B ug/L	U at reported concentration
	barium	0.6B ug/L	
	beryllium	0.3B ug/L	
	cadmium	0.5B ug/L	
	calcium	38.3B ug/L	
	magnesium	41.5B ug/L	
	potassium	67.7B ug/L	
	silver	1.8B ug/L	
	sodium	430.4B ug/L	

Blank ID	Analyte	Concentration	Action Level
14FB02	calcium	31500 ug/L	J or R at reported concentration
	copper	42.1 ug/L	
	magnesium	9460 ug/L	
	sodium	13300 ug/L	

Associated samples and required qualifications are noted in the following table.

Sample ID	Analyte	Q Flag
all samples with concentrations < CRQL	antimony, barium, beryllium, cadmium, calcium, magnesium, potassium, silver, sodium	U at reported conc.
all samples with concentrations >CRQL but <FB contamination level	calcium, magnesium, sodium	R
all samples with concentrations >FB but less than 10X FB contamination level	calcium, magnesium, sodium	J

Diesel

One of the associated field QC blanks exhibited contamination as noted in the following table.

Blank ID	Compound	Concentration	Action Level	Q Flag
14FB01	diesel	0.21J ug/L	1.05 ug/L or 21 mg/Kg	U, RL

Sample ID	Compound	Q Flag
14SB01-00, 14SB02-00, 14SB03-00, 14SB03-06, 14SB03-11, 14SB05-02, 14SB06-07, 14SB06-07DUP	diesel	RL
14SB05-09, 14SB07-00, 14SB07-06, 14SB07-08	diesel	U

Surrogates

VOA

The samples listed in the table below exhibited non-compliant surrogate recoveries for the surrogates listed. The samples were qualified as stated in the table.

Sample ID	Non-compliant Surrogate	% Recovery	QC limits	Q Flag
14SB01-06	dibromofluoromethane	12%	85-115%	J/UJ
	bromofluorobenzene	302%	75-120%	
14SB02-03	bromofluorobenzene	128%	75-120%	J
14SB05-09	dibromofluoromethane	73%	85-115%	J/UJ
14SB04-10	1,2-dichloroethane-d4	132%	70-120%	J

PCBs

The samples listed in the table below exhibited non-compliant surrogate recoveries for the surrogates listed. The samples were qualified as stated in the table.

Sample ID	Non-compliant Surrogates	% Recovery	Q Flag
14SB02-03	TCMX and DCB	42%/47%, 48%	J/UJ
14SB04-01		25%, 23%/30%, 30%	

Matrix Spike and Matrix Spike Duplicate

VOA

The associated medium level matrix spike and matrix spike duplicate, 14SB01-11, and medium level LCSs exhibited low recoveries for chloroethane. Therefore, the compound results for chloroethane in all samples analyzed at medium level have been qualified as estimated (J/UJ).

Metals

The MS/MSD pair of sample 14SB01-11 exhibited recoveries above and below the QC limits. The PDS spikes exhibited acceptable recoveries with the exception of selenium and thallium. Results in the field samples were flagged based on Region II guidance and professional judgment. Specific recovery and action information is noted in the following table.

MS/MSD ID	Analytes	Samples Affected	%Recovery	Q Flag
14SB01-11	antimony	all samples	46.5%/47.8%	J/UJ
	thallium		65.9%	
	arsenic		142.2%	J
	lead		158.6%	
	selenium		185.0%	
	vanadium		193.0%/305.6%*	
	copper		221.1%/270.8%	R

* vanadium was flagged based on professional judgment because only one spike recovery was greater than 200%.

Diesel

The MS/MSD pair of sample 14SB01-11 exhibited recoveries below the QC limits. Specific recovery and action information is noted in the following table.

MS/MSD ID	Compound	Samples Affected	%Recovery	Q Flag
14SB01-11	diesel	14SB01-11	39%/ 28%	J

Gasoline

The MS/MSD pair of sample 14SB01-11 exhibited recoveries above and below the QC limits. Specific recovery and action information is noted in the following table.

MS/MSD ID	Compound	Samples Affected	%Recovery	Q Flag
14SB01-11	gasoline	14SB01-11	-180%/153%	J

Matrix Duplicate Precision

Metals

The matrix duplicate analysis of the sample 14SB01-11 exhibited non-compliant %Ds (>20%) for eight analytes. Specific action is noted in the following table.

MD	Analytes	Samples Affected	%D	Q Flag
14SB01-11	arsenic	all samples	62.6%	J+
	copper		40.9%	
	iron		37.2%	
	lead		28.4%	
	manganese		22.5%	
	selenium		57.4%	
	vanadium		45.5%	
	zinc		35.3%	

Serial Dilutions

Metals

The serial dilution analysis of the sample 14SB01-11 analyzed for the samples in this SDG exhibited non-compliant %Ds for thirteen analytes. Specific action is noted in the following table.

SD ID	Analytes	Samples Affected	%Difference	Q Flag
14SB01-11	aluminum	all samples	12.5%	J+
	barium		13.3%	
	calcium		15.5%	
	chromium		15.0%	
	cobalt		21.3%	
	iron		13.3%	
	magnesium		16.3%	
	manganese		12.9%	
	nickel		19.3%	
	potassium		11.7%	
	sodium		31.2%	
	vanadium		11.6%	
	zinc		11.1%	

Field Duplicate

SVOA

Sample 14SB01-11 and field duplicate 14SB01-11DUP did not exhibit comparable results for 2-methylnapthalene (83% RPD) that resulted in qualifying the compound as estimated.

PAH

Sample 14SB01-11 and field duplicate sample 14SB01-11DUP did not exhibit comparable results for naphthalene (72% RPD), 1-methylnapthalene (56% RPD) and 2-methylnapthalene (87% RPD) which resulted in qualifying these compounds as estimated.

Metals

The field duplicate pair of samples 14SB01-11 and 14SB01-11DUP exhibited non-compliant precision results for the analyte barium (150%). Based on Region II guidelines, the reported result for barium in the field duplicate pair is rejected R.

The field duplicate pair of samples 14SB06-07 and 14SB06-07DUP exhibited non-compliant precision results for the analytes copper (69%), iron (43%), and vanadium (46%). Based on Region II guidelines, the reported results for copper, iron and vanadium in the field duplicate pair are qualified as estimated J.

Gasoline

Sample 14SB01-11 and field duplicate sample 14SB01-11DUP did not exhibit comparable results for gasoline (133% RPD). The target fuel was qualified as estimated J in both the field sample and field duplicate.

Compound Identification/Quantitation

VOA

According to the case narrative samples "14SB01-11 and 14SB01-11 DUP were re-analyzed as medium level due to the large amount of organic material present as demonstrated by the number of TICs." The low level analysis also exhibited non-compliant surrogate recoveries. The medium level analysis of these samples exhibited compliant surrogate recoveries. Therefore, the low level analysis for these samples was not used in favor of the medium analysis.

Samples 14SB01-06 and 14SB04-10 were reanalyzed due to non-compliant surrogate recoveries. The reanalysis exhibited similar results; therefore, the reanalysis of these samples was not used in favor of the initial analysis.

PAH

A dilution was required for samples 14SB02-08, 14SB02-03 and 14SB01-11DUP, due to results that exceeded the calibration range in the initial analysis. Therefore, the E-flagged compounds in the initial analysis were not used in favor of the corresponding D-flagged result.

PCBs

Sample 14SB04-01 was re-extracted due to non-compliant surrogate recoveries. The re-extraction exhibited similar results; therefore, the re-extraction of this sample was not used in favor of the initial analysis.

Metals

All sample results reported at concentrations between the instrument detection limit (IDL) and the contract required detection limit (CRDL) are qualified as estimated, J.

Diesel

Sample 14SB06-07 was re-extracted due to non-compliant surrogate recoveries. The re-extraction exhibited acceptable recoveries; therefore, the original analysis of this sample was not used in favor of the re-extraction.

Gasoline

A dilution was required for sample 14SB01-06 due to results that exceeded the calibration range in the initial analysis. Therefore, the E-flagged compound in the initial analysis was not used in favor of the corresponding D-flagged result.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff
President

Jacqueline Cleveland
Vice President

Summary of Data Qualifications

VOA

Sample ID	Compound	Results	Q-Flag
14SB04-10	all results	+/-	J/UJ
all low level samples	acetonitrile isobutyl alcohol 1,4-dioxane	+/-	J/R
all low level samples	acetonitrile isobutyl alcohol 1,4-dioxane	+/-	J/R
all low level samples	2-butanone methacrylonitrile 2-hexanone 1,2-dibromo-3-chloropropane	+/-	J/UJ
all medium level samples	acrolein propionitrile isobutyl alcohol 1,4-dioxane	+/-	J/R
14SB04-01, 14SB01-11DL, 14SB01-11DUP DL	acrolein propionitrile isobutyl alcohol 1,4-dioxane	+/-	J/R
14SB04-01, 14SB01-11DL, 14SB01-11DUP DL	iodomethane acetone acrylonitrile 2-butanone methacrylonitrile dibromomethane methylmethacrylate tetrachloroethene pentachloroethane	+/-	J/UJ
14SB04-10	acrolein propionitrile isobutyl alcohol 1,4-dioxane	+/-	J/R
14SB04-10	bromomethane chloroethane acetone acrylonitrile vinyl acetate 2-butanone methacrylonitrile 1,2-dichloroethane methylmethacrylate 4-methyl-2-pentanone ethylmethacrylate 2-hexanone 1,2,3-trichloropropane trans-1,4-dichloro-2-butene 1,2-dibromo-3-chloropropane	+/-	J/UJ

Sample ID	Compound	Results	Q-Flag
14SB04-01, 14SB01-06, 14SB01-11DL, 14SB01-11DUPDL, 14SB02-08, 14SB07-06, 14SB07-08	acetone	+	CRQL
14SB01-00, 14SB02-00, 14SB03-00, 14SB05-02, 14SB06-01, 14SB07-00	acetone	+	U
14SB01-00, 14SB02-00	toluene	+	U
14SB02-03, 14SB02-08, 14SB03-00, 14SB03-11, 14SB05-02, 14SB06-01, 14SB06-07DUP, 14SB07-08	toluene	+	CRQL
14SB02-00	benzene	+	U
14SB02-03, 14SB05-02, 14SB06-01	benzene	+	CRQL
all medium level samples	chloroethane	+/-	J/UJ
14SB01-11 and 14SB01-11 DUP	all low level results	+/-	R
14SB01-06 RE and 14SB04-10 RE	all results	+/-	R

SVOA

Sample ID	Compound	Results	Q-Flag
all samples	nitrosomethylethylamine n-nitrosodiethylamine n-nitrosopyrrolidine n-nitroso-di-n-propylamine n-nitrosomorpholine n-nitroso-di-n-butylamine p-phenylenediamine 4-nitrophenol a,a-dimethylphenethylamine	+/-	J/UJ
14SB04-01, 14SB04-10, 14SB03-11, 14SB05-02, 14SB05-09, 14SB06-01, 14SB06-07, 14SB06-07DUP, 14SB07-00, 14SB07-06, 14SB07-08, 14SB03-06	2,4-dinitrophenol 4-nitroquinoline-1-oxide methapyrilene	+/-	J/UJ
14SB01-11 and 14SB01-11DUP	2-methylnapthalene	+	J

PAH

Sample ID	Compound	Results	Q-Flag
all samples	1-methylnaphthalene fluoranthene	+	J
14SB03-00, 14SB03-06, 14SB03-11, 14SB04-10, 14SB05-02, 14SB05-09, 14SB06-01, 14SB06-07	2-methylnaphthalene 1-methylnaphthalene acenaphthylene	+/-	J/UJ
14SB06-07DUP, 14SB07-00, 14SB07-06, 14SB07-08	1-methylnaphthalene	+/-	J/UJ
14SB02-03, 14SB02-08, 14SB06-01	phenanthrene	+	CRQL
14SB02-08, 14SB02-03 and 14SB01-11DUP	all E-flagged compounds	+	R
14SB02-08DL, 14SB02-03DL and 14SB01-11DUPDL	all results except D-flagged compounds	+/-	R

Sample ID	Compound	Results	Q-Flag
14SB01-11 and 14SB01-11DUP	naphthalene 1-methylnapthalene 2-methylnapthalene	+	J

PCBs

Sample ID	Compound	Results	Q-Flag
14SB02-03, 14SB04-01	all compounds	+/-	J/UJ
14SB04-01RE	all compounds	+/-	R

Metals

Sample ID	Analyte	Results	Q flag
all samples	chromium	+ ↑ to 2X CRDL	J
all samples	selenium	+/- ↑ to 2X CRDL	J/UJ
all samples with concentrations < CRQL	antimony, barium, beryllium, cadmium, calcium, magnesium, potassium, silver, sodium	+	U at reported conc.
all samples with concentrations >CRQL but <FB contamination level	calcium, magnesium, sodium	+	R
all samples with concentrations >FB but less than 10X FB contamination level	calcium, magnesium, sodium	+	J
all samples	antimony	+/-	J/UJ
	thallium		
	arsenic	+	J
	lead		
	selenium		
	vanadium		
	copper	+/-	R
all samples	arsenic, copper, iron, lead, manganese, selenium, vanadium, zinc	+	J
all samples	aluminum, barium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, potassium, sodium, vanadium, zinc	+	J
14SB01-11 and 14SB01-11DUP	barium	+	R
14SB06-07 and 14SB06-07DUP	copper, iron, vanadium	+	J
All Samples	All > IDL < CRDL	+B	J

Diesel

Sample ID	Compound	Results	Q-Flag
14SB06-07DUPRE	diesel	+/-	J
14SB01-00, 14SB02-00, 14SB03-00, 14SB03-06, 14SB03-11, 14SB05-02, 14SB06-07, 14SB06-07DUP	diesel	+	RL
14SB05-09, 14SB07-00, 14SB07-06, 14SB07-08	diesel	+	U
14SB01-11	diesel	+	J
14SB06-07DUP	diesel	+/-	R

Gasoline

Sample ID	Compound	Results	Q-Flag
14SB01-11	gasoline	+	J
14SB01-11, 14SB01-11DUP	gasoline	+	J
14SB01-06	E-flagged compound	+E	R

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high

Method/Preparation Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X (10X for common laboratory contaminants) the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
U	The sample result for the blank contaminant is greater than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value.
RL	The sample result for the blank contaminant is less than the sample RL and is less than 5X (10X for common laboratory contaminants) the blank value.

General Abbreviations

RL	reporting limit
+	positive result
-	non-detect result

APPENDIX C.3
PARADIGM ANALYTICAL LABS SDG G349-146

Michael Baker, Jr., Inc.
5261 Fountain Drive, Suite A
Crown Point, IN 46307

May 11, 2006
SDG# G349-146, Paradigm Analytical Labs
Naval Activity Puerto Rico, Ceiba, Puerto Rico

Dear Mr. Kimes,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG # G349-146. The data validation was performed in accordance with the SW-846 method utilized by the laboratory and professional judgment. Region II does not have a validation SOP for this method, therefore, the validator used the QC requirements of the method, Region II flagging conventions as applicable, and professional judgment to validate the Dioxin/Furan results. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	D/F
14FB01	G349-146-5B	water	X
14FB02	G349-146-6B	water	X
14ER02	G349-146-7B	water	X
14SB04-01	G349-146-1B	soil	X
14SB05-09	G349-146-2B	soil	X
14SB06-07	G349-146-3B	soil	X
14SB06-07DUP	G349-146-4B	soil	X

The following quality control samples were provided with this SDG: Sample 14ER02-equipment blank; samples 14FB01 and 14FB02-field blanks; and sample 14SB06-07DUP-field duplicate of sample 14SB06-07.

- Data Completeness *
- Technical Holding Times *
- Column Resolution *
- Window Defining Mixture *
- Initial/Continuing Calibrations *
- Blanks
- Recovery Standard Recoveries *
- Internal Standard Recoveries *
- Ongoing Precision Results *
- Matrix Spike Recoveries NA
- Field Duplicates *

- Identification/Quantitation
- Reporting Limits *

* - indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

A summary of qualifications applied to the sample results are noted below for the fractions validated. Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Dioxin/Furan

Blank contamination was noted in the blanks associated with samples in this batch. Qualifications were added to the data.

Results reported as EMPC that were not flagged R due to method blank contamination and results reported below the lower calibration limit were qualified as estimated J

Specific Evaluation of Data

Data Completeness

The SDG was received intact. Further standards information was requested from the laboratory. This information was provided by the laboratory via e-mail on 5/11/06. Copies of requests and communication between the laboratory and the validator are included in the validation worksheets.

Technical Holding Times

According to chain of custody records, sampling was performed on 3/6-9/06 and samples were received at the sub-contract laboratory on 3/17/06. All sample preparation and analysis was performed within holding time requirements. Chain of custody and receipt documentation are included in the validation worksheets.

Blanks

The method blank associated with the soil samples exhibited contamination as noted in the following table.

Blank ID	Analyte	Concentration	Action Level
LMB12402	total TCDFs	47.3 pg/g EMPC	236.5 pg/g

Sample ID	Compound	Q Flag
14SB04-01, 14SB05-09, 14SB06-07, 14SB06-07DUP	Total TCDFs (EMPC)	R

One sample result was reported at a concentration below the lower calibration level and was qualified as estimated, J.

The EMPC values for total TCDFs in the field QC blank samples were qualified as estimated J.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Jacqueline Cleveland
Vice President

Summary of Data Qualifications

Dioxin/Furan

Sample ID	Compound	Results	Q-Flag
14SB04-01, 14SB05-09, 14SB06-07, 14SB06-07DUP	Total TCDFs	+ EMPC	R
14FB01, 14FB02, 14ER02	Total TCDFs	+ EMPC	J
14SB04-01	1,2,3,4,6,7,8-HpCDD	+A	J

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected, the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high

Method/Preparation Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
U at RL	The sample result for the blank contaminant is less than the sample RL and is less than 5X the blank value. The sample result for the blank contaminant is qualified as U at the compound RL.
U	The sample result for the blank contaminant is greater than the sample RL but is less than 5X the blank value. The sample result for the blank contaminant is qualified as U at the compound value reported.
R	The sample results and the blank contaminant were reported as EMPC values due to unmet QC criteria. The sample result is less than 5X the blank value. The sample result is rejected and red-lined.

General Abbreviations

RL	reporting limit
Q flag	validation flag
+	positive result
-	non-detect result
EMPC	estimated maximum possible concentration

APPENDIX D
HUMAN HEALTH RISK ASSESSMENT DATA SETS

APPENDIX D

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Volatiles (ug/kg)									
1,1,1,2-Tetrachloroethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
1,1,1-Trichloroethane (TCA)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1,2,2-Tetrachloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1,2-Trichloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1-Dichloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1-Dichloroethene	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,2,3-Trichloropropane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dibromo-3-chloropropane (DBCP)	25 UJ	25 UJ	23 UJ	24 U	22 U	4.5 UJ	5 UJ	5.4 UJ	4.3 UJ
1,2-Dibromoethane (EDB)	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloroethane	6 UJ	6 UJ	6 UJ	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloropropane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,3-Dichloropropene (cis)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,3-Dichloropropene (trans)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,4-Dichloro-2-butene (trans)	25 U	25 UJ	23 U	24 U	22 U	90 U	100 U	110 U	85 U
2-Butanone (MEK)	12 U	12 UJ	12 U	12 U	11 U	36 J	31 J	23 J	11 UJ
2-Chloro-1,3-butadiene (Chloroprene)	120 U	120 UJ	120 U	120 U	110 U	4.5 U	5 U	5.4 U	4.3 U
2-Hexanone (MBK)	12 UJ	12 UJ	12 UJ	12 U	11 U	2.3 J	3 J	13 UJ	11 UJ
3-Chloropropene (Allyl Chloride)	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
4-Methyl-2-pentanone (MIBK)	12 U	12 UJ	12 U	12 U	11 U	11 U	12 U	13 U	11 U
Acetone	12 UJ	12 UJ	12 UJ	12 UJ	11 UJ	240 U	95 U	200 U	18 U
Acetonitrile	120 U	120 UJ	120 U	120 U	110 U	4.5 R	5 R	5.4 R	4.3 R
Acrolein	620 U	630 UJ	590 U	590 U	540 U	45 U	50 U	54 U	43 U
Acrylonitrile	120 U	120 UJ	120 U	120 U	110 U	45 U	50 U	54 U	43 U
Benzene	6 U	6 UJ	6 U	6 U	5 U	9.5	5.3 U	5.4 U	4.3 U
Bromodichloromethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Bromoform	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Bromomethane	12 U	12 UJ	12 U	12 U	11 U	0.7 J	5 U	5.4 U	4.3 U
Carbon Disulfide	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Carbon Tetrachloride	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Volatiles (ug/kg) (Cont)									
Chlorobenzene	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Chloroethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Chloroform	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Chloromethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Dibromochloromethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Dibromomethane	12 U	12 UJ	12 U	12 UJ	11 UJ	4.5 U	5 U	5.4 U	4.3 U
Dichlorodifluoromethane (Freon-12)	25 U	25 UJ	23 U	24 UJ	22 UJ	4.5 U	5 U	5.4 U	4.3 U
Ethyl Methacrylate	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
Ethylbenzene	6 U	6 UJ	6 U	6 UJ	5 UJ	1.5 J	1.6 J	5.4 U	4.3 U
Iodomethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Isobutyl Alcohol	2500 R	2500 R	2300 R	2400 R	2200 R	230 R	250 R	270 R	210 R
Methyl Acrylonitrile	25 U	25 UJ	23 U	24 U	22 U	4.5 UJ	5 UJ	5.4 UJ	4.3 UJ
Methyl Methacrylate	25 U	25 UJ	23 U	24 U	22 U	45 U	50 U	54 U	43 U
Methylene Chloride	6 UJ	6 UJ	6 UJ	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Pentachloroethane	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
Propionitrile (Ethyl Cyanide)	62 R	63 R	59 R	59 R	54 R	230 U	250 U	270 U	210 U
Styrene (Ethenylbenzene)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Tetrachloroethene (PCE)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Toluene	6 U	6 UJ	6 U	6 U	5 U	9.1 U	7.2 U	5.4 U	4.3 U
Trichloroethene (TCE)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Trichlorofluoromethane	12 UJ	12 UJ	12 UJ	12 UJ	11 UJ	4.5 U	5 U	5.4 U	4.3 U
Vinyl Acetate	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Vinyl Chloride	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Xylenes, total	6 U	6 UJ	6 U	6 U	5 U	2.3 J	2.7 J	16 U	13 U
Semivolatiles (ug/kg)									
1,2,4,5-Tetrachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,2,4-Trichlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,2-Dichlorobenzene (o-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,3,5-Trinitrobenzene	4000 U	4100 U	3900 U	3900 U	3600 U	380 U	410 U	380 U	420 U
1,3-Dichlorobenzene (m-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
1,3-Dinitrobenzene (m-)	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
1,4-Dichlorobenzene (p-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,4-Dioxane (p-)	800 R	820 R	770 R	770 R	710 R	230 R	250 R	270 R	210 R
1,4-Naphthoquinone	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 U
1,4-Phenylenediamine	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 UJ	410 UJ	380 UJ	420 UJ
1-Naphthylamine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
2,3,4,6-Tetrachlorophenol	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
2,4,5-Trichlorophenol	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
2,4,6-Trichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dimethylphenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dinitrophenol	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	750 U	810 U	770 U	840 UJ
2,4-Dinitrotoluene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,6-Dichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,6-Dinitrotoluene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Acetylaminofluorene	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
2-Chloronaphthalene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Chlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Methylnaphthalene	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
2-Methylphenol (o-Cresol)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Naphthylamine	1000 U	1000 U	970 U	970 U	890 U	380 U	410 U	380 U	420 U
2-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
2-Nitrophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Picoline	400 R	410 R	390 R	390 R	360 R	380 U	410 U	380 U	420 U
3,3'-Dichlorobenzidine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
3,3'-Dimethylbenzidine	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
3-Methylcholanthrene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
3-Methylphenol (m-Cresol)	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
3-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
4,6-Dinitro-2-methylphenol	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	750 U	810 U	770 U	840 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
4-Aminobiphenyl	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
4-Chloro-3-methylphenol	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Chloroaniline	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Chlorophenyl-phenylether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
4-Dimethylaminoazobenzene (p-)	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Methylphenol (p-Cresol)	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
4-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
4-Nitrophenol	2000 U	2100 U	1900 U	1900 U	1800 U	750 UJ	810 UJ	770 UJ	840 UJ
4-Nitroquinoline-1-Oxide	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 UJ
5-Nitro-o-toluidine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
7,12-Dimethylbenz(a)anthracene	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
a,a-Dimethylphenethylamine	2000 U	2100 U	1900 U	1900 U	1800 U	76000 UJ	83000 UJ	78000 UJ	85000 UJ
Acetophenone	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Aniline	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 U
Aramite	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 U	410 U	380 U	420 U
Benzyl Alcohol	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
Bis(2-chloroethoxy)methane	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-chloroisopropyl)ether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-chloroethyl)ether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-ethylhexyl) Phthalate (BEHP)	400 U	410 U	97 J	390 U	360 U	380 U	410 U	380 U	420 U
Butyl Benzyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diallate (cis)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diallate (trans)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Dibenzofuran	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diethyl Phthalate (DEP)	400 U	410 U	54 J	390 U	360 U	380 U	410 U	380 U	420 U
Dimethyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Di-n-butyl Phthalate (DBP)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Di-n-octyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Dinoseb	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 U	410 U	380 U	420 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
Ethyl Methanesulfonate (EMS)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorobutadiene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorocyclopentadiene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachloroethane	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorophene	4000 R	4100 R	3900 R	3900 R	3600 R	NA	NA	NA	NA
Hexachloropropene	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
Isophorone	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Isosafrole	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
Methapyrilene	1000 UJ	1000 UJ	970 UJ	970 UJ	890 UJ	380 U	410 U	380 U	420 UJ
Methyl Methane Sulfonate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Nitrobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosodiethylamine	400 UJ	410 U	390 U	390 U	360 U	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodimethylamine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitroso-di-n-butylamine	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodi-n-propylamine	400 U	410 U	390 U	390 U	360 U	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodiphenylamine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosomethylethylamine	400 U	410 UJ	390 UJ	390 UJ	360 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosomorpholine	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosopiperidine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosopyrrolidine	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 UJ	410 UJ	380 UJ	420 UJ
o-Toluidine	400 R	410 R	390 R	390 R	360 R	380 U	410 U	380 U	420 U
Pentachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pentachloronitrobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pentachlorophenol	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
Phenacetin	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Phenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pronamide	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pyridine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
Safrole	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
PAHs (ug/kg)									
1-Methylnaphthalene	NA	NA	NA	NA	NA	7.6 U	6 J	7.8 UJ	8.5 UJ
2-Methylnaphthalene	NA	NA	NA	NA	NA	7.6 U	7.4 J	7.8 UJ	8.5 U
Acenaphthene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Acenaphthylene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 UJ	8.5 U
Anthracene	400 U	410 U	390 U	110 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)anthracene	400 U	45 J	300 J	3400	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)pyrene (BaP)	400 U	45 J	1800	5000	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(b)fluoranthene	400 U	410 U	2800	7600	360 U	5.8 J	8.3 U	7.8 U	8.5 U
Benzo(g,h,i)perylene	66 J	91 J	1200	3600	360 U	11	5.5 J	7.8 U	8.5 U
Benzo(k)fluoranthene	400 U	410 U	640	2400	360 U	5.7 J	8.3 U	7.8 U	8.5 U
Chrysene	400 U	50 J	690	3800	360 U	5 J	8.3 U	7.8 U	8.5 U
Dibenz(a,h)anthracene	400 U	410 U	210 J	920	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Fluoranthene	88 J	110 J	230 J	67 J	360 U	6.5 J	8.3 U	7.8 U	8.5 U
Fluorene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Indeno(1,2,3-cd)pyrene	400 U	58 J	1300	3800	360 U	9.6	4.8 J	7.8 U	8.5 U
Naphthalene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Phenanthrene	400 U	410 U	39 J	58 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Pyrene	170 J	270 J	650	100 J	360 U	6.6 J	8.3 U	7.8 U	8.5 U
PCBs (ug/kg)									
Aroclor-1016	48 U	49 U	46 U	46 U	42 U	35 U	38 U	36 U	39 U
Aroclor-1221	48 U	49 U	46 U	46 U	42 U	48 U	52 U	49 U	53 U
Aroclor-1232	48 U	49 U	46 U	46 U	42 U	35 U	38 U	36 U	39 U
Aroclor-1242	48 U	49 U	46 U	46 U	42 U	24 U	26 U	24 U	27 U
Aroclor-1248	48 U	49 U	46 U	46 U	42 U	24 U	26 U	24 U	27 U
Aroclor-1254	96 U	98 U	93 U	93 U	85 U	24 U	26 U	24 U	27 U
Aroclor-1260	28	17	12	19	6 NJ	23 J	27 J	36 U	39 U
TPH (mg/kg)									
Diesel Range Organics (DRO)	560	360	120	490	4.5 U	11 U	12 U	12 U	15 U
Gasoline Range Organics (GRO)	3.7	3.8	1.8	1.8	0.032	0.57 U	0.62 U	0.58 U	0.63 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Inorganics (mg/kg)									
Antimony	NA	NA	NA	NA	NA	1.6 J	1.5 J	1.9 J	1.4 J
Arsenic	NA	NA	NA	NA	NA	2.5 J	1.4 J	2.9 J	2.6 J
Barium	NA	NA	NA	NA	NA	110 J	106 J	155 J	26.5 J
Beryllium	NA	NA	NA	NA	NA	0.05 U	0.03 U	0.02 U	0.01 U
Cadmium	NA	NA	NA	NA	NA	1.3	1.1	1.6	0.58 U
Chromium	NA	NA	NA	NA	NA	38.7 J	43.3 J	75.1 J	33.8 J
Cobalt	NA	NA	NA	NA	NA	31.2 J	24.1 J	46.9 J	5.8 J
Copper	NA	NA	NA	NA	NA	88.5 R	124 R	107 R	71.1 R
Lead	NA	NA	NA	NA	NA	85.3 J	79.9 J	40 J	4.9 J
Mercury	NA	NA	NA	NA	NA	0.031 J	0.077	0.042	0.049
Nickel	NA	NA	NA	NA	NA	9.7 J	14.4 J	11.5 J	4.1 J
Selenium	NA	NA	NA	NA	NA	3 J	2.1 J	4.3 J	4.7 J
Silver	NA	NA	NA	NA	NA	0.09 U	0.06 U	0.06 U	0.06 U
Tin	NA	NA	NA	NA	NA				
Thallium	NA	NA	NA	NA	NA	0.43 UJ	0.46 UJ	0.65 J	0.47 UJ
Vanadium	NA	NA	NA	NA	NA	187 J	187 J	323 J	287 J
Zinc	NA	NA	NA	NA	NA	87.8 J	85 J	64.6 J	17.9 J

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NJ - Presumptive evidence for the presence of the material at an estimated value
R - Result is rejected and unusable
NA - Not Analyzed

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI			
	14SB02-03	14SB04-01	14SB05-02	14SB06-01
	03-07-2006	03-06-2006	03-07-2006	03-07-2006
	5.0 - 7.0	1.5 - 3.0	3.5 - 5.0	1.5 - 3.0
Volatiles (ug/kg)				
1,1,1,2-Tetrachloroethane	4.8 U	220 U	4.6 U	4 U
1,1,1-Trichloroethane (TCA)	4.8 U	220 U	4.6 U	4 U
1,1,2,2-Tetrachloroethane	4.8 U	220 U	4.6 U	4 U
1,1,2-Trichloroethane	4.8 U	220 U	4.6 U	4 U
1,1-Dichloroethane	4.8 U	220 U	4.6 U	4 U
1,1-Dichloroethene	4.8 U	220 U	4.6 U	4 U
1,2,3-Trichloropropane	4.8 U	220 U	4.6 U	4 U
1,2-Dibromo-3-chloropropane (DBCP)	4.8 UJ	220 U	4.6 UJ	4 UJ
1,2-Dibromoethane (EDB)	4.8 U	220 U	4.6 U	4 U
1,2-Dichloroethane	4.8 U	220 U	4.6 U	4 U
1,2-Dichloroethene (trans)	4.8 U	220 U	4.6 U	4 U
1,2-Dichloropropane	4.8 U	220 U	4.6 U	4 U
1,3-Dichloropropene (cis)	4.8 U	220 U	4.6 U	4 U
1,3-Dichloropropene (trans)	4.8 U	220 U	4.6 U	4 U
1,4-Dichloro-2-butene (trans)	97 U	870 U	91 U	80 U
2-Butanone (MEK)	12 UJ	540 UJ	7.8 J	8.7 J
2-Chloro-1,3-butadiene (Chloroprene)	4.8 U	220 U	4.6 U	4 U
2-Hexanone (MBK)	12 UJ	540 U	11 UJ	10 UJ
3-Chloropropene (Allyl Chloride)	4.8 U	220 U	4.6 U	4 U
4-Methyl-2-pentanone (MIBK)	12 U	540 U	11 U	10 U
Acetone	12 U	540 UJ	22 U	30 U
Acetonitrile	4.8 R	220 U	4.6 R	4 R
Acrolein	48 U	2200 R	46 U	40 U
Acrylonitrile	48 U	2200 UJ	46 U	40 U
Benzene	4.8 U	220 U	4.6 U	4 U
Bromodichloromethane	4.8 U	220 U	4.6 U	4 U
Bromoform	4.8 U	220 U	4.6 U	4 U
Bromomethane	4.8 U	220 U	4.6 U	4 U
Carbon Disulfide	1.3 J	220 U	4.6 U	0.9 J
Carbon Tetrachloride	4.8 U	220 U	4.6 U	4 U
Chlorobenzene	4.8 U	220 U	4.6 U	4 U
Chloroethane	4.8 U	220 U	4.6 U	4 U
Chloroform	4.8 U	220 U	4.6 U	4 U
Chloromethane	4.8 U	220 U	4.6 U	4 U
Dibromochloromethane	4.8 U	220 U	4.6 U	4 U
Dibromomethane	4.8 U	220 UJ	4.6 U	4 U
Dichlorodifluoromethane (Freon-12)	4.8 U	220 U	4.6 U	4 U
Ethyl Methacrylate	4.8 U	2200 U	4.6 U	4 U
Ethylbenzene	14	740	4.6 U	4 U
Iodomethane	4.8 U	220 UJ	4.6 U	4 U
Isobutyl Alcohol	240 R	1100 R	230 R	200 R
Methyl Acrylonitrile	4.8 UJ	2200 UJ	4.6 UJ	4 UJ
Methyl Methacrylate	48 U	2200 UJ	46 U	40 U
Methylene Chloride	4.8 U	220 U	4.6 U	4 U
Pentachloroethane	4.8 U	220 UJ	4.6 U	4 U
Propionitrile (Ethyl Cyanide)	240 U	11000 R	230 U	200 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI			
	14SB02-03	14SB04-01	14SB05-02	14SB06-01
	03-07-2006	03-06-2006	03-07-2006	03-07-2006
	5.0 - 7.0	1.5 - 3.0	3.5 - 5.0	1.5 - 3.0
Volatiles (ug/kg) (Cont)				
Styrene (Ethenylbenzene)	4.8 U	220 U	4.6 U	4 U
Tetrachloroethene (PCE)	4.8 U	220 UJ	4.6 U	4 U
Toluene	4.8 U	220 U	4.6 U	4 U
Trichloroethene (TCE)	4.8 U	220 U	4.6 U	4 U
Trichlorofluoromethane	4.8 U	220 U	4.6 U	4 U
Vinyl Acetate	4.8 U	220 U	4.6 U	4 U
Vinyl Chloride	4.8 U	220 U	4.6 U	4 U
Xylenes, total	22	130 J	14 U	12 U
Semivolatiles (ug/kg)				
1,2,4,5-Tetrachlorobenzene	440 U	380 U	420 U	400 U
1,2,4-Trichlorobenzene	440 U	380 U	420 U	400 U
1,2-Dichlorobenzene (o-)	440 U	380 U	420 U	400 U
1,3,5-Trinitrobenzene	440 U	380 U	420 U	400 U
1,3-Dichlorobenzene (m-)	440 U	380 U	420 U	400 U
1,3-Dinitrobenzene (m-)	440 U	380 U	420 U	400 U
1,4-Dichlorobenzene (p-)	440 U	380 U	420 U	400 U
1,4-Dioxane (p-)	240 R	11000 R	230 R	200 R
1,4-Naphthoquinone	440 U	380 U	420 U	400 U
1,4-Phenylenediamine	440 UJ	380 UJ	420 U	400 UJ
1-Naphthylamine	440 U	380 U	420 U	400 U
2,3,4,6-Tetrachlorophenol	440 U	380 U	420 U	400 U
2,4,5-Trichlorophenol	440 U	380 U	420 U	400 U
2,4,6-Trichlorophenol	440 U	380 U	420 U	400 U
2,4-Dichlorophenol	440 U	380 U	420 U	400 U
2,4-Dimethylphenol	440 U	380 U	420 U	400 U
2,4-Dinitrophenol	880 U	760 UJ	850 UJ	800 UJ
2,4-Dinitrotoluene	440 U	380 U	420 U	400 U
2,6-Dichlorophenol	440 U	380 U	420 U	400 U
2,6-Dinitrotoluene	440 U	380 U	420 U	400 U
2-Acetylaminofluorene	440 U	380 U	420 U	400 U
2-Chloronaphthalene	440 U	380 U	420 U	400 U
2-Chlorophenol	440 U	380 U	420 U	400 U
2-Methylphenol (o-Cresol)	440 U	380 U	420 U	400 U
2-Naphthylamine	440 U	380 U	420 U	400 U
2-Nitroaniline	880 U	760 U	850 U	800 U
2-Nitrophenol	440 U	380 U	420 U	400 U
2-Picoline	440 U	380 U	420 U	400 U
3,3'-Dichlorobenzidine	440 U	380 U	420 U	400 U
3,3'-Dimethylbenzidine	440 U	380 U	420 U	400 U
3-Methylcholanthrene	440 U	380 U	420 U	400 U
3-Methylphenol (m-Cresol)	440 U	380 U	420 U	400 U
3-Nitroaniline	880 U	760 U	850 U	800 U
4,6-Dinitro-2-methylphenol	880 U	760 U	850 U	800 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI			
	14SB02-03	14SB04-01	14SB05-02	14SB06-01
	03-07-2006	03-06-2006	03-07-2006	03-07-2006
	5.0 - 7.0	1.5 - 3.0	3.5 - 5.0	1.5 - 3.0
Semivolatiles (ug/kg) (Cont)				
4-Aminobiphenyl	440 U	380 U	420 U	400 U
4-Bromophenyl-phenylether	440 U	380 U	420 U	400 U
4-Chloro-3-methylphenol	440 U	380 U	420 U	400 U
4-Chloroaniline	440 U	380 U	420 U	400 U
4-Chlorophenyl-phenylether	440 U	380 U	420 U	400 U
4-Dimethylaminoazobenzene (p-)	440 U	380 U	420 U	400 U
4-Methylphenol (p-Cresol)	440 U	380 U	420 U	400 U
4-Nitroaniline	880 U	760 U	850 U	800 U
4-Nitrophenol	880 UJ	760 UJ	850 UJ	800 UJ
4-Nitroquinoline-1-Oxide	440 U	380 UJ	420 UJ	400 UJ
5-Nitro-o-toluidine	440 U	380 U	420 U	400 U
7,12-Dimethylbenz(a)anthracene	440 U	380 U	420 U	400 U
a,a-Dimethylphenethylamine	89000 UJ	77000 UJ	86000 UJ	82000 UJ
Acetophenone	440 U	380 U	420 U	400 U
Aniline	440 U	380 U	420 U	400 U
Aramite	440 U	380 U	420 U	400 U
Benzyl Alcohol	440 U	380 U	420 U	400 U
Bis(2-chloroethoxy)methane	440 U	380 U	420 U	400 U
Bis(2-chloroisopropyl)ether	440 U	380 U	420 U	400 U
Bis(2-chloroethyl)ether	440 U	380 U	420 U	400 U
Bis(2-ethylhexyl) Phthalate (BEHP)	440 U	380 U	420 U	400 U
Butyl Benzyl Phthalate	440 U	380 U	420 U	400 U
Diallate (cis)	440 U	380 U	420 U	400 U
Diallate (trans)	440 U	380 U	420 U	400 U
Dibenzofuran	440 U	380 U	420 U	400 U
Diethyl Phthalate (DEP)	440 U	380 U	420 U	400 U
Dimethyl Phthalate	440 U	380 U	420 U	400 U
Di-n-butyl Phthalate (DBP)	440 U	380 U	420 U	400 U
Di-n-octyl Phthalate	440 U	380 U	420 U	400 U
Dinoseb	440 U	380 U	420 U	400 U
Ethyl Methanesulfonate (EMS)	440 U	380 U	420 U	400 U
Hexachlorobenzene	440 U	380 U	420 U	400 U
Hexachlorobutadiene	440 U	380 U	420 U	400 U
Hexachlorocyclopentadiene	440 U	380 U	420 U	400 U
Hexachloroethane	440 U	380 U	420 U	400 U
Hexachlorophene	NA	NA	NA	NA
Hexachloropropene	440 U	380 U	420 U	400 U
Isophorone	440 U	380 U	420 U	400 U
Isosafrole	440 U	380 U	420 U	400 U
Methapyrilene	440 U	380 UJ	420 UJ	400 UJ
Methyl Methane Sulfonate	440 U	380 U	420 U	400 U
Nitrobenzene	440 U	380 U	420 U	400 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI			
	14SB02-03	14SB04-01	14SB05-02	14SB06-01
	03-07-2006	03-06-2006	03-07-2006	03-07-2006
	5.0 - 7.0	1.5 - 3.0	3.5 - 5.0	1.5 - 3.0
Semivolatiles (ug/kg) (Cont)				
n-Nitrosodiethylamine	440 UJ	380 UJ	420 UJ	400 UJ
n-Nitrosodimethylamine	440 U	380 U	420 U	400 U
n-Nitroso-di-n-butylamine	440 UJ	380 UJ	420 U	400 UJ
n-Nitrosodi-n-propylamine	440 UJ	380 UJ	420 UJ	400 UJ
n-Nitrosodiphenylamine	440 U	380 U	420 U	400 U
n-Nitrosomethylethylamine	440 UJ	380 UJ	420 UJ	400 UJ
n-Nitrosomorpholine	440 UJ	380 UJ	420 UJ	400 UJ
n-Nitrosopiperidine	440 U	380 U	420 U	400 U
n-Nitrosopyrrolidine	440 UJ	380 UJ	420 UJ	400 UJ
o-Toluidine	440 U	380 U	420 U	400 U
Pentachlorobenzene	440 U	380 U	420 U	400 U
Pentachloronitrobenzene	440 U	380 U	420 U	400 U
Pentachlorophenol	880 U	760 U	850 U	800 U
Phenacetin	440 U	380 U	420 U	400 U
Phenol	440 U	380 U	420 U	400 U
Pronamide	440 U	380 U	420 U	400 U
Pyridine	440 U	380 U	420 U	400 U
Safrole	440 U	380 U	420 U	400 U
PAHs (ug/kg)				
1-Methylnaphthalene	930 J	NA	8.6 UJ	8.2 UJ
2-Methylnaphthalene	910	1700	8.6 UJ	8.2 UJ
Acenaphthene	8.9 U	380 U	8.6 U	8.2 U
Acenaphthylene	8.9 U	380 U	8.6 UJ	8.2 UJ
Anthracene	8.9 U	380 U	8.6 U	8.2 U
Benzo(a)anthracene	8.9 U	380 U	8.6 U	8.2 U
Benzo(a)pyrene (BaP)	8.9 U	380 U	8.6 U	8.2 U
Benzo(b)fluoranthene	8.9 U	380 U	8.6 U	8.2 U
Benzo(g,h,i)perylene	8.9 U	16 J	8.6 U	7.7 J
Benzo(k)fluoranthene	8.9 U	380 U	8.6 U	8.2 U
Chrysene	8.9 U	380 U	8.6 U	8.2 U
Dibenz(a,h)anthracene	8.9 U	380 U	8.6 U	8.2 U
Fluoranthene	8.9 U	380 U	8.6 U	8.2 U
Fluorene	28	380 U	8.6 U	8.2 U
Indeno(1,2,3-cd)pyrene	8.9 U	380 U	8.6 U	5.6 J
Naphthalene	580	480	8.6 U	8.2 U
Phenanthrene	8.9 U	45 J	8.6 U	8.2 U
Pyrene	8.9 U	62 J	8.6 U	8.2 U
PCBs (ug/kg)				
Aroclor-1016	41 UJ	36 UJ	40 U	38 U
Aroclor-1221	56 UJ	48 UJ	54 U	51 U
Aroclor-1232	41 UJ	36 UJ	40 U	38 U
Aroclor-1242	28 UJ	24 UJ	27 U	26 U
Aroclor-1248	28 UJ	24 UJ	27 U	26 U
Aroclor-1254	28 UJ	24 UJ	27 U	26 U
Aroclor-1260	41 UJ	36 UJ	40 U	38 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI			
	14SB02-03	14SB04-01	14SB05-02	14SB06-01
	03-07-2006	03-06-2006	03-07-2006	03-07-2006
	5.0 - 7.0	1.5 - 3.0	3.5 - 5.0	1.5 - 3.0
Dioxins / Furans (ug/kg)				
TCDD, 2,3,7,8-	NA	0.113 U	NA	NA
PeCDD, 1,2,3,7,8-	NA	0.113 U	NA	NA
HxCDD, 1,2,3,4,7,8-	NA	0.283 U	NA	NA
HxCDD, 1,2,3,6,7,8-	NA	0.283 U	NA	NA
HxCDD, 1,2,3,7,8,9-	NA	0.283 U	NA	NA
HpCDD, 1,2,3,4,6,7,8-	NA	1.27 J	NA	NA
OCDD	NA	11.6	NA	NA
TCDF, 2,3,7,8-	NA	0.113 U	NA	NA
PeCDF, 1,2,3,7,8-	NA	0.113 U	NA	NA
PeCDF, 2,3,4,7,8-	NA	0.113 U	NA	NA
HxCDF, 1,2,3,4,7,8-	NA	0.283 U	NA	NA
HxCDF, 1,2,3,6,7,8-	NA	0.283 U	NA	NA
HxCDF, 2,3,4,6,7,8-	NA	0.283 U	NA	NA
HxCDF, 1,2,3,7,8,9-	NA	0.283 U	NA	NA
HpCDF, 1,2,3,4,6,7,8-	NA	0.283 U	NA	NA
HpCDF, 1,2,3,4,7,8,9-	NA	0.283 U	NA	NA
OCDF	NA	0.566 U	NA	NA
TPH (mg/kg)				
Diesel Range Organics (DRO)	1100	2400	13 U	29
Gasoline Range Organics (GRO)	2.9	5.4	0.19 J	0.61 U
Inorganics (mg/kg)				
Antimony	0.99 UJ	1 UJ	1.3 J	1.4 J
Arsenic	1.8 J	0.79 J	4.2 J	1.2 J
Barium	4.7 U	64.4 J	57.8 J	63.8 J
Beryllium	0.01 U	0.01 U	0.01 U	0.01 U
Cadmium	0.3 U	0.84	1.1	1
Chromium	25.4 J	20.8 J	36.5 J	31.9 J
Cobalt	0.84 J	12.8 J	9.4 J	24.5 J
Copper	24.2 R	84 R	52.4 R	143 R
Lead	4 J	39.8 J	29.7 J	14.8 J
Mercury	0.022 U	0.017 U	0.086	0.019 U
Nickel	1.2 J	7.7 J	4.3 J	13.5 J
Selenium	2.7 J	0.54 J	3.7 J	1.1 J
Silver	0.06 U	0.05 U	0.06 U	0.06 U
Thallium	0.5 UJ	0.42 UJ	0.49 UJ	0.46 UJ
Tin				
Vanadium	267 J	98.8 J	227 J	178 J
Zinc	4.6 J	68 J	46.5 J	75.9 J

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed
R - Result is rejected and unusable

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Volatiles (ug/L)			
1,1,1,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane (TCA)	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U
1,2,3-Trichloropropane	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane (DBCP)	0.5 UJ	0.5 UJ	0.5 U
1,2-Dibromoethane (EDB)	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	4.1	0.5 U	0.5 U
1,2-Dichloroethene (trans)	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U
1,4-Dichloro-2-butene (trans)	20 U	20 U	20 R
2-Butanone (MEK)	16	7.2	2.5 R
2-Chloro-1,3-butadiene (Chloroprene)	0.5 U	0.5 U	0.5 UJ
2-Hexanone (MBK)	2.5 U	2.5 U	2.5 U
3-Chloropropene (Allyl Chloride)	0.5 U	0.5 U	0.5 UJ
4-Methyl-2-pentanone (MIBK)	2.5 U	2.5 U	2.5 U
Acetone	72	58	2.5 U
Acetonitrile	0.5 R	0.5 R	0.5 R
Acrolein	5 R	5 R	5 R
Acrylonitrile	5 R	5 R	5 R
Benzene	220	0.41 J	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U
Carbon Disulfide	0.13 J	0.22 J	0.5 U
Carbon Tetrachloride	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 U	0.5 UJ
Chloroform	0.5 U	0.5 U	0.5 U
Chloromethane	0.5 U	0.5 U	0.5 UJ
Dibromochloromethane	0.5 U	0.5 U	0.5 U
Dibromomethane	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U
Ethyl Methacrylate	5 U	5 U	5 U
Ethylbenzene	1.3	0.56	0.5 U
Iodomethane	0.5 U	0.58 J	0.5 UJ
Isobutyl Alcohol	25 UJ	25 UJ	25 UJ
Methyl Acrylonitrile	5 UJ	5 UJ	5 UJ
Methyl Methacrylate	5 U	5 U	5 U
Methylene Chloride	0.5 U	0.5 U	0.5 U
Pentachloroethane	0.5 UJ	0.5 UJ	0.5 UJ
Propionitrile (Ethyl Cyanide)	25 R	25 R	25 R
Styrene (Ethenylbenzene)	0.5 U	0.5 U	0.5 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Volatiles (ug/L) (Cont)			
Tetrachloroethene (PCE)	0.5 U	0.5 U	0.5 U
Toluene	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	0.5 U	0.5 U	0.5 U
Vinyl Acetate	1 U	1 U	1 U
Vinyl Chloride	0.5 U	0.5 U	0.5 U
Xylene, m/p-	0.28 J	0.35 J	1 U
Xylene, o-	1	0.53	0.5 U
Xylenes, total	1.3	0.91	0.5 U
Semivolatiles (ug/L)			
1,2,4,5-Tetrachlorobenzene	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U
1,2-Dichlorobenzene (o-)	10 U	10 U	10 U
1,3,5-Trinitrobenzene	10 U	10 U	10 U
1,3-Dichlorobenzene (m-)	10 U	10 U	10 U
1,3-Dinitrobenzene (m-)	10 U	10 U	10 U
1,4-Dichlorobenzene (p-)	10 U	10 U	10 U
1,4-Dioxane (p-)	25 U	25 U	25 UJ
1,4-Naphthoquinone	10 U	10 U	10 U
1,4-Phenylenediamine	100 UJ	100 UJ	100 UJ
1-Naphthylamine	10 U	10 U	10 U
2,3,4,6-Tetrachlorophenol	10 U	10 U	10 U
2,4,5-Trichlorophenol	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U
2,4-Dinitrophenol	20 U	20 U	20 U
2,4-Dinitrotoluene	10 U	10 U	10 U
2,6-Dichlorophenol	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U
2-Acetylaminofluorene	10 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U
2-Methylphenol (o-Cresol)	10 U	10 U	10 U
2-Naphthylamine	10 U	10 U	10 U
2-Nitroaniline	20 U	20 U	20 U
2-Nitrophenol	10 U	10 U	10 U
2-Picoline	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U
3,3'-Dimethylbenzidine	10 U	10 U	10 U
3-Methylcholanthrene	10 U	10 U	10 U
3-Methylphenol (m-Cresol)	10 U	10 U	10 U
3-Nitroaniline	20 U	20 U	20 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Semivolatiles (ug/L) (Cont)			
4,6-Dinitro-2-methylphenol	20 U	20 U	20 U
4-Aminobiphenyl	10 U	10 U	10 U
4-Bromophenyl-phenylether	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U
4-Dimethylaminoazobenzene (p-)	10 U	10 U	10 U
4-Methylphenol (p-Cresol)	10 U	10 U	10 U
4-Nitroaniline	20 U	20 U	20 U
4-Nitrophenol	20 U	20 U	20 U
4-Nitroquinoline-1-Oxide	10 U	10 U	10 U
5-Nitro-o-toluidine	10 U	10 U	10 U
7,12-Dimethylbenz(a)anthracene	10 U	10 U	10 U
a,a-Dimethylphenethylamine	2000 U	2000 U	2000 U
Acetophenone	0.33 J	10 U	10 U
Aniline	10 U	10 U	10 U
Aramite	10 U	10 U	10 U
Benzyl Alcohol	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	10 U	10 U	10 U
Bis(2-chloroisopropyl)ether	10 U	10 U	10 U
Bis(2-chloroethyl)ether	10 U	10 U	10 U
Bis(2-ethylhexyl) Phthalate (BEHP)	10 U	10 U	10 U
Butyl Benzyl Phthalate	10 U	10 U	0.3 J
Chrysene	10 U	10 U	10 U
Diallate (cis)	10 U	10 U	10 U
Diallate (trans)	10 U	10 U	10 U
Dibenzofuran	0.43 J	10 U	10 U
Diethyl Phthalate (DEP)	0.89 J	10 U	1.3 J
Dimethyl Phthalate	10 U	10 U	10 U
Di-n-butyl Phthalate (DBP)	10 U	10 U	0.48 J
Di-n-octyl Phthalate	10 U	10 U	10 U
Dinoseb	10 U	10 U	10 U
Ethyl Methanesulfonate (EMS)	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U
Hexachloropropene	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U
Isosafrole	10 U	10 U	10 U
Methapyrilene	10 U	10 U	10 U
Methyl Methane Sulfonate	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Semivolatiles (ug/L) (Cont)			
n-Nitrosodiethylamine	10 U	10 U	10 U
n-Nitrosodimethylamine	10 UJ	10 UJ	10 UJ
n-Nitroso-di-n-butylamine	10 UJ	10 UJ	10 UJ
n-Nitrosodi-n-propylamine	10 UJ	10 UJ	10 UJ
n-Nitrosodiphenylamine	10 U	10 U	10 U
n-Nitrosomethylethylamine	10 U	10 U	10 U
n-Nitrosomorpholine	10 UJ	10 UJ	10 UJ
n-Nitrosopiperidine	10 U	10 U	10 U
n-Nitrosopyrrolidine	10 UJ	10 UJ	10 UJ
o-Toluidine	10 U	10 U	10 U
Pentachlorobenzene	10 U	10 U	10 U
Pentachloronitrobenzene	10 U	10 U	10 U
Pentachlorophenol	20 U	20 U	20 U
Phenacetin	10 U	10 U	10 U
Phenol	10 U	10 U	10 U
Pronamide	10 U	10 U	10 U
Pyridine	10 U	10 U	10 U
Safrole	10 U	10 U	10 U
PAHs (ug/L)			
1-Methylnaphthalene	1.4 J	1.9 J	0.2 UJ
2-Methylnaphthalene	2 J	1.8 J	0.2 U
Acenaphthene	0.081 J	0.079 J	0.2 U
Acenaphthylene	0.2 U	0.2 UJ	0.2 U
Anthracene	0.2 U	0.2 U	0.2 U
Benzo(a)anthracene	0.095 J	0.2 U	0.2 U
Benzo(a)pyrene (BaP)	0.084 J	0.2 U	0.2 U
Benzo(b)fluoranthene	0.083 J	0.2 U	0.2 U
Benzo(g,h,i)perylene	0.088 J	0.2 U	0.2 U
Benzo(k)fluoranthene	0.093 J	0.2 U	0.2 U
Chrysene	0.078 J	0.2 U	0.2 U
Dibenz(a,h)anthracene	0.097 J	0.2 U	0.2 U
Fluoranthene	0.078 J	0.2 U	0.2 U
Fluorene	0.25	0.11 J	0.066 J
Indeno(1,2,3-cd)pyrene	0.11 J	0.2 U	0.2 U
Naphthalene	14	3	0.34
Phenanthrene	0.2 U	0.2 U	0.2 U
Pyrene	0.087 J	0.2 U	0.2 U
PCBs (ug/L)			
Aroclor-1016	NA	0.93 U	NA
Aroclor-1221	NA	1.3 U	NA
Aroclor-1232	NA	0.93 U	NA
Aroclor-1242	NA	0.63 U	NA
Aroclor-1248	NA	0.63 U	NA
Aroclor-1254	NA	0.63 U	NA
Aroclor-1260	NA	0.93 U	NA

APPENDIX D (Continued)

SUMMARY OF ANALYTICAL RESULTS, GROUNDWATER
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
TPH (mg/L)			
Diesel Range Organics (DRO)	1.8	1.4	1.5
Gasoline Range Organics (GRO)	0.86	0.15 J	0.5 U
Metals (ug/L)			
Antimony	NA	1.4 U	1.2 U
Arsenic	NA	1.4 U	1.4 U
Barium	NA	157 U	110 U
Beryllium	NA	0.1 U	0.34 U
Cadmium	NA	0.2 U	0.2 U
Chromium	NA	16.5 J	27.8 J
Cobalt	NA	5	28.2
Copper	NA	24.8 R	74.3 J
Lead	NA	6.1	1.9 J
Mercury	NA	0.1 U	0.1 U
Nickel	NA	4.1 J	11.1 J
Selenium	NA	3.3 UJ	3.3 UJ
Silver	NA	0.5 U	0.5 U
Thallium	NA	3.9 U	3.9 U
Tin			
Vanadium	NA	59.2	74
Zinc	NA	12.7 U	50.8

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed
R - Result is rejected and unusable

APPENDIX E
HHRA STATISTICAL SUMMARY
(Pro UCL Computational Output)

APPENDIX E

STATISTICAL SUMMARY OF COPCS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	2-Hexanone (MBK)	Benzo(a)anthracene	Benzo(a)pyrene (BaP)	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene
Raw Statistics						
Number of Observations	9	9	9	9	9	9
Number of Missing Data	0	0	0	0	0	0
Number of Valid Observations	9	9	9	9	9	9
Number of Distinct Observations	5	9	9	9	9	9
Minimum	2.3	3.8	3.8	3.9	3.9	3.9
Maximum	6.5	3400	5000	7600	2400	3800
Mean	5.2	460.1222222	804.5666667	1222.566667	404.7777778	548.5888889
Standard Deviation	1.486606875	1107.873966	1676.623923	2555.936371	775.3630231	1239.078669
Variance	2.21	1227384.725	2811067.781	6532810.731	601187.8176	1535315.947
Coefficient of Variation	0.285885937	2.407781917	2.083884398	2.090631489	1.915527644	2.258665266
Skewness	-1.50363241	2.944636114	2.450999841	2.433425671	2.644915842	2.831323235
Too Few Distinct Observations?	NO	NO	NO	NO	NO	NO
Normal Statistics						
Lilliefors Test Statisitic	N/R	N/R	N/R	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R	N/R	N/R	N/R
Shapiro-Wilk Test Statisitic	0.729903345	0.471240688	0.569831866	0.565753259	0.583463078	0.51411215
Shapiro-Wilk 5% Critical Value	0.829	0.829	0.829	0.829	0.829	0.829
5% Normality Test Result	NOT NORMAL	NOT NORMAL	NOT NORMAL	NOT NORMAL	NOT NORMAL	NOT NORMAL
95% Student's-t UCL	6.121472295	1146.837172	1843.820904	2806.862147	885.3860382	1316.630987
Gamma Statistics						
k hat	9.98759669	0.290403658	0.260878624	0.25228261	0.338123272	0.287429167
k star (bias corrected)	6.732471867	0.267676513	0.247993157	0.242262481	0.299489589	0.265693519
Theta hat	0.520645773	1584.422956	3084.065122	4846.020373	1197.130785	1908.605498
Theta star	0.772376046	1718.948807	3244.309949	5046.454836	1351.558762	2064.743209
nu hat	179.7767404	5.227265845	4.69581524	4.541086976	6.086218893	5.17372501
nu star	121.1844936	4.81817723	4.463876826	4.360724651	5.390812595	4.78248334
5% Approximate Chi Square Value	96.75865679	1.068744779	0.912722787	0.868841041	1.336461405	1.05267167
Adjusted Level of Significance	0.02308	0.02308	0.02308	0.02308	0.02308	0.02308
Adjusted Chi Square Value	92.16129188	0.747186713	0.626008315	0.59239457	0.960021615	0.734593546
Anderson-Darling Test Statistic	1.421077746	0.80485154	0.755692075	0.762393026	0.626294133	0.696152843
Anderson-Darling 5% Critical Value	0.721752506	0.810910296	0.822079616	0.825331489	0.800305347	0.812035546
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	AD GAMMA	AD GAMMA	AD GAMMA	AD GAMMA	AD GAMMA
Kolmogrov-Smirnov Test Statistic	0.389632798	0.245275348	0.246157293	0.284960203	0.260920314	0.243213903
Kolmogrov-Smirnov 5% Critical Value	0.27932129	0.302035781	0.303807283	0.304323043	0.300053251	0.30221425
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	KS GAMMA	KS GAMMA	KS GAMMA	KS GAMMA	KS GAMMA
5% Gamma Test Result	NOT GAMMA	GAMMA	GAMMA	GAMMA	GAMMA	GAMMA
95% Approximate Gamma UCL	6.51269238	2074.349702	3934.914905	6136.078233	1632.730384	2492.341437
95% Adjusted Gamma UCL	6.837570893	2967.063488	5737.122679	8999.536581	2272.950014	3571.522286
Lognormal Statistics						
Minimum of log data	0.832909123	1.335001067	1.335001067	1.360976553	1.360976553	1.360976553
Maximum of log data	1.871802177	8.131530711	8.517193191	8.935903526	7.783224016	8.242756346
Mean of log data	1.597761961	3.744361648	3.98629742	4.297380467	4.003382937	3.891465217
Standard Deviation of log data	0.367879141	2.493884341	2.806099802	2.938526746	2.511452945	2.580797034
Variance of log data	0.135335062	6.219459107	7.874196099	8.634939435	6.307395897	6.660513331
Lilliefors Test Statisitic	N/R	N/R	N/R	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R	N/R	N/R	N/R

APPENDIX E (Continued)

STATISTICAL SUMMARY OF COPCS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	2-Hexanone (MBK)	Benzo(a)anthracene	Benzo(a)pyrene (BaP)	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene
Lognormal Statistics (Cont)						
Shapiro-Wilk Test Statisitic	0.68628538	0.857292972	0.85512013	0.852620289	0.842137269	0.870670644
Shapiro-Wilk 5% Critical Value	0.829	0.829	0.829	0.829	0.829	0.829
5% Lognormality Test Result	NOT LOGNORMAL	LOGNORMAL	LOGNORMAL	LOGNORMAL	LOGNORMAL	LOGNORMAL
MLE Mean	5.287943892	947.7504236	2761.130481	5512.922634	1283.159771	1368.84402
MLE Standard Deviation	2.013035852	21222.65671	141535.1345	413424.8363	30027.43119	38228.54981
MLE Coefficient of Variation	0.380684042	22.39266391	51.25985007	74.99195323	23.40116319	27.92761574
MLE Skewness	1.197220985	11295.56274	134842.7381	421964.2012	12885.01833	21865.9748
MLE Median	4.94195974	42.28200779	53.85511687	73.50698733	54.78316491	48.98260409
MLE 80% Quantile	6.74377485	347.8230648	576.7747175	880.452137	457.4010952	433.6504133
MLE 90% Quantile	7.928680725	1042.110253	1982.543045	3207.949849	1381.050847	1349.904874
MLE 95% Quantile	9.05143354	2557.540642	5444.338794	9239.628555	3410.871237	3418.223797
MLE 99% Quantile	11.6283821	13976.55589	36801.19364	68349.78373	18864.22383	19819.0548
MVU Estimate of Median	4.90491461	29.5440345	34.04158064	44.3365803	38.07783842	33.33099094
MVU Estimate of Mean	5.246461475	409.8707898	861.3385655	1466.090253	545.7958255	544.2254382
MVU Estimate of Standard Deviation	1.947119438	1276.460659	3127.220164	5657.936284	1715.177048	1771.394919
MVU Estimate of SE of Mean	0.648694721	318.5659683	716.7498706	1248.879058	426.0786952	431.9856705
95% H-UCL	6.958278715	530841.1475	7934744.973	33614662.63	783988.3339	1185489.71
95% Chebyshev (MVUE) UCL	8.074056207	1798.467653	3985.578819	6909.827859	2403.0298	2427.207321
97.5% Chebyshev (MVUE) UCL	9.297558707	2399.314624	5337.440072	9265.337469	3206.656424	3241.975086
99% Chebyshev (MVUE) UCL	11.70089245	3579.562154	7992.909733	13892.27998	4785.225315	4842.42859
Non-parametric Statisitics						
95% CLT UCL	6.01508357	1067.552393	1723.833648	2623.947071	829.8973383	1227.95657
95% Adjusted-CLT UCL	5.749698969	1454.863451	2211.717952	3362.371452	1073.372604	1644.467342
95% Modified-t UCL	6.08007766	1207.24987	1919.920996	2922.041428	923.3632594	1381.598251
95% Jackknife UCL	6.121472295	1146.837172	1843.820904	2806.862147	885.3860382	1316.630987
95% Chebyshev (Mean, Sd) UCL	7.359989712	2069.825776	3240.64475	4936.256115	1531.354132	2348.928455
97.5% Chebyshev (Mean, Sd) UCL	8.294618986	2766.345789	4294.737682	6543.172506	2018.82462	3127.936824
99% Chebyshev (Mean, Sd) UCL	10.13051721	4134.524483	6365.299135	9699.648596	2976.366002	4658.147918
Bootstrap Statistics						
Number of Bootstrap Runs	2000	2000	2000	2000	2000	2000
95% Standard Bootstrap UCL	5.957133832	1039.294521	1675.85953	2563.848804	814.7303799	1188.075497
95% Bootstrap-t UCL	5.903854785	6028.464908	15000.10614	30686.11126	3010.13985	7887.382766
95% Hall's Bootstrap UCL	5.768483326	4087.251739	9914.838519	16440.68057	2801.718932	5285.651692
95% Percentile Bootstrap UCL	5.944444444	1179.566667	1736.955556	2643.605556	886.45	1352.005556
95% BCA Bootstrap UCL	5.777777778	1537.466667	2068.444444	3440.922222	1110.455556	1786.922222
Recommendations						
Human Inspection Recommended?	YES	NO	NO	NO	NO	NO
Appropriate Distribution	NON-PARAMETRIC	GAMMA	GAMMA	GAMMA	GAMMA	GAMMA
1st Recommended UCL	6.121472295	2967.063488	5737.122679	8999.536581	2272.950014	3571.522286
UCL Test	95% Student's-t UCL	95% Adjusted Gamma UCL	95% Adjusted Gamma UCL	95% Adjusted Gamma UCL	95% Adjusted Gamma UCL	95% Adjusted Gamma UCL
2nd Recommended UCL	6.08007766					
3rd Recommended UCL						
Recommended UCL > Max Data Value						
Recommendation Warning!	NONE	NONE	NONE	NONE	NONE	NONE
Alternative UCL	NONE	NONE	NONE	NONE	NONE	NONE

APPENDIX E (Continued)

STATISTICAL SUMMARY OF COPCS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Diesel Range Organics (DRO)	Gasoline Range Organics (GRO)	Arsenic
Raw Statistics					
Number of Observations	9	9	9	9	4
Number of Missing Data	0	0	0	0	0
Number of Valid Observations	9	9	9	9	4
Number of Distinct Observations	9	9	8	8	4
Minimum	3.8	3.9	2.25	0.032	1.4
Maximum	920	3800	560	3.8	2.9
Mean	192.3444444	617.8388889	173.0277778	1.370222222	2.35
Standard Deviation	289.8323798	1263.447092	231.4130656	1.503084061	0.655743852
Variance	84002.8084	1596298.555	53552.00694	2.259261694	0.43
Coefficient of Variation	1.506840401	2.044945883	1.337433033	1.096963716	0.279039937
Skewness	2.366959628	2.49340617	0.942092528	0.939318233	-1.588822314
Too Few Distinct Observations?	NO	NO	NO	NO	NO
Normal Statistics					
Lilliefors Test Statisitic	N/R	N/R	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R	N/R	N/R
Shapiro-Wilk Test Statisitic	0.65714655	0.575170301	0.748617372	0.784660563	0.850699926
Shapiro-Wilk 5% Critical Value	0.829	0.829	0.829	0.829	0.748
5% Normality Test Result	NOT NORMAL	NOT NORMAL	NOT NORMAL	NOT NORMAL	NORMAL
95% Student's-t UCL	371.9968547	1400.985739	316.4690145	2.30190789	3.121601745
Gamma Statistics					
k hat	0.425482574	0.293352805	0.393931572	0.741486411	13.98859876
k star (bias corrected)	0.357729123	0.269642611	0.336695122	0.568398348	3.663816356
Theta hat	452.0618615	2106.12913	439.2330805	1.847939764	0.167993953
Theta star	537.6818152	2291.325123	513.9004592	2.410672423	0.641407694
nu hat	7.658686333	5.280350497	7.090768293	13.34675539	111.9087901
nu star	6.439124222	4.853566998	6.060512195	10.23117026	29.31053085
5% Approximate Chi Square Value	1.867692355	1.08475613	1.670364144	4.085899655	17.94969628
Adjusted Level of Significance	0.02308	0.02308	0.02308	0.02308	N/A
Adjusted Chi Square Value	1.395324695	0.75975457	1.231982516	3.307586354	N/A
Anderson-Darling Test Statistic	0.862493566	0.627370127	0.881633729	0.581279559	0.552174868
Anderson-Darling 5% Critical Value	0.784322963	0.809794634	0.790095219	0.752114865	0.657096011
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	AD GAMMA	NOT AD GAMMA	AD GAMMA	AD GAMMA
Kolmogrov-Smirnov Test Statistic	0.289956629	0.231599529	0.329944627	0.282119151	0.376517524
Kolmogrov-Smirnov 5% Critical Value	0.296829693	0.301858832	0.297993925	0.289443461	0.394654787
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	KS GAMMA	NOT KS GAMMA	KS GAMMA	KS GAMMA
5% Gamma Test Result	APPROX GAMMA	GAMMA	NOT GAMMA	GAMMA	GAMMA
95% Approximate Gamma UCL	663.1337158	2764.42083	627.7894319	3.431062442	3.837376769
95% Adjusted Gamma UCL	887.6283606	3946.962033	851.178441	4.238431094	N/A
Lognormal Statistics					
Minimum of log data	1.335001067	1.360976553	0.810930216	-3.442019376	0.336472237
Maximum of log data	6.82437367	8.242756346	6.327936784	1.335001067	1.064710737
Mean of log data	3.727974482	4.066985297	3.478893135	-0.493624249	0.818246288
Standard Deviation of log data	2.269641801	2.586949143	2.266601944	1.567386545	0.327264112
Variance of log data	5.151273903	6.69230587	5.137484372	2.456700581	0.107101799
Lilliefors Test Statisitic	N/R	N/R	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R	N/R	N/R

APPENDIX E (Continued)

STATISTICAL SUMMARY OF COPCS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Diesel Range Organics (DRO)	Gasoline Range Organics (GRO)	Arsenic
Lognormal Statistics (Cont)					
Shapiro-Wilk Test Statisitic	0.777533296	0.895250105	0.817815788	0.885476173	0.800086562
Shapiro-Wilk 5% Critical Value	0.829	0.829	0.829	0.829	0.748
5% Lognormality Test Result	NOT LOGNORMAL	LOGNORMAL	NOT LOGNORMAL	LOGNORMAL	LOGNORMAL
MLE Mean	546.5421507	1657.620189	423.1113238	2.084910736	2.391204436
MLE Standard Deviation	7160.563475	47036.09536	5505.113299	6.809158904	0.803983798
MLE Coefficient of Variation	13.10157591	28.37567717	13.01102804	3.265923469	0.336225454
MLE Skewness	2288.207151	22932.62796	2241.629046	44.63294653	1.046685828
MLE Median	41.5947718	58.38069655	32.42381343	0.610410103	2.266521523
MLE 80% Quantile	283.1061181	519.5470232	220.1197635	2.295194024	2.988538472
MLE 90% Quantile	768.5181617	1621.675164	596.7370912	4.574363035	3.451402506
MLE 95% Quantile	1739.817051	4115.504218	1349.451285	8.042392534	3.882952245
MLE 99% Quantile	8161.3209	23962.10742	6317.060428	23.38551596	4.852347521
MVU Estimate of Median	30.97053238	39.65002674	24.16171561	0.531512202	2.236299593
MVU Estimate of Mean	286.8823168	654.9965517	222.6269808	1.650934009	2.358655362
MVU Estimate of Standard Deviation	792.548192	2138.521246	613.9976481	2.908066166	0.765795089
MVU Estimate of SE of Mean	209.4041632	520.653464	162.3489855	0.888140956	0.382863473
95% H-UCL	106420.4912	1481394.667	81271.2433	28.29431016	4.566454824
95% Chebyshev (MVUE) UCL	1199.653903	2924.472386	930.2898024	5.522250684	4.027518549
97.5% Chebyshev (MVUE) UCL	1594.610897	3906.476392	1236.496071	7.197372502	4.749636983
99% Chebyshev (MVUE) UCL	2370.427434	5835.43311	1837.978991	10.48782495	6.168098817
Non-parametric Statisitics					
95% CLT UCL	351.2550583	1310.5674	299.9079846	2.194339979	2.889301327
95% Adjusted-CLT UCL	432.7021644	1684.581517	325.7912664	2.361963102	2.610990578
95% Modified-t UCL	384.7009573	1459.324383	320.5062834	2.32805371	3.078190892
95% Jackknife UCL	371.9968547	1400.985739	316.4690145	2.30190789	3.121601745
95% Chebyshev (Mean, Sd) UCL	613.4611292	2453.584954	509.2631669	3.554152731	3.779160593
97.5% Chebyshev (Mean, Sd) UCL	795.6786551	3247.913743	654.7524883	4.499141206	4.397559523
99% Chebyshev (Mean, Sd) UCL	1153.6097	4808.218836	940.5380881	6.355388081	5.612284476
Bootstrap Statistics					
Number of Bootstrap Runs	2000	2000	2000	2000	2000
95% Standard Bootstrap UCL	345.7157805	1287.526298	293.4278987	2.160692403	N/R
95% Bootstrap-t UCL	559.6683609	9037.588241	395.6954132	3.046790304	N/R
95% Hall's Bootstrap UCL	954.2720642	6300.020435	280.2302951	2.496037128	N/R
95% Percentile Bootstrap UCL	355	1323.822222	298.3333333	2.136888889	N/R
95% BCA Bootstrap UCL	420.9888889	1733.183333	315.2777778	2.298333333	N/R
Recommendations					
Human Inspection Recommended?	NO	NO	YES	NO	YES
Appropriate Distribution	GAMMA	GAMMA	NON-PARAMETRIC	GAMMA	NORMAL
1st Recommended UCL	887.6283606	3946.962033	280.2302951	3.431062442	3.121601745
UCL Test	95% Adjusted Gamma UCL	95% Adjusted Gamma UCL	95% Hall's Bootstrap UCL	95% Approximate Gamma UCL	95% Student's-t UCL
2nd Recommended UCL					
3rd Recommended UCL					
Recommended UCL > Max Data Value					YES
Recommendation Warning!	NONE	NONE	PLEASE CHECK	NONE	NONE
Alternative UCL	NONE	NONE	NONE	NONE	NONE

APPENDIX E (Continued)

STATISTICAL SUMMARY OF COPCS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	Chromium	Thallium	Vanadium
Raw Statistics			
Number of Observations	4	4	4
Number of Missing Data	0	0	0
Number of Valid Observations	4	4	4
Number of Distinct Observations	4	4	3
Minimum	33.8	0.215	187
Maximum	75.1	0.65	323
Mean	47.725	0.3325	246
Standard Deviation	18.65768385	0.211837202	69.69457176
Variance	348.1091667	0.044875	4857.333333
Coefficient of Variation	0.390941516	0.637104366	0.283311267
Skewness	1.744206293	1.990281195	0.225870832
Too Few Distinct Observations?	NO	NO	NO
Normal Statistics			
Lilliefors Test Statisitic	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R
Shapiro-Wilk Test Statisitic	0.813810401	0.667501227	0.833823534
Shapiro-Wilk 5% Critical Value	0.748	0.748	0.748
5% Normality Test Result	NORMAL	NOT NORMAL	NORMAL
95% Student's-t UCL	69.67915384	0.581764944	328.0083223
Gamma Statistics			
k hat	10.23698029	4.315207734	16.56183388
k star (bias corrected)	2.725911738	1.2454686	4.307125137
Theta hat	4.662019333	0.077053069	14.85342757
Theta star	17.50790363	0.26696779	57.11466284
nu hat	81.89584228	34.52166187	132.494671
nu star	21.8072939	9.963748802	34.45700109
5% Approximate Chi Square Value	12.1923374	3.918276905	22.02776312
Adjusted Level of Significance	N/A	N/A	N/A
Adjusted Chi Square Value	N/A	N/A	N/A
Anderson-Darling Test Statistic	0.464558231	0.833418106	0.527344498
Anderson-Darling 5% Critical Value	0.657099763	0.658927281	0.657093438
Anderson-Darling 5% Gamma Test Result	AD GAMMA	NOT AD GAMMA	AD GAMMA
Kolmogrov-Smirnov Test Statistic	0.329697618	0.447104848	0.337305429
Kolmogrov-Smirnov 5% Critical Value	0.394913648	0.396074894	0.394477234
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	NOT KS GAMMA	KS GAMMA
5% Gamma Test Result	GAMMA	NOT GAMMA	GAMMA
95% Approximate Gamma UCL	85.36124512	0.845511065	384.8063111
95% Adjusted Gamma UCL	N/A	N/A	N/A
Lognormal Statistics			
Minimum of log data	3.520460802	-1.537117251	5.231108617
Maximum of log data	4.318820559	-0.430782916	5.777652323
Mean of log data	3.815818399	-1.221436475	5.474837943
Standard Deviation of log data	0.350291557	0.528462624	0.285539271
Variance of log data	0.122704175	0.279272745	0.081532675
Lilliefors Test Statisitic	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R

APPENDIX E (Continued)

STATISTICAL SUMMARY OF COPCS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	Chromium	Thallium	Vanadium
Lognormal Statistics (Cont)			
Shapiro-Wilk Test Statisitic	0.874785814	0.696466055	0.818434324
Shapiro-Wilk 5% Critical Value	0.748	0.748	0.748
5% Lognormality Test Result	LOGNORMAL	NOT LOGNORMAL	LOGNORMAL
MLE Mean	48.28739176	0.338984769	248.5401199
MLE Standard Deviation	17.44705229	0.192407202	72.43939085
MLE Coefficient of Variation	0.361316933	0.567598369	0.291459547
MLE Skewness	1.131120698	1.885657088	0.899137742
MLE Median	45.41390788	0.294806381	238.6117951
MLE 80% Quantile	61.05742192	0.460756508	303.7237669
MLE 90% Quantile	71.23206365	0.581373423	344.3835151
MLE 95% Quantile	80.80574056	0.703198926	381.6675888
MLE 99% Quantile	102.5752381	1.007797833	463.5908093
MVU Estimate of Median	44.72054651	0.2846222	236.1873873
MVU Estimate of Mean	47.53262314	0.326665304	245.9745023
MVU Estimate of Standard Deviation	16.49965331	0.169151493	69.81077646
MVU Estimate of SE of Mean	8.248867946	0.084527305	34.90357316
95% H-UCL	99.52470822	1.535856514	419.2967555
95% Chebyshev (MVUE) UCL	83.48860491	0.695111282	398.1156504
97.5% Chebyshev (MVUE) UCL	99.04678695	0.854538152	463.9472468
99% Chebyshev (MVUE) UCL	129.6078229	1.167701365	593.2606703
Non-parametric Statisitics			
95% CLT UCL	63.06957949	0.506720595	303.3186846
95% Adjusted-CLT UCL	71.76270603	0.619346189	307.5238156
95% Modified-t UCL	71.03510591	0.59933226	328.6642377
95% Jackknife UCL	69.67915384	0.581764944	328.0083223
95% Chebyshev (Mean, Sd) UCL	88.38847921	0.794188477	397.8957976
97.5% Chebyshev (Mean, Sd) UCL	105.9835992	0.99396145	463.6212306
99% Chebyshev (Mean, Sd) UCL	140.5458052	1.386376772	592.7261167
Bootstrap Statistics			
Number of Bootstrap Runs	2000	2000	2000
95% Standard Bootstrap UCL	N/R	N/R	N/R
95% Bootstrap-t UCL	N/R	N/R	N/R
95% Hall's Bootstrap UCL	N/R	N/R	N/R
95% Percentile Bootstrap UCL	N/R	N/R	N/R
95% BCA Bootstrap UCL	N/R	N/R	N/R
Recommendations			
Human Inspection Recommended?	NO	YES	YES
Appropriate Distribution	NORMAL	NON-PARAMETRIC	NORMAL
1st Recommended UCL	69.67915384	0.794188477	328.0083223
UCL Test	95% Student's-t UCL	95% Chebyshev (Mean, Sd) UCL	95% Student's-t UCL
2nd Recommended UCL			
3rd Recommended UCL			
Recommended UCL > Max Data Value		YES	YES
Recommendation Warning!	NONE	NONE	NONE
Alternative UCL	NONE	NONE	NONE

APPENDIX E (Continued)

STATISTICAL SUMMARY OF COPCS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	Diesel Range Organics (DRO)	Gasoline Range Organics (GRO)	Arsenic	Chromium	Vanadium
Raw Statistics					
Number of Observations	4	4	4	4	4
Number of Missing Data	0	0	0	0	0
Number of Valid Observations	4	4	4	4	4
Number of Distinct Observations	4	4	4	4	4
Minimum	6.5	0.19	0.79	20.8	98.8
Maximum	2400	5.4	4.2	36.5	267
Mean	883.875	2.19875	1.9975	28.65	192.7
Standard Deviation	1132.246026	2.473938746	1.525786682	6.937098337	72.41150921
Variance	1281981.063	6.120372917	2.328025	48.12333333	5243.426667
Coefficient of Variation	1.281002433	1.125156905	0.763848151	0.242132577	0.37577327
Skewness	1.008125846	0.803722573	1.578201014	1.48E-15	-0.668250595
Too Few Distinct Observations?	NO	NO	NO	NO	NO
Normal Statistics					
Lilliefors Test Statisitic	N/R	N/R	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R	N/R	N/R
Shapiro-Wilk Test Statisitic	0.865459475	0.878170239	0.855231242	0.977438382	0.974395535
Shapiro-Wilk 5% Critical Value	0.748	0.748	0.748	0.748	0.748
5% Normality Test Result	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
95% Student's-t UCL	2216.168099	5.109788275	3.79286516	36.81275618	277.9052927
Gamma Statistics					
k hat	0.374128886	0.73862703	2.660783373	22.14501846	7.931227301
k star (bias corrected)	0.260198888	0.351323424	0.83186251	5.702921281	2.149473492
Theta hat	2362.487991	2.976806848	0.750718762	1.293744688	24.29636583
Theta star	3396.920741	6.258478227	2.401238157	5.023741095	89.64986111
nu hat	2.993031087	5.909016236	21.28626698	177.1601477	63.4498184
nu star	2.081591105	2.810587392	6.654900079	45.62337025	17.19578793
5% Approximate Chi Square Value	0.162071256	0.318437368	1.982636024	31.12481326	8.810943706
Adjusted Level of Significance	N/A	N/A	N/A	N/A	N/A
Adjusted Chi Square Value	N/A	N/A	N/A	N/A	N/A
Anderson-Darling Test Statistic	0.363982357	0.396498548	0.299682121	0.233160019	0.291265037
Anderson-Darling 5% Critical Value	0.695523636	0.670782669	0.659796707	0.657007774	0.657898546
Anderson-Darling 5% Gamma Test Result	AD GAMMA	AD GAMMA	AD GAMMA	AD GAMMA	AD GAMMA
Kolmogrov-Smirnov Test Statistic	0.283873095	0.305768574	0.233816395	0.22077353	0.222855998
Kolmogrov-Smirnov 5% Critical Value	0.415175267	0.405229742	0.39701455	0.39420997	0.395327204
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	KS GAMMA	KS GAMMA	KS GAMMA	KS GAMMA
5% Gamma Test Result	GAMMA	GAMMA	GAMMA	GAMMA	GAMMA
95% Approximate Gamma UCL	11352.20631	19.40657612	6.704792381	41.99573975	376.080979
95% Adjusted Gamma UCL	N/A	N/A	N/A	N/A	N/A
Lognormal Statistics					
Minimum of log data	1.871802177	-1.660731207	-0.235722334	3.034952987	4.593097605
Maximum of log data	7.783224016	1.686398954	1.435084525	3.597312261	5.587248658
Mean of log data	5.006346871	-0.024266255	0.492367603	3.332405108	5.196769958
Standard Deviation of log data	2.840762254	1.647548198	0.712756036	0.248423375	0.435578029
Variance of log data	8.069930184	2.714415064	0.508021167	0.061714173	0.189728219
Lilliefors Test Statisitic	N/R	N/R	N/R	N/R	N/R
Lilliefors 5% Critical Value	N/R	N/R	N/R	N/R	N/R

APPENDIX E (Continued)

STATISTICAL SUMMARY OF COPCS, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Variable:	Diesel Range Organics (DRO)	Gasoline Range Organics (GRO)	Arsenic	Chromium	Vanadium
Lognormal Statistics (Cont)					
Shapiro-Wilk Test Statisitic	0.901619915	0.880582048	0.970485523	0.974061841	0.920821609
Shapiro-Wilk 5% Critical Value	0.748	0.748	0.748	0.748	0.748
5% Lognormality Test Result	LOGNORMAL	LOGNORMAL	LOGNORMAL	LOGNORMAL	LOGNORMAL
MLE Mean	8444.849119	3.792180856	2.109346506	28.88326017	198.6677969
MLE Standard Deviation	477405.0772	14.23749414	1.716234522	7.287417655	90.80682994
MLE Coefficient of Variation	56.53210265	3.754434368	0.813633283	0.252305924	0.457078759
MLE Skewness	180839.335	64.18497432	2.979524366	0.772979134	1.466729623
MLE Median	149.3581138	0.976025804	1.636185476	28.0056173	180.6876695
MLE 80% Quantile	1647.132169	3.927142148	2.988126055	34.54707407	261.0817018
MLE 90% Quantile	5748.684742	8.107853659	4.088830996	38.53739795	316.2356694
MLE 95% Quantile	15984.91555	14.67214108	5.284887234	42.14270344	369.9233474
MLE 99% Quantile	110631.4708	45.05711258	8.58690306	49.91082329	497.6636527
MVU Estimate of Median	38.24130689	0.676979516	1.534244925	27.79007379	176.432861
MVU Estimate of Mean	1242.159336	2.32099095	1.966199168	28.65826088	193.8204512
MVU Estimate of Standard Deviation	2503.34347	3.258511479	1.351587651	7.086713743	83.25390385
MVU Estimate of SE of Mean	1110.089308	1.581304674	0.6745991	3.543250618	41.6156327
95% H-UCL	7.42E+21	4306272.933	30.59898889	44.24579691	571.6790216
95% Chebyshev (MVUE) UCL	6080.926447	9.213738223	4.906708472	44.10293226	375.2187886
97.5% Chebyshev (MVUE) UCL	8174.664841	12.19623547	6.179069196	50.7858539	453.7099941
99% Chebyshev (MVUE) UCL	12287.40849	18.0547738	8.678375462	63.9131594	607.8907684
Non-parametric Statisitics					
95% CLT UCL	1815.064491	4.23338356	3.25234788	34.35525568	252.2531668
95% Adjusted-CLT UCL	2119.977517	4.764531536	3.89559309	34.35525568	239.3270708
95% Modified-t UCL	2263.728369	5.192636625	3.893198414	36.81275618	275.8890829
95% Jackknife UCL	2216.168099	5.109788275	3.79286516	36.81275618	277.9052927
95% Chebyshev (Mean, Sd) UCL	3351.548002	7.590574492	5.322874979	43.76905531	350.5172255
97.5% Chebyshev (Mean, Sd) UCL	4419.312082	9.923621257	6.761767389	50.31108261	418.8048651
99% Chebyshev (Mean, Sd) UCL	6516.727856	14.50643986	9.588192903	63.16162848	552.9427098
Bootstrap Statistics					
Number of Bootstrap Runs	2000	2000	2000	2000	2000
95% Standard Bootstrap UCL	N/R	N/R	N/R	N/R	N/R
95% Bootstrap-t UCL	N/R	N/R	N/R	N/R	N/R
95% Hall's Bootstrap UCL	N/R	N/R	N/R	N/R	N/R
95% Percentile Bootstrap UCL	N/R	N/R	N/R	N/R	N/R
95% BCA Bootstrap UCL	N/R	N/R	N/R	N/R	N/R
Recommendations					
Human Inspection Recommended?	NO	NO	NO	YES	YES
Appropriate Distribution	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
1st Recommended UCL	2216.168099	5.109788275	3.79286516	36.81275618	277.9052927
UCL Test	95% Student's-t UCL	95% Student's-t UCL	95% Student's-t UCL	95% Student's-t UCL	95% Student's-t UCL
2nd Recommended UCL					
3rd Recommended UCL					
Recommended UCL > Max Data Value				YES	YES
Recommendation Warning!	NONE	NONE	NONE	NONE	NONE
Alternative UCL	NONE	NONE	NONE	NONE	NONE

APPENDIX F
CHEMICAL INTAKE EQUATIONS

Surface Soil/Subsurface Soil

Incidental Ingestion of Soil

The following equation is used in the calculation of a CDI (mg/kg/day) for a human receptor who incidentally ingests soil at the site:

$$CDI = \frac{Cs \ x \ IR \ x \ FI \ x \ CF \ x \ EF \ x \ ED}{BW \ x \ AT_c \ or \ AT_{nc}}$$

Where:

Cs	=	chemical concentration in soil (mg/kg)
IR	=	ingestion rate (mg/day)
FI	=	fraction of soil ingested from the source (unitless)
CF	=	conversion factor (10^{-06} kg/mg)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yrs)
BW	=	adult body weight (kg)
AT_c	=	averaging time carcinogens (days)
AT_{nc}	=	averaging time, noncarcinogens (days)

Dermal Contact with Surface Soil/Subsurface Soil

The absorbed dose associated with the potential dermal contact of COPCs in soil was calculated using the following equation (USEPA, 1989):

$$DAD = \frac{Cs \ x \ SA \ x \ AF \ x \ ABS \ x \ EF \ x \ ED \ x \ CF}{BW \ x \ AT}$$

Where:

DAD	=	Dermally Absorbed Dose, mg/kg-day
Cs	=	Chemical concentration in the soil, mg/kg
AF	=	Adherence Factor, milligram per square centimeter day (mg/cm^2-d)
ABS	=	Absorbed fraction, unitless
CF	=	Conversion Factor, 10^{-06} mg/kg
SA	=	Surface Area of exposed skin, cm^2
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
BW	=	average Body Weight, kg
AT	=	Averaging Time, days

Inhalation of Fugitive Dust from Surface Soil/Subsurface Soil

The daily intake resulting from the inhalation of COPCs adsorbed onto fugitive dust particulate and/or volatiles was estimated using the following equation (USEPA, 1989):

$$CDI = \frac{Ca \ x \ RR \ x \ ET \ x \ EF \ x \ ED}{BW \ x \ AT}$$

Where:

CDI	=	Chronic Daily Intake, mg/kg-day
Ca	=	Chemical concentration in air as fugitive dust, milligrams per cubic meter (mg/m^3)
RR	=	Respiration Rate, m^3/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
BW	=	average Body Weight, kg
AT	=	Averaging Time, days

The air concentration (Ca) of a chemical in fugitive dust emissions was estimated from the following equation, adapted from Cowherd (1985).

$$Ca = Cs \times (1/PEF + 1/VF)$$

Where:

Ca	=	Chemical concentration in air as fugitive dust, mg/m^3
Cs	=	Concentration of chemical in the soil, mg/kg
PEF	=	Particulate Emission Factor, m^3/kg
VF	=	Volatilization Factor, m^3/kg

Volatilization factors used in this HHRA were obtained from the USEPA Region IX PRG tables (USEPA, 2004) or if not available there, were calculated (USEPA, 2001).

<u>Groundwater</u>

Ingestion of Groundwater

The daily intake associated with the direct potential ingestion of the COPCs in groundwater under a drinking water scenario were calculated using the following equation (USEPA, 1989):

$$CDI = \frac{Cw \times IR \times EF \times ED}{BW \times AT}$$

Where:

CDI	=	Chronic Daily Intake, mg/kg-day
Cw	=	Chemical concentration in water, mg/L
IR	=	Ingestion Rate, L/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
BW	=	average Body Weight, kg
AT	=	Averaging Time, days

Dermal Contact with Groundwater

The absorbed dose associated with potential dermal contact with COPCs in groundwater was calculated using the following equation (USEPA, 1989 and 2004):

$$CDI = \frac{DA_{event} * EF * ED * CF * SA}{BW \ x \ AT}$$

Where:

CDI	=	Chronic Daily Intake, mg/kg-day
DA_{event}	=	Absorbed dose per event (mg/cm^2-event) (assume 1 event/day)
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, 1 L/1000 cm^3
SA	=	Surface Area of exposed skin, cm^2
BW	=	average Body Weight, kg
AT	=	Averaging Time, days

The following equations are used to calculate DA_{event} for organic compounds:

If $t_{event} \leq t^*$, then

$$DA_{event} = 2FA * K_p * C_w * \sqrt{\frac{6\tau_{event} * t_{event}}{\pi}}$$

If $t_{event} > t^*$, then

$$DA_{event} = FA * K_p * C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

Where:

DA_{event}	=	Absorbed dose per event (mg/cm^2-event)
FA	=	Fraction absorbed (dimensionless)
K_p	=	Dermal permeability coefficient of compound in water (cm/hour)
Cw	=	Chemical concentration in water (mg/cm^3)
τ_{event}	=	Lag time per event (hour /event)
t_{event}	=	Event duration (hour /event) (assume 1 event/day)
t*	=	Time to reach steady-state (hour) = $2.4\tau_{event}$
B	=	Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (ve) (dimensionless).

The following equation is used to calculate DA_{event} for inorganic and highly ionized organic chemicals:

$$DA_{event} = K_p * C_w * t_{event}$$

Where:

DA_{event}	=	Absorbed dose per event (mg/cm^2-event)
K_p	=	Dermal permeability coefficient of compound in water (cm/ hour)
C_w	=	Chemical concentration in water (mg/cm^3)
t_{event}	=	Event duration (hours/event) (assume 1 event/day)

Inhalation of Volatiles in Groundwater While Showering

The equation used to calculate the concentration of volatile chemicals from groundwater being inhaled by the receptor while showering is as follows, (USEPA, 1989):

$$CDI = \frac{Cw_{shwr} \ x \ IR \ x \ EF \ x \ ED \ x \ EF}{BW \ x \ AT}$$

Where:

CDI	=	Chronic daily intake, mg/kg-day
C_{shwr}	=	Contaminant in concentration in shower air, mg/m^3/shower
IR	=	Inhalation Rate (m^3/hour)
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
ET	=	Exposure Time , hours/day
BW	=	Body Weight, kg
AT	=	Averaging Time, days

For the groundwater inhalation scenario, the airborne concentration of contaminant in the shower, C_x, is derived from a theoretical shower model. Indoor emissions as a result of volatilization of chemicals indoors during use of contaminated water while showering can be estimated by using a theoretical model developed by Foster and Chrostowski. In the model, inhalation exposure to volatile organic compounds while showering is generated by estimating the rate of chemical releases into the air, the build-up of VOCs in the shower room air while the shower is on, the decay of VOCs after the shower is off, and the quantity of airborne VOCs inhaled while the shower is both on and off. This model was utilized to generate the concentrations of contaminant in the shower air for the groundwater inhalation exposure dose equation.

APPENDIX G
RISK CALCULATION SPREAD SHEETS

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	240	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	90	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	NA	7.4E-11	--	--	5.2E-09	--	--
Benzo(a)anthracene	3.0E+00	7.3E-01	NA	3.6E-08	2.6E-08	3.3%	2.5E-06	--	--
Benzo(a)pyrene (BaP)	5.7E+00	7.3E+00	NA	6.9E-08	5.1E-07	64.6%	4.9E-06	--	--
Benzo(b)fluoranthene	9.0E+00	7.3E-01	NA	1.1E-07	7.9E-08	10.1%	7.6E-06	--	--
Benzo(k)fluoranthene	2.3E+00	7.3E-02	NA	2.7E-08	2.0E-09	0.3%	1.9E-06	--	--
Chrysene	3.6E+00	7.3E-03	NA	4.3E-08	3.1E-10	0.0%	3.0E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	7.3E+00	NA	1.1E-08	7.8E-08	10.0%	7.5E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	7.3E-01	NA	4.8E-08	3.5E-08	4.4%	3.3E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	NA	3.4E-06	--	--	2.4E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	NA	4.1E-08	--	--	2.9E-06	--	--
Arsenic	3.1E+00	1.5E+00	3.0E-04	3.8E-08	5.7E-08	7.2%	2.6E-06	8.8E-03	2.8%
Chromium	7.0E+01	NA	3.0E-03 (1)	8.4E-07	--	--	5.9E-05	2.0E-02	6.2%
Thallium	7.9E-01	NA	7.0E-05	9.6E-09	--	--	6.7E-07	9.6E-03	3.0%
Vanadium	3.3E+02	NA	1.0E-03	4.0E-06	--	--	2.8E-04	2.8E-01	87.9%
				Total ILCR:	7.8E-07	100.0%	Total HI:	3.2E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,230	
EF	days/year	Exposure frequency	90	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	3.0E-02	NA	NA	6.0E-12	--	--	4.2E-10	--	--
Benzo(a)anthracene	3.0E+00	1.3E-01	7.3E-01	NA	1.3E-08	9.2E-09	3.5%	8.8E-07	--	--
Benzo(a)pyrene (BaP)	5.7E+00	1.3E-01	7.3E+00	NA	2.4E-08	1.8E-07	68.4%	1.7E-06	--	--
Benzo(b)fluoranthene	9.0E+00	1.3E-01	7.3E-01	NA	3.8E-08	2.8E-08	10.7%	2.7E-06	--	--
Benzo(k)fluoranthene	2.3E+00	1.3E-01	7.3E-02	NA	9.6E-09	7.0E-10	0.3%	6.7E-07	--	--
Chrysene	3.6E+00	1.3E-01	7.3E-03	NA	1.5E-08	1.1E-10	0.0%	1.1E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	1.3E-01	7.3E+00	NA	3.8E-09	2.7E-08	10.6%	2.6E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	1.3E-01	7.3E-01	NA	1.7E-08	1.2E-08	4.7%	1.2E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	1.0E-01	NA	NA	9.1E-07	--	--	6.4E-05	--	--
Gasoline Range Organics (GRO)	3.4E+00	1.0E-01	NA	NA	1.1E-08	--	--	7.8E-07	--	--
Arsenic	3.1E+00	3.0E-02	1.5E+00	3.0E-04	3.0E-09	4.6E-09	1.8%	2.1E-07	7.1E-04	0.2%
Chromium	7.0E+01	1.0E-02	NA	7.5E-05 (1)	2.3E-08	--	--	1.6E-06	2.1E-02	6.8%
Thallium	7.9E-01	1.0E-02	NA	7.0E-05	2.6E-10	--	--	1.8E-08	2.6E-04	0.1%
Vanadium	3.3E+02	1.0E-02	NA	2.6E-05	1.1E-07	--	--	7.5E-06	2.9E-01	92.8%
					Total ILCR:	2.6E-07	100.0%	Total HI:	3.1E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	2.00	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	90	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	4.64E-12	NA	NA	3.7E-15	--	--	2.6E-13	--	--
Benzo(a)anthracene	3.0E+00	1.8E+07	1.66E-07	NA	NA	1.3E-10	--	--	9.4E-09	--	--
Benzo(a)pyrene (BaP)	5.7E+00	3.5E+07	1.67E-07	3.1E+00	NA	1.3E-10	4.2E-10	19.1%	9.4E-09	--	--
Benzo(b)fluoranthene	9.0E+00	2.1E+07	4.32E-07	NA	NA	3.5E-10	--	--	2.4E-08	--	--
Benzo(k)fluoranthene	2.3E+00	4.5E+07	5.20E-08	NA	NA	4.2E-11	--	--	2.9E-09	--	--
Chrysene	3.6E+00	2.7E+06	1.31E-06	NA	NA	1.1E-09	--	--	7.4E-08	--	--
Dibenz(a,h)anthracene	8.9E-01	8.7E+07	1.09E-08	NA	NA	8.8E-12	--	--	6.2E-10	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	8.2E+07	5.11E-08	NA	NA	4.1E-11	--	--	2.9E-09	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	2.12E-07	NA	NA	1.7E-10	--	--	1.2E-08	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	2.60E-09	NA	NA	2.1E-12	--	--	1.5E-10	--	--
Arsenic	3.1E+00	NA	2.36E-09	1.5E+01	NA	1.9E-12	2.9E-11	1.3%	1.3E-10	--	--
Chromium	7.0E+01	NA	5.28E-08	4.1E+01 (1)	3.0E-05 (1)	4.3E-11	1.7E-09	79.6%	3.0E-09	9.9E-05	100.0%
Thallium	7.9E-01	NA	6.02E-10	NA	NA	4.8E-13	--	--	3.4E-11	--	--
Vanadium	3.3E+02	NA	2.48E-07	NA	NA	2.0E-10	--	--	1.4E-08	--	--
						Total ILCR:	2.2E-09	100.0%	Total HI:	9.9E-05	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	240	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	90	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	1.5E+03 (1)	NA	1.5E-11	2.3E-08	20.4%	1.1E-09	--	--
OCDD	1.2E-02	1.5E+02 (2)	NA	1.4E-10	2.1E-08	18.6%	9.8E-09	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	NA	2.7E-05	--	--	1.9E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	NA	6.2E-08	--	--	4.3E-06	--	--
Arsenic	3.8E+00	1.5E+00	3.0E-04	4.6E-08	6.9E-08	61.0%	3.2E-06	1.1E-02	4.2%
Chromium	3.7E+01	NA	3.0E-03 (3)	4.4E-07	--	--	3.1E-05	1.0E-02	4.1%
Vanadium	2.8E+02	NA	1.0E-03	3.4E-06	--	--	2.3E-04	2.3E-01	91.8%
				Total ILCR:	1.1E-07	100.0%	Total HI:	2.6E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,230	
EF	days/year	Exposure frequency	90	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	3.0E-02	1.5E+03 (1)	NA	1.2E-12	1.9E-09	20.4%	8.7E-11	--	--
OCDD	1.2E-02	3.0E-02	1.5E+02 (2)	NA	1.1E-11	1.7E-09	18.6%	7.9E-10	--	--
Diesel Range Organics (DRO)	2.2E+03	1.0E-01	NA	NA	7.2E-06	--	--	5.0E-04	--	--
Gasoline Range Organics (GRO)	5.1E+00	1.0E-01	NA	NA	1.7E-08	--	--	1.2E-06	--	--
Arsenic	3.8E+00	3.0E-02	1.5E+00	3.0E-04	3.7E-09	5.5E-09	61.0%	2.6E-07	8.6E-04	0.3%
Chromium	3.7E+01	1.0E-02	NA	7.5E-05 (3)	1.2E-08	--	--	8.4E-07	1.1E-02	4.4%
Vanadium	2.8E+02	1.0E-02	NA	2.6E-05	9.0E-08	--	--	6.3E-06	2.4E-01	95.3%
					Total ILCR:	9.1E-09	100.0%	Total HI:	2.6E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	2.00	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	90	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	NA	9.62E-13	1.5E+03 (1)	NA	7.7E-16	1.2E-12	0.1%	5.4E-14	--	--
OCDD	1.2E-02	NA	8.79E-12	1.5E+02 (2)	NA	7.1E-15	1.1E-12	0.1%	5.0E-13	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	1.68E-06	NA	NA	1.4E-09	--	--	9.5E-08	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	3.87E-09	NA	NA	3.1E-12	--	--	2.2E-10	--	--
Arsenic	3.8E+00	NA	2.87E-09	1.5E+01	NA	2.3E-12	3.5E-11	3.6%	1.6E-10	--	--
Chromium	3.7E+01	NA	2.79E-08	4.1E+01 (3)	3.0E-05 (3)	2.2E-11	9.2E-10	96.1%	1.6E-09	5.2E-05	100.0%
Vanadium	2.8E+02	NA	2.11E-07	NA	NA	1.7E-10	--	--	1.2E-08	--	--
						Total ILCR:	9.6E-10	100.0%	Total HI:	5.2E-05	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH GROUNDWATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

DAD (mg/kg/d) = (C*CF*Kp*SA*EF*ED*ET)/(BW*AT) Inorganics ILCR = CDI*CSFo Adj CSF Adj = CSF/AD
DAD (mg/kg/d) = (C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT) ET ≤ t* (Organics) HQ = CDI/RfDo Adj RfD Adj = RfD*AD
DAD (mg/kg/d) = (C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B+B^2)/(1+B)^2))*SA*EF*ED)/(BW*AT) ET > t* (Benzene & Vinyl Chloride)

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
SA	cm2	Skin surface area available for contact	3,230	
EF	days/year	Exposure frequency	90	
ED	years	Exposure duration	1	
ET	hours/day	Exposure time	8.00	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	
C	mg/L	Concentration of chemical in water	CS	
CF	L/cm3	Conversion factor	1.00E-03	
Kp	cm/hour	Dermal permeability coefficient	CS	
AD	NA	Adjustment for absorbed dose	CS	

								Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	Kp (cm/hour)	tau (hours)	t* (hours)	B	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	4.20E-03	3.8E-01	9.2E-01	3.0E-03 (1)	9.1E-02	NA	2.4E-08	2.2E-09	0.1%	1.7E-06	--	--
Benzene	2.2E-01	1.50E-02	2.9E-01	7.0E-01	1.0E-01	5.5E-02	4.0E-03	4.2E-06	2.3E-07	5.6%	3.0E-04	7.4E-02	23.4%
Iodomethane	5.8E-04	2.50E-03	6.7E-01	1.6E+00	3.2E-03 (1)	NA	NA	2.2E-09	--	--	1.5E-07	--	--
1-Methylnaphthalene	1.9E-03	9.08E-02	5.6E-01 (2)	1.3E+00 (2)	2.0E-01 (2)	NA	NA	2.2E-07	--	--	1.6E-05	--	--
Benzo(a)anthracene	9.5E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-01	NA	8.1E-08	5.9E-08	1.4%	5.7E-06	--	--
Benzo(a)pyrene (BaP)	8.4E-05	7.00E-01	2.7E+00	1.2E+01	4.3E+00	7.3E+00	NA	1.2E-07	8.9E-07	21.6%	8.6E-06	--	--
Benzo(b)fluoranthene	8.3E-05	7.00E-01	2.8E+00	1.2E+01	4.3E+00	7.3E-01	NA	1.2E-07	9.0E-08	2.2%	8.6E-06	--	--
Benzo(k)fluoranthene	9.3E-05	6.74E-01	2.9E+00 (3)	1.4E+01 (3)	1.3E+02 (3)	7.3E-02	NA	1.4E-07	9.9E-09	0.2%	9.5E-06	--	--
Chrysene	7.8E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-03	NA	6.6E-08	4.8E-10	0.0%	4.6E-06	--	--
Dibenz(a,h)anthracene	9.7E-05	1.50E+00	3.9E+00	1.8E+01	9.7E+00	7.3E+00	NA	3.6E-07	2.7E-06	64.1%	2.5E-05	--	--
Indeno(1,2,3-cd)pyrene	1.1E-04	1.00E+00	3.8E+00	1.7E+01	6.7E+00	7.3E-01	NA	2.7E-07	2.0E-07	4.8%	1.9E-05	--	--
Naphthalene	1.4E-02	4.70E-02	5.6E-01	1.3E+00	2.0E-01	NA	2.0E-02	8.5E-07	--	--	5.9E-05	3.0E-03	0.9%
Diesel Range Organics (DRO)	1.8E-03	--	NA	NA	NA	NA	NA	--	--	--	--	--	--
Gasoline Range Organics (GRO)	8.6E-04	--	NA	NA	NA	NA	NA	--	--	--	--	--	--
Chromium	2.8E-02	8.11E-04	NA	NA	NA	NA	7.5E-05 (4)	2.9E-08	--	--	2.1E-06	2.7E-02	8.6%
Vanadium	7.4E-02	8.22E-04	NA	NA	NA	NA	2.6E-05	7.9E-08	--	--	5.5E-06	2.1E-01	67.1%
								Total ILCR:	4.1E-06	100.0%	Total HI:	3.2E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Dermal Exposure Assessment Value
(2) Value for napthalene
(3) VA Voluntary Remediation Program (VRP) value
(4) Value for chromium VI

Kp, tau, t*, and B values are derived from the USEPA RAGS E Guidance unless otherwise noted

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	480	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	180	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	NA	3.0E-10	--	--	2.1E-08	--	--
Benzo(a)anthracene	3.0E+00	7.3E-01	NA	1.4E-07	1.0E-07	3.3%	1.0E-05	--	--
Benzo(a)pyrene (BaP)	5.7E+00	7.3E+00	NA	2.8E-07	2.0E-06	64.6%	1.9E-05	--	--
Benzo(b)fluoranthene	9.0E+00	7.3E-01	NA	4.3E-07	3.2E-07	10.1%	3.0E-05	--	--
Benzo(k)fluoranthene	2.3E+00	7.3E-02	NA	1.1E-07	8.0E-09	0.3%	7.7E-06	--	--
Chrysene	3.6E+00	7.3E-03	NA	1.7E-07	1.3E-09	0.0%	1.2E-05	--	--
Dibenz(a,h)anthracene	8.9E-01	7.3E+00	NA	4.3E-08	3.1E-07	10.0%	3.0E-06	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	7.3E-01	NA	1.9E-07	1.4E-07	4.4%	1.3E-05	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	NA	1.4E-05	--	--	9.5E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	NA	1.7E-07	--	--	1.2E-05	--	--
Arsenic	3.1E+00	1.5E+00	3.0E-04	1.5E-07	2.3E-07	7.2%	1.1E-05	3.5E-02	2.8%
Chromium	7.0E+01	NA	3.0E-03 (1)	3.4E-06	--	--	2.4E-04	7.9E-02	6.2%
Thallium	7.9E-01	NA	7.0E-05	3.8E-08	--	--	2.7E-06	3.8E-02	3.0%
Vanadium	3.3E+02	NA	1.0E-03	1.6E-05	--	--	1.1E-03	1.1E+00	87.9%
				Total ILCR:	3.1E-06	100.0%	Total HI:	1.3E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,300	
EF	days/year	Exposure frequency	180	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	3.0E-02	NA	NA	1.2E-11	--	--	8.5E-10	--	--
Benzo(a)anthracene	3.0E+00	1.3E-01	7.3E-01	NA	2.6E-08	1.9E-08	3.5%	1.8E-06	--	--
Benzo(a)pyrene (BaP)	5.7E+00	1.3E-01	7.3E+00	NA	5.0E-08	3.6E-07	68.4%	3.5E-06	--	--
Benzo(b)fluoranthene	9.0E+00	1.3E-01	7.3E-01	NA	7.8E-08	5.7E-08	10.7%	5.4E-06	--	--
Benzo(k)fluoranthene	2.3E+00	1.3E-01	7.3E-02	NA	2.0E-08	1.4E-09	0.3%	1.4E-06	--	--
Chrysene	3.6E+00	1.3E-01	7.3E-03	NA	3.1E-08	2.3E-10	0.0%	2.2E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	1.3E-01	7.3E+00	NA	7.7E-09	5.6E-08	10.6%	5.4E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	1.3E-01	7.3E-01	NA	3.4E-08	2.5E-08	4.7%	2.4E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	1.0E-01	NA	NA	1.9E-06	--	--	1.3E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	1.0E-01	NA	NA	2.3E-08	--	--	1.6E-06	--	--
Arsenic	3.1E+00	3.0E-02	1.5E+00	3.0E-04	6.2E-09	9.3E-09	1.8%	4.4E-07	1.5E-03	0.2%
Chromium	7.0E+01	1.0E-02	NA	7.5E-05 (1)	4.6E-08	--	--	3.2E-06	4.3E-02	6.8%
Thallium	7.9E-01	1.0E-02	NA	7.0E-05	5.3E-10	--	--	3.7E-08	5.3E-04	0.1%
Vanadium	3.3E+02	1.0E-02	NA	2.6E-05	2.2E-07	--	--	1.5E-05	5.9E-01	92.8%
					Total ILCR:	5.3E-07	100.0%	Total HI:	6.3E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	2.00	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	180	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	4.64E-12	NA	NA	7.5E-15	--	--	5.2E-13	--	--
Benzo(a)anthracene	3.0E+00	1.8E+07	1.66E-07	NA	NA	2.7E-10	--	--	1.9E-08	--	--
Benzo(a)pyrene (BaP)	5.7E+00	3.5E+07	1.67E-07	3.1E+00	NA	2.7E-10	8.3E-10	19.1%	1.9E-08	--	--
Benzo(b)fluoranthene	9.0E+00	2.1E+07	4.32E-07	NA	NA	7.0E-10	--	--	4.9E-08	--	--
Benzo(k)fluoranthene	2.3E+00	4.5E+07	5.20E-08	NA	NA	8.4E-11	--	--	5.9E-09	--	--
Chrysene	3.6E+00	2.7E+06	1.31E-06	NA	NA	2.1E-09	--	--	1.5E-07	--	--
Dibenz(a,h)anthracene	8.9E-01	8.7E+07	1.09E-08	NA	NA	1.8E-11	--	--	1.2E-09	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	8.2E+07	5.11E-08	NA	NA	8.2E-11	--	--	5.8E-09	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	2.12E-07	NA	NA	3.4E-10	--	--	2.4E-08	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	2.60E-09	NA	NA	4.2E-12	--	--	2.9E-10	--	--
Arsenic	3.1E+00	NA	2.36E-09	1.5E+01	NA	3.8E-12	5.8E-11	1.3%	2.7E-10	--	--
Chromium	7.0E+01	NA	5.28E-08	4.1E+01 (1)	3.0E-05 (1)	8.5E-11	3.5E-09	79.6%	6.0E-09	2.0E-04	100.0%
Thallium	7.9E-01	NA	6.02E-10	NA	NA	9.7E-13	--	--	6.8E-11	--	--
Vanadium	3.3E+02	NA	2.48E-07	NA	NA	4.0E-10	--	--	2.8E-08	--	--
						Total ILCR:	4.4E-09	100.0%	Total HI:	2.0E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	480	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	180	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	1.5E+03 (1)	NA	6.1E-11	9.2E-08	20.4%	4.3E-09	--	--
OCDD	1.2E-02	1.5E+02 (2)	NA	5.6E-10	8.4E-08	18.6%	3.9E-08	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	NA	1.1E-04	--	--	7.5E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	NA	2.5E-07	--	--	1.7E-05	--	--
Arsenic	3.8E+00	1.5E+00	3.0E-04	1.8E-07	2.7E-07	61.0%	1.3E-05	4.3E-02	4.2%
Chromium	3.7E+01	NA	3.0E-03 (3)	1.8E-06	--	--	1.2E-04	4.1E-02	4.1%
Vanadium	2.8E+02	NA	1.0E-03	1.3E-05	--	--	9.4E-04	9.4E-01	91.8%
				Total ILCR:	4.5E-07	100.0%	Total HI:	1.0E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,300	
EF	days/year	Exposure frequency	180	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	3.0E-02	1.5E+03 (1)	NA	2.5E-12	3.8E-09	20.4%	1.8E-10	--	--
OCDD	1.2E-02	3.0E-02	1.5E+02 (2)	NA	2.3E-11	3.5E-09	18.6%	1.6E-09	--	--
Diesel Range Organics (DRO)	2.2E+03	1.0E-01	NA	NA	1.5E-05	--	--	1.0E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	1.0E-01	NA	NA	3.4E-08	--	--	2.4E-06	--	--
Arsenic	3.8E+00	3.0E-02	1.5E+00	3.0E-04	7.6E-09	1.1E-08	61.0%	5.3E-07	1.8E-03	0.3%
Chromium	3.7E+01	1.0E-02	NA	7.5E-05 (3)	2.4E-08	--	--	1.7E-06	2.3E-02	4.4%
Vanadium	2.8E+02	1.0E-02	NA	2.6E-05	1.8E-07	--	--	1.3E-05	5.0E-01	95.3%
					Total ILCR:	1.9E-08	100.0%	Total HI:	5.2E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	2.00	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	180	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	NA	9.62E-13	1.5E+03 (1)	NA	1.5E-15	2.3E-12	0.1%	1.1E-13	--	--
OCDD	1.2E-02	NA	8.79E-12	1.5E+02 (2)	NA	1.4E-14	2.1E-12	0.1%	9.9E-13	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	1.68E-06	NA	NA	2.7E-09	--	--	1.9E-07	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	3.87E-09	NA	NA	6.2E-12	--	--	4.4E-10	--	--
Arsenic	3.8E+00	NA	2.87E-09	1.5E+01	NA	4.6E-12	7.0E-11	3.6%	3.2E-10	--	--
Chromium	3.7E+01	NA	2.79E-08	4.1E+01 (3)	3.0E-05 (3)	4.5E-11	1.8E-09	96.1%	3.1E-09	1.0E-04	100.0%
Vanadium	2.8E+02	NA	2.11E-07	NA	NA	3.4E-10	--	--	2.4E-08	--	--
						Total ILCR:	1.9E-09	100.0%	Total HI:	1.0E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH GROUNDWATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

DAD (mg/kg/d) = (C*CF*Kp*SA*EF*ED*ET)/(BW*AT) Inorganics ILCR = CDI*CSFo Adj CSF Adj = CSF/AD
DAD (mg/kg/d) = (C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT) ET ≤ t* (Organics) HQ = CDI/RfDo Adj RfD Adj = RfD*AD
DAD (mg/kg/d) = (C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B+B^2)/(1+B)^2))*SA*EF*ED)/(BW*AT) ET > t* (Benzene & Vinyl Chloride)

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
SA	cm2	Skin surface area available for contact	3,300	
EF	days/year	Exposure frequency	180	
ED	years	Exposure duration	1	
ET	hours/day	Exposure time	8.00	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	
C	mg/L	Concentration of chemical in water	CS	
CF	L/cm3	Conversion factor	1.00E-03	
Kp	cm/hour	Dermal permeability coefficient	CS	
AD	NA	Adjustment for absorbed dose	CS	

								Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	Kp (cm/hour)	tau (hours)	t* (hours)	B	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	4.20E-03	3.8E-01	9.2E-01	3.0E-03 (1)	9.1E-02	NA	5.0E-08	4.5E-09	0.1%	3.5E-06	--	--
Benzene	2.2E-01	1.50E-02	2.9E-01	7.0E-01	1.0E-01	5.5E-02	4.0E-03	8.7E-06	4.8E-07	5.6%	6.1E-04	1.5E-01	23.4%
Iodomethane	5.8E-04	2.50E-03	6.7E-01	1.6E+00	3.2E-03 (1)	NA	NA	4.5E-09	--	--	3.1E-07	--	--
1-Methylnaphthalene	1.9E-03	9.08E-02	5.6E-01 (2)	1.3E+00 (2)	2.0E-01 (2)	NA	NA	4.5E-07	--	--	3.2E-05	--	--
Benzo(a)anthracene	9.5E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-01	NA	1.7E-07	1.2E-07	1.4%	1.2E-05	--	--
Benzo(a)pyrene (BaP)	8.4E-05	7.00E-01	2.7E+00	1.2E+01	4.3E+00	7.3E+00	NA	2.5E-07	1.8E-06	21.6%	1.8E-05	--	--
Benzo(b)fluoranthene	8.3E-05	7.00E-01	2.8E+00	1.2E+01	4.3E+00	7.3E-01	NA	2.5E-07	1.8E-07	2.2%	1.8E-05	--	--
Benzo(k)fluoranthene	9.3E-05	6.74E-01	2.9E+00 (3)	1.4E+01 (3)	1.3E+02 (3)	7.3E-02	NA	2.8E-07	2.0E-08	0.2%	1.9E-05	--	--
Chrysene	7.8E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-03	NA	1.4E-07	9.9E-10	0.0%	9.5E-06	--	--
Dibenz(a,h)anthracene	9.7E-05	1.50E+00	3.9E+00	1.8E+01	9.7E+00	7.3E+00	NA	7.4E-07	5.4E-06	64.1%	5.2E-05	--	--
Indeno(1,2,3-cd)pyrene	1.1E-04	1.00E+00	3.8E+00	1.7E+01	6.7E+00	7.3E-01	NA	5.6E-07	4.1E-07	4.8%	3.9E-05	--	--
Naphthalene	1.4E-02	4.70E-02	5.6E-01	1.3E+00	2.0E-01	NA	2.0E-02	1.7E-06	--	--	1.2E-04	6.1E-03	0.9%
Diesel Range Organics (DRO)	1.8E-03	--	NA	NA	NA	NA	NA	--	--	--	--	--	--
Gasoline Range Organics (GRO)	8.6E-04	--	NA	NA	NA	NA	NA	--	--	--	--	--	--
Chromium	2.8E-02	8.11E-04	NA	NA	NA	NA	7.5E-05 (4)	6.0E-08	--	--	4.2E-06	5.6E-02	8.6%
Vanadium	7.4E-02	8.22E-04	NA	NA	NA	NA	2.6E-05	1.6E-07	--	--	1.1E-05	4.3E-01	67.1%
								Total ILCR:	8.5E-06	100.0%	Total HI:	6.5E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Dermal Exposure Assessment Value
(2) Value for napthalene
(3) VA Voluntary Remediation Program (VRP) value
(4) Value for chromium VI

Kp, tau, t*, and B values are derived from the USEPA RAGS E Guidance unless otherwise noted

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
ACCIDENTAL INGESTION OF SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	50	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	219	
ED	years	Exposure duration	9	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	3,285	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	NA	3.4E-10	--	--	2.6E-09	--	--
Benzo(a)anthracene	3.0E+00	7.3E-01	NA	1.6E-07	1.2E-07	3.3%	1.3E-06	--	--
Benzo(a)pyrene (BaP)	5.7E+00	7.3E+00	NA	3.2E-07	2.3E-06	64.6%	2.5E-06	--	--
Benzo(b)fluoranthene	9.0E+00	7.3E-01	NA	5.0E-07	3.6E-07	10.1%	3.9E-06	--	--
Benzo(k)fluoranthene	2.3E+00	7.3E-02	NA	1.3E-07	9.1E-09	0.3%	9.7E-07	--	--
Chrysene	3.6E+00	7.3E-03	NA	2.0E-07	1.4E-09	0.0%	1.5E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	7.3E+00	NA	4.9E-08	3.6E-07	10.0%	3.8E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	7.3E-01	NA	2.2E-07	1.6E-07	4.4%	1.7E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	NA	1.5E-05	--	--	1.2E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	NA	1.9E-07	--	--	1.5E-06	--	--
Arsenic	3.1E+00	1.5E+00	3.0E-04	1.7E-07	2.6E-07	7.2%	1.3E-06	4.5E-03	2.8%
Chromium	7.0E+01	NA	3.0E-03 (1)	3.8E-06	--	--	3.0E-05	1.0E-02	6.2%
Thallium	7.9E-01	NA	7.0E-05	4.4E-08	--	--	3.4E-07	4.9E-03	3.0%
Vanadium	3.3E+02	NA	1.0E-03	1.8E-05	--	--	1.4E-04	1.4E-01	87.9%
				Total ILCR:	3.6E-06	100.0%	Total HI:	1.6E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
DERMAL CONTACT WITH SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	5,000	
EF	days/year	Exposure frequency	219	
ED	years	Exposure duration	9	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	3,285	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	3.0E-02	NA	NA	2.0E-10	--	--	1.6E-09	--	--
Benzo(a)anthracene	3.0E+00	1.3E-01	7.3E-01	NA	4.3E-07	3.1E-07	3.5%	3.3E-06	--	--
Benzo(a)pyrene (BaP)	5.7E+00	1.3E-01	7.3E+00	NA	8.2E-07	6.0E-06	68.4%	6.4E-06	--	--
Benzo(b)fluoranthene	9.0E+00	1.3E-01	7.3E-01	NA	1.3E-06	9.4E-07	10.7%	1.0E-05	--	--
Benzo(k)fluoranthene	2.3E+00	1.3E-01	7.3E-02	NA	3.3E-07	2.4E-08	0.3%	2.5E-06	--	--
Chrysene	3.6E+00	1.3E-01	7.3E-03	NA	5.1E-07	3.7E-09	0.0%	4.0E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	1.3E-01	7.3E+00	NA	1.3E-07	9.3E-07	10.6%	9.9E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	1.3E-01	7.3E-01	NA	5.7E-07	4.1E-07	4.7%	4.4E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	1.0E-01	NA	NA	3.1E-05	--	--	2.4E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	1.0E-01	NA	NA	3.8E-07	--	--	2.9E-06	--	--
Arsenic	3.1E+00	3.0E-02	1.5E+00	3.0E-04	1.0E-07	1.5E-07	1.8%	8.0E-07	2.7E-03	0.2%
Chromium	7.0E+01	1.0E-02	NA	7.5E-05 (1)	7.7E-07	--	--	6.0E-06	8.0E-02	6.8%
Thallium	7.9E-01	1.0E-02	NA	7.0E-05	8.8E-09	--	--	6.8E-08	9.7E-04	0.1%
Vanadium	3.3E+02	1.0E-02	NA	2.6E-05	3.6E-06	--	--	2.8E-05	1.1E+00	92.8%
					Total ILCR:	8.8E-06	100.0%	Total HI:	1.2E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	1.27	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	219	
ED	years	Exposure duration	9	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	3,285	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	4.64E-12	NA	NA	5.2E-14	--	--	4.0E-13	--	--
Benzo(a)anthracene	3.0E+00	1.8E+07	1.66E-07	NA	NA	1.9E-09	--	--	1.4E-08	--	--
Benzo(a)pyrene (BaP)	5.7E+00	3.5E+07	1.67E-07	3.1E+00	NA	1.9E-09	5.8E-09	19.1%	1.5E-08	--	--
Benzo(b)fluoranthene	9.0E+00	2.1E+07	4.32E-07	NA	NA	4.8E-09	--	--	3.8E-08	--	--
Benzo(k)fluoranthene	2.3E+00	4.5E+07	5.20E-08	NA	NA	5.8E-10	--	--	4.5E-09	--	--
Chrysene	3.6E+00	2.7E+06	1.31E-06	NA	NA	1.5E-08	--	--	1.1E-07	--	--
Dibenz(a,h)anthracene	8.9E-01	8.7E+07	1.09E-08	NA	NA	1.2E-10	--	--	9.5E-10	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	8.2E+07	5.11E-08	NA	NA	5.7E-10	--	--	4.5E-09	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	2.12E-07	NA	NA	2.4E-09	--	--	1.8E-08	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	2.60E-09	NA	NA	2.9E-11	--	--	2.3E-10	--	--
Arsenic	3.1E+00	NA	2.36E-09	1.5E+01	NA	2.6E-11	4.0E-10	1.3%	2.1E-10	--	--
Chromium	7.0E+01	NA	5.28E-08	4.1E+01 (1)	3.0E-05 (1)	5.9E-10	2.4E-08	79.6%	4.6E-09	1.5E-04	100.0%
Thallium	7.9E-01	NA	6.02E-10	NA	NA	6.7E-12	--	--	5.2E-11	--	--
Vanadium	3.3E+02	NA	2.48E-07	NA	NA	2.8E-09	--	--	2.2E-08	--	--
						Total ILCR:	3.0E-08	100.0%	Total HI:	1.5E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	50	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	219	
ED	years	Exposure duration	9	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	3,285	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	1.5E+03 (1)	NA	7.0E-11	1.0E-07	20.4%	5.4E-10	--	--
OCDD	1.2E-02	1.5E+02 (2)	NA	6.4E-10	9.6E-08	18.6%	5.0E-09	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	NA	1.2E-04	--	--	9.5E-04	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	NA	2.8E-07	--	--	2.2E-06	--	--
Arsenic	3.8E+00	1.5E+00	3.0E-04	2.1E-07	3.1E-07	61.0%	1.6E-06	5.4E-03	4.2%
Chromium	3.7E+01	NA	3.0E-03 (3)	2.0E-06	--	--	1.6E-05	5.3E-03	4.1%
Vanadium	2.8E+02	NA	1.0E-03	1.5E-05	--	--	1.2E-04	1.2E-01	91.8%
				Total ILCR:	5.1E-07	100.0%	Total HI:	1.3E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
DERMAL CONTACT WITH SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	5,000	
EF	days/year	Exposure frequency	219	
ED	years	Exposure duration	9	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	3,285	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	3.0E-02	1.5E+03 (1)	NA	4.2E-11	6.3E-08	20.4%	3.3E-10	--	--
OCDD	1.2E-02	3.0E-02	1.5E+02 (2)	NA	3.8E-10	5.8E-08	18.6%	3.0E-09	--	--
Diesel Range Organics (DRO)	2.2E+03	1.0E-01	NA	NA	2.4E-04	--	--	1.9E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	1.0E-01	NA	NA	5.6E-07	--	--	4.4E-06	--	--
Arsenic	3.8E+00	3.0E-02	1.5E+00	3.0E-04	1.3E-07	1.9E-07	61.0%	9.8E-07	3.3E-03	0.3%
Chromium	3.7E+01	1.0E-02	NA	7.5E-05 (3)	4.1E-07	--	--	3.2E-06	4.2E-02	4.4%
Vanadium	2.8E+02	1.0E-02	NA	2.6E-05	3.1E-06	--	--	2.4E-05	9.2E-01	95.3%
					Total ILCR:	3.1E-07	100.0%	Total HI:	9.6E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
INHALATION OF FUGITIVE DUSTS EMANATING FROM SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	1.27	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	219	
ED	years	Exposure duration	9	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	3,285	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	NA	9.62E-13	1.5E+03 (1)	NA	1.1E-14	1.6E-11	0.1%	8.4E-14	--	--
OCDD	1.2E-02	NA	8.79E-12	1.5E+02 (2)	NA	9.8E-14	1.5E-11	0.1%	7.7E-13	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	1.68E-06	NA	NA	1.9E-08	--	--	1.5E-07	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	3.87E-09	NA	NA	4.3E-11	--	--	3.4E-10	--	--
Arsenic	3.8E+00	NA	2.87E-09	1.5E+01	NA	3.2E-11	4.9E-10	3.6%	2.5E-10	--	--
Chromium	3.7E+01	NA	2.79E-08	4.1E+01 (3)	3.0E-05 (3)	3.1E-10	1.3E-08	96.1%	2.4E-09	8.1E-05	100.0%
Vanadium	2.8E+02	NA	2.11E-07	NA	NA	2.4E-09	--	--	1.8E-08	--	--
						Total ILCR:	1.3E-08	100.0%	Total HI:	8.1E-05	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
ACCIDENTAL INGESTION OF SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	100	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	NA	2.1E-09	--	--	6.0E-09	--	--
Benzo(a)anthracene	3.0E+00	7.3E-01	NA	1.0E-06	7.6E-07	3.3%	2.9E-06	--	--
Benzo(a)pyrene (BaP)	5.7E+00	7.3E+00	NA	2.0E-06	1.5E-05	64.6%	5.6E-06	--	--
Benzo(b)fluoranthene	9.0E+00	7.3E-01	NA	3.1E-06	2.3E-06	10.1%	8.8E-06	--	--
Benzo(k)fluoranthene	2.3E+00	7.3E-02	NA	7.9E-07	5.8E-08	0.3%	2.2E-06	--	--
Chrysene	3.6E+00	7.3E-03	NA	1.2E-06	9.1E-09	0.0%	3.5E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	7.3E+00	NA	3.1E-07	2.3E-06	10.0%	8.7E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	7.3E-01	NA	1.4E-06	1.0E-06	4.4%	3.9E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	NA	9.8E-05	--	--	2.7E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	NA	1.2E-06	--	--	3.4E-06	--	--
Arsenic	3.1E+00	1.5E+00	3.0E-04	1.1E-06	1.6E-06	7.2%	3.1E-06	1.0E-02	2.8%
Chromium	7.0E+01	NA	3.0E-03 (1)	2.4E-05	--	--	6.8E-05	2.3E-02	6.2%
Thallium	7.9E-01	NA	7.0E-05	2.8E-07	--	--	7.8E-07	1.1E-02	3.0%
Vanadium	3.3E+02	NA	1.0E-03	1.1E-04	--	--	3.2E-04	3.2E-01	87.9%
				Total ILCR:	2.3E-05	100.0%	Total HI:	3.6E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
DERMAL CONTACT WITH SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	5,700	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	3.0E-02	NA	NA	7.3E-10	--	--	2.0E-09	--	--
Benzo(a)anthracene	3.0E+00	1.3E-01	7.3E-01	NA	1.5E-06	1.1E-06	3.5%	4.3E-06	--	--
Benzo(a)pyrene (BaP)	5.7E+00	1.3E-01	7.3E+00	NA	3.0E-06	2.2E-05	68.4%	8.3E-06	--	--
Benzo(b)fluoranthene	9.0E+00	1.3E-01	7.3E-01	NA	4.7E-06	3.4E-06	10.7%	1.3E-05	--	--
Benzo(k)fluoranthene	2.3E+00	1.3E-01	7.3E-02	NA	1.2E-06	8.6E-08	0.3%	3.3E-06	--	--
Chrysene	3.6E+00	1.3E-01	7.3E-03	NA	1.8E-06	1.4E-08	0.0%	5.2E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	1.3E-01	7.3E+00	NA	4.6E-07	3.4E-06	10.6%	1.3E-06	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	1.3E-01	7.3E-01	NA	2.0E-06	1.5E-06	4.7%	5.7E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	1.0E-01	NA	NA	1.1E-04	--	--	3.1E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	1.0E-01	NA	NA	1.4E-06	--	--	3.8E-06	--	--
Arsenic	3.1E+00	3.0E-02	1.5E+00	3.0E-04	3.7E-07	5.6E-07	1.8%	1.0E-06	3.5E-03	0.2%
Chromium	7.0E+01	1.0E-02	NA	7.5E-05 (1)	2.8E-06	--	--	7.8E-06	1.0E-01	6.8%
Thallium	7.9E-01	1.0E-02	NA	7.0E-05	3.2E-08	--	--	8.9E-08	1.3E-03	0.1%
Vanadium	3.3E+02	1.0E-02	NA	2.6E-05	1.3E-05	--	--	3.7E-05	1.4E+00	92.8%
					Total ILCR:	3.2E-05	100.0%	Total HI:	1.5E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	1.27	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	4.64E-12	NA	NA	1.6E-13	--	--	4.6E-13	--	--
Benzo(a)anthracene	3.0E+00	1.8E+07	1.66E-07	NA	NA	5.9E-09	--	--	1.6E-08	--	--
Benzo(a)pyrene (BaP)	5.7E+00	3.5E+07	1.67E-07	3.1E+00	NA	5.9E-09	1.8E-08	19.1%	1.7E-08	--	--
Benzo(b)fluoranthene	9.0E+00	2.1E+07	4.32E-07	NA	NA	1.5E-08	--	--	4.3E-08	--	--
Benzo(k)fluoranthene	2.3E+00	4.5E+07	5.20E-08	NA	NA	1.8E-09	--	--	5.2E-09	--	--
Chrysene	3.6E+00	2.7E+06	1.31E-06	NA	NA	4.7E-08	--	--	1.3E-07	--	--
Dibenz(a,h)anthracene	8.9E-01	8.7E+07	1.09E-08	NA	NA	3.9E-10	--	--	1.1E-09	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	8.2E+07	5.11E-08	NA	NA	1.8E-09	--	--	5.1E-09	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	2.12E-07	NA	NA	7.5E-09	--	--	2.1E-08	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	2.60E-09	NA	NA	9.2E-11	--	--	2.6E-10	--	--
Arsenic	3.1E+00	NA	2.36E-09	1.5E+01	NA	8.4E-11	1.3E-09	1.3%	2.4E-10	--	--
Chromium	7.0E+01	NA	5.28E-08	4.1E+01 (1)	3.0E-05 (1)	1.9E-09	7.7E-08	79.6%	5.2E-09	1.7E-04	100.0%
Thallium	7.9E-01	NA	6.02E-10	NA	NA	2.1E-11	--	--	6.0E-11	--	--
Vanadium	3.3E+02	NA	2.48E-07	NA	NA	8.8E-09	--	--	2.5E-08	--	--
						Total ILCR:	9.7E-08	100.0%	Total HI:	1.7E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	100	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	1.5E+03 (1)	NA	4.4E-10	6.7E-07	20.4%	1.2E-09	--	--
OCDD	1.2E-02	1.5E+02 (2)	NA	4.1E-09	6.1E-07	18.6%	1.1E-08	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	NA	7.7E-04	--	--	2.2E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	NA	1.8E-06	--	--	5.0E-06	--	--
Arsenic	3.8E+00	1.5E+00	3.0E-04	1.3E-06	2.0E-06	61.0%	3.7E-06	1.2E-02	4.2%
Chromium	3.7E+01	NA	3.0E-03 (3)	1.3E-05	--	--	3.6E-05	1.2E-02	4.1%
Vanadium	2.8E+02	NA	1.0E-03	9.7E-05	--	--	2.7E-04	2.7E-01	91.8%
				Total ILCR:	3.3E-06	100.0%	Total HI:	3.0E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
DERMAL CONTACT WITH SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	5,700	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	3.0E-02	1.5E+03 (1)	NA	1.5E-10	2.3E-07	20.4%	4.2E-10	--	--
OCDD	1.2E-02	3.0E-02	1.5E+02 (2)	NA	1.4E-09	2.1E-07	18.6%	3.9E-09	--	--
Diesel Range Organics (DRO)	2.2E+03	1.0E-01	NA	NA	8.8E-04	--	--	2.5E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	1.0E-01	NA	NA	2.0E-06	--	--	5.7E-06	--	--
Arsenic	3.8E+00	3.0E-02	1.5E+00	3.0E-04	4.5E-07	6.8E-07	61.0%	1.3E-06	4.2E-03	0.3%
Chromium	3.7E+01	1.0E-02	NA	7.5E-05 (3)	1.5E-06	--	--	4.1E-06	5.5E-02	4.4%
Vanadium	2.8E+02	1.0E-02	NA	2.6E-05	1.1E-05	--	--	3.1E-05	1.2E+00	95.3%
					Total ILCR:	1.1E-06	100.0%	Total HI:	1.3E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT ON-SITE WORKERS - CURRENT AND FUTURE SCENARIOS
INHALATION OF FUGITIVE DUSTS EMANATING FROM SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
VF	m3/kg	Volatilization Factor	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	1.27	
ET	hours/day	Exposure time	8.0	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

						Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	NA	9.62E-13	1.5E+03 (1)	NA	3.4E-14	5.1E-11	0.1%	9.6E-14	--	--
OCDD	1.2E-02	NA	8.79E-12	1.5E+02 (2)	NA	3.1E-13	4.7E-11	0.1%	8.7E-13	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	1.68E-06	NA	NA	6.0E-08	--	--	1.7E-07	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	3.87E-09	NA	NA	1.4E-10	--	--	3.8E-10	--	--
Arsenic	3.8E+00	NA	2.87E-09	1.5E+01	NA	1.0E-10	1.5E-09	3.6%	2.9E-10	--	--
Chromium	3.7E+01	NA	2.79E-08	4.1E+01 (3)	3.0E-05 (3)	9.9E-10	4.1E-08	96.1%	2.8E-09	9.2E-05	100.0%
Vanadium	2.8E+02	NA	2.11E-07	NA	NA	7.5E-09	--	--	2.1E-08	--	--
						Total ILCR:	4.2E-08	100.0%	Total HI:	9.2E-05	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIC
ACCIDENTAL INGESTION OF SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	50	100	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	NA	2.8E-10	--	--	2.8E-09	--	--	7.5E-10	--	--	2.6E-08	--	--
Benzo(a)anthracene	3.0E+00	7.3E-01	NA	1.4E-07	9.9E-08	3.3%	1.4E-06	--	--	3.6E-07	2.6E-07	3.3%	1.3E-05	--	--
Benzo(a)pyrene (BaP)	5.7E+00	7.3E+00	NA	2.6E-07	1.9E-06	64.6%	2.6E-06	--	--	7.0E-07	5.1E-06	64.6%	2.5E-05	--	--
Benzo(b)fluoranthene	9.0E+00	7.3E-01	NA	4.1E-07	3.0E-07	10.1%	4.1E-06	--	--	1.1E-06	8.0E-07	10.1%	3.8E-05	--	--
Benzo(k)fluoranthene	2.3E+00	7.3E-02	NA	1.0E-07	7.6E-09	0.3%	1.0E-06	--	--	2.8E-07	2.0E-08	0.3%	9.7E-06	--	--
Chrysene	3.6E+00	7.3E-03	NA	1.6E-07	1.2E-09	0.0%	1.6E-06	--	--	4.4E-07	3.2E-09	0.0%	1.5E-05	--	--
Dibenz(a,h)anthracene	8.9E-01	7.3E+00	NA	4.1E-08	3.0E-07	10.0%	4.1E-07	--	--	1.1E-07	7.9E-07	10.0%	3.8E-06	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	7.3E-01	NA	1.8E-07	1.3E-07	4.4%	1.8E-06	--	--	4.8E-07	3.5E-07	4.4%	1.7E-05	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	NA	1.3E-05	--	--	1.3E-04	--	--	3.4E-05	--	--	1.2E-03	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	NA	1.6E-07	--	--	1.6E-06	--	--	4.2E-07	--	--	1.5E-05	--	--
Arsenic	3.1E+00	1.5E+00	3.0E-04	1.4E-07	2.1E-07	7.2%	1.4E-06	4.8E-03	2.8%	3.8E-07	5.7E-07	7.2%	1.3E-05	4.4E-02	2.8%
Chromium	7.0E+01	NA	3.0E-03 (1)	3.2E-06	--	--	3.2E-05	1.1E-02	6.2%	8.5E-06	--	--	3.0E-04	9.9E-02	6.2%
Thallium	7.9E-01	NA	7.0E-05	3.6E-08	--	--	3.6E-07	5.2E-03	3.0%	9.7E-08	--	--	3.4E-06	4.8E-02	3.0%
Vanadium	3.3E+02	NA	1.0E-03	1.5E-05	--	--	1.5E-04	1.5E-01	87.9%	4.0E-05	--	--	1.4E-03	1.4E+00	87.9%
				Total ILCR:	3.0E-06	100.0%	Total HI:	1.7E-01	100.0%	Total ILCR:	7.9E-06	100.0%	Total HI:	1.6E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,000	2,000	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	3.0E-02	NA	NA	5.9E-11	--	--	5.9E-10	--	--	9.0E-11	--	--	3.1E-09	--	--
Benzo(a)anthracene	3.0E+00	1.3E-01	7.3E-01	NA	1.2E-07	9.0E-08	3.5%	1.2E-06	--	--	1.9E-07	1.4E-07	3.5%	6.6E-06	--	--
Benzo(a)pyrene (BaP)	5.7E+00	1.3E-01	7.3E+00	NA	2.4E-07	1.7E-06	68.4%	2.4E-06	--	--	3.6E-07	2.7E-06	68.4%	1.3E-05	--	--
Benzo(b)fluoranthene	9.0E+00	1.3E-01	7.3E-01	NA	3.8E-07	2.7E-07	10.7%	3.8E-06	--	--	5.7E-07	4.2E-07	10.7%	2.0E-05	--	--
Benzo(k)fluoranthene	2.3E+00	1.3E-01	7.3E-02	NA	9.5E-08	6.9E-09	0.3%	9.5E-07	--	--	1.4E-07	1.1E-08	0.3%	5.1E-06	--	--
Chrysene	3.6E+00	1.3E-01	7.3E-03	NA	1.5E-07	1.1E-09	0.0%	1.5E-06	--	--	2.3E-07	1.7E-09	0.0%	7.9E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	1.3E-01	7.3E+00	NA	3.7E-08	2.7E-07	10.6%	3.7E-07	--	--	5.6E-08	4.1E-07	10.6%	2.0E-06	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	1.3E-01	7.3E-01	NA	1.6E-07	1.2E-07	4.7%	1.6E-06	--	--	2.5E-07	1.8E-07	4.7%	8.8E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	1.0E-01	NA	NA	9.0E-06	--	--	9.0E-05	--	--	1.4E-05	--	--	4.8E-04	--	--
Gasoline Range Organics (GRO)	3.4E+00	1.0E-01	NA	NA	1.1E-07	--	--	1.1E-06	--	--	1.7E-07	--	--	5.9E-06	--	--
Arsenic	3.1E+00	3.0E-02	1.5E+00	3.0E-04	3.0E-08	4.5E-08	1.8%	3.0E-07	1.0E-03	0.2%	4.6E-08	6.9E-08	1.8%	1.6E-06	5.3E-03	0.2%
Chromium	7.0E+01	1.0E-02	NA	7.5E-05 (1)	2.2E-07	--	--	2.2E-06	3.0E-02	6.8%	3.4E-07	--	--	1.2E-05	1.6E-01	6.8%
Thallium	7.9E-01	1.0E-02	NA	7.0E-05	2.5E-09	--	--	2.5E-08	3.6E-04	0.1%	3.9E-09	--	--	1.4E-07	1.9E-03	0.1%
Vanadium	3.3E+02	1.0E-02	NA	2.6E-05	1.1E-06	--	--	1.1E-05	4.0E-01	92.8%	1.6E-06	--	--	5.6E-05	2.2E+00	92.8%
					Total ILCR:	2.6E-06	100.0%	Total HI:	4.4E-01	100.0%	Total ILCR:	3.9E-06	100.0%	Total HI:	2.3E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
VF	m3/kg	Volatilization Factor	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	1.27	0.69	
ET	hours/day	Exposure time	24.0	24.0	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	

						Adult						Young Child					
						Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	4.64E-12	NA	NA	1.3E-13	--	--	1.3E-12	--	--	9.4E-14	--	--	3.3E-12	--	--
Benzo(a)anthracene	3.0E+00	1.8E+07	1.66E-07	NA	NA	4.6E-09	--	--	4.6E-08	--	--	3.4E-09	--	--	1.2E-07	--	--
Benzo(a)pyrene (BaP)	5.7E+00	3.5E+07	1.67E-07	3.1E+00	NA	4.7E-09	1.4E-08	19.1%	4.7E-08	--	--	3.4E-09	1.0E-08	19.1%	1.2E-07	--	--
Benzo(b)fluoranthene	9.0E+00	2.1E+07	4.32E-07	NA	NA	1.2E-08	--	--	1.2E-07	--	--	8.7E-09	--	--	3.1E-07	--	--
Benzo(k)fluoranthene	2.3E+00	4.5E+07	5.20E-08	NA	NA	1.5E-09	--	--	1.5E-08	--	--	1.1E-09	--	--	3.7E-08	--	--
Chrysene	3.6E+00	2.7E+06	1.31E-06	NA	NA	3.7E-08	--	--	3.7E-07	--	--	2.7E-08	--	--	9.3E-07	--	--
Dibenz(a,h)anthracene	8.9E-01	8.7E+07	1.09E-08	NA	NA	3.0E-10	--	--	3.0E-09	--	--	2.2E-10	--	--	7.7E-09	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	8.2E+07	5.11E-08	NA	NA	1.4E-09	--	--	1.4E-08	--	--	1.0E-09	--	--	3.6E-08	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	2.12E-07	NA	NA	5.9E-09	--	--	5.9E-08	--	--	4.3E-09	--	--	1.5E-07	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	2.60E-09	NA	NA	7.3E-11	--	--	7.3E-10	--	--	5.3E-11	--	--	1.8E-09	--	--
Arsenic	3.1E+00	NA	2.36E-09	1.5E+01	NA	6.6E-11	1.0E-09	1.3%	6.6E-10	--	--	4.8E-11	7.2E-10	1.3%	1.7E-09	--	--
Chromium	7.0E+01	NA	5.28E-08	4.1E+01 (1)	3.0E-05 (1)	1.5E-09	6.0E-08	79.6%	1.5E-08	4.9E-04	100.0%	1.1E-09	4.4E-08	79.6%	3.7E-08	1.2E-03	100.0%
Thallium	7.9E-01	NA	6.02E-10	NA	NA	1.7E-11	--	--	1.7E-10	--	--	1.2E-11	--	--	4.3E-10	--	--
Vanadium	3.3E+02	NA	2.48E-07	NA	NA	6.9E-09	--	--	6.9E-08	--	--	5.0E-09	--	--	1.8E-07	--	--
						Total ILCR:	7.6E-08	100.0%	Total HI:	4.9E-04	100.0%	Total ILCR:	5.5E-08	100.0%	Total HI:	1.2E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	50	100	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	1.5E+03 (1)	NA	5.8E-11	8.7E-08	20.4%	5.8E-10	--	--	1.6E-10	2.3E-07	20.4%	5.4E-09	--	--
OCDD	1.2E-02	1.5E+02 (2)	NA	5.3E-10	8.0E-08	18.6%	5.3E-09	--	--	1.4E-09	2.1E-07	18.6%	5.0E-08	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	NA	1.0E-04	--	--	1.0E-03	--	--	2.7E-04	--	--	9.5E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	NA	2.3E-07	--	--	2.3E-06	--	--	6.2E-07	--	--	2.2E-05	--	--
Arsenic	3.8E+00	1.5E+00	3.0E-04	1.7E-07	2.6E-07	61.0%	1.7E-06	5.8E-03	4.2%	4.6E-07	6.9E-07	61.0%	1.6E-05	5.4E-02	4.2%
Chromium	3.7E+01	NA	3.0E-03 (3)	1.7E-06	--	--	1.7E-05	5.6E-03	4.1%	4.5E-06	--	--	1.6E-04	5.2E-02	4.1%
Vanadium	2.8E+02	NA	1.0E-03	1.3E-05	--	--	1.3E-04	1.3E-01	91.8%	3.4E-05	--	--	1.2E-03	1.2E+00	91.8%
				Total ILCR:	4.3E-07	100.0%	Total HI:	1.4E-01	100.0%	Total ILCR:	1.1E-06	100.0%	Total HI:	1.3E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,000	2,000	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	3.0E-02	1.5E+03 (1)	NA	1.2E-11	1.8E-08	20.4%	1.2E-10	--	--	1.9E-11	2.8E-08	20.4%	6.5E-10	--	--
OCDD	1.2E-02	3.0E-02	1.5E+02 (2)	NA	1.1E-10	1.7E-08	18.6%	1.1E-09	--	--	1.7E-10	2.5E-08	18.6%	5.9E-09	--	--
Diesel Range Organics (DRO)	2.2E+03	1.0E-01	NA	NA	7.1E-05	--	--	7.1E-04	--	--	1.1E-04	--	--	3.8E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	1.0E-01	NA	NA	1.6E-07	--	--	1.6E-06	--	--	2.5E-07	--	--	8.7E-06	--	--
Arsenic	3.8E+00	3.0E-02	1.5E+00	3.0E-04	3.6E-08	5.5E-08	61.0%	3.6E-07	1.2E-03	0.3%	5.6E-08	8.3E-08	61.0%	1.9E-06	6.5E-03	0.3%
Chromium	3.7E+01	1.0E-02	NA	7.5E-05 (3)	1.2E-07	--	--	1.2E-06	1.6E-02	4.4%	1.8E-07	--	--	6.3E-06	8.4E-02	4.4%
Vanadium	2.8E+02	1.0E-02	NA	2.6E-05	8.9E-07	--	--	8.9E-06	3.4E-01	95.3%	1.4E-06	--	--	4.8E-05	1.8E+00	95.3%
					Total ILCR:	9.0E-08	100.0%	Total HI:	3.6E-01	100.0%	Total ILCR:	1.4E-07	100.0%	Total HI:	1.9E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
VF	m3/kg	Volatilization Factor	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	1.27	0.69	
ET	hours/day	Exposure time	24.0	24.0	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	

						Adult						Young Child					
						Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	NA	9.62E-13	1.5E+03 (1)	NA	2.7E-14	4.0E-11	0.1%	2.7E-13	--	--	1.9E-14	2.9E-11	0.1%	6.8E-13	--	--
OCDD	1.2E-02	NA	8.79E-12	1.5E+02 (2)	NA	2.5E-13	3.7E-11	0.1%	2.5E-12	--	--	1.8E-13	2.7E-11	0.1%	6.2E-12	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	1.68E-06	NA	NA	4.7E-08	--	--	4.7E-07	--	--	3.4E-08	--	--	1.2E-06	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	3.87E-09	NA	NA	1.1E-10	--	--	1.1E-09	--	--	7.8E-11	--	--	2.7E-09	--	--
Arsenic	3.8E+00	NA	2.87E-09	1.5E+01	NA	8.0E-11	1.2E-09	3.6%	8.0E-10	--	--	5.8E-11	8.8E-10	3.6%	2.0E-09	--	--
Chromium	3.7E+01	NA	2.79E-08	4.1E+01 (3)	3.0E-05 (3)	7.8E-10	3.2E-08	96.1%	7.8E-09	2.6E-04	100.0%	5.6E-10	2.3E-08	96.1%	2.0E-08	6.6E-04	100.0%
Vanadium	2.8E+02	NA	2.11E-07	NA	NA	5.9E-09	--	--	5.9E-08	--	--	4.3E-09	--	--	1.5E-07	--	--
						Total ILCR:	3.3E-08	100.0%	Total HI:	2.6E-04	100.0%	Total ILCR:	2.4E-08	100.0%	Total HI:	6.6E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INGESTION OF GROUNDWATER AS DRINKING WATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/L	Concentration of chemical in water	CS	CS	
IR-W	L/day	Ingestion rate of water	1.4	1	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	9.1E-02	NA	5.3E-06	4.8E-07	2.7%	5.3E-05	--	--	5.0E-06	4.6E-07	2.7%	1.8E-04	--	--
Benzene	2.2E-01	5.5E-02	4.0E-03	2.8E-04	1.6E-05	86.4%	2.8E-03	7.1E-01	39.6%	2.7E-04	1.5E-05	86.4%	9.4E-03	2.4E+00	39.6%
Iodomethane	5.8E-04	NA	NA	7.4E-07	--	--	7.4E-06	--	--	7.1E-07	--	--	2.5E-05	--	--
1-Methylnaphthalene	1.9E-03	NA	NA	2.4E-06	--	--	2.4E-05	--	--	2.3E-06	--	--	8.1E-05	--	--
Benzo(a)anthracene	9.5E-05	7.3E-01	NA	1.2E-07	8.9E-08	0.5%	1.2E-06	--	--	1.2E-07	8.5E-08	0.5%	4.1E-06	--	--
Benzo(a)pyrene (BaP)	8.4E-05	7.3E+00	NA	1.1E-07	7.9E-07	4.4%	1.1E-06	--	--	1.0E-07	7.5E-07	4.4%	3.6E-06	--	--
Benzo(b)fluoranthene	8.3E-05	7.3E-01	NA	1.1E-07	7.8E-08	0.4%	1.1E-06	--	--	1.0E-07	7.4E-08	0.4%	3.5E-06	--	--
Benzo(k)fluoranthene	9.3E-05	7.3E-02	NA	1.2E-07	8.7E-09	0.0%	1.2E-06	--	--	1.1E-07	8.3E-09	0.0%	4.0E-06	--	--
Chrysene	7.8E-05	7.3E-03	NA	1.0E-07	7.3E-10	0.0%	1.0E-06	--	--	9.5E-08	7.0E-10	0.0%	3.3E-06	--	--
Dibenz(a,h)anthracene	9.7E-05	7.3E+00	NA	1.2E-07	9.1E-07	5.1%	1.2E-06	--	--	1.2E-07	8.6E-07	5.1%	4.1E-06	--	--
Indeno(1,2,3-cd)pyrene	1.1E-04	7.3E-01	NA	1.4E-07	1.0E-07	0.6%	1.4E-06	--	--	1.3E-07	9.8E-08	0.6%	4.7E-06	--	--
Naphthalene	1.4E-02	NA	2.0E-02	1.8E-05	--	--	1.8E-04	9.0E-03	0.5%	1.7E-05	--	--	6.0E-04	3.0E-02	0.5%
Diesel Range Organics (DRO)	1.8E-03	NA	NA	2.3E-06	--	--	2.3E-05	--	--	2.2E-06	--	--	7.7E-05	--	--
Gasoline Range Organics (GRO)	8.6E-04	NA	NA	1.1E-06	--	--	1.1E-05	--	--	1.1E-06	--	--	3.7E-05	--	--
Chromium	2.8E-02	NA	3.0E-03 (4)	3.6E-05	--	--	3.6E-04	1.2E-01	6.7%	3.4E-05	--	--	1.2E-03	4.0E-01	6.7%
Vanadium	7.4E-02	NA	1.0E-03	9.5E-05	--	--	9.5E-04	9.5E-01	53.3%	9.0E-05	--	--	3.2E-03	3.2E+00	53.3%
				Total ILCR:	1.8E-05	100.0%	Total HI:	1.8E+00	100.0%	Total ILCR:	1.7E-05	100.0%	Total HI:	5.9E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH GROUNDWATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

DAD (mg/kg/d) = (C*CF*Kp*SA*EF*ED*ET)/(BW*AT) Inorganics ILCR = CDI*CSFo Adj CSF Adj = CSF/AD
DAD (mg/kg/d) = (C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT) ET ≤ t* (Organics) HQ = CDI/RfDo Adj RfD Adj = RfD*AD
DAD (mg/kg/d) = (C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B+B^2)/(1+B)^2))*SA*EF*ED)/(BW*AT) ET > t* (Benzene & Vinyl Chloride)

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
SA	cm2	Skin surface area available for contact	18,000	6,600	
EF	days/year	Exposure frequency	234	234	
ED	years	Exposure duration	7	2	
ET	hours/day	Exposure time	0.25	0.33	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	730	
C	mg/L	Concentration of chemical in water	CS	CS	
CF	L/cm3	Conversion factor	1.00E-03	1.00E-03	
Kp	cm/hour	Dermal permeability coefficient	CS	CS	
AD	NA	Adjustment for absorbed dose	CS	CS	

								Adult						Young Child					
								Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	Kp (cm/hour)	tau (hours)	t* (hours)	B	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	4.20E-03	3.8E-01	9.2E-01	3.0E-03 (1)	9.1E-02	NA	2.4E-07	2.2E-08	0.0%	2.4E-06	--	--	1.4E-07	1.2E-08	0.0%	4.8E-06	--	--
Benzene	2.2E-01	1.50E-02	2.9E-01	7.0E-01	1.0E-01	5.5E-02	4.0E-03	4.0E-05	2.2E-06	3.1%	4.0E-04	1.0E-01	46.9%	2.3E-05	1.3E-06	3.1%	8.0E-04	2.0E-01	43.7%
Iodomethane	5.8E-04	2.50E-03	6.7E-01	1.6E+00	3.2E-03 (1)	NA	NA	2.7E-08	--	--	2.7E-07	--	--	1.5E-08	--	--	5.3E-07	--	--
1-Methylnaphthalene	1.9E-03	9.08E-02	5.6E-01 (2)	1.3E+00 (2)	2.0E-01 (2)	NA	NA	2.9E-06	--	--	2.9E-05	--	--	1.7E-06	--	--	5.8E-05	--	--
Benzo(a)anthracene	9.5E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-01	NA	1.4E-06	1.1E-06	1.5%	1.4E-05	--	--	8.1E-07	5.9E-07	1.5%	2.8E-05	--	--
Benzo(a)pyrene (BaP)	8.4E-05	7.00E-01	2.7E+00	1.2E+01	4.3E+00	7.3E+00	NA	2.2E-06	1.6E-05	22.2%	2.2E-05	--	--	1.2E-06	9.0E-06	22.2%	4.3E-05	--	--
Benzo(b)fluoranthene	8.3E-05	7.00E-01	2.8E+00	1.2E+01	4.3E+00	7.3E-01	NA	2.2E-06	1.6E-06	2.2%	2.2E-05	--	--	1.2E-06	9.0E-07	2.2%	4.3E-05	--	--
Benzo(k)fluoranthene	9.3E-05	6.74E-01	2.9E+00 (3)	1.4E+01 (3)	1.3E+02 (3)	7.3E-02	NA	2.4E-06	1.8E-07	0.2%	2.4E-05	--	--	1.4E-06	1.0E-07	0.2%	4.8E-05	--	--
Chrysene	7.8E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-03	NA	1.2E-06	8.7E-09	0.0%	1.2E-05	--	--	6.7E-07	4.9E-09	0.0%	2.3E-05	--	--
Dibenz(a,h)anthracene	9.7E-05	1.50E+00	3.9E+00	1.8E+01	9.7E+00	7.3E+00	NA	6.5E-06	4.8E-05	65.9%	6.5E-05	--	--	3.7E-06	2.7E-05	65.9%	1.3E-04	--	--
Indeno(1,2,3-cd)pyrene	1.1E-04	1.00E+00	3.8E+00	1.7E+01	6.7E+00	7.3E-01	NA	4.9E-06	3.6E-06	4.9%	4.9E-05	--	--	2.7E-06	2.0E-06	4.9%	9.6E-05	--	--
Naphthalene	1.4E-02	4.70E-02	5.6E-01	1.3E+00	2.0E-01	NA	2.0E-02	1.1E-05	--	--	1.1E-04	5.6E-03	2.6%	6.3E-06	--	--	2.2E-04	1.1E-02	2.4%
Diesel Range Organics (DRO)	1.8E-03	--	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
Gasoline Range Organics (GRO)	8.6E-04	--	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	2.8E-02	8.11E-04	NA	NA	NA	NA	7.5E-05 (4)	9.3E-08	--	--	9.3E-07	1.2E-02	5.7%	6.0E-08	--	--	2.1E-06	2.8E-02	6.1%
Vanadium	7.4E-02	8.22E-04	NA	NA	NA	NA	2.6E-05	2.5E-07	--	--	2.5E-06	9.6E-02	44.7%	1.6E-07	--	--	5.7E-06	2.2E-01	47.8%
								Total ILCR:	7.2E-05	100.0%	Total HI:	2.2E-01	100.0%	Total ILCR:	4.1E-05	100.0%	Total HI:	4.6E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Dermal Exposure Assessment Value
(2) Value for napthalene
(3) VA Voluntary Remediation Program (VRP) value
(4) Value for chromium VI

Kp, tau, t*, and B values are derived from the USEPA RAGS E Guidance unless otherwise noted

ADULT RESIDENTS - FUTURE SCENARIO
RESULTING FROM SHOWERING WITH WATER CONTAINING VOLATILE CONSTITUENTS OF INTEREST*
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

(1) Estimation of overall mass transfer coefficient, KL (cm/hr):

KL = 1/(1/kl + RT/Hkg),

where

H = Henry's Law Constant (atm-m3/mol-K);
RT = product of ideal gas constant (8.2E-5atm-m3/mol-K) and absolute temperature (293K)
= 0.024 atm-m3/mole;
kl = VOC-specific liquid-film mass transfer coefficient (cm/hr); and
= kl(CO2)*(44/MWvoc)^0.5; and
kg = VOC-specific gas-film mass transfer coefficient (cm/hr)
kl(H2O)*(18/MWvoc)^0.5

where

kl(CO2) = 20 cm/hr
kl(H2O) = 3000 cm/hr
MWvoc = Molecular weight of VOC.

(2) Adjustment of overall mass transfer coefficient, KL, to shower water temperature:

KaL = KL[(Tc*us)/(Ts*uc)]^-0.5

where

KaL = adjusted overall mass transfer coefficient (cm/hr);
Tc = calibration water temperature of KL (K);
uc = water viscosity at Tc (cp); and
us = water viscosity at Ts (cp).

(3) Estimation of VOC concentration leaving shower droplet, Cwd (ug/L):

Cwd = Cw[1-exp((-KaL*ts)/60d)]

where

Cw = shower water concentrations (ug;L);
d = shower droplet diameter (mm); and
ts = shower droplet drop time (sec).

(4) Estimation of VOC generation rate in the shower room,

S (ug/m3-min):

S = (Cwd*FR)/SV

where

FR = shower water flow rate (L/min); and
SV = shower room air volume (m3).

(5) Calculation of time-dependent indoor air concentration, Ca(t) (ug/m3):

Ca(t) = (S/R)[wxp(RDs)-1]*exp(-Rt) for t>Ds

where

Ds = shower duration (min); and
t = time (min).

* Chrostowski, Foster, 1987.

ADULT RESIDENTS - FUTURE SCENARIO
RESULTING FROM SHOWERING WITH WATER CONTAINING VOLATILE CONSTITUENTS OF INTEREST*
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

(1) Estimation of overall mass transfer coefficient, KL (cm/hr):

KL = 1/(1/kl + RT/Hkg),

COPC	kl(CO2) (cm/hr)	kg(H2O) (cm/hr)	MW (g/mol)	kl (cm/hr)	kg (cm/hr)	RT (atm-m3/mol)	H atm-m3/mol-K	KL (cm/hr)
1,2-Dichloroethane	20	3000	98.95916	13.34	1279.47	0.024	0.000979	10.62
Benzene	20	3000	78.11364	15.01	1440.10	0.024	0.00555	14.36
Iodomethane	20	3000	141.93929	11.14	1068.33	0.024	0.00526	10.63

(2) Adjustment of overall mass transfer coefficient, KL, to shower water temperature:

KaL = KL[(Tc*us)/(Ts*uc)]^-0.5

COPC	KL (cm/hr)	Tc (K)	Ts (K)	uc (cp)	us (cp)	KaL (cm/hr)
1,2-Dichloroethane	10.62	293	318	0.01002	0.5996	1.43
Benzene	14.36	293	318	0.01002	0.5996	1.93
Iodomethane	10.63	293	318	0.01002	0.5996	1.43

(3) Estimation of VOC concentration leaving shower droplet, Cwd (ug/L):

Cwd = Cw*[1-exp((-KaL*ts)/60*d)]
= Cw(1-exp(A))

COPC	C (ug/L)	KaL (cm/hr)	ts (sec)	d (mm)	A	exp(A)	Cwd (ug/L)
1,2-Dichloroethane	4.1	1.43	2	1	-0.048	0.953	0.19
Benzene	220	1.93	2	1	-0.064	0.938	13.74
Iodomethane	0.58	1.43	2	1	-0.048	0.953	0.03

ADULT RESIDENTS - FUTURE SCENARIO
RESULTING FROM SHOWERING WITH WATER CONTAINING VOLATILE CONSTITUENTS OF INTEREST*
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

(4) Estimation of VOC generation rate in the shower room, S (ug/m3-min):

S = (Cwd*FR)/SV

COPC	Cwd (ug/L)	FR (L/min)	SV (M3)	S (ug/m3-min)
1,2-Dichloroethane	0.19	10	6	0.32
Benzene	13.74	10	6	22.90
Iodomethane	0.03	10	6	0.05

(5) Calculation of time-dependent indoor air concentration, Ca(t) (ug/m3):

Ca(t) = (S/R)[exp(RDs)-1]*exp(-Rt) for t>Ds

COPC	S (ug/m3-min)	R (1/min)	Ds (min)	t (min)	RDs	Rt	exp(RDs)	exp(-Rt)	Ca(t) (ug/m3)	Ca(t) (mg/m3)
1,2-Dichloroethane	0.32	0.008	15	20	0.12	0.16	1.13	0.85	4.32	0.00432123
Benzene	22.90	0.008	15	20	0.12	0.16	1.13	0.85	310.94	0.31093936
Iodomethane	0.05	0.008	15	20	0.12	0.16	1.13	0.85	0.61	0.00061174

ADULT RESIDENTS - FUTURE SCENARIO
INHALATION OF VOLATILES IN GROUNDWATER EMANATING FROM SHOWER WATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AI
CENTRAL TENDENCY
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = Shower Model

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
C	mg/L	Concentration of chemical in groundwater	CS	
Ca	mg/m3	Concentration of chemical in shower water	CS	
		Calculated using shower model		
RR	m3/hour	Respiration rate	1.27	
ET	hours/day	Exposure time	0.25	
EF	days/year	Exposure frequency	234	
ED	years	Exposure duration	7	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	2,555	

					Adult					
					Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	4.32E-03	9.1E-02	7.0E-01	1.3E-06	1.1E-07	4.5%	1.3E-05	1.8E-05	0.0%
Benzene	2.2E-01	3.11E-01	2.7E-02	8.6E-03	9.0E-05	2.4E-06	95.5%	9.0E-04	1.1E-01	100.0%
Iodomethane	5.8E-04	6.12E-04	NA	NA	1.8E-07	--	--	1.8E-06	--	--
					Total ILCR:	2.6E-06	100.0%	Total HI:	1.1E-01	100.0%

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

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIC
ACCIDENTAL INGESTION OF SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	100	200	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	NA	2.9E-09	--	--	8.4E-09	--	--	6.7E-09	--	--	7.8E-08	--	--
Benzo(a)anthracene	3.0E+00	7.3E-01	NA	1.4E-06	1.0E-06	3.3%	4.1E-06	--	--	3.3E-06	2.4E-06	3.3%	3.8E-05	--	--
Benzo(a)pyrene (BaP)	5.7E+00	7.3E+00	NA	2.7E-06	2.0E-05	64.6%	7.9E-06	--	--	6.3E-06	4.6E-05	64.6%	7.3E-05	--	--
Benzo(b)fluoranthene	9.0E+00	7.3E-01	NA	4.2E-06	3.1E-06	10.1%	1.2E-05	--	--	9.9E-06	7.2E-06	10.1%	1.2E-04	--	--
Benzo(k)fluoranthene	2.3E+00	7.3E-02	NA	1.1E-06	7.8E-08	0.3%	3.1E-06	--	--	2.5E-06	1.8E-07	0.3%	2.9E-05	--	--
Chrysene	3.6E+00	7.3E-03	NA	1.7E-06	1.2E-08	0.0%	4.9E-06	--	--	3.9E-06	2.9E-08	0.0%	4.6E-05	--	--
Dibenz(a,h)anthracene	8.9E-01	7.3E+00	NA	4.2E-07	3.0E-06	10.0%	1.2E-06	--	--	9.7E-07	7.1E-06	10.0%	1.1E-05	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	7.3E-01	NA	1.9E-06	1.4E-06	4.4%	5.4E-06	--	--	4.3E-06	3.2E-06	4.4%	5.0E-05	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	NA	1.3E-04	--	--	3.8E-04	--	--	3.1E-04	--	--	3.6E-03	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	NA	1.6E-06	--	--	4.7E-06	--	--	3.8E-06	--	--	4.4E-05	--	--
Arsenic	3.1E+00	1.5E+00	3.0E-04	1.5E-06	2.2E-06	7.2%	4.3E-06	1.4E-02	2.8%	3.4E-06	5.1E-06	7.2%	4.0E-05	1.3E-01	2.8%
Chromium	7.0E+01	NA	3.0E-03 (1)	3.3E-05	--	--	9.5E-05	3.2E-02	6.2%	7.6E-05	--	--	8.9E-04	3.0E-01	6.2%
Thallium	7.9E-01	NA	7.0E-05	3.7E-07	--	--	1.1E-06	1.6E-02	3.0%	8.7E-07	--	--	1.0E-05	1.5E-01	3.0%
Vanadium	3.3E+02	NA	1.0E-03	1.5E-04	--	--	4.5E-04	4.5E-01	87.9%	3.6E-04	--	--	4.2E-03	4.2E+00	87.9%
				Total ILCR:	3.0E-05	100.0%	Total HI:	5.1E-01	100.0%	Total ILCR:	7.1E-05	100.0%	Total HI:	4.8E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,700	2,800	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	3.0E-02	NA	NA	3.4E-10	--	--	1.0E-09	--	--	5.6E-10	--	--	6.6E-09	--	--
Benzo(a)anthracene	3.0E+00	1.3E-01	7.3E-01	NA	7.2E-07	5.3E-07	3.5%	2.1E-06	--	--	1.2E-06	8.6E-07	3.5%	1.4E-05	--	--
Benzo(a)pyrene (BaP)	5.7E+00	1.3E-01	7.3E+00	NA	1.4E-06	1.0E-05	68.4%	4.1E-06	--	--	2.3E-06	1.7E-05	68.4%	2.7E-05	--	--
Benzo(b)fluoranthene	9.0E+00	1.3E-01	7.3E-01	NA	2.2E-06	1.6E-06	10.7%	6.4E-06	--	--	3.6E-06	2.6E-06	10.7%	4.2E-05	--	--
Benzo(k)fluoranthene	2.3E+00	1.3E-01	7.3E-02	NA	5.5E-07	4.0E-08	0.3%	1.6E-06	--	--	9.1E-07	6.6E-08	0.3%	1.1E-05	--	--
Chrysene	3.6E+00	1.3E-01	7.3E-03	NA	8.7E-07	6.4E-09	0.0%	2.5E-06	--	--	1.4E-06	1.0E-08	0.0%	1.7E-05	--	--
Dibenz(a,h)anthracene	8.9E-01	1.3E-01	7.3E+00	NA	2.2E-07	1.6E-06	10.6%	6.3E-07	--	--	3.5E-07	2.6E-06	10.6%	4.1E-06	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	1.3E-01	7.3E-01	NA	9.6E-07	7.0E-07	4.7%	2.8E-06	--	--	1.6E-06	1.1E-06	4.7%	1.8E-05	--	--
Diesel Range Organics (DRO)	2.8E+02	1.0E-01	NA	NA	5.3E-05	--	--	1.5E-04	--	--	8.6E-05	--	--	1.0E-03	--	--
Gasoline Range Organics (GRO)	3.4E+00	1.0E-01	NA	NA	6.4E-07	--	--	1.9E-06	--	--	1.1E-06	--	--	1.2E-05	--	--
Arsenic	3.1E+00	3.0E-02	1.5E+00	3.0E-04	1.8E-07	2.6E-07	1.8%	5.1E-07	1.7E-03	0.2%	2.9E-07	4.3E-07	1.8%	3.4E-06	1.1E-02	0.2%
Chromium	7.0E+01	1.0E-02	NA	7.5E-05 (1)	1.3E-06	--	--	3.8E-06	5.1E-02	6.8%	2.1E-06	--	--	2.5E-05	3.3E-01	6.8%
Thallium	7.9E-01	1.0E-02	NA	7.0E-05	1.5E-08	--	--	4.3E-08	6.2E-04	0.1%	2.4E-08	--	--	2.8E-07	4.1E-03	0.1%
Vanadium	3.3E+02	1.0E-02	NA	2.6E-05	6.1E-06	--	--	1.8E-05	6.9E-01	92.8%	1.0E-05	--	--	1.2E-04	4.5E+00	92.8%
					Total ILCR:	1.5E-05	100.0%	Total HI:	7.4E-01	100.0%	Total ILCR:	2.4E-05	100.0%	Total HI:	4.9E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
VF	m3/kg	Volatilization Factor	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	1.27	0.69	
ET	hours/day	Exposure time	24.0	24.0	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

						Adult						Young Child					
						Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	4.64E-12	NA	NA	6.6E-13	--	--	1.9E-12	--	--	4.2E-13	--	--	4.9E-12	--	--
Benzo(a)anthracene	3.0E+00	1.8E+07	1.66E-07	NA	NA	2.4E-08	--	--	6.9E-08	--	--	1.5E-08	--	--	1.8E-07	--	--
Benzo(a)pyrene (BaP)	5.7E+00	3.5E+07	1.67E-07	3.1E+00	NA	2.4E-08	7.4E-08	19.1%	7.0E-08	--	--	1.5E-08	4.7E-08	19.1%	1.8E-07	--	--
Benzo(b)fluoranthene	9.0E+00	2.1E+07	4.32E-07	NA	NA	6.2E-08	--	--	1.8E-07	--	--	3.9E-08	--	--	4.6E-07	--	--
Benzo(k)fluoranthene	2.3E+00	4.5E+07	5.20E-08	NA	NA	7.4E-09	--	--	2.2E-08	--	--	4.7E-09	--	--	5.5E-08	--	--
Chrysene	3.6E+00	2.7E+06	1.31E-06	NA	NA	1.9E-07	--	--	5.5E-07	--	--	1.2E-07	--	--	1.4E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	8.7E+07	1.09E-08	NA	NA	1.6E-09	--	--	4.6E-09	--	--	9.9E-10	--	--	1.2E-08	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	8.2E+07	5.11E-08	NA	NA	7.3E-09	--	--	2.1E-08	--	--	4.6E-09	--	--	5.4E-08	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	2.12E-07	NA	NA	3.0E-08	--	--	8.9E-08	--	--	1.9E-08	--	--	2.2E-07	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	2.60E-09	NA	NA	3.7E-10	--	--	1.1E-09	--	--	2.4E-10	--	--	2.8E-09	--	--
Arsenic	3.1E+00	NA	2.36E-09	1.5E+01	NA	3.4E-10	5.1E-09	1.3%	9.9E-10	--	--	2.1E-10	3.2E-09	1.3%	2.5E-09	--	--
Chromium	7.0E+01	NA	5.28E-08	4.1E+01 (1)	3.0E-05 (1)	7.6E-09	3.1E-07	79.6%	2.2E-08	7.3E-04	100.0%	4.8E-09	2.0E-07	79.6%	5.6E-08	1.9E-03	100.0%
Thallium	7.9E-01	NA	6.02E-10	NA	NA	8.6E-11	--	--	2.5E-10	--	--	5.5E-11	--	--	6.4E-10	--	--
Vanadium	3.3E+02	NA	2.48E-07	NA	NA	3.6E-08	--	--	1.0E-07	--	--	2.3E-08	--	--	2.6E-07	--	--
						Total ILCR:	3.9E-07	100.0%	Total HI:	7.3E-04	100.0%	Total ILCR:	2.5E-07	100.0%	Total HI:	1.9E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	100	200	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	1.5E+03 (1)	NA	6.0E-10	8.9E-07	20.4%	1.7E-09	--	--	1.4E-09	2.1E-06	20.4%	1.6E-08	--	--
OCDD	1.2E-02	1.5E+02 (2)	NA	5.4E-09	8.2E-07	18.6%	1.6E-08	--	--	1.3E-08	1.9E-06	18.6%	1.5E-07	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	NA	1.0E-03	--	--	3.0E-03	--	--	2.4E-03	--	--	2.8E-02	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	NA	2.4E-06	--	--	7.0E-06	--	--	5.6E-06	--	--	6.5E-05	--	--
Arsenic	3.8E+00	1.5E+00	3.0E-04	1.8E-06	2.7E-06	61.0%	5.2E-06	1.7E-02	4.2%	4.2E-06	6.2E-06	61.0%	4.8E-05	1.6E-01	4.2%
Chromium	3.7E+01	NA	3.0E-03 (3)	1.7E-05	--	--	5.0E-05	1.7E-02	4.1%	4.0E-05	--	--	4.7E-04	1.6E-01	4.1%
Vanadium	2.8E+02	NA	1.0E-03	1.3E-04	--	--	3.8E-04	3.8E-01	91.8%	3.0E-04	--	--	3.6E-03	3.6E+00	91.8%
				Total ILCR:	4.4E-06	100.0%	Total HI:	4.1E-01	100.0%	Total ILCR:	1.0E-05	100.0%	Total HI:	3.9E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,700	2,800	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	3.0E-02	1.5E+03 (1)	NA	7.1E-11	1.1E-07	20.4%	2.1E-10	--	--	1.2E-10	1.8E-07	20.4%	1.4E-09	--	--
OCDD	1.2E-02	3.0E-02	1.5E+02 (2)	NA	6.5E-10	9.8E-08	18.6%	1.9E-09	--	--	1.1E-09	1.6E-07	18.6%	1.2E-08	--	--
Diesel Range Organics (DRO)	2.2E+03	1.0E-01	NA	NA	4.2E-04	--	--	1.2E-03	--	--	6.8E-04	--	--	7.9E-03	--	--
Gasoline Range Organics (GRO)	5.1E+00	1.0E-01	NA	NA	9.6E-07	--	--	2.8E-06	--	--	1.6E-06	--	--	1.8E-05	--	--
Arsenic	3.8E+00	3.0E-02	1.5E+00	3.0E-04	2.1E-07	3.2E-07	61.0%	6.2E-07	2.1E-03	0.3%	3.5E-07	5.2E-07	61.0%	4.1E-06	1.4E-02	0.3%
Chromium	3.7E+01	1.0E-02	NA	7.5E-05 (3)	6.9E-07	--	--	2.0E-06	2.7E-02	4.4%	1.1E-06	--	--	1.3E-05	1.8E-01	4.4%
Vanadium	2.8E+02	1.0E-02	NA	2.6E-05	5.2E-06	--	--	1.5E-05	5.8E-01	95.3%	8.5E-06	--	--	9.9E-05	3.8E+00	95.3%
					Total ILCR:	5.2E-07	100.0%	Total HI:	6.1E-01	100.0%	Total ILCR:	8.6E-07	100.0%	Total HI:	4.0E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SUBSURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
VF	m3/kg	Volatilization Factor	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	1.27	0.69	
ET	hours/day	Exposure time	24.0	24.0	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

						Adult						Young Child					
						Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
HpCDD, 1,2,3,4,6,7,8-	1.3E-03	NA	9.62E-13	1.5E+03 (1)	NA	1.4E-13	2.1E-10	0.1%	4.0E-13	--	--	8.7E-14	1.3E-10	0.1%	1.0E-12	--	--
OCDD	1.2E-02	NA	8.79E-12	1.5E+02 (2)	NA	1.3E-12	1.9E-10	0.1%	3.7E-12	--	--	8.0E-13	1.2E-10	0.1%	9.3E-12	--	--
Diesel Range Organics (DRO)	2.2E+03	NA	1.68E-06	NA	NA	2.4E-07	--	--	7.0E-07	--	--	1.5E-07	--	--	1.8E-06	--	--
Gasoline Range Organics (GRO)	5.1E+00	NA	3.87E-09	NA	NA	5.5E-10	--	--	1.6E-09	--	--	3.5E-10	--	--	4.1E-09	--	--
Arsenic	3.8E+00	NA	2.87E-09	1.5E+01	NA	4.1E-10	6.2E-09	3.6%	1.2E-09	--	--	2.6E-10	3.9E-09	3.6%	3.0E-09	--	--
Chromium	3.7E+01	NA	2.79E-08	4.1E+01 (3)	3.0E-05 (3)	4.0E-09	1.6E-07	96.1%	1.2E-08	3.9E-04	100.0%	2.5E-09	1.0E-07	96.1%	3.0E-08	9.8E-04	100.0%
Vanadium	2.8E+02	NA	2.11E-07	NA	NA	3.0E-08	--	--	8.8E-08	--	--	1.9E-08	--	--	2.2E-07	--	--
						Total ILCR:	1.7E-07	100.0%	Total HI:	3.9E-04	100.0%	Total ILCR:	1.1E-07	100.0%	Total HI:	9.8E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INGESTION OF GROUNDWATER AS DRINKING WATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/L	Concentration of chemical in water	CS	CS	
IR-W	L/day	Ingestion rate of water	2	1	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	9.1E-02	NA	3.9E-05	3.5E-06	2.7%	1.1E-04	--	--	2.2E-05	2.0E-06	2.7%	2.6E-04	--	--
Benzene	2.2E-01	5.5E-02	4.0E-03	2.1E-03	1.1E-04	86.4%	6.0E-03	1.5E+00	39.6%	1.2E-03	6.6E-05	86.4%	1.4E-02	3.5E+00	39.6%
Iodomethane	5.8E-04	NA	NA	5.4E-06	--	--	1.6E-05	--	--	3.2E-06	--	--	3.7E-05	--	--
1-Methylnaphthalene	1.9E-03	NA	NA	1.8E-05	--	--	5.2E-05	--	--	1.0E-05	--	--	1.2E-04	--	--
Benzo(a)anthracene	9.5E-05	7.3E-01	NA	8.9E-07	6.5E-07	0.5%	2.6E-06	--	--	5.2E-07	3.8E-07	0.5%	6.1E-06	--	--
Benzo(a)pyrene (BaP)	8.4E-05	7.3E+00	NA	7.9E-07	5.8E-06	4.4%	2.3E-06	--	--	4.6E-07	3.4E-06	4.4%	5.4E-06	--	--
Benzo(b)fluoranthene	8.3E-05	7.3E-01	NA	7.8E-07	5.7E-07	0.4%	2.3E-06	--	--	4.5E-07	3.3E-07	0.4%	5.3E-06	--	--
Benzo(k)fluoranthene	9.3E-05	7.3E-02	NA	8.7E-07	6.4E-08	0.0%	2.5E-06	--	--	5.1E-07	3.7E-08	0.0%	5.9E-06	--	--
Chrysene	7.8E-05	7.3E-03	NA	7.3E-07	5.3E-09	0.0%	2.1E-06	--	--	4.3E-07	3.1E-09	0.0%	5.0E-06	--	--
Dibenz(a,h)anthracene	9.7E-05	7.3E+00	NA	9.1E-07	6.7E-06	5.1%	2.7E-06	--	--	5.3E-07	3.9E-06	5.1%	6.2E-06	--	--
Indeno(1,2,3-cd)pyrene	1.1E-04	7.3E-01	NA	1.0E-06	7.5E-07	0.6%	3.0E-06	--	--	6.0E-07	4.4E-07	0.6%	7.0E-06	--	--
Naphthalene	1.4E-02	NA	2.0E-02	1.3E-04	--	--	3.8E-04	1.9E-02	0.5%	7.7E-05	--	--	8.9E-04	4.5E-02	0.5%
Diesel Range Organics (DRO)	1.8E-03	NA	NA	1.7E-05	--	--	4.9E-05	--	--	9.9E-06	--	--	1.2E-04	--	--
Gasoline Range Organics (GRO)	8.6E-04	NA	NA	8.1E-06	--	--	2.4E-05	--	--	4.7E-06	--	--	5.5E-05	--	--
Chromium	2.8E-02	NA	3.0E-03 (4)	2.6E-04	--	--	7.6E-04	2.5E-01	6.7%	1.5E-04	--	--	1.8E-03	5.9E-01	6.7%
Vanadium	7.4E-02	NA	1.0E-03	7.0E-04	--	--	2.0E-03	2.0E+00	53.3%	4.1E-04	--	--	4.7E-03	4.7E+00	53.3%
				Total ILCR:	1.3E-04	100.0%	Total HI:	3.8E+00	100.0%	Total ILCR:	7.7E-05	100.0%	Total HI:	8.9E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH GROUNDWATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

DAD (mg/kg/d) = (C*CF*Kp*SA*EF*ED*ET)/(BW*AT) Inorganics ILCR = CDI*CSFo Adj CSF Adj = CSF/AD
DAD (mg/kg/d) = (C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT) ET ≤ t* (Organics) HQ = CDI/RfDo Adj RfD Adj = RfD*AD
DAD (mg/kg/d) = (C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B+B^2)/(1+B)^2))*SA*EF*ED)/(BW*AT) ET > t* (Benzene & Vinyl Chloride)

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
SA	cm2	Skin surface area available for contact	18,000	6,600	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
ET	hours/day	Exposure time	0.58	1.00	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	
C	mg/L	Concentration of chemical in water	CS	CS	
CF	L/cm3	Conversion factor	1.00E-03	1.00E-03	
Kp	cm/hour	Dermal permeability coefficient	CS	CS	
AD	NA	Adjustment for absorbed dose	CS	CS	

								Adult						Young Child					
								Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	Kp (cm/hour)	tau (hours)	t* (hours)	B	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	4.20E-03	3.8E-01	9.2E-01	3.0E-03 (1)	9.1E-02	NA	1.9E-06	1.7E-07	0.0%	5.5E-06	--	--	1.1E-06	1.0E-07	0.0%	1.3E-05	--	--
Benzene	2.2E-01	1.50E-02	2.9E-01	7.0E-01	1.0E-01	5.5E-02	4.0E-03	3.2E-04	1.7E-05	3.1%	9.2E-04	2.3E-01	37.1%	1.8E-04	1.0E-05	3.2%	2.1E-03	5.4E-01	31.9%
Iodomethane	5.8E-04	2.50E-03	6.7E-01	1.6E+00	3.2E-03 (1)	NA	NA	2.1E-07	--	--	6.2E-07	--	--	1.2E-07	--	--	1.4E-06	--	--
1-Methylnaphthalene	1.9E-03	9.08E-02	5.6E-01 (2)	1.3E+00 (2)	2.0E-01 (2)	NA	NA	2.3E-05	--	--	6.7E-05	--	--	1.3E-05	--	--	1.5E-04	--	--
Benzo(a)anthracene	9.5E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-01	NA	1.1E-05	8.3E-06	1.5%	3.3E-05	--	--	6.4E-06	4.6E-06	1.5%	7.4E-05	--	--
Benzo(a)pyrene (BaP)	8.4E-05	7.00E-01	2.7E+00	1.2E+01	4.3E+00	7.3E+00	NA	1.7E-05	1.3E-04	22.2%	5.0E-05	--	--	9.6E-06	7.0E-05	22.1%	1.1E-04	--	--
Benzo(b)fluoranthene	8.3E-05	7.00E-01	2.8E+00	1.2E+01	4.3E+00	7.3E-01	NA	1.7E-05	1.3E-05	2.2%	5.0E-05	--	--	9.7E-06	7.1E-06	2.2%	1.1E-04	--	--
Benzo(k)fluoranthene	9.3E-05	6.74E-01	2.9E+00 (3)	1.4E+01 (3)	1.3E+02 (3)	7.3E-02	NA	1.9E-05	1.4E-06	0.2%	5.5E-05	--	--	1.1E-05	7.8E-07	0.2%	1.2E-04	--	--
Chrysene	7.8E-05	4.70E-01	2.0E+00	8.5E+00	2.8E+00	7.3E-03	NA	9.3E-06	6.8E-08	0.0%	2.7E-05	--	--	5.2E-06	3.8E-08	0.0%	6.1E-05	--	--
Dibenz(a,h)anthracene	9.7E-05	1.50E+00	3.9E+00	1.8E+01	9.7E+00	7.3E+00	NA	5.1E-05	3.7E-04	65.9%	1.5E-04	--	--	2.9E-05	2.1E-04	65.8%	3.3E-04	--	--
Indeno(1,2,3-cd)pyrene	1.1E-04	1.00E+00	3.8E+00	1.7E+01	6.7E+00	7.3E-01	NA	3.8E-05	2.8E-05	4.9%	1.1E-04	--	--	2.1E-05	1.6E-05	4.9%	2.5E-04	--	--
Naphthalene	1.4E-02	4.70E-02	5.6E-01	1.3E+00	2.0E-01	NA	2.0E-02	8.8E-05	--	--	2.6E-04	1.3E-02	2.1%	4.9E-05	--	--	5.7E-04	2.9E-02	1.7%
Diesel Range Organics (DRO)	1.8E-03	--	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
Gasoline Range Organics (GRO)	8.6E-04	--	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	2.8E-02	8.11E-04	NA	NA	NA	NA	7.5E-05 (4)	1.1E-06	--	--	3.2E-06	4.3E-02	6.9%	8.1E-07	--	--	9.5E-06	1.3E-01	7.6%
Vanadium	7.4E-02	8.22E-04	NA	NA	NA	NA	2.6E-05	3.0E-06	--	--	8.7E-06	3.3E-01	53.9%	2.2E-06	--	--	2.6E-05	9.9E-01	58.8%
								Total ILCR:	5.7E-04	100.0%	Total HI:	6.2E-01	100.0%	Total ILCR:	3.2E-04	100.0%	Total HI:	1.7E+00	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Dermal Exposure Assessment Value
(2) Value for napthalene
(3) VA Voluntary Remediation Program (VRP) value
(4) Value for chromium VI

Kp, tau, t*, and B values are derived from the USEPA RAGS E Guidance unless otherwise noted

ADULT RESIDENTS - FUTURE SCENARIO
RESULTING FROM SHOWERING WITH WATER CONTAINING VOLATILE CONSTITUENTS OF INTEREST*
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

(1) Estimation of overall mass transfer coefficient, KL (cm/hr):

KL = 1/(1/kl + RT/Hkg),

where

H = Henry's Law Constant (atm-m3/mol-K);
RT = product of ideal gas constant (8.2E-5atm-m3/mol-K) and absolute temperature (293K)
= 0.024 atm-m3/mole;
kl = VOC-specific liquid-film mass transfer coefficient (cm/hr); and
= kl(CO2)*(44/MWvoc)^0.5; and
kg = VOC-specific gas-film mass transfer coefficient (cm/hr)
kl(H2O)*(18/MWvoc)^0.5

where

kl(CO2) = 20 cm/hr
kl(H2O) = 3000 cm/hr
MWvoc = Molecular weight of VOC.

(2) Adjustment of overall mass transfer coefficient, KL, to shower water temperature:

KaL = KL[(Tc*us)/(Ts*uc)]^-0.5

where

KaL = adjusted overall mass transfer coefficient (cm/hr);
Tc = calibration water temperature of KL (K);
uc = water viscosity at Tc (cp); and
us = water viscosity at Ts (cp).

(3) Estimation of VOC concentration leaving shower droplet, Cwd (ug/L):

Cwd = Cw[1-exp((-KaL*ts)/60d)]

where

Cw = shower water concentrations (ug;L);
d = shower droplet diameter (mm); and
ts = shower droplet drop time (sec).

(4) Estimation of VOC generation rate in the shower room,

S (ug/m3-min):

S = (Cwd*FR)/SV

where

FR = shower water flow rate (L/min); and
SV = shower room air volume (m3).

(5) Calculation of time-dependent indoor air concentration, Ca(t) (ug/m3):

Ca(t) = (S/R)[wxp(RDs)-1]*exp(-Rt) for t>Ds

where

Ds = shower duration (min); and
t = time (min).

* Chrostowski, Foster, 1987.

ADULT RESIDENTS - FUTURE SCENARIO
RESULTING FROM SHOWERING WITH WATER CONTAINING VOLATILE CONSTITUENTS OF INTEREST*
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

(1) Estimation of overall mass transfer coefficient, KL (cm/hr):

KL = 1/(1/kl + RT/Hkg),

COPC	kl(CO2) (cm/hr)	kg(H2O) (cm/hr)	MW (g/mol)	kl (cm/hr)	kg (cm/hr)	RT (atm-m3/mol)	H atm-m3/mol-K	KL (cm/hr)
1,2-Dichloroethane	20	3000	98.95916	13.34	1279.47	0.024	0.000979	10.62
Benzene	20	3000	78.11364	15.01	1440.10	0.024	0.00555	14.36
Iodomethane	20	3000	141.93929	11.14	1068.33	0.024	0.00526	10.63

(2) Adjustment of overall mass transfer coefficient, KL, to shower water temperature:

KaL = KL[(Tc*us)/(Ts*uc)]^-0.5

COPC	KL (cm/hr)	Tc (K)	Ts (K)	uc (cp)	us (cp)	KaL (cm/hr)
1,2-Dichloroethane	10.62	293	318	0.01002	0.5996	1.43
Benzene	14.36	293	318	0.01002	0.5996	1.93
Iodomethane	10.63	293	318	0.01002	0.5996	1.43

(3) Estimation of VOC concentration leaving shower droplet, Cwd (ug/L):

Cwd = Cw*[1-exp((-KaL*ts)/60*d)]
= Cw(1-exp(A))

COPC	C (ug/L)	KaL (cm/hr)	ts (sec)	d (mm)	A	exp(A)	Cwd (ug/L)
1,2-Dichloroethane	4.1	1.43	2	1	-0.048	0.953	0.19
Benzene	220	1.93	2	1	-0.064	0.938	13.74
Iodomethane	0.58	1.43	2	1	-0.048	0.953	0.03

ADULT RESIDENTS - FUTURE SCENARIO
RESULTING FROM SHOWERING WITH WATER CONTAINING VOLATILE CONSTITUENTS OF INTEREST*
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

(4) Estimation of VOC generation rate in the shower room, S (ug/m3-min):

S = (Cwd*FR)/SV

COPC	Cwd (ug/L)	FR (L/min)	SV (M3)	S (ug/m3-min)
1,2-Dichloroethane	0.19	10	6	0.32
Benzene	13.74	10	6	22.90
Iodomethane	0.03	10	6	0.05

(5) Calculation of time-dependent indoor air concentration, Ca(t) (ug/m3):

Ca(t) = (S/R)[exp(RDs)-1]*exp(-Rt) for t>Ds

COPC	S (ug/m3-min)	R (1/min)	Ds (min)	t (min)	RDs	Rt	exp(RDs)	exp(-Rt)	Ca(t) (ug/m3)	Ca(t) (mg/m3)
1,2-Dichloroethane	0.32	0.008	34.8	20	0.2784	0.16	1.32	0.85	10.88	0.0108801
Benzene	22.90	0.008	34.8	20	0.2784	0.16	1.32	0.85	782.89	0.78289025
Iodomethane	0.05	0.008	34.8	20	0.2784	0.16	1.32	0.85	1.54	0.00154025

ADULT RESIDENTS - FUTURE SCENARIO
INHALATION OF VOLATILES IN GROUNDWATER EMANATING FROM SHOWER WATER - SWMU 14 - FIRE TRAINING PIT AT CRASH CREV
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = Shower Model

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
C	mg/L	Concentration of chemical in groundwater	CS	
Ca	mg/m3	Concentration of chemical in shower water	CS	
		Calculated using shower model		
RR	m3/hour	Respiration rate	1.27	
ET	hours/day	Exposure time	0.58	
EF	days/year	Exposure frequency	350	
ED	years	Exposure duration	24	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	

					Adult					
					Carcinogens			Noncarcinogens		
Parameter	C (mg/L)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
1,2-Dichloroethane	4.1E-03	1.09E-02	9.1E-02	7.0E-01	3.8E-05	3.4E-06	4.5%	1.1E-04	1.6E-04	0.0%
Benzene	2.2E-01	7.83E-01	2.7E-02	8.6E-03	2.7E-03	7.3E-05	95.5%	7.9E-03	9.2E-01	100.0%
Iodomethane	5.8E-04	1.54E-03	NA	NA	5.3E-06	--	--	1.6E-05	--	--
					Total ILCR:	7.7E-05	100.0%	Total HI:	9.2E-01	100.0%

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

ADULT AND ADOLESCENT TRESPASSERS - CURRENT SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Adolescent	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	100	100	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	52	52	
ED	years	Exposure duration	24	9	
BW	kg	Body weight	70	45	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	3,285	

				Adult						Adolescent					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	NA	4.3E-10	--	--	1.2E-09	--	--	2.5E-10	--	--	1.9E-09	--	--
Benzo(a)anthracene	3.0E+00	7.3E-01	NA	2.1E-07	1.5E-07	3.3%	6.0E-07	--	--	1.2E-07	8.8E-08	3.3%	9.4E-07	--	--
Benzo(a)pyrene (BaP)	5.7E+00	7.3E+00	NA	4.0E-07	2.9E-06	64.6%	1.2E-06	--	--	2.3E-07	1.7E-06	64.6%	1.8E-06	--	--
Benzo(b)fluoranthene	9.0E+00	7.3E-01	NA	6.3E-07	4.6E-07	10.1%	1.8E-06	--	--	3.7E-07	2.7E-07	10.1%	2.8E-06	--	--
Benzo(k)fluoranthene	2.3E+00	7.3E-02	NA	1.6E-07	1.2E-08	0.3%	4.6E-07	--	--	9.3E-08	6.8E-09	0.3%	7.2E-07	--	--
Chrysene	3.6E+00	7.3E-03	NA	2.5E-07	1.8E-09	0.0%	7.3E-07	--	--	1.5E-07	1.1E-09	0.0%	1.1E-06	--	--
Dibenz(a,h)anthracene	8.9E-01	7.3E+00	NA	6.2E-08	4.5E-07	10.0%	1.8E-07	--	--	3.6E-08	2.6E-07	10.0%	2.8E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	7.3E-01	NA	2.8E-07	2.0E-07	4.4%	8.0E-07	--	--	1.6E-07	1.2E-07	4.4%	1.2E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	NA	NA	2.0E-05	--	--	5.7E-05	--	--	1.1E-05	--	--	8.9E-05	--	--
Gasoline Range Organics (GRO)	3.4E+00	NA	NA	2.4E-07	--	--	7.0E-07	--	--	1.4E-07	--	--	1.1E-06	--	--
Arsenic	3.1E+00	1.5E+00	3.0E-04	2.2E-07	3.3E-07	7.2%	6.4E-07	2.1E-03	2.8%	1.3E-07	1.9E-07	7.2%	9.9E-07	3.3E-03	2.8%
Chromium	7.0E+01	NA	3.0E-03 (1)	4.9E-06	--	--	1.4E-05	4.7E-03	6.2%	2.8E-06	--	--	2.2E-05	7.4E-03	6.2%
Thallium	7.9E-01	NA	7.0E-05	5.5E-08	--	--	1.6E-07	2.3E-03	3.0%	3.2E-08	--	--	2.5E-07	3.6E-03	3.0%
Vanadium	3.3E+02	NA	1.0E-03	2.3E-05	--	--	6.7E-05	6.7E-02	87.9%	1.3E-05	--	--	1.0E-04	1.0E-01	87.9%
				Total ILCR:	4.5E-06	100.0%	Total HI:	7.6E-02	100.0%	Total ILCR:	2.6E-06	100.0%	Total HI:	1.2E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND ADOLESCENT TRESPASSERS - CURRENT SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Parameter	Units	Description	Adult	Adolescent	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,700	3,200	
EF	days/year	Exposure frequency	52	52	
ED	years	Exposure duration	24	9	
BW	kg	Body weight	70	45	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	3,285	

					Adult						Adolescent					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	3.0E-02	NA	NA	5.1E-11	--	--	1.5E-10	--	--	4.8E-11	--	--	3.7E-10	--	--
Benzo(a)anthracene	3.0E+00	1.3E-01	7.3E-01	NA	1.1E-07	7.8E-08	3.5%	3.1E-07	--	--	1.0E-07	7.3E-08	3.5%	7.8E-07	--	--
Benzo(a)pyrene (BaP)	5.7E+00	1.3E-01	7.3E+00	NA	2.1E-07	1.5E-06	68.4%	6.1E-07	--	--	1.9E-07	1.4E-06	68.4%	1.5E-06	--	--
Benzo(b)fluoranthene	9.0E+00	1.3E-01	7.3E-01	NA	3.3E-07	2.4E-07	10.7%	9.5E-07	--	--	3.0E-07	2.2E-07	10.7%	2.4E-06	--	--
Benzo(k)fluoranthene	2.3E+00	1.3E-01	7.3E-02	NA	8.2E-08	6.0E-09	0.3%	2.4E-07	--	--	7.7E-08	5.6E-09	0.3%	6.0E-07	--	--
Chrysene	3.6E+00	1.3E-01	7.3E-03	NA	1.3E-07	9.4E-10	0.0%	3.8E-07	--	--	1.2E-07	8.8E-10	0.0%	9.4E-07	--	--
Dibenz(a,h)anthracene	8.9E-01	1.3E-01	7.3E+00	NA	3.2E-08	2.3E-07	10.6%	9.4E-08	--	--	3.0E-08	2.2E-07	10.6%	2.3E-07	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	1.3E-01	7.3E-01	NA	1.4E-07	1.0E-07	4.7%	4.2E-07	--	--	1.3E-07	9.8E-08	4.7%	1.0E-06	--	--
Diesel Range Organics (DRO)	2.8E+02	1.0E-01	NA	NA	7.8E-06	--	--	2.3E-05	--	--	7.3E-06	--	--	5.7E-05	--	--
Gasoline Range Organics (GRO)	3.4E+00	1.0E-01	NA	NA	9.6E-08	--	--	2.8E-07	--	--	8.9E-08	--	--	7.0E-07	--	--
Arsenic	3.1E+00	3.0E-02	1.5E+00	3.0E-04	2.6E-08	3.9E-08	1.8%	7.6E-08	2.5E-04	0.2%	2.4E-08	3.7E-08	1.8%	1.9E-07	6.3E-04	0.2%
Chromium	7.0E+01	1.0E-02	NA	7.5E-05 (1)	1.9E-07	--	--	5.7E-07	7.5E-03	6.8%	1.8E-07	--	--	1.4E-06	1.9E-02	6.8%
Thallium	7.9E-01	1.0E-02	NA	7.0E-05	2.2E-09	--	--	6.4E-09	9.2E-05	0.1%	2.1E-09	--	--	1.6E-08	2.3E-04	0.1%
Vanadium	3.3E+02	1.0E-02	NA	2.6E-05	9.1E-07	--	--	2.7E-06	1.0E-01	92.8%	8.5E-07	--	--	6.6E-06	2.6E-01	92.8%
					Total ILCR:	2.2E-06	100.0%	Total HI:	1.1E-01	100.0%	Total ILCR:	2.1E-06	100.0%	Total HI:	2.8E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ADULT AND ADOLESCENT TRESPASSERS - CURRENT SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
RCRA FACILITY INVESTIGATION - NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C/VF + C/PEF

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Adolescent	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
VF	m3/kg	Volatilization Factor	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	1.27	0.69	
ET	hours/day	Exposure time	2.0	2.0	
EF	days/year	Exposure frequency	52	52	
ED	years	Exposure duration	24	9	
BW	kg	Body weight	70	45	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	3,285	

						Adult						Adolescent					
						Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	VF (m3/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
2-Hexanone (MBK)	6.1E-03	NA	4.64E-12	NA	NA	8.2E-15	--	--	2.4E-14	--	--	2.6E-15	--	--	2.0E-14	--	--
Benzo(a)anthracene	3.0E+00	1.8E+07	1.66E-07	NA	NA	2.9E-10	--	--	8.6E-10	--	--	9.3E-11	--	--	7.3E-10	--	--
Benzo(a)pyrene (BaP)	5.7E+00	3.5E+07	1.67E-07	3.1E+00	NA	3.0E-10	9.2E-10	19.1%	8.6E-10	--	--	9.4E-11	2.9E-10	19.1%	7.3E-10	--	--
Benzo(b)fluoranthene	9.0E+00	2.1E+07	4.32E-07	NA	NA	7.7E-10	--	--	2.2E-09	--	--	2.4E-10	--	--	1.9E-09	--	--
Benzo(k)fluoranthene	2.3E+00	4.5E+07	5.20E-08	NA	NA	9.2E-11	--	--	2.7E-10	--	--	2.9E-11	--	--	2.3E-10	--	--
Chrysene	3.6E+00	2.7E+06	1.31E-06	NA	NA	2.3E-09	--	--	6.8E-09	--	--	7.4E-10	--	--	5.7E-09	--	--
Dibenz(a,h)anthracene	8.9E-01	8.7E+07	1.09E-08	NA	NA	1.9E-11	--	--	5.6E-11	--	--	6.1E-12	--	--	4.8E-11	--	--
Indeno(1,2,3-cd)pyrene	3.9E+00	8.2E+07	5.11E-08	NA	NA	9.1E-11	--	--	2.6E-10	--	--	2.9E-11	--	--	2.2E-10	--	--
Diesel Range Organics (DR(	2.8E+02	NA	2.12E-07	NA	NA	3.8E-10	--	--	1.1E-09	--	--	1.2E-10	--	--	9.3E-10	--	--
Gasoline Range Organics (G	3.4E+00	NA	2.60E-09	NA	NA	4.6E-12	--	--	1.3E-11	--	--	1.5E-12	--	--	1.1E-11	--	--
Arsenic	3.1E+00	NA	2.36E-09	1.5E+01	NA	4.2E-12	6.3E-11	1.3%	1.2E-11	--	--	1.3E-12	2.0E-11	1.3%	1.0E-11	--	--
Chromium	7.0E+01	NA	5.28E-08	4.1E+01 (1)	3.0E-05 (1)	9.4E-11	3.8E-09	79.6%	2.7E-10	9.1E-06	100.0%	3.0E-11	1.2E-09	79.6%	2.3E-10	7.7E-06	100.0%
Thallium	7.9E-01	NA	6.02E-10	NA	NA	1.1E-12	--	--	3.1E-12	--	--	3.4E-13	--	--	2.6E-12	--	--
Vanadium	3.3E+02	NA	2.48E-07	NA	NA	4.4E-10	--	--	1.3E-09	--	--	1.4E-10	--	--	1.1E-09	--	--
						Total ILCR:	4.8E-09	100.0%	Total HI:	9.1E-06	100.0%	Total ILCR:	1.5E-09	100.0%	Total HI:	7.7E-06	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.
(1) Value for chromium VI

ONSITE JOHNSON AND ETTINGER MODEL RESULTS

INDOOR AIR SIMULATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: NAPR SWMU 14
Report Date: Wed Mar 7 13:33:47 EST 2007
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.htm
Type of sample: GROUND WATER Concentration = 4.1[µg/L]
Depth to ground water table: 14.5ft +/- 0.2ft
Average soil/ground water temperature: 10C

CHEMICAL PROPERTIES
Chemical of Concern: 1,2-Dichloroethane CAS Number: 107062
Molecular Weight: 98.96 [g/mole] Henrys Constant: 0.0196182 [unitless]
Diffusivity in Air: 0.1040 [cm^2/sec] Diffusivity in Water: 9.900e-6 [cm^2/sec]
Unit Risk Factor: 0.000026 [$(\mu g/m^3)^{-1}$] Reference Concentration: 0 [mg/m^3]

SOIL PROPERTIES
Soil Type: Sandy Loam Total Porosity: 0.387
Unsaturated Zone Moisture Content:
low= 0.039 best estimate= 0.103 high= 0.17
Capillary Zone Moisture Content: 0.32 Height of Capillary Rise: 0.25 [m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 350 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficient (D^T_{eff}): 0.002271[cm^2/s]
Ground Water to Indoor Air Attenuation Factor (α_{GW}) = 0.0003017

[1]Low Indoor Air Prediction: 0.01891 [$\mu g/m^3$] or 0.004675 [ppbv]
Cancer Risk of this concentration: 2.020e-7 Hazard Risk of this concentration: 0.

Best Estimate Indoor Air Prediction: 0.02427[$\mu g/m^3$] or 0.006000 [ppbv]
Cancer Risk of this concentration: 2.593e-7 Hazard Risk of this concentration: 0.

[2]High Indoor Air Prediction: 0.02684[$\mu g/m^3$] or 0.006635 [ppbv]
Cancer Risk of this concentration: 2.867e-7 Hazard Risk of this concentration: 0.

Based on parameter analysis: Advection is the dominant mechanism across foundation. Diffusion through soil is the overall rate-limiting process for the subsurface to indoor-air pathway.

[1]"Low Prediction" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.

[2]"High Prediction" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

Exposure Frequency for non-carcinogens has been changed from default value of 365 days/year.

INDOOR AIR SIMULATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: NAPR SWMU 14
Report Date: Wed Mar 7 13:46:49 EST 2007
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.htm
Type of sample: GROUND WATER Concentration = 220[µg/L]
Depth to ground water table: 14.5ft +/- 0.2ft
Average soil/ground water temperature: 10C

CHEMICAL PROPERTIES
Chemical of Concern: Benzene CAS Number: 71432
Molecular Weight: 78.11 [g/mole] Henrys Constant: 0.1152703 [unitless]
Diffusivity in Air: 8.800e-2 [cm^2/sec] Diffusivity in Water: 9.800e-6 [cm^2/sec]
Unit Risk Factor: 0.0000078 [$(\mu g/m^3)^{-1}$] Reference Concentration: 0 [mg/m^3]

SOIL PROPERTIES
Soil Type: Sandy Loam Total Porosity: 0.387
Unsaturated Zone Moisture Content:
low= 0.039 best estimate= 0.103 high= 0.17
Capillary Zone Moisture Content: 0.32 Height of Capillary Rise: 0.25 [m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 350 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficient (D^T_{eff}): 0.001298[cm^2/s]
Ground Water to Indoor Air Attenuation Factor (α_{GW}) = 0.0001772

[1]Low Indoor Air Prediction: 3.752 [$\mu g/m^3$] or 1.175 [ppbv]
Cancer Risk of this concentration: 1.203e-5 Hazard Risk of this concentration: 0.

Best Estimate Indoor Air Prediction: 4.493[$\mu g/m^3$] or 1.407 [ppbv]
Cancer Risk of this concentration: 1.440e-5 Hazard Risk of this concentration: 0.

[2]High Indoor Air Prediction: 4.812[$\mu g/m^3$] or 1.507 [ppbv]
Cancer Risk of this concentration: 1.543e-5 Hazard Risk of this concentration: 0.

Based on parameter analysis: Advection is the dominant mechanism across foundation. Diffusion through soil is the overall rate-limiting process for the subsurface to indoor-air pathway.

[1]"Low Prediction" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.

[2]"High Prediction" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

Exposure Frequency for non-carcinogens has been changed from default value of 365 days/year.

APPENDIX H
RAGS PART D TABLES

Revised: March 23, 2007

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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	Surface Soil	Surface Soil	Surface Soil	On-Site Workers	Adult	Ingestion Dermal	Quantitative	Current landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Ingestion Dermal	NA	Not a current receptor.
				Trespassers	Adult and Adolescent	Ingestion Dermal	Quantitative	Current access of the site without permission
				Residents	Adult and Young Child	Ingestion Dermal	NA	Not a current receptor.
		Air	Fugitive Dusts	On-Site Workers	Adult	Inhalation	Quantitative	Current landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Inhalation	NA	Not a current receptor.
				Trespassers	Adult and Adolescent	Inhalation	Quantitative	Current access of the site without permission
				Residents	Adult and Young Child	Inhalation	NA	Not a current receptor.
	Subsurface Soil	Subsurface Soil	Subsurface Soil	On-Site Workers	Adult	Ingestion Dermal	Quantitative	Current landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Ingestion Dermal	NA	Not a current receptor.
				Trespassers	Adult and Adolescent	Ingestion Dermal	NA	Not currently exposed to this medium.
				Residents	Adult and Young Child	Ingestion Dermal	NA	Not a current receptor.
		Air	Fugitive Dusts	On-Site Workers	Adult	Inhalation	Quantitative	Current landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Inhalation	NA	Not a current receptor.
				Trespassers	Adult and Adolescent	Inhalation	NA	Not currently exposed to this medium.
				Residents	Adult and Young Child	Inhalation	NA	Not a current receptor.

TABLE 1 (Continued)
SELECTION OF EXPOSURE PATHWAYS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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 (Cont)	Groundwater	Groundwater	Groundwater	On-Site Workers	Adult	Ingestion Dermal	NA	Not currently exposed to this medium.
				Construction Workers	Adult	Ingestion Dermal	NA	Not a current receptor.
				Trespassers	Adult and Adolescent	Ingestion Dermal	NA	Not currently exposed to this medium.
				Residents	Adult and Young Child	Ingestion Dermal	NA	Not a current receptor.
		Air	Volatilization	Residents	Adult	Inhalation	NA	Not a current receptor.
			Vapor Migration to Indoor Air	Residents	Adult	Inhalation	NA	Not a current receptor.
				Construction Workers	Adult	Inhalation	NA	Not a current receptor.

TABLE 1 (Continued)
SELECTION OF EXPOSURE PATHWAYS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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	Surface Soil	Surface Soil	Surface Soil	On-Site Workers	Adult	Ingestion Dermal	Quantitative	Future potential landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Ingestion Dermal	Quantitative	Future potential excavation or construction activities for development.
				Trespassers	Adult and Adolescent	Ingestion Dermal	NA	Not anticipated as a future receptor.
				Residents	Adult and Young Child	Ingestion Dermal	Quantitative	Future potential residential development.
		Air	Fugitive Dusts	On-Site Workers	Adult	Inhalation	Quantitative	Future potential landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Inhalation	Quantitative	Future potential excavation or construction activities for development.
				Trespassers	Adult and Adolescent	Inhalation	NA	Not anticipated as a future receptor.
				Residents	Adult and Young Child	Inhalation	Quantitative	Future potential residential development.
	Subsurface Soil	Subsurface Soil	Subsurface Soil	On-Site Workers	Adult	Ingestion Dermal	Quantitative	Future potential landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Ingestion Dermal	Quantitative	Future potential excavation or construction activities for development.
				Trespassers	Adult and Adolescent	Ingestion Dermal	NA	Not anticipated as a future receptor.
				Residents	Adult and Young Child	Ingestion Dermal	Quantitative	Future potential residential development.
		Air	Fugitive Dusts	On-Site Workers	Adult	Inhalation	Quantitative	Future potential landscaping, outdoor work-related activities for site.
				Construction Workers	Adult	Inhalation	Quantitative	Future potential excavation or construction activities for development.
				Trespassers	Adult and Adolescent	Inhalation	NA	Not anticipated as a future receptor.
				Residents	Adult and Young Child	Inhalation	Quantitative	Future potential residential development.

TABLE 1 (Continued)
SELECTION OF EXPOSURE PATHWAYS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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 (Cont)	Groundwater	Groundwater	Groundwater	On-Site Workers	Adult	Ingestion Dermal	NA	Not expected to be exposed to media.
				Construction Workers	Adult	Ingestion Dermal	Quantitative	Future potential excavation or construction activities for development.
				Trespassers	Adult and Adolescent	Ingestion Dermal	NA	Not anticipated as a future receptor.
				Residents	Adult and Young Child	Ingestion Dermal	Quantitative	Future potential residential development.
		Air	Volatilization	Residents	Adult	Inhalation	Quantitative	Future potential residential development.
			Vapor Migration to Indoor Air	Residents	Adult	Inhalation	Quantitative	Future potential residential development.
				Construction Workers	Adult	Inhalation	Qualitative	Future potential excavation or construction activities for development.

TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Soil		**Volatiles (ug/kg)**													
	78-93-3	2-Butanone (MEK)	23 J	36 J	µg/kg	14SB01-00	3/9	11UJ - 12U	36	NA	4.69E+06 N	N/A	N/A	NO	BSL
	591-78-6	2-Hexanone (MBK)	2.3 J	3 J	µg/kg	14SB02-00	2/9	11UJ - 13UJ	3	NA	N/A	N/A	N/A	YES	NSC
	71-43-2	Benzene	9.5	9.5	µg/kg	14SB01-00	1/9	4.3U - 6U	9.5	NA	1.16E+04 C	N/A	N/A	NO	BSL
	74-83-9	Bromomethane	0.7 J	0.7 J	µg/kg	14SB01-00	1/9	4.3U - 12U	0.7	NA	1.10E+04 N	N/A	N/A	NO	BSL
	100-41-4	Ethylbenzene	1.5 J	1.6 J	µg/kg	14SB02-00	2/9	4.3U - 6UJ	1.6	NA	7.82E+05 N	N/A	N/A	NO	BSL
	1330-20-7	Xylenes, total	2.3 J	2.7 J	µg/kg	14SB02-00	2/9	5U - 16U	2.7	NA	1.56E+06 N	N/A	N/A	NO	BSL
		Semivolatiles (ug/kg)													
	117-81-7	Bis(2-ethylhexyl) Phthalate (BEHP)	97 J	97 J	µg/kg	14SS06	1/9	360U - 420U	97	NA	4.56E+04 C	N/A	N/A	NO	BSL
	84-66-2	Diethyl Phthalate (DEP)	54 J	54 J	µg/kg	14SS06	1/9	360U - 420U	54	NA	6.26E+06 N	N/A	N/A	NO	BSL
		PAHs (ug/kg)													
	90-12-0	1-Methylnaphthalene	6 J	6 J	µg/kg	14SB02-00	1/4	7.6U - 8.5UJ	6	NA	1.56E+05 N (7)	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	7.4 J	7.4 J	µg/kg	14SB02-00	1/4	7.6U - 8.5U	7.4	NA	3.13E+04 N	N/A	N/A	NO	BSL
	120-12-7	Anthracene	110 J	110 J	µg/kg	14SS07	1/9	7.6U - 410U	110	NA	2.35E+06 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	45 J	3,400	µg/kg	14SS07	3/9	7.6U - 400U	3,400	NA	2.20E+02 C	N/A	N/A	YES	ASL
	50-32-8	Benzo(a)pyrene (BaP)	45 J	5,000	µg/kg	14SS07	3/9	7.6U - 400U	5,000	NA	2.20E+01 C	N/A	N/A	YES	ASL
	205-99-2	Benzo(b)fluoranthene	5.8 J	7,600	µg/kg	14SS07	3/9	7.8U - 410U	7,600	NA	2.20E+02 C	N/A	N/A	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	5.5 J	3,600	µg/kg	14SS07	6/9	7.8U - 360U	3,600	NA	2.35E+05 N (8)	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	5.7 J	2,400	µg/kg	14SS07	3/9	7.8U - 410U	2,400	NA	2.20E+03 C	N/A	N/A	YES	ASL
	218-01-9	Chrysene	5 J	3,800	µg/kg	14SS07	4/9	7.8U - 400U	3,800	NA	2.20E+04 C	N/A	N/A	YES	CHEM
	53-70-3	Dibenz(a,h)anthracene	210 J	920	µg/kg	14SS07	2/9	7.6U - 410U	920	NA	2.20E+01 C	N/A	N/A	YES	ASL
	206-44-0	Fluoranthene	6.5 J	230 J	µg/kg	14SS06	5/9	7.8U - 360U	230	NA	3.13E+05 N	N/A	N/A	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	4.8 J	3,800	µg/kg	14SS07	5/9	7.8U - 400U	3,800	NA	2.20E+02 C	N/A	N/A	YES	ASL
	85-01-8	Phenanthrene	39 J	58 J	µg/kg	14SS07	2/9	7.6U - 410U	58	NA	2.35E+05 N (8)	N/A	N/A	NO	BSL
	129-00-0	Pyrene	6.6 J	650	µg/kg	14SS06	5/9	7.8U - 360U	650	NA	2.35E+05 N	N/A	N/A	NO	BSL
		PCBs (ug/kg)													
	11096-82-5	Aroclor-1260	6 NJ	28	µg/kg	14SS04	7/9	36U - 39U	28	NA	3.19E+02 C	N/A	N/A	NO	BSL
		TPH (mg/kg)													
	68334-30-5	Diesel Range Organics (DRO)	120	560	mg/kg	14SS04	4/9	4.5U - 15U	560	ND	N/A	N/A	N/A	YES	NSC
	86290-81-5	Gasoline Range Organics (GRO)	0.032	3.8	mg/kg	14SS05	5/9	0.57U - 0.63U	3.8	ND	N/A	N/A	N/A	YES	NSC
		Inorganics (mg/kg)													
	7440-36-0	Antimony	1.4 J	1.9 J	mg/kg	14SB03-00	4/4	(6)	1.9	2.46	3.13E+00 N	N/A	N/A	NO	BSL
	7440-38-2	Arsenic	1.4 J	2.9 J	mg/kg	14SB03-00	4/4	(6)	2.9	2.65	4.26E-01 C	N/A	N/A	YES	ASL
	7440-39-3	Barium	26.5 J	155 J	mg/kg	14SB03-00	4/4	(6)	155	199	1.56E+03 N	N/A	N/A	NO	BSL
	7440-43-9	Cadmium	1.1	1.6	mg/kg	14SB03-00	3/4	0.58U - 0.58U	1.6	5.76	3.91E+00 N	N/A	N/A	NO	BSL
	7440-47-3	Chromium	33.8 J	75.1 J	mg/kg	14SB03-00	4/4	(6)	75.1	49.8	2.35E+05 N (9)	N/A	N/A	YES	ASL
	7440-48-4	Cobalt	5.8 J	46.9 J	mg/kg	14SB03-00	4/4	(6)	46.9	46.2	1.56E+02 N (10)	N/A	N/A	NO	BSL
	7439-92-1	Lead	4.9 J	85.3 J	mg/kg	14SB01-00	4/4	(6)	85.3	22.0	4.00E+02 N (11)	N/A	N/A	NO	BSL
	7439-97-6	Mercury	0.031 J	0.077	mg/kg	14SB02-00	4/4	(6)	0.077	0.109	2.35E+00 N (12)	N/A	N/A	NO	BSL
	7440-02-0	Nickel	4.1 J	14.4 J	mg/kg	14SB02-00	4/4	(6)	14.4	20.7	1.56E+02 N	N/A	N/A	NO	BSL
	7782-49-2	Selenium	2.1 J	4.7 J	mg/kg	14SB07-00	4/4	(6)	4.7	1.18	3.91E+01 N	N/A	N/A	NO	BSL

TABLE 2.1 (Continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Soil		**Inorganics (mg/kg)**													
	7440-28-0	Thallium	0.65 J	0.65 J	mg/kg	14SB03-00	1/4	0.43UJ - 0.47UJ	0.65	NA	5.48E-01 N	N/A	N/A	YES	ASL
	7440-62-2	Vanadium	187 J	323 J	mg/kg	14SB03-00	4/4	(6)	323	287	7.82E+00 N	N/A	N/A	YES	ASL
	7440-66-6	Zinc	17.9 J	87.8 J	mg/kg	14SB01-00	4/4	(6)	87.8	115	2.35E+03 N	N/A	N/A	NO	BSL

(1) J - Analyte present - Reported value is estimated
NJ - Presumptive evidence for the presence of the material at an estimated valu
U - Not detected
UJ - Reported quantitation limit is qualified as estimatec

(2) Maximum concentration used for screening
(3) Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2006): ULN
(4) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemical
USEPA Region III Residential Soil COC Screening Value (derived from USEPA Region III RBC Table - October, 2006
(5) Rationale Codes

Selection Reason: Same chemical class (CHEM)
No Screening Criteria (NSC)
Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

(6) No detection limits given; analyte detected in every sample
(7) Screening value for naphthalene used as a surrogate
(8) Screening value for pyrene used as a surrogate.
(9) Screening value for chromium VI used as a surrogate
(10) Screening value retained from the April 2005 version of the RBCs
(11) Action level for lead.
(12) Screening value for mercuric chloride used as a surrogate

Definitions: N/A = Not Applicable
ND = Not Detected
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considerec

C = Carcinogenic
N = Non-Carcinogenic

mg/kg = milligrams per kilogran
ug/kg = microgram per kilogran

TABLE 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Subsurface Soil		**Volatiles (ug/kg)**													
	78-93-3	2-Butanone (MEK)	7.8 J	8.7 J	µg/kg	14SB06-01	2/4	12UJ - 540UJ	8.7	NA	4.69E+06 N	N/A	N/A	NO	BSL
	75-15-0	Carbon Disulfide	0.9 J	1.3 J	µg/kg	14SB02-03	2/4	4.6U - 220U	1.3	NA	7.82E+05 N	N/A	N/A	NO	BSL
	100-41-4	Ethylbenzene	14	740	µg/kg	14SB04-01	2/4	4U - 4.6U	740	NA	7.82E+05 N	N/A	N/A	NO	BSL
	1330-20-7	Xylenes, total	22	130 J	µg/kg	14SB04-01	2/4	12U - 14U	130	NA	1.56E+06 N	N/A	N/A	NO	BSL
		PAHs (ug/kg)													
	90-12-0	1-Methylnaphthalene	930 J	930 J	µg/kg	14SB02-03	1/3	8.2UJ - 8.6UJ	930	NA	1.56E+05 N (7)	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	910	1,700	µg/kg	14SB04-01	2/4	8.2UJ - 8.6UJ	1,700	NA	3.13E+04 N	N/A	N/A	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	7.7 J	16 J	µg/kg	14SB04-01	2/4	8.6U - 8.9U	16	NA	2.35E+05 N (8)	N/A	N/A	NO	BSL
	86-73-7	Fluorene	28	28	µg/kg	14SB02-03	1/4	8.2U - 380U	28	NA	3.13E+05 N	N/A	N/A	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	5.6 J	5.6 J	µg/kg	14SB06-01	1/4	8.6U - 380U	5.6	NA	2.20E+02 C	N/A	N/A	NO	BSL
	91-20-3	Naphthalene	480	580	µg/kg	14SB02-03	2/4	8.2U - 8.6U	580	NA	1.56E+05 N	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	45 J	45 J	µg/kg	14SB04-01	1/4	8.2U - 8.9U	45	NA	2.35E+05 N (8)	N/A	N/A	NO	BSL
	129-00-0	Pyrene	62 J	62 J	µg/kg	14SB04-01	1/4	8.2U - 8.9U	62	NA	2.35E+05 N	N/A	N/A	NO	BSL
		Dioxins / Furans (ug/kg)													
	35822-46-9	HpCDD, 1,2,3,4,6,7,8-	1.27 J	1.27 J	µg/kg	14SB04-01	1/1	(6)	1.27	NA	4.26E-05 C (9)	N/A	N/A	YES	ASL
	3268-87-9	OCDD	11.6	11.6	µg/kg	14SB04-01	1/1	(6)	11.6	NA	4.26E-06 C (10)	N/A	N/A	YES	ASL
		TPH (mg/kg)													
	68334-30-5	Diesel Range Organics (DRO)	29	2,400	mg/kg	14SB04-01	3/4	13U - 13U	2,400	ND	N/A	N/A	N/A	YES	NSC
	86290-81-5	Gasoline Range Organics (GRO)	0.19 J	5.4	mg/kg	14SB04-01	3/4	0.61U - 0.61U	5.4	ND	N/A	N/A	N/A	YES	NSC
		Inorganics (mg/kg)													
	7440-36-0	Antimony	1.3 J	1.4 J	mg/kg	14SB06-01	2/4	0.99UJ - 1UJ	1.4	--	3.13E+00 N	N/A	N/A	NO	BSL
	7440-38-2	Arsenic	0.79 J	4.2 J	mg/kg	14SB05-02	4/4	(6)	4.2	1.59	4.26E-01 C	N/A	N/A	YES	ASL
	7440-39-3	Barium	57.8 J	64.4 J	mg/kg	14SB04-01	3/4	4.7U - 4.7U	64.4	220	1.56E+03 N	N/A	N/A	NO	BSL
	7440-43-9	Cadmium	0.84	1.1	mg/kg	14SB05-02	3/4	0.3U - 0.3U	1.1	0.539	3.91E+00 N	N/A	N/A	NO	BSL
	7440-47-3	Chromium	20.8 J	36.5 J	mg/kg	14SB05-02	4/4	(6)	36.5	114	2.35E+01 N (11)	N/A	N/A	YES	ASL
	7440-48-4	Cobalt	0.84 J	24.5 J	mg/kg	14SB06-01	4/4	(6)	24.5	26.9	1.56E+02 N (12)	N/A	N/A	NO	BSL
	7439-92-1	Lead	4 J	39.8 J	mg/kg	14SB04-01	4/4	(6)	39.8	6.29	4.00E+02 N (13)	N/A	N/A	NO	BSL
	7439-97-6	Mercury	0.086	0.086	mg/kg	14SB05-02	1/4	0.017U - 0.022U	0.086	0.108	2.35E+00 N (14)	N/A	N/A	NO	BSL
	7440-02-0	Nickel	1.2 J	13.5 J	mg/kg	14SB06-01	4/4	(6)	13.5	24.7	1.56E+02 N	N/A	N/A	NO	BSL
	7782-49-2	Selenium	0.54 J	3.7 J	mg/kg	14SB05-02	4/4	(6)	3.7	5.94	3.91E+01 N	N/A	N/A	NO	BSL
	7440-62-2	Vanadium	98.8 J	267 J	mg/kg	14SB02-03	4/4	(6)	267	434	7.82E+00 N	N/A	N/A	YES	ASL
	7440-66-6	Zinc	4.6 J	75.9 J	mg/kg	14SB06-01	4/4	(6)	75.9	88.1	2.35E+03 N	N/A	N/A	NO	BSL

(1) J - Analyte present - Reported value is estimated
U - Not detected
UJ - Reported quantitation limit is qualified as estimate

(2) Maximum concentration used for screening
(3) Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2006): ULM
(4) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemical
USEPA Region III Residential Soil COC Screening Value (derived from USEPA Region III RBC Table - October, 2006
(5) Rationale Codes
Selection Reason: No Screening Criteria (NSC)
Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

Definitions: N/A = Not Applic
NA = Not Analyz
ND = Not Detecte
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considere

C = Carcinogenic
N = Non-Carcinogenic
mg/kg = milligrams per kilogram
ug/kg = microgram per kilogram

(6) No detection limits given; analyte detected in every sample
(7) Screening value for naphthalene used as a surrogate
(8) Screening value for pyrene used as a surrogate.
(9) Screening value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994).
(10) Screening value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994).
(11) Screening value for chromium VI used as a surrogate.
(12) Screening value retained from the April 2005 version of the RBC
(13) Action level for lead.
(14) Screening value for mercuric chloride used as a surrogate

TABLE 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Groundwater		**Volatiles (ug/L)**													
	107-06-2	1,2-Dichloroethane	4.1	4.1	µg/L	14TW01	1/3	0.5U - 0.5U	4.1	NA	1.16E-01 C	5	MCL	YES	ASL
	78-93-3	2-Butanone (MEK)	7.2	16	µg/L	14TW01	2/2	(6)	16	NA	6.97E+02 N	N/A	N/A	NO	BSL
	67-64-1	Acetone	58	72	µg/L	14TW01	2/3	2.5U - 2.5U	72	NA	5.48E+02 N	N/A	N/A	NO	BSL
	71-43-2	Benzene	0.41 J	220	µg/L	14TW01	2/3	0.5U - 0.5U	220	NA	3.36E-01 C	5	MCL	YES	ASL
	75-15-0	Carbon Disulfide	0.13 J	0.22 J	µg/L	14TW02	2/3	0.5U - 0.5U	0.22	NA	1.04E+02 N	N/A	N/A	NO	BSL
	100-41-4	Ethylbenzene	0.56	1.3	µg/L	14TW01	2/3	0.5U - 0.5U	1.3	NA	1.34E+02 N	700	MCL	NO	BSL
	74-88-4	Iodomethane	0.58 J	0.58 J	µg/L	14TW02	1/3	0.5UJ - 0.5UJ	0.58	NA	N/A	N/A	N/A	YES	NSC
	000000-01-4	Xylene, m/p-	0.28 J	0.35 J	µg/L	14TW02	2/3	1U - 1U	0.35	NA	2.13E+01 N (7)	10000	(19) MCL	NO	BSL
	95-47-6	Xylene, o-	0.53	1	µg/L	14TW01	2/3	0.5U - 0.5U	1	NA	2.13E+01 N (7)	10000	(19) MCL	NO	BSL
	1330-20-7	Xylenes, total	0.91	1.3	µg/L	14TW01	2/3	0.5U - 0.5U	1.3	NA	2.13E+01 N	10000	MCL	NO	BSL
		Semivolatiles (ug/L)													
	98-86-2	Acetophenone	0.33 J	0.33 J	µg/L	14TW01	1/3	10U - 10U	0.33	NA	6.08E+01 N	N/A	N/A	NO	BSL
	85-68-7	Butyl Benzyl Phthalate	0.3 J	0.3 J	µg/L	14TW07	1/3	10U - 10U	0.3	NA	7.30E+02 N	N/A	N/A	NO	BSL
	132-64-9	Dibenzofuran	0.43 J	0.43 J	µg/L	14TW01	1/3	10U - 10U	0.43	NA	1.22E+00 N (8)	N/A	N/A	NO	BSL
	84-66-2	Diethyl Phthalate (DEP)	0.89 J	1.3 J	µg/L	14TW07	2/3	10U - 10U	1.3	NA	2.92E+03 N	N/A	N/A	NO	BSL
	84-74-2	Di-n-butyl Phthalate (DBP)	0.48 J	0.48 J	µg/L	14TW07	1/3	10U - 10U	0.48	NA	3.65E+02 N	N/A	N/A	NO	BSL
		PAHs (ug/L)													
	90-12-0	1-Methylnaphthalene	1.4 J	1.9 J	µg/L	14TW02	2/3	0.2UJ - 0.2UJ	1.9	NA	6.51E-01 N (9)	N/A	N/A	YES	ASL
	91-57-6	2-Methylnaphthalene	1.8 J	2 J	µg/L	14TW01	2/3	0.2U - 0.2U	2	NA	2.43E+00 N	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	0.079 J	0.081 J	µg/L	14TW01	2/3	0.2U - 0.2U	0.081	NA	3.65E+01 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	0.095 J	0.095 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.095	NA	3.00E-02 C	N/A	N/A	YES	ASL
	50-32-8	Benzo(a)pyrene (BaP)	0.084 J	0.084 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.084	NA	3.00E-03 C	0.2	MCL	YES	ASL
	205-99-2	Benzo(b)fluoranthene	0.083 J	0.083 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.083	NA	3.00E-02 C	N/A	N/A	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	0.088 J	0.088 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.088	NA	1.83E+01 N (10)	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	0.093 J	0.093 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.093	NA	3.00E-01 C	N/A	N/A	YES	CHEM
	218-01-9	Chrysene	0.078 J	0.078 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.078	NA	3.00E+00 C	N/A	N/A	YES	CHEM
	53-70-3	Dibenz(a,h)anthracene	0.097 J	0.097 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.097	NA	3.00E-03 C	N/A	N/A	YES	ASL
	206-44-0	Fluoranthene	0.078 J	0.078 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.078	NA	1.46E+02 N	N/A	N/A	NO	BSL
	86-73-7	Fluorene	0.066 J	0.25	µg/L	14TW01	3/3	(6)	0.25	NA	2.43E+01 N	N/A	N/A	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.11 J	0.11 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.11	NA	3.00E-02 C	N/A	N/A	YES	ASL
	91-20-3	Naphthalene	0.34	14	µg/L	14TW01	3/3	(6)	14	NA	6.51E-01 N	N/A	N/A	YES	ASL
	129-00-0	Pyrene	0.087 J	0.087 J	µg/L	14TW01	1/3	0.2U - 0.2U	0.087	NA	1.83E+01 N	N/A	N/A	NO	BSL
		TPH (mg/L)													
	68334-30-5	Diesel Range Organics (DRO)	1.4	1.8	µg/L	14TW01	3/3	(6)	1.8	ND	N/A	N/A	N/A	YES	NSC
	86290-81-5	Gasoline Range Organics (GRO)	0.15 J	0.86	µg/L	14TW01	2/3	0.5U - 0.5U	0.86	ND	N/A	N/A	N/A	YES	NSC

TABLE 2.3 (Continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Groundwater		**Inorganics (ug/L)**													
	7440-47-3	Chromium	16.5 J	27.8 J	µg/L	14TW07	2/2	(6)	27.8	162	1.10E+01 N (11)	100	MCL	YES	ASL
	7440-48-4	Cobalt	5	28.2	µg/L	14TW07	2/2	(6)	28.2	633	7.30E+01 N (8)	N/A	N/A	NO	BSL
	7440-50-8	Copper	74.3 J	74.3 J	µg/L	14TW07	1/1	(6)	74.3	324	1.46E+02 N	1300	(14) MCL	NO	BSL
	7439-92-1	Lead	1.9 J	6.1	µg/L	14TW02	2/2	(6)	6.1	26.2	1.50E+01 N (12)	15	(14) MCL	NO	BSL
	7440-02-0	Nickel	4.1 J	11.1 J	µg/L	14TW07	2/2	(6)	11.1	95.7	7.30E+01 N	N/A	N/A	NO	BSL
	7440-62-2	Vanadium	59.2	74	µg/L	14TW07	2/2	(6)	74	485	3.65E+00 N	N/A	N/A	YES	ASL
	7440-66-6	Zinc	50.8	50.8	µg/L	14TW07	1/2	12.7U - 12.7U	50.8	548	1.10E+03 N	5000	sMCL	NO	BSL

(1) J - Analyte present - Reported value is estimated
U - Not detected
UJ - Reported quantitation limit is qualified as es

(2) Maximum concentration used for screening
(3) Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2006): ULN
(4) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemical
USEPA Region III Tap Water COC Screening Value (derived from USEPA Region III RBC Table - October, 2006)
(5) Rationale Codes
Selection Reason: Same chemical class (CHEM)
No Screening Criteria (NSC)
Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

(6) No detection limits given; analyte detected in every sample
(7) Screening value for xylenes (total) used as a surrogate.
(8) Screening value retained from the April 2005 version of the RBCs
(9) Screening value for naphthalene used as a surrogate
(10) Screening value for pyrene used as a surrogate.
(11) Screening value for chromium VI used as a surrogate
(12) Action level for lead.

Definitions: N/A = Not Applicable
NA = Not Analyzed
ND = Not Detected
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Maximum Contaminant Levels (Winter, 2004)

C = Carcinogenic
N = Non-Carcinogenic ug/L = microgram per liter

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (2)	Rationale (ProUCL)
Surface Soil									
	2-Hexanone (MBK)	µg/kg	5.20	6.12 (NP)	3 J	0.00612	mg/kg	95% UCL (NP)	95% Student's-t UCL
	Benzo(a)anthracene	µg/kg	460	2,967 (G)	3,400	2.97	mg/kg	95% UCL (G)	95% Adjusted Gamma UCL
	Benzo(a)pyrene (BaP)	µg/kg	805	5,737 (G)	5,000	5.74	mg/kg	95% UCL (G)	95% Adjusted Gamma UCL
	Benzo(b)fluoranthene	µg/kg	1,223	9,000 (G)	7,600	9.00	mg/kg	95% UCL (G)	95% Adjusted Gamma UCL
	Benzo(k)fluoranthene	µg/kg	405	2,273 (G)	2,400	2.27	mg/kg	95% UCL (G)	95% Adjusted Gamma UCL
	Chrysene	µg/kg	549	3,572 (G)	3,800	3.57	mg/kg	95% UCL (G)	95% Adjusted Gamma UCL
	Dibenz(a,h)anthracene	µg/kg	192	888 (G)	920	0.888	mg/kg	95% UCL (G)	95% Adjusted Gamma UCL
	Indeno(1,2,3-cd)pyrene	µg/kg	618	3,947 (G)	3,800	3.95	mg/kg	95% UCL (G)	95% Adjusted Gamma UCL
	Diesel Range Organics (DRO)	mg/kg	173	280 (NP)	560	280	mg/kg	95% UCL (NP)	95% Hall's Bootstrap UCL
	Gasoline Range Organics (GRO)	mg/kg	1.37	3.43 (G)	3.8	3.43	mg/kg	95% UCL (G)	95% Approximate Gamma UCL
	Arsenic	mg/kg	2.35	3.12 (N)	2.9 J	3.12	mg/kg	95% UCL (N)	95% Student's-t UCL
	Chromium	mg/kg	47.7	69.7 (N)	75.1 J	69.7	mg/kg	95% UCL (N)	95% Student's-t UCL
	Thallium	mg/kg	0.333	0.794 (NP)	0.65 J	0.794	mg/kg	95% UCL (NP)	95% Chebyshev (Mean, Sd) UCL
	Vanadium	mg/kg	246	328 (N)	323 J	328	mg/kg	95% UCL (N)	95% Student's-t UCL

EPC = Exposure Point Concentration
UCL = Upper Confidence Level
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

(1) Distribution and 95% UCL were calculated by ProUCL and are indicated as follows:
(N) - Normal distribution and 95% UCL
(NP) - Non-parametric distribution and 95% UCL
(G) - Gamma distribution and 95% UCL

(2) Exposure point concentration statistic will be the 95% UCL (as calculated by ProUCL).

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (2)	Rationale (ProUCL)
Subsurface Soil									
	HpCDD, 1,2,3,4,6,7,8-	µg/kg	1.27	ND	1.27 J	0.00127	mg/kg	Max	Less than 3 samples
	OCDD	µg/kg	11.6	ND	11.6	0.0116	mg/kg	Max	Less than 3 samples
	Diesel Range Organics (DRO)	mg/kg	884	2,216 (N)	2,400	2,216	mg/kg	95% UCL (N)	95% Student's-t UCL
	Gasoline Range Organics (GRO)	mg/kg	2.20	5.11 (N)	5.4	5.11	mg/kg	95% UCL (N)	95% Student's-t UCL
	Arsenic	mg/kg	2.0	3.79 (N)	4.2 J	3.79	mg/kg	95% UCL (N)	95% Student's-t UCL
	Chromium	mg/kg	28.7	36.8 (N)	36.5 J	36.8	mg/kg	95% UCL (N)	95% Student's-t UCL
	Vanadium	mg/kg	193	278 (N)	267 J	278	mg/kg	95% UCL (N)	95% Student's-t UCL

EPC = Exposure Point Concentration
UCL = Upper Confidence Level
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

(1) Distribution and 95% UCL were calculated by ProUCL and are indicated as follows:
(N) - Normal distribution and 95% UCL

(2) Exposure point concentration statistic will be the 95% UCL (as calculated by ProUCL) or the maximum detected (in the case of less than 3 samples).

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (2)	Rationale
Groundwater									
	1,2-Dichloroethane	µg/L	1.53	Not Calculated	4.1	0.0041	mg/L	Max	Conservative Estimate
	Benzene	µg/L	73.6	Not Calculated	220	0.22	mg/L	Max	Conservative Estimate
	Iodomethane	µg/L	0.360	Not Calculated	0.58 J	0.00058	mg/L	Max	Conservative Estimate
	1-Methylnaphthalene	µg/L	1.13	Not Calculated	1.9 J	0.0019	mg/L	Max	Conservative Estimate
	Benzo(a)anthracene	µg/L	0.0983	Not Calculated	0.095 J	0.000095	mg/L	Max	Conservative Estimate
	Benzo(a)pyrene (BaP)	µg/L	0.0947	Not Calculated	0.084 J	0.000084	mg/L	Max	Conservative Estimate
	Benzo(b)fluoranthene	µg/L	0.0943	Not Calculated	0.083 J	0.000083	mg/L	Max	Conservative Estimate
	Benzo(k)fluoranthene	µg/L	0.0977	Not Calculated	0.093 J	0.000093	mg/L	Max	Conservative Estimate
	Chrysene	µg/L	0.0927	Not Calculated	0.078 J	0.000078	mg/L	Max	Conservative Estimate
	Dibenz(a,h)anthracene	µg/L	0.0990	Not Calculated	0.097 J	0.000097	mg/L	Max	Conservative Estimate
	Indeno(1,2,3-cd)pyrene	µg/L	0.103	Not Calculated	0.11 J	0.00011	mg/L	Max	Conservative Estimate
	Naphthalene	µg/L	5.78	Not Calculated	14	0.014	mg/L	Max	Conservative Estimate
	Diesel Range Organics (DRO)	µg/L	1.57	Not Calculated	1.8	0.0018	mg/L	Max	Conservative Estimate
	Gasoline Range Organics (GRO)	µg/L	0.420	Not Calculated	0.86	0.00086	mg/L	Max	Conservative Estimate
	Chromium	µg/L	22.2	Not Calculated	27.8 J	0.0278	mg/L	Max	Conservative Estimate
	Vanadium	µg/L	66.6	Not Calculated	74	0.074	mg/L	Max	Conservative Estimate

EPC = Exposure Point Concentration
UCL = Upper Confidence Level
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

(1) Distribution and 95% UCL were not calculated because we are using the maximum as a conservative estimate
(2) Conservative estimate using the maximum concentration

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion									Chronic Daily Intake (CDI) Equations
	Current Trespassers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	52	days/year	Prof Judge	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	24	years	USEPA, 1991	
				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	
		Adolescent	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	52	days/year	Prof Judge	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	9	years	USEPA, 1991	
				BW	Body Weight	45	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Current and Future On-Site Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1997	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	250	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	25	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (Cont)	Future Residents	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1991	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	350	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	24	years	USEPA, 1997	
				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	
		Young Child	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	200	mg/day	USEPA, 1991	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	350	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	6	years	USEPA, 1997	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
	Future Construction Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	480	mg/day	USEPA, 1997	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	180	days/year	Prof Judge	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal									Dermally Adjusted Dose (DAD) Equations
	Current Trespassers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,700	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.07	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	52	days/year	Prof Judge	1/BW x1/AT
				ED	Exposure Duration	24	years	USEPA, 1991	
				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	
		Adolescent	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	3,200	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	52	days/year	Prof Judge	1/BW x1/AT
				ED	Exposure Duration	9	years	USEPA, 1991	
				BW	Body Weight	45	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Current and Future On-Site Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,700	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	250	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	25	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (Cont)	Future Residents	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,700	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.07	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	350	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	24	years	USEPA, 1997	
				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	
		Young Child	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	2,800	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	350	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	6	years	USEPA, 1997	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
	Future Construction Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	3,300	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	180	days/year	Prof Judge	1/BW x1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used

Chemical Specific - See Table 3.1 Prof Judge - Professional Judgment

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993
USEPA, 1995: Assessing Dermal Exposure from Soil
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005

TABLE 4.1a.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation									Chronic Daily Intake (CDI) Equations
	Current Trespassers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	2	hours/day	USEPA, 1997	
				EF	Exposure Frequency	52	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	24	years	USEPA, 1991	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				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	
		Adolescent	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	0.69	m3/hour	USEPA, 1997	
				ET	Exposure Time	2	hours/day	USEPA, 1997	
				EF	Exposure Frequency	52	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	9	years	USEPA, 1991	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	45	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Current and Future On-Site Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	25	years	USEPA, 2004	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	

TABLE 4.1a.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation (Cont)									Chronic Daily Intake (CDI) Equations
	Future Residents	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	24	years	USEPA, 1997	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				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	
		Young Child	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	0.69	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	6	years	USEPA, 1997	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
	Future Construction Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	2	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	180	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	1	years	Prof Judge	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used.

Chemical Specific - See Table 3.1 Prof Judge - Professional Judgment

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion									Chronic Daily Intake (CDI) Equations
	Current and Future On-Site Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1997	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	250	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	25	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	
	Future Residents	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1991	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	350	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	24	years	USEPA, 1997	
				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	
		Young Child	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	200	mg/day	USEPA, 1991	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	350	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	6	years	USEPA, 1997	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
	Future Construction Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	480	mg/day	USEPA, 1997	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	180	days/year	Prof Judge	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal									Dermally Adjusted Dose (DAD) Equations
	Current and Future On-Site Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,700	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	250	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	25	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	
	Future Residents	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,700	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.07	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	350	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	24	years	USEPA, 1997	
				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	
		Young Child	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	2,800	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	350	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	6	years	USEPA, 1997	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (Cont)									Dermally Adjusted Dose (DAD) Equations
	Future Construction Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	3,300	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	180	days/year	Prof Judge	1/BW x1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were us

Chemical Specific - See Table 3.1
Prof Judge - Professional Judgment

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993
USEPA, 1995: Assessing Dermal Exposure from Soil
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005

TABLE 4.2a.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Medium: 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									Chronic Daily Intake (CDI) Equations
	Current and Future On-Site Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	25	years	USEPA, 2004	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	
	Future Residents	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	24	years	USEPA, 1997	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				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	
		Young Child	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	0.69	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	6	years	USEPA, 1997	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

TABLE 4.2a.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Medium: 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 (Cont)									Chronic Daily Intake (CDI) Equations
	Future Construction Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	2	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	180	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	1	years	Prof Judge	Ca x RR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used.

Chemical Specific - See Table 3.1
Prof Judge - Professional Judgment

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.3.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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									Chronic Daily Intake (CDI) Equations
	Future Residents	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	2	L/hour	USEPA, 1989	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	24	years	USEPA, 1997	C x IR-W x EF x ED x 1/BW x 1/AT
				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	
		Young Child	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	1	L/hour	USEPA, 1989	
				EF	Exposure Frequency	350	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	6	years	USEPA, 1997	C x IR-W x EF x ED x 1/BW x 1/AT
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
	Future Construction Workers	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	--	L/hour	--	
				EF	Exposure Frequency	180	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	1	years	Prof Judge	C x IR-W x EF x ED x 1/BW x 1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

TABLE 4.3.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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
Dermal									Dermally Adjusted Dose (DAD) Equations
	Future Residents	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				CF	Conversion Factor	1.00E-03	L/cm3	USEPA, 1989	DAD (mg/kg-day) =
				SA	Surface Area Available for Contact	18,000	cm2	USEPA, 2004	
				PC	Permeability Constant	Chemical Specific	cm/hour	USEPA, 2004	Inorganics
				tau	Lag Time	Chemical Specific	hour	USEPA, 2004	(C*CF*Kp*SA*EF*ED*ET)/(BW*AT)
				t*	Time to Reach Steady State	Chemical Specific	hour	USEPA, 2004	
				B	Permeability Coefficient of a Compound	Chemical Specific	NA	USEPA, 2004	Organics: ET <= t*
				ET	Exposure Time	0.58	hours/day	USEPA, 2004	(C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT)
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	24	years	USEPA, 1997	Organics: ET > t*
				BW	Body Weight	70	kg	USEPA, 1997	(C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B)/(1+B)))*SA*EF*ED)/(BW*AT)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
		Young Child	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				CF	Conversion Factor	1.00E-03	L/cm3	USEPA, 1989	DAD (mg/kg-day) =
				SA	Surface Area Available for Contact	6,600	cm2	USEPA, 2004	
				PC	Permeability Constant	Chemical Specific	cm/hour	USEPA, 2004	Inorganics
				tau	Lag Time	Chemical Specific	hour	USEPA, 2004	(C*CF*Kp*SA*EF*ED*ET)/(BW*AT)
				t*	Time to Reach Steady State	Chemical Specific	hour	USEPA, 2004	
				B	Permeability Coefficient of a Compound	Chemical Specific	NA	USEPA, 2004	Organics: ET <= t*
				ET	Exposure Time	1	hours/day	USEPA, 2004	(C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT)
				EF	Exposure Frequency	350	days/year	USEPA, 1993	
				ED	Exposure Duration	6	years	USEPA, 1997	Organics: ET > t*
				BW	Body Weight	15	kg	USEPA, 1997	(C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B)/(1+B)))*SA*EF*ED)/(BW*AT)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

TABLE 4.3.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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
Dermal (Cont)									Dermally Adjusted Dose (DAD) Equations
	Future Construction Workers	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				CF	Conversion Factor	1.00E-03	L/cm3	USEPA, 1989	DAD (mg/kg-day) =
				SA	Surface Area Available for Contact	3,300	cm2	USEPA, 1997	
				PC	Permeability Constant	Chemical Specific	cm/hour	USEPA, 2004	Inorganics
				tau	Lag Time	Chemical Specific	hour	USEPA, 2004	(C*CF*Kp*SA*EF*ED*ET)/(BW*AT)
				t*	Time to Reach Steady State	Chemical Specific	hour	USEPA, 2004	
				B	Permeability Coefficient of a Compound	Chemical Specific	NA	USEPA, 2004	Organics: ET <= t*
				ET	Exposure Time	8	hours/day	Prof Judge	(C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT)
				EF	Exposure Frequency	180	days/year	Prof Judge	
				ED	Exposure Duration	1	years	Prof Judge	Organics: ET > t*
				BW	Body Weight	70	kg	USEPA, 1997	(C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B)/(1+B)))*SA*EF*ED)/(BW*AT)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used.

Chemical Specific - See Table 3.3
Prof Judge - Professional Judgment

Sources:

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

TABLE 4.3a.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation									Chronic Daily Intake (CDI) Equations
	Future Residents	Adult	Water Vapors from Showerhead	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	2	L/hour	USEPA, 1989	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	24	years	USEPA, 1997	C x IR-W x EF x ED x 1/BW x 1/AT
				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) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were us

Chemical Specific - See Table 3.3

Sources:

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

TABLE 4.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion									Chronic Daily Intake (CDI) Equations
	Current and Future On-Site Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	219	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	9	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Future Residents	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	234	days/year	USEPA, 1993	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	7	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
		Young Child	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	234	days/year	USEPA, 1993	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	2	years	USEPA, 1993	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
	Future Construction Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	240	mg/day	Prof Judge	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	90	days/year	Prof Judge	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

TABLE 4.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal									Dermally Adjusted Dose (DAD) Equations
	Current and Future On-Site Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,000	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	219	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	9	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Future Residents	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,000	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.07	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	234	days/year	USEPA, 1993	1/BW x1/AT
				ED	Exposure Duration	7	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
		Young Child	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	2,000	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	234	days/year	USEPA, 1993	1/BW x1/AT
				ED	Exposure Duration	2	years	USEPA, 1993	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

TABLE 4.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (Cont)									Dermally Adjusted Dose (DAD) Equations
	Future Construction Workers	Adult	Surface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	3,230	cm2/day	USEPA, 1992	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	90	days/year	Prof Judge	1/BW x1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used.

Chemical Specific - See Table 3.1

Prof Judge - Professional Judgment

Sources:

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

TABLE 4.1a.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Current and Future On-Site Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	Chronic Daily Intake (CDI) Equations
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	219	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	9	years	USEPA, 2004	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Future Residents	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	7	years	USEPA, 1993	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
		Young Child	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	0.69	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	2	years	USEPA, 1993	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

TABLE 4.1a.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation (Cont)	Future Construction Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	2	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	90	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	1	years	Prof Judge	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used.

Chemical Specific - See Table 3.1
Prof Judge - Professional Judgment

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.2.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion									Chronic Daily Intake (CDI) Equations
	Current and Future On-Site Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	219	days/year	USEPA, 1991	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	9	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Future Residents	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	234	days/year	USEPA, 1993	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	7	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
		Young Child	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1993	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	234	days/year	USEPA, 1993	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	2	years	USEPA, 1993	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
	Future Construction Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				IR-S	Ingestion Rate of Soil	240	mg/day	Prof Judge	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				FI	Fraction Ingested from Source	1	NA	Prof Judge	CDI (mg/kg-day) =
				EF	Exposure Frequency	90	days/year	Prof Judge	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

TABLE 4.2.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal									Dermally Adjusted Dose (DAD) Equations
	Current and Future On-Site Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,000	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	219	days/year	USEPA, 1991	1/BW x1/AT
				ED	Exposure Duration	9	years	USEPA, 2004	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Future Residents	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	5,000	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.07	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	234	days/year	USEPA, 1993	1/BW x1/AT
				ED	Exposure Duration	7	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
		Young Child	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	2,000	cm2/day	USEPA, 1997	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	234	days/year	USEPA, 1993	1/BW x1/AT
				ED	Exposure Duration	2	years	USEPA, 1993	
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

TABLE 4.2.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal									Dermally Adjusted Dose (DAD) Equations
	Future Construction Workers	Adult	Subsurface Soil	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				SA	Surface Area Available for Contact	3,230	cm2/day	USEPA, 1992	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm2	USEPA, 1997	DAD (mg/kg-day) =
				ABS	Absorption Factor	CS	NA	USEPA, 1995	C x CF x SA x AF x ABS x EF x ED x
				EF	Exposure Frequency	90	days/year	Prof Judge	1/BW x1/AT
				ED	Exposure Duration	1	years	Prof Judge	
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used.

Chemical Specific - See Table 3.1
Prof Judge - Professional Judgment

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993
USEPA, 1995: Assessing Dermal Exposure from Soil
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005

TABLE 4.2.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: 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	Current and Future On-Site Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	Chronic Daily Intake (CDI) Equations
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	219	days/year	USEPA, 1991	CDI (mg/kg-day) =
				ED	Exposure Duration	9	years	USEPA, 2004	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
	Future Residents	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	1.27	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	7	years	USEPA, 1993	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
		Young Child	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	0.69	m3/hour	USEPA, 1997	
				ET	Exposure Time	24	hours/day	Prof Judge	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	2	years	USEPA, 1993	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

TABLE 4.2.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Medium: 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 (Cont)	Future Construction Workers	Adult	Fugative dust	C	Contaminant Concentration in Soil	Chemical Specific	mg/kg	Chemical Specific	
				RR	Respiration Rate	2	m3/hour	USEPA, 1997	
				ET	Exposure Time	8	hours/day	Prof Judge	
				EF	Exposure Frequency	90	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	1	years	Prof Judge	C x IR x ET x EF x ED x 1/PEF x
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	Cowherd, et al., 1995	1/BW x1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used

Chemical Specific - See Table 3.1
Prof Judge - Professional Judgment

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005

TABLE 4.3.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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									Chronic Daily Intake (CDI) Equations
	Future Residents	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	1.4	L/hour	USEPA, 1993	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	7	years	USEPA, 1993	C x IR-W x EF x ED x 1/BW x 1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
		Young Child	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	1	L/hour	USEPA, 1993	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	2	years	USEPA, 1993	C x IR-W x EF x ED x 1/BW x 1/AT
				BW	Body Weight	15	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
	Future Construction Workers	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	--	L/hour	--	
				EF	Exposure Frequency	90	days/year	Prof Judge	CDI (mg/kg-day) =
				ED	Exposure Duration	1	years	Prof Judge	C x IR-W x EF x ED x 1/BW x 1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal									Dermally Adjusted Dose (DAD) Equations
	Future Residents	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				CF	Conversion Factor	1.00E-03	L/cm3	USEPA, 1989	DAD (mg/kg-day) =
				SA	Surface Area Available for Contact	18,000	cm2	USEPA, 2004	
				PC	PeCTability Constant	Chemical Specific	cm/hour	USEPA, 2004	Inorganics
				tau	Lag Time	Chemical Specific	hour	USEPA, 2004	(C*CF*Kp*SA*EF*ED*ET)/(BW*AT)
				t*	Time to Reach Steady State	Chemical Specific	hour	USEPA, 2004	
				B	PeCTability Coefficient of a Compound	Chemical Specific	NA	USEPA, 2004	Organics: ET <= t*
				ET	Exposure Time	0.25	hours/day	USEPA, 2004	(C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT)
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED	Exposure Duration	7	years	USEPA, 1993	Organics: ET > t*
				BW	Body Weight	70	kg	USEPA, 1997	(C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B)/(1+B)))*SA*EF*ED)/(BW*AT)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

TABLE 4.3.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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
Dermal (Cont)									Dermally Adjusted Dose (DAD) Equations
	Future Residents	Young Child	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				CF	Conversion Factor	1.00E-03	L/cm3	USEPA, 1989	DAD (mg/kg-day) =
				SA	Surface Area Available for Contact	6,600	cm2	USEPA, 2004	
				PC	PeCTability Constant	Chemical Specific	cm/hour	USEPA, 2004	Inorganics
				tau	Lag Time	Chemical Specific	hour	USEPA, 2004	(C*CF*Kp*SA*EF*ED*ET)/(BW*AT)
				t*	Time to Reach Steady State	Chemical Specific	hour	USEPA, 2004	
				B	PeCTability Coefficient of a Compound	Chemical Specific	NA	USEPA, 2004	Organics: ET <= t*
				ET	Exposure Time	0.33	hours/day	USEPA, 2004	(C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT)
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED	Exposure Duration	2	years	USEPA, 1993	Organics: ET > t*
				BW	Body Weight	15	kg	USEPA, 1997	(C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B)/(1+B)))*SA*EF*ED)/(BW*AT)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
	Future Construction Workers	Adult	Groundwater	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				CF	Conversion Factor	1.00E-03	L/cm3	USEPA, 1989	DAD (mg/kg-day) =
				SA	Surface Area Available for Contact	3,230	cm2	USEPA, 1992	
				PC	PeCTability Constant	Chemical Specific	cm/hour	USEPA, 2004	Inorganics
				tau	Lag Time	Chemical Specific	hour	USEPA, 2004	(C*CF*Kp*SA*EF*ED*ET)/(BW*AT)
				t*	Time to Reach Steady State	Chemical Specific	hour	USEPA, 2004	
				B	PeCTability Coefficient of a Compound	Chemical Specific	NA	USEPA, 2004	Organics: ET <= t*
				ET	Exposure Time	8	hours/day	Prof Judge	(C*CF*(2*Kp*SQRT(6*tau*ET/pi))*SA*EF*ED)/(BW*AT)
				EF	Exposure Frequency	90	days/year	Prof Judge	
				ED	Exposure Duration	1	years	Prof Judge	Organics: ET > t*
				BW	Body Weight	70	kg	USEPA, 1997	(C*CF*(Kp*(ET/(1+B)+2*tau*((1+3*B)/(1+B)))*SA*EF*ED)/(BW*AT)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used.

Chemical Specific - See Table 3.3
Prof Judge - Professional Judgment

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2004: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.3a.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation									Chronic Daily Intake (CDI) Equations
	Future Residents	Adult	Water Vapors from Showerhead	C	Contaminant Concentration in Groundwater	Chemical Specific	mg/L	Chemical Specific	
				IR-W	Ingestion Rate of Groundwater	1.4	L/hour	USEPA, 1993	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	CDI (mg/kg-day) =
				ED	Exposure Duration	7	years	USEPA, 1993	C x IR-W x EF x ED x 1/BW x 1/AT
				BW	Body Weight	70	kg	USEPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes

(1) In the absense of USEPA RAGS Part E ABS values, USEPA Region III default values of 0.05% and 3.0% for VOCs; 13% for PAHs, 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 14% for PCBs; 3.2% for arsenic, and 1% for inorganics were used

Chemical Specific - See Table 3.3

Sources:

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

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s)
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	Chronic	4.00E-03	mg/kg/day	100%	4.00E-03	mg/kg/day	CVS	300/1	IRIS	5/25/2006
Iodomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	2.00E-02	mg/kg/day	100%	2.00E-02	mg/kg/day	Whole Body	3000/1	IRIS	5/25/2006
HpCDD, 1,2,3,4,6,7,8-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics (DRO)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline Range Organics (GRO)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	Chronic	3.00E-04	mg/kg/day	100%	3.00E-04	mg/kg/day	Skin / CVS	3/1	IRIS	1/26/2006
Chromium (3)	Chronic	3.00E-03	mg/kg/day	3%	7.50E-05	mg/kg/day	NOEL	300/3	IRIS	2/16/2006
Thallium	Chronic	7.00E-05	mg/kg/day	100%	7.00E-05	mg/kg/day	Liver / CVS / Skin	3000/1	Other	3/29/1999
Vanadium	Chronic	1.00E-03	mg/kg/day	3%	2.60E-05	mg/kg/day	GIS / Kidney	100/1	NCEA	7/1/1997

Notes:

(1) Refer to RAGS, Part E
(2) Adjusted dermal RfD = Oral RfD * Adj Factor
(3) Value for chromium VI

NA = Not Applicable

Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
NOEL = No Observed Effect Level

Sources:
IRIS = Integrated Risk Information System
NCEA = National Center for Environmental Assessment, USEPA

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s)
1,2-Dichloroethane	Chronic	2.5E+00	mg/m3	7.00E-01	mg/kg/day	GIS / Liver / Kidney	3000/1	ATSDR MRL	10/1/2000
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	Chronic	3.0E-02	mg/m3	8.60E-03	mg/kg/day	CVS	300/1	IRIS	5/25/2006
Iodomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	3.2E-03	mg/m3	9.00E-04	mg/kg/day	RsS	3000/1	IRIS	5/25/2006
HpCDD, 1,2,3,4,6,7,8-	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics (DRO)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline Range Organics (GRO)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (1)	Chronic	1.1E-04	mg/m3	3.00E-05	mg/kg/day	RsS	300/1 (particulates)	IRIS	2/16/2006
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

NA = Not Applicable

(1) Value for chromium VI

Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System

Sources:
IRIS = Integrated Risk Information System
ATSDR MRL = Agency for Toxic Substances and Disease Registry - Minimal Risk Levels

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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)
1,2-Dichloroethane	9.10E-02	1 / (mg/kg/day)	100%	9.10E-02	1 / (mg/kg/day)	B2	IRIS	5/25/2006
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	5.50E-02	1 / (mg/kg/day)	100%	5.50E-02	1 / (mg/kg/day)	A	IRIS	5/25/2006
Iodomethane	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	7.30E-01	1 / (mg/kg/day)	100%	7.30E-01	1 / (mg/kg/day)	B2	NCEA	4/26/2000
Benzo(a)pyrene (BaP)	7.30E+00	1 / (mg/kg/day)	100%	7.30E+00	1 / (mg/kg/day)	B2	IRIS	1/26/2006
Benzo(b)fluoranthene	7.30E-01	1 / (mg/kg/day)	100%	7.30E-01	1 / (mg/kg/day)	B2	NCEA	4/26/2000
Benzo(k)fluoranthene	7.30E-02	1 / (mg/kg/day)	100%	7.30E-02	1 / (mg/kg/day)	B2	NCEA	4/26/2000
Chrysene	7.30E-03	1 / (mg/kg/day)	100%	7.30E-03	1 / (mg/kg/day)	B2	NCEA	4/26/2000
Dibenz(a,h)anthracene	7.30E+00	1 / (mg/kg/day)	100%	7.30E+00	1 / (mg/kg/day)	B2	NCEA	4/26/2000
Indeno(1,2,3-cd)pyrene	7.30E-01	1 / (mg/kg/day)	100%	7.30E-01	1 / (mg/kg/day)	B2	NCEA	4/26/2000
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
HpCDD, 1,2,3,4,6,7,8- (3)	1.50E+03	1 / (mg/kg/day)	100%	1.50E+03	1 / (mg/kg/day)	B2	HEAST	9/18/2000
OCDD (4)	1.50E+02	1 / (mg/kg/day)	100%	1.50E+02	1 / (mg/kg/day)	B2	HEAST	9/18/2000
Diesel Range Organics (DRO)	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline Range Organics (GRO)	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.50E+00	1 / (mg/kg/day)	100%	1.50E+00	1 / (mg/kg/day)	A	IRIS	1/26/2006
Chromium	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

(1) Refer to RAGS, Part E
(2) Adjusted dermal CSF = Oral CSF / Adj Factor
(3) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(4) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)

NA = Not Applicable

Sources:
IRIS = Integrated Risk Informati
HEAST= Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment, USEPA

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

Weight of Evidence:
Known/Likely (EPA classes A, B1, B2, C)
Cannot be Determined (EPA class D)
Not Likely (EPA class E)

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s)
1,2-Dichloroethane	2.6E-05	ug/m3	9.10E-02	mg/kg/day	B2	IRIS	5/25/2006
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA
Benzene	7.7E-06	ug/m3	2.70E-02	mg/kg/day	A	IRIS	5/25/2006
Iodomethane	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	8.9E-04	ug/m3	3.10E+00	mg/kg/day	B2	NCEA	4/26/2000
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
HpCDD, 1,2,3,4,6,7,8- (1)	4.3E-01	ug/m3	1.50E+03	mg/kg/day	B2	HEAST	9/18/2000
OCDD (2)	4.3E-02	ug/m3	1.50E+02	mg/kg/day	B2	HEAST	9/18/2000
Diesel Range Organics (DRO)	NA	NA	NA	NA	NA	NA	NA
Gasoline Range Organics (GRO)	NA	NA	NA	NA	NA	NA	NA
Arsenic	4.3E-03	ug/m3	1.51E+01	mg/kg/day	A	IRIS	1/26/2006
Chromium (3)	1.2E-02	ug/m3	4.10E+01	mg/kg/day	A	IRIS	2/16/2006
Thallium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA

Notes:

EPA Group:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are availabl
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

(1) Value for total, estimated using a 2,3,7,8-TCDD TEF of 0.01 (USEPA, 1994)
(2) Value was estimated using a 2,3,7,8-TCDD TEF of 0.001 (USEPA, 1994)
(3) Value for chromium VI

Sources:

IRIS = Integrated Risk Information Systen
HEAST= Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment, USEPA

NA = Not Applicable

Weight of Evidence:
- Known/Likely (EPA classes A, B1, B2, C)
- Cannot be Determin
- Not Likely (EPA class E)

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	4.3E-10	mg/kg-day	NA	--	--	1.2E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	2.1E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.5E-07	6.0E-07	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	4.0E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.9E-06	1.2E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	6.3E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	4.6E-07	1.8E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.6E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	1.2E-08	4.6E-07	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	2.5E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.8E-09	7.3E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	6.2E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	4.5E-07	1.8E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	2.8E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.0E-07	8.0E-07	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	2.0E-05	mg/kg-day	NA	--	--	5.7E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	2.4E-07	mg/kg-day	NA	--	--	7.0E-07	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	2.2E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	3.3E-07	6.4E-07	mg/kg-day	3.0E-04	mg/kg-day	2.1E-03
				Chromium	6.97E+01	mg/kg	4.9E-06	mg/kg-day	NA	--	--	1.4E-05	mg/kg-day	3.0E-03	mg/kg-day	4.7E-03
				Thallium	7.94E-01	mg/kg	5.5E-08	mg/kg-day	NA	--	--	1.6E-07	mg/kg-day	7.0E-05	mg/kg-day	2.3E-03
				Vanadium	3.28E+02	mg/kg	2.3E-05	mg/kg-day	NA	--	--	6.7E-05	mg/kg-day	1.0E-03	mg/kg-day	6.7E-02
			Ingestion Total								4.5E-06					7.6E-02
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	5.1E-11	mg/kg-day	NA	--	--	1.5E-10	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.1E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.8E-08	3.1E-07	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.1E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.5E-06	6.1E-07	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.3E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.4E-07	9.5E-07	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	8.2E-08	mg/kg-day	7.3E-02	1/(mg/kg-day)	6.0E-09	2.4E-07	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.3E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	9.4E-10	3.8E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.2E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.3E-07	9.4E-08	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.4E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.0E-07	4.2E-07	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	7.8E-06	mg/kg-day	NA	--	--	2.3E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	9.6E-08	mg/kg-day	NA	--	--	2.8E-07	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	2.6E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	3.9E-08	7.6E-08	mg/kg-day	3.0E-04	mg/kg-day	2.5E-04
				Chromium	6.97E+01	mg/kg	1.9E-07	mg/kg-day	NA	--	--	5.7E-07	mg/kg-day	7.5E-05	mg/kg-day	7.5E-03
				Thallium	7.94E-01	mg/kg	2.2E-09	mg/kg-day	NA	--	--	6.4E-09	mg/kg-day	7.0E-05	mg/kg-day	9.2E-05
				Vanadium	3.28E+02	mg/kg	9.1E-07	mg/kg-day	NA	--	--	2.7E-06	mg/kg-day	2.6E-05	mg/kg-day	1.0E-01
			Dermal Total								2.2E-06					1.1E-01
		Exposure Point Total									6.7E-06					1.9E-01
	Exposure Medium Total										6.7E-06					1.9E-01

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	8.2E-15	mg/kg-day	NA	--	--	2.4E-14	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	2.9E-10	mg/kg-day	NA	--	--	8.6E-10	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	3.0E-10	mg/kg-day	3.1E+00	1/(mg/kg-day)	9.2E-10	8.6E-10	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	7.7E-10	mg/kg-day	NA	--	--	2.2E-09	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	9.2E-11	mg/kg-day	NA	--	--	2.7E-10	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	2.3E-09	mg/kg-day	NA	--	--	6.8E-09	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	1.9E-11	mg/kg-day	NA	--	--	5.6E-11	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	9.1E-11	mg/kg-day	NA	--	--	2.6E-10	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	3.8E-10	mg/kg-day	NA	--	--	1.1E-09	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	4.6E-12	mg/kg-day	NA	--	--	1.3E-11	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	4.2E-12	mg/kg-day	1.5E+01	1/(mg/kg-day)	6.3E-11	1.2E-11	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	9.4E-11	mg/kg-day	4.1E+01	1/(mg/kg-day)	3.8E-09	2.7E-10	mg/kg-day	3.0E-05	mg/kg-day	9.1E-06
				Thallium	7.94E-01	mg/kg	1.1E-12	mg/kg-day	NA	--	--	3.1E-12	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	4.4E-10	mg/kg-day	NA	--	--	1.3E-09	mg/kg-day	NA	--	--
			Inhalation Total								4.8E-09					9.1E-06
		Exposure Point Total									4.8E-09					9.1E-06
	Exposure Medium Total										4.8E-09					9.1E-06
Surface Soil Total											6.7E-06					1.9E-01
										Total of Receptor Risks Across All Media	6.7E-06	Total of Receptor Hazards Across All Media				1.9E-01

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	2.5E-10	mg/kg-day	NA	--	--	1.9E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	8.8E-08	9.4E-07	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.3E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.7E-06	1.8E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.7E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.7E-07	2.8E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	9.3E-08	mg/kg-day	7.3E-02	1/(mg/kg-day)	6.8E-09	7.2E-07	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.5E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.1E-09	1.1E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.6E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.6E-07	2.8E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.6E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.2E-07	1.2E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.1E-05	mg/kg-day	NA	--	--	8.9E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.4E-07	mg/kg-day	NA	--	--	1.1E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.3E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	1.9E-07	9.9E-07	mg/kg-day	3.0E-04	mg/kg-day	3.3E-03
				Chromium	6.97E+01	mg/kg	2.8E-06	mg/kg-day	NA	--	--	2.2E-05	mg/kg-day	3.0E-03	mg/kg-day	7.4E-03
				Thallium	7.94E-01	mg/kg	3.2E-08	mg/kg-day	NA	--	--	2.5E-07	mg/kg-day	7.0E-05	mg/kg-day	3.6E-03
				Vanadium	3.28E+02	mg/kg	1.3E-05	mg/kg-day	NA	--	--	1.0E-04	mg/kg-day	1.0E-03	mg/kg-day	1.0E-01
			Ingestion Total								2.6E-06					1.2E-01
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	4.8E-11	mg/kg-day	NA	--	--	3.7E-10	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.0E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.3E-08	7.8E-07	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	1.9E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.4E-06	1.5E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.0E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.2E-07	2.4E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	7.7E-08	mg/kg-day	7.3E-02	1/(mg/kg-day)	5.6E-09	6.0E-07	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.2E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	8.8E-10	9.4E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.0E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.2E-07	2.3E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.3E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.8E-08	1.0E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	7.3E-06	mg/kg-day	NA	--	--	5.7E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	8.9E-08	mg/kg-day	NA	--	--	7.0E-07	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	2.4E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	3.7E-08	1.9E-07	mg/kg-day	3.0E-04	mg/kg-day	6.3E-04
				Chromium	6.97E+01	mg/kg	1.8E-07	mg/kg-day	NA	--	--	1.4E-06	mg/kg-day	7.5E-05	mg/kg-day	1.9E-02
				Thallium	7.94E-01	mg/kg	2.1E-09	mg/kg-day	NA	--	--	1.6E-08	mg/kg-day	7.0E-05	mg/kg-day	2.3E-04
				Vanadium	3.28E+02	mg/kg	8.5E-07	mg/kg-day	NA	--	--	6.6E-06	mg/kg-day	2.6E-05	mg/kg-day	2.6E-01
			Dermal Total								2.1E-06					2.8E-01
		Exposure Point Total									4.7E-06					3.9E-01
	Exposure Medium Total										4.7E-06					3.9E-01

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	2.6E-15	mg/kg-day	NA	--	--	2.0E-14	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	9.3E-11	mg/kg-day	NA	--	--	7.3E-10	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	9.4E-11	mg/kg-day	3.1E+00	1/(mg/kg-day)	2.9E-10	7.3E-10	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	2.4E-10	mg/kg-day	NA	--	--	1.9E-09	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	2.9E-11	mg/kg-day	NA	--	--	2.3E-10	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	7.4E-10	mg/kg-day	NA	--	--	5.7E-09	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	6.1E-12	mg/kg-day	NA	--	--	4.8E-11	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	2.9E-11	mg/kg-day	NA	--	--	2.2E-10	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.2E-10	mg/kg-day	NA	--	--	9.3E-10	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.5E-12	mg/kg-day	NA	--	--	1.1E-11	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.3E-12	mg/kg-day	1.5E+01	1/(mg/kg-day)	2.0E-11	1.0E-11	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	3.0E-11	mg/kg-day	4.1E+01	1/(mg/kg-day)	1.2E-09	2.3E-10	mg/kg-day	3.0E-05	mg/kg-day	7.7E-06
				Thallium	7.94E-01	mg/kg	3.4E-13	mg/kg-day	NA	--	--	2.6E-12	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	1.4E-10	mg/kg-day	NA	--	--	1.1E-09	mg/kg-day	NA	--	--
			Inhalation Total								1.5E-09					7.7E-06
		Exposure Point Total									1.5E-09					7.7E-06
	Exposure Medium Total										1.5E-09					7.7E-06
Surface Soil Total											4.7E-06					3.9E-01
										Total of Receptor Risks Across All Media	4.7E-06	Total of Receptor Hazards Across All Media				3.9E-01

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	2.1E-09	mg/kg-day	NA	--	--	6.0E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.0E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.6E-07	2.9E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.0E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.5E-05	5.6E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.1E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.3E-06	8.8E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	7.9E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	5.8E-08	2.2E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.2E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	9.1E-09	3.5E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.1E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.3E-06	8.7E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.4E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.0E-06	3.9E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	9.8E-05	mg/kg-day	NA	--	--	2.7E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.2E-06	mg/kg-day	NA	--	--	3.4E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	1/(mg/kg-day)	1.6E-06	3.1E-06	mg/kg-day	3.0E-04	mg/kg-day	1.0E-02
				Chromium	6.97E+01	mg/kg	2.4E-05	mg/kg-day	NA	--	--	6.8E-05	mg/kg-day	3.0E-03	mg/kg-day	2.3E-02
				Thallium	7.94E-01	mg/kg	2.8E-07	mg/kg-day	NA	--	--	7.8E-07	mg/kg-day	7.0E-05	mg/kg-day	1.1E-02
				Vanadium	3.28E+02	mg/kg	1.1E-04	mg/kg-day	NA	--	--	3.2E-04	mg/kg-day	1.0E-03	mg/kg-day	3.2E-01
			Ingestion Total								2.3E-05					3.6E-01
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	7.3E-10	mg/kg-day	NA	--	--	2.0E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.5E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.1E-06	4.3E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	3.0E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.2E-05	8.3E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	4.7E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.4E-06	1.3E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.2E-06	mg/kg-day	7.3E-02	1/(mg/kg-day)	8.6E-08	3.3E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.8E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.4E-08	5.2E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	4.6E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.4E-06	1.3E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	2.0E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.5E-06	5.7E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.1E-04	mg/kg-day	NA	--	--	3.1E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.4E-06	mg/kg-day	NA	--	--	3.8E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.7E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	5.6E-07	1.0E-06	mg/kg-day	3.0E-04	mg/kg-day	3.5E-03
				Chromium	6.97E+01	mg/kg	2.8E-06	mg/kg-day	NA	--	--	7.8E-06	mg/kg-day	7.5E-05	mg/kg-day	1.0E-01
				Thallium	7.94E-01	mg/kg	3.2E-08	mg/kg-day	NA	--	--	8.9E-08	mg/kg-day	7.0E-05	mg/kg-day	1.3E-03
				Vanadium	3.28E+02	mg/kg	1.3E-05	mg/kg-day	NA	--	--	3.7E-05	mg/kg-day	2.6E-05	mg/kg-day	**1.4E+00**
			Dermal Total								3.2E-05					**1.5E+00**
		Exposure Point Total									5.4E-05					**1.9E+00**
	Exposure Medium Total										5.4E-05					**1.9E+00**

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	1.6E-13	mg/kg-day	NA	--	--	4.6E-13	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	5.9E-09	mg/kg-day	NA	--	--	1.6E-08	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	5.9E-09	mg/kg-day	3.1E+00	1/(mg/kg-day)	1.8E-08	1.7E-08	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	1.5E-08	mg/kg-day	NA	--	--	4.3E-08	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.8E-09	mg/kg-day	NA	--	--	5.2E-09	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	4.7E-08	mg/kg-day	NA	--	--	1.3E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.9E-10	mg/kg-day	NA	--	--	1.1E-09	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.8E-09	mg/kg-day	NA	--	--	5.1E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	7.5E-09	mg/kg-day	NA	--	--	2.1E-08	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	9.2E-11	mg/kg-day	NA	--	--	2.6E-10	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	8.4E-11	mg/kg-day	1.5E+01	1/(mg/kg-day)	1.3E-09	2.4E-10	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	1.9E-09	mg/kg-day	4.1E+01	1/(mg/kg-day)	7.7E-08	5.2E-09	mg/kg-day	3.0E-05	mg/kg-day	1.7E-04
				Thallium	7.94E-01	mg/kg	2.1E-11	mg/kg-day	NA	--	--	6.0E-11	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	8.8E-09	mg/kg-day	NA	--	--	2.5E-08	mg/kg-day	NA	--	--
			Inhalation Total								9.7E-08					1.7E-04
		Exposure Point Total									9.7E-08					1.7E-04
	Exposure Medium Total										9.7E-08					1.7E-04
Surface Soil Total											5.4E-05					**1.9E+00**

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	4.4E-10	mg/kg-day	1.5E+03	1/(mg/kg-day)	6.7E-07	1.2E-09	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	4.1E-09	mg/kg-day	1.5E+02	1/(mg/kg-day)	6.1E-07	1.1E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	7.7E-04	mg/kg-day	NA	--	--	2.2E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	1.8E-06	mg/kg-day	NA	--	--	5.0E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.0E-06	3.7E-06	mg/kg-day	3.0E-04	mg/kg-day	1.2E-02
				Chromium	3.68E+01	mg/kg	1.3E-05	mg/kg-day	NA	--	--	3.6E-05	mg/kg-day	3.0E-03	mg/kg-day	1.2E-02
				Vanadium	2.78E+02	mg/kg	9.7E-05	mg/kg-day	NA	--	--	2.7E-04	mg/kg-day	1.0E-03	mg/kg-day	2.7E-01
			Ingestion Total								3.3E-06					3.0E-01
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.5E-10	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.3E-07	4.2E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.4E-09	mg/kg-day	1.5E+02	1/(mg/kg-day)	2.1E-07	3.9E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	8.8E-04	mg/kg-day	NA	--	--	2.5E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	2.0E-06	mg/kg-day	NA	--	--	5.7E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	4.5E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	6.8E-07	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	4.2E-03
				Chromium	3.68E+01	mg/kg	1.5E-06	mg/kg-day	NA	--	--	4.1E-06	mg/kg-day	7.5E-05	mg/kg-day	5.5E-02
				Vanadium	2.78E+02	mg/kg	1.1E-05	mg/kg-day	NA	--	--	3.1E-05	mg/kg-day	2.6E-05	mg/kg-day	**1.2E+00**
			Dermal Total								1.1E-06					**1.3E+00**
		Exposure Point Total									4.4E-06					**1.5E+00**
	Exposure Medium Total										4.4E-06					**1.5E+00**
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	3.4E-14	mg/kg-day	1.5E+03	1/(mg/kg-day)	5.1E-11	9.6E-14	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	3.1E-13	mg/kg-day	1.5E+02	1/(mg/kg-day)	4.7E-11	8.7E-13	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	6.0E-08	mg/kg-day	NA	--	--	1.7E-07	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	1.4E-10	mg/kg-day	NA	--	--	3.8E-10	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	1.0E-10	mg/kg-day	1.5E+01	1/(mg/kg-day)	1.5E-09	2.9E-10	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	9.9E-10	mg/kg-day	4.1E+01	1/(mg/kg-day)	4.1E-08	2.8E-09	mg/kg-day	3.0E-05	mg/kg-day	9.2E-05
				Vanadium	2.78E+02	mg/kg	7.5E-09	mg/kg-day	NA	--	--	2.1E-08	mg/kg-day	NA	--	--
			Inhalation Total								4.2E-08					9.2E-05
		Exposure Point Total									4.2E-08					9.2E-05
	Exposure Medium Total										4.2E-08					9.2E-05
Subsurface Soil Total											4.4E-06					**1.5E+00**
										Total of Receptor Risks Across All Media	5.9E-05	Total of Receptor Hazards Across All Media				**3.4E+00**

TABLE 7.3.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	3.4E-10	mg/kg-day	NA	--	--	2.6E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.6E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.2E-07	1.3E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	3.2E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.3E-06	2.5E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	5.0E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.6E-07	3.9E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.3E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	9.1E-09	9.7E-07	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	2.0E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.4E-09	1.5E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	4.9E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.6E-07	3.8E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	2.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.6E-07	1.7E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.5E-05	mg/kg-day	NA	--	--	1.2E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.9E-07	mg/kg-day	NA	--	--	1.5E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.6E-07	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	4.5E-03
				Chromium	6.97E+01	mg/kg	3.8E-06	mg/kg-day	NA	--	--	3.0E-05	mg/kg-day	3.0E-03	mg/kg-day	1.0E-02
				Thallium	7.94E-01	mg/kg	4.4E-08	mg/kg-day	NA	--	--	3.4E-07	mg/kg-day	7.0E-05	mg/kg-day	4.9E-03
				Vanadium	3.28E+02	mg/kg	1.8E-05	mg/kg-day	NA	--	--	1.4E-04	mg/kg-day	1.0E-03	mg/kg-day	1.4E-01
			Ingestion Total								3.6E-06					1.6E-01
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	2.0E-10	mg/kg-day	NA	--	--	1.6E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	4.3E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.1E-07	3.3E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	8.2E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	6.0E-06	6.4E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	1.3E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.4E-07	1.0E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	3.3E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	2.4E-08	2.5E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	5.1E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	3.7E-09	4.0E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	1.3E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	9.3E-07	9.9E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	5.7E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	4.1E-07	4.4E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	3.1E-05	mg/kg-day	NA	--	--	2.4E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	3.8E-07	mg/kg-day	NA	--	--	2.9E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.0E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	1.5E-07	8.0E-07	mg/kg-day	3.0E-04	mg/kg-day	2.7E-03
				Chromium	6.97E+01	mg/kg	7.7E-07	mg/kg-day	NA	--	--	6.0E-06	mg/kg-day	7.5E-05	mg/kg-day	8.0E-02
				Thallium	7.94E-01	mg/kg	8.8E-09	mg/kg-day	NA	--	--	6.8E-08	mg/kg-day	7.0E-05	mg/kg-day	9.7E-04
				Vanadium	3.28E+02	mg/kg	3.6E-06	mg/kg-day	NA	--	--	2.8E-05	mg/kg-day	2.6E-05	mg/kg-day	**1.1E+00**
			Dermal Total								8.8E-06					**1.2E+00**
		Exposure Point Total									1.2E-05					**1.3E+00**
	Exposure Medium Total										1.2E-05					**1.3E+00**

TABLE 7.3.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	5.2E-14	mg/kg-day	NA	--	--	4.0E-13	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.9E-09	mg/kg-day	NA	--	--	1.4E-08	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	1.9E-09	mg/kg-day	3.1E+00	1/(mg/kg-day)	5.8E-09	1.5E-08	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	4.8E-09	mg/kg-day	NA	--	--	3.8E-08	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	5.8E-10	mg/kg-day	NA	--	--	4.5E-09	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.5E-08	mg/kg-day	NA	--	--	1.1E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	1.2E-10	mg/kg-day	NA	--	--	9.5E-10	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	5.7E-10	mg/kg-day	NA	--	--	4.5E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	2.4E-09	mg/kg-day	NA	--	--	1.8E-08	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	2.9E-11	mg/kg-day	NA	--	--	2.3E-10	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	2.6E-11	mg/kg-day	1.5E+01	1/(mg/kg-day)	4.0E-10	2.1E-10	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	5.9E-10	mg/kg-day	4.1E+01	1/(mg/kg-day)	2.4E-08	4.6E-09	mg/kg-day	3.0E-05	mg/kg-day	1.5E-04
				Thallium	7.94E-01	mg/kg	6.7E-12	mg/kg-day	NA	--	--	5.2E-11	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	2.8E-09	mg/kg-day	NA	--	--	2.2E-08	mg/kg-day	NA	--	--
			Inhalation Total								3.0E-08					1.5E-04
		Exposure Point Total									3.0E-08					1.5E-04
	Exposure Medium Total										3.0E-08					1.5E-04
Surface Soil Total											1.2E-05					**1.3E+00**

TABLE 7.3.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	7.0E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.0E-07	5.4E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	6.4E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	9.6E-08	5.0E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.2E-04	mg/kg-day	NA	--	--	9.5E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	2.8E-07	mg/kg-day	NA	--	--	2.2E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	3.1E-07	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	5.4E-03
				Chromium	3.68E+01	mg/kg	2.0E-06	mg/kg-day	NA	--	--	1.6E-05	mg/kg-day	3.0E-03	mg/kg-day	5.3E-03
				Vanadium	2.78E+02	mg/kg	1.5E-05	mg/kg-day	NA	--	--	1.2E-04	mg/kg-day	1.0E-03	mg/kg-day	1.2E-01
			Ingestion Total								5.1E-07					1.3E-01
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	4.2E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	6.3E-08	3.3E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	3.8E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	5.8E-08	3.0E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	2.4E-04	mg/kg-day	NA	--	--	1.9E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	5.6E-07	mg/kg-day	NA	--	--	4.4E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	1.3E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	1.9E-07	9.8E-07	mg/kg-day	3.0E-04	mg/kg-day	3.3E-03
				Chromium	3.68E+01	mg/kg	4.1E-07	mg/kg-day	NA	--	--	3.2E-06	mg/kg-day	7.5E-05	mg/kg-day	4.2E-02
				Vanadium	2.78E+02	mg/kg	3.1E-06	mg/kg-day	NA	--	--	2.4E-05	mg/kg-day	2.6E-05	mg/kg-day	9.2E-01
			Dermal Total								3.1E-07					9.6E-01
		Exposure Point Total									8.2E-07					**1.1E+00**
	Exposure Medium Total										8.2E-07					**1.1E+00**
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.1E-14	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.6E-11	8.4E-14	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	9.8E-14	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.5E-11	7.7E-13	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.9E-08	mg/kg-day	NA	--	--	1.5E-07	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	4.3E-11	mg/kg-day	NA	--	--	3.4E-10	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	3.2E-11	mg/kg-day	1.5E+01	1/(mg/kg-day)	4.9E-10	2.5E-10	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	3.1E-10	mg/kg-day	4.1E+01	1/(mg/kg-day)	1.3E-08	2.4E-09	mg/kg-day	3.0E-05	mg/kg-day	8.1E-05
				Vanadium	2.78E+02	mg/kg	2.4E-09	mg/kg-day	NA	--	--	1.8E-08	mg/kg-day	NA	--	--
			Inhalation Total								1.3E-08					8.1E-05
		Exposure Point Total									1.3E-08					8.1E-05
	Exposure Medium Total										1.3E-08					8.1E-05
Subsurface Soil Total											8.4E-07					**1.1E+00**
										Total of Receptor Risks Across All Media	1.3E-05	Total of Receptor Hazards Across All Media				**2.4E+00**

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	2.9E-09	mg/kg-day	NA	--	--	8.4E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.4E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.0E-06	4.1E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.7E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.0E-05	7.9E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	4.2E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.1E-06	1.2E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.1E-06	mg/kg-day	7.3E-02	1/(mg/kg-day)	7.8E-08	3.1E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.7E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.2E-08	4.9E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	4.2E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.0E-06	1.2E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.9E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.4E-06	5.4E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.3E-04	mg/kg-day	NA	--	--	3.8E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.6E-06	mg/kg-day	NA	--	--	4.7E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.5E-06	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.2E-06	4.3E-06	mg/kg-day	3.0E-04	mg/kg-day	1.4E-02
				Chromium	6.97E+01	mg/kg	3.3E-05	mg/kg-day	NA	--	--	9.5E-05	mg/kg-day	3.0E-03	mg/kg-day	3.2E-02
				Thallium	7.94E-01	mg/kg	3.7E-07	mg/kg-day	NA	--	--	1.1E-06	mg/kg-day	7.0E-05	mg/kg-day	1.6E-02
				Vanadium	3.28E+02	mg/kg	1.5E-04	mg/kg-day	NA	--	--	4.5E-04	mg/kg-day	1.0E-03	mg/kg-day	4.5E-01
			Ingestion Total								3.0E-05					5.1E-01
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	3.4E-10	mg/kg-day	NA	--	--	1.0E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	7.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	5.3E-07	2.1E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	1.4E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.0E-05	4.1E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	2.2E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.6E-06	6.4E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	5.5E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	4.0E-08	1.6E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	8.7E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	6.4E-09	2.5E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	2.2E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.6E-06	6.3E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	9.6E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.0E-07	2.8E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	5.3E-05	mg/kg-day	NA	--	--	1.5E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	6.4E-07	mg/kg-day	NA	--	--	1.9E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.8E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.6E-07	5.1E-07	mg/kg-day	3.0E-04	mg/kg-day	1.7E-03
				Chromium	6.97E+01	mg/kg	1.3E-06	mg/kg-day	NA	--	--	3.8E-06	mg/kg-day	7.5E-05	mg/kg-day	5.1E-02
				Thallium	7.94E-01	mg/kg	1.5E-08	mg/kg-day	NA	--	--	4.3E-08	mg/kg-day	7.0E-05	mg/kg-day	6.2E-04
				Vanadium	3.28E+02	mg/kg	6.1E-06	mg/kg-day	NA	--	--	1.8E-05	mg/kg-day	2.6E-05	mg/kg-day	6.9E-01
			Dermal Total								1.5E-05					7.4E-01
		Exposure Point Total									4.5E-05					**1.3E+00**
	Exposure Medium Total										4.5E-05					**1.3E+00**

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	6.6E-13	mg/kg-day	NA	--	--	1.9E-12	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	2.4E-08	mg/kg-day	NA	--	--	6.9E-08	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.4E-08	mg/kg-day	3.1E+00	1/(mg/kg-day)	7.4E-08	7.0E-08	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	6.2E-08	mg/kg-day	NA	--	--	1.8E-07	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	7.4E-09	mg/kg-day	NA	--	--	2.2E-08	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.9E-07	mg/kg-day	NA	--	--	5.5E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	1.6E-09	mg/kg-day	NA	--	--	4.6E-09	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	7.3E-09	mg/kg-day	NA	--	--	2.1E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	3.0E-08	mg/kg-day	NA	--	--	8.9E-08	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	3.7E-10	mg/kg-day	NA	--	--	1.1E-09	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.4E-10	mg/kg-day	1.5E+01	1/(mg/kg-day)	5.1E-09	9.9E-10	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	7.6E-09	mg/kg-day	4.1E+01	1/(mg/kg-day)	3.1E-07	2.2E-08	mg/kg-day	3.0E-05	mg/kg-day	7.3E-04
				Thallium	7.94E-01	mg/kg	8.6E-11	mg/kg-day	NA	--	--	2.5E-10	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	3.6E-08	mg/kg-day	NA	--	--	1.0E-07	mg/kg-day	NA	--	--
			Inhalation Total								3.9E-07					7.3E-04
		Exposure Point Total									3.9E-07					7.3E-04
	Exposure Medium Total										3.9E-07					7.3E-04
Surface Soil Total											4.6E-05					**1.3E+00**

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	6.0E-10	mg/kg-day	1.5E+03	1/(mg/kg-day)	8.9E-07	1.7E-09	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	5.4E-09	mg/kg-day	1.5E+02	1/(mg/kg-day)	8.2E-07	1.6E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.0E-03	mg/kg-day	NA	--	--	3.0E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	2.4E-06	mg/kg-day	NA	--	--	7.0E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	1.8E-06	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.7E-06	5.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1.7E-02
				Chromium	3.68E+01	mg/kg	1.7E-05	mg/kg-day	NA	--	--	5.0E-05	mg/kg-day	3.0E-03	mg/kg-day	1.7E-02
				Vanadium	2.78E+02	mg/kg	1.3E-04	mg/kg-day	NA	--	--	3.8E-04	mg/kg-day	1.0E-03	mg/kg-day	3.8E-01
			Ingestion Total								4.4E-06					4.1E-01
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	7.1E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.1E-07	2.1E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	6.5E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	9.8E-08	1.9E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	4.2E-04	mg/kg-day	NA	--	--	1.2E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	9.6E-07	mg/kg-day	NA	--	--	2.8E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	3.2E-07	6.2E-07	mg/kg-day	3.0E-04	mg/kg-day	2.1E-03
				Chromium	3.68E+01	mg/kg	6.9E-07	mg/kg-day	NA	--	--	2.0E-06	mg/kg-day	7.5E-05	mg/kg-day	2.7E-02
				Vanadium	2.78E+02	mg/kg	5.2E-06	mg/kg-day	NA	--	--	1.5E-05	mg/kg-day	2.6E-05	mg/kg-day	5.8E-01
			Dermal Total								5.2E-07					6.1E-01
		Exposure Point Total									4.9E-06					**1.0E+00**
	Exposure Medium Total										4.9E-06					**1.0E+00**
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.4E-13	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.1E-10	4.0E-13	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.3E-12	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.9E-10	3.7E-12	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	2.4E-07	mg/kg-day	NA	--	--	7.0E-07	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	5.5E-10	mg/kg-day	NA	--	--	1.6E-09	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	4.1E-10	mg/kg-day	1.5E+01	1/(mg/kg-day)	6.2E-09	1.2E-09	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	4.0E-09	mg/kg-day	4.1E+01	1/(mg/kg-day)	1.6E-07	1.2E-08	mg/kg-day	3.0E-05	mg/kg-day	3.9E-04
				Vanadium	2.78E+02	mg/kg	3.0E-08	mg/kg-day	NA	--	--	8.8E-08	mg/kg-day	NA	--	--
			Inhalation Total								1.7E-07					3.9E-04
		Exposure Point Total									1.7E-07					3.9E-04
	Exposure Medium Total										1.7E-07					3.9E-04
Subsurface Soil Total											5.1E-06					**1.0E+00**

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap	Ingestion													
				1,2-Dichloroethane	4.10E-03	mg/L	3.9E-05	mg/kg-day	9.1E-02	1/(mg/kg-day)	3.5E-06	1.1E-04	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	2.1E-03	mg/kg-day	5.5E-02	1/(mg/kg-day)	**1.1E-04**	6.0E-03	mg/kg-day	4.0E-03	mg/kg-day	**1.5E+00**
				Iodomethane	5.80E-04	mg/L	5.4E-06	mg/kg-day	NA	--	--	1.6E-05	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	1.8E-05	mg/kg-day	NA	--	--	5.2E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	8.9E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	6.5E-07	2.6E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	7.9E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	5.8E-06	2.3E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	7.8E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	5.7E-07	2.3E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	8.7E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	6.4E-08	2.5E-06	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	7.3E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	5.3E-09	2.1E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	9.1E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	6.7E-06	2.7E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	1.0E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.5E-07	3.0E-06	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	1.3E-04	mg/kg-day	NA	--	--	3.8E-04	mg/kg-day	2.0E-02	mg/kg-day	1.9E-02
				Diesel Range Organics (D	1.80E-03	mg/L	1.7E-05	mg/kg-day	NA	--	--	4.9E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	8.1E-06	mg/kg-day	NA	--	--	2.4E-05	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	2.6E-04	mg/kg-day	NA	--	--	7.6E-04	mg/kg-day	3.0E-03	mg/kg-day	2.5E-01
				Vanadium	7.40E-02	mg/L	7.0E-04	mg/kg-day	NA	--	--	2.0E-03	mg/kg-day	1.0E-03	mg/kg-day	**2.0E+00**
			Ingestion Total								**1.3E-04**					**3.8E+00**
			Dermal													
				1,2-Dichloroethane	4.10E-03	mg/L	1.9E-06	mg/kg-day	9.1E-02	1/(mg/kg-day)	1.7E-07	5.5E-06	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	3.2E-04	mg/kg-day	5.5E-02	1/(mg/kg-day)	1.7E-05	9.2E-04	mg/kg-day	4.0E-03	mg/kg-day	2.3E-01
				Iodomethane	5.80E-04	mg/L	2.1E-07	mg/kg-day	NA	--	--	6.2E-07	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	2.3E-05	mg/kg-day	NA	--	--	6.7E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	1.1E-05	mg/kg-day	7.3E-01	1/(mg/kg-day)	8.3E-06	3.3E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	1.7E-05	mg/kg-day	7.3E+00	1/(mg/kg-day)	**1.3E-04**	5.0E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	1.7E-05	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.3E-05	5.0E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	1.9E-05	mg/kg-day	7.3E-02	1/(mg/kg-day)	1.4E-06	5.5E-05	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	9.3E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	6.8E-08	2.7E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	5.1E-05	mg/kg-day	7.3E+00	1/(mg/kg-day)	**3.7E-04**	1.5E-04	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	3.8E-05	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.8E-05	1.1E-04	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	8.8E-05	mg/kg-day	NA	--	--	2.6E-04	mg/kg-day	2.0E-02	mg/kg-day	1.3E-02
				Diesel Range Organics (D	1.80E-03	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	1.1E-06	mg/kg-day	NA	--	--	3.2E-06	mg/kg-day	7.5E-05	mg/kg-day	4.3E-02
				Vanadium	7.40E-02	mg/L	3.0E-06	mg/kg-day	NA	--	--	8.7E-06	mg/kg-day	2.6E-05	mg/kg-day	3.3E-01
			Dermal Total								**5.7E-04**					6.2E-01
		Exposure Point Total									**7.0E-04**					**4.4E+00**
	Exposure Medium Total										**7.0E-04**					**4.4E+00**

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater (Cont)	Air	Water Vapors from Showerhead	Inhalation	1,2-Dichloroethane	4.10E-03	mg/L	3.8E-05	mg/kg-day	9.1E-02	1/(mg/kg-day)	3.4E-06	1.1E-04	mg/kg-day	7.0E-01	mg/kg-day	1.6E-04
				Benzene	2.20E-01	mg/L	2.7E-03	mg/kg-day	2.7E-02	1/(mg/kg-day)	7.3E-05	7.9E-03	mg/kg-day	8.6E-03	mg/kg-day	9.2E-01
				Iodomethane	5.80E-04	mg/L	5.3E-06	mg/kg-day	NA	--	--	1.6E-05	mg/kg-day	NA	--	--
			Inhalation Total								7.7E-05					9.2E-01
		Exposure Point Total									7.7E-05					9.2E-01
	Exposure Medium Total										7.7E-05					9.2E-01
Groundwater Total											**7.7E-04**					**5.3E+00**
										Total of Receptor Risks Across All Media	**8.2E-04**	Total of Receptor Hazards Across All Media				**7.6E+00**

TABLE 7.4.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	2.8E-10	mg/kg-day	NA	--	--	2.8E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.4E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.9E-08	1.4E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.6E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.9E-06	2.6E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	4.1E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.0E-07	4.1E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.0E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	7.6E-09	1.0E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.6E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.2E-09	1.6E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	4.1E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.0E-07	4.1E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.8E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.3E-07	1.8E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.3E-05	mg/kg-day	NA	--	--	1.3E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.6E-07	mg/kg-day	NA	--	--	1.6E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.4E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.1E-07	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	4.8E-03
				Chromium	6.97E+01	mg/kg	3.2E-06	mg/kg-day	NA	--	--	3.2E-05	mg/kg-day	3.0E-03	mg/kg-day	1.1E-02
				Thallium	7.94E-01	mg/kg	3.6E-08	mg/kg-day	NA	--	--	3.6E-07	mg/kg-day	7.0E-05	mg/kg-day	5.2E-03
				Vanadium	3.28E+02	mg/kg	1.5E-05	mg/kg-day	NA	--	--	1.5E-04	mg/kg-day	1.0E-03	mg/kg-day	1.5E-01
			Ingestion Total								3.0E-06					1.7E-01
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	5.9E-11	mg/kg-day	NA	--	--	5.9E-10	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.0E-08	1.2E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.4E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.7E-06	2.4E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.8E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.7E-07	3.8E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	9.5E-08	mg/kg-day	7.3E-02	1/(mg/kg-day)	6.9E-09	9.5E-07	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.5E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.1E-09	1.5E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.7E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.7E-07	3.7E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.6E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.2E-07	1.6E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	9.0E-06	mg/kg-day	NA	--	--	9.0E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.1E-07	mg/kg-day	NA	--	--	1.1E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.0E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	4.5E-08	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	1.0E-03
				Chromium	6.97E+01	mg/kg	2.2E-07	mg/kg-day	NA	--	--	2.2E-06	mg/kg-day	7.5E-05	mg/kg-day	3.0E-02
				Thallium	7.94E-01	mg/kg	2.5E-09	mg/kg-day	NA	--	--	2.5E-08	mg/kg-day	7.0E-05	mg/kg-day	3.6E-04
				Vanadium	3.28E+02	mg/kg	1.1E-06	mg/kg-day	NA	--	--	1.1E-05	mg/kg-day	2.6E-05	mg/kg-day	4.0E-01
			Dermal Total								2.6E-06					4.4E-01
		Exposure Point Total									5.5E-06					6.1E-01
	Exposure Medium Total										5.5E-06					6.1E-01

TABLE 7.4.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	1.3E-13	mg/kg-day	NA	--	--	1.3E-12	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	4.6E-09	mg/kg-day	NA	--	--	4.6E-08	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	4.7E-09	mg/kg-day	3.1E+00	1/(mg/kg-day)	1.4E-08	4.7E-08	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	1.2E-08	mg/kg-day	NA	--	--	1.2E-07	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.5E-09	mg/kg-day	NA	--	--	1.5E-08	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	3.7E-08	mg/kg-day	NA	--	--	3.7E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.0E-10	mg/kg-day	NA	--	--	3.0E-09	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.4E-09	mg/kg-day	NA	--	--	1.4E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	5.9E-09	mg/kg-day	NA	--	--	5.9E-08	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	7.3E-11	mg/kg-day	NA	--	--	7.3E-10	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	6.6E-11	mg/kg-day	1.5E+01	1/(mg/kg-day)	1.0E-09	6.6E-10	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	1.5E-09	mg/kg-day	4.1E+01	1/(mg/kg-day)	6.0E-08	1.5E-08	mg/kg-day	3.0E-05	mg/kg-day	4.9E-04
				Thallium	7.94E-01	mg/kg	1.7E-11	mg/kg-day	NA	--	--	1.7E-10	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	6.9E-09	mg/kg-day	NA	--	--	6.9E-08	mg/kg-day	NA	--	--
			Inhalation Total								7.6E-08					4.9E-04
		Exposure Point Total									7.6E-08					4.9E-04
	Exposure Medium Total										7.6E-08					4.9E-04
Surface Soil Total											5.6E-06					6.1E-01

TABLE 7.4.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	5.8E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	8.7E-08	5.8E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	5.3E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	8.0E-08	5.3E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.0E-04	mg/kg-day	NA	--	--	1.0E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	2.3E-07	mg/kg-day	NA	--	--	2.3E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.6E-07	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	5.8E-03
				Chromium	3.68E+01	mg/kg	1.7E-06	mg/kg-day	NA	--	--	1.7E-05	mg/kg-day	3.0E-03	mg/kg-day	5.6E-03
				Vanadium	2.78E+02	mg/kg	1.3E-05	mg/kg-day	NA	--	--	1.3E-04	mg/kg-day	1.0E-03	mg/kg-day	1.3E-01
			Ingestion Total								4.3E-07					1.4E-01
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.2E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.8E-08	1.2E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.1E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.7E-08	1.1E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	7.1E-05	mg/kg-day	NA	--	--	7.1E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	1.6E-07	mg/kg-day	NA	--	--	1.6E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	3.6E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	5.5E-08	3.6E-07	mg/kg-day	3.0E-04	mg/kg-day	1.2E-03
				Chromium	3.68E+01	mg/kg	1.2E-07	mg/kg-day	NA	--	--	1.2E-06	mg/kg-day	7.5E-05	mg/kg-day	1.6E-02
				Vanadium	2.78E+02	mg/kg	8.9E-07	mg/kg-day	NA	--	--	8.9E-06	mg/kg-day	2.6E-05	mg/kg-day	3.4E-01
			Dermal Total								9.0E-08					3.6E-01
		Exposure Point Total									5.2E-07					5.0E-01
	Exposure Medium Total										5.2E-07					5.0E-01
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	2.7E-14	mg/kg-day	1.5E+03	1/(mg/kg-day)	4.0E-11	2.7E-13	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	2.5E-13	mg/kg-day	1.5E+02	1/(mg/kg-day)	3.7E-11	2.5E-12	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	4.7E-08	mg/kg-day	NA	--	--	4.7E-07	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	1.1E-10	mg/kg-day	NA	--	--	1.1E-09	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	8.0E-11	mg/kg-day	1.5E+01	1/(mg/kg-day)	1.2E-09	8.0E-10	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	7.8E-10	mg/kg-day	4.1E+01	1/(mg/kg-day)	3.2E-08	7.8E-09	mg/kg-day	3.0E-05	mg/kg-day	2.6E-04
				Vanadium	2.78E+02	mg/kg	5.9E-09	mg/kg-day	NA	--	--	5.9E-08	mg/kg-day	NA	--	--
			Inhalation Total								3.3E-08					2.6E-04
		Exposure Point Total									3.3E-08					2.6E-04
	Exposure Medium Total										3.3E-08					2.6E-04
Subsurface Soil Total											5.5E-07					5.0E-01

TABLE 7.4.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap	Ingestion													
				1,2-Dichloroethane	4.10E-03	mg/L	5.3E-06	mg/kg-day	9.1E-02	1/(mg/kg-day)	4.8E-07	5.3E-05	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	2.8E-04	mg/kg-day	5.5E-02	1/(mg/kg-day)	1.6E-05	2.8E-03	mg/kg-day	4.0E-03	mg/kg-day	7.1E-01
				Iodomethane	5.80E-04	mg/L	7.4E-07	mg/kg-day	NA	--	--	7.4E-06	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	2.4E-06	mg/kg-day	NA	--	--	2.4E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	1.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	8.9E-08	1.2E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	1.1E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	7.9E-07	1.1E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	1.1E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.8E-08	1.1E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	1.2E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	8.7E-09	1.2E-06	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	1.0E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	7.3E-10	1.0E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	1.2E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	9.1E-07	1.2E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	1.4E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.0E-07	1.4E-06	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	1.8E-05	mg/kg-day	NA	--	--	1.8E-04	mg/kg-day	2.0E-02	mg/kg-day	9.0E-03
				Diesel Range Organics (D	1.80E-03	mg/L	2.3E-06	mg/kg-day	NA	--	--	2.3E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	1.1E-06	mg/kg-day	NA	--	--	1.1E-05	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	3.6E-05	mg/kg-day	NA	--	--	3.6E-04	mg/kg-day	3.0E-03	mg/kg-day	1.2E-01
				Vanadium	7.40E-02	mg/L	9.5E-05	mg/kg-day	NA	--	--	9.5E-04	mg/kg-day	1.0E-03	mg/kg-day	9.5E-01
			Ingestion Total								1.8E-05					**1.8E+00**
			Dermal													
				1,2-Dichloroethane	4.10E-03	mg/L	2.4E-07	mg/kg-day	9.1E-02	1/(mg/kg-day)	2.2E-08	2.4E-06	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	4.0E-05	mg/kg-day	5.5E-02	1/(mg/kg-day)	2.2E-06	4.0E-04	mg/kg-day	4.0E-03	mg/kg-day	1.0E-01
				Iodomethane	5.80E-04	mg/L	2.7E-08	mg/kg-day	NA	--	--	2.7E-07	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	2.9E-06	mg/kg-day	NA	--	--	2.9E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	1.4E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.1E-06	1.4E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	2.2E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.6E-05	2.2E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	2.2E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.6E-06	2.2E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	2.4E-06	mg/kg-day	7.3E-02	1/(mg/kg-day)	1.8E-07	2.4E-05	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	1.2E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	8.7E-09	1.2E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	6.5E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	4.8E-05	6.5E-05	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	4.9E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.6E-06	4.9E-05	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	1.1E-05	mg/kg-day	NA	--	--	1.1E-04	mg/kg-day	2.0E-02	mg/kg-day	5.6E-03
				Diesel Range Organics (D	1.80E-03	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	9.3E-08	mg/kg-day	NA	--	--	9.3E-07	mg/kg-day	7.5E-05	mg/kg-day	1.2E-02
				Vanadium	7.40E-02	mg/L	2.5E-07	mg/kg-day	NA	--	--	2.5E-06	mg/kg-day	2.6E-05	mg/kg-day	9.6E-02
			Dermal Total								7.2E-05					2.2E-01
		Exposure Point Total									9.0E-05					**2.0E+00**
	Exposure Medium Total										9.0E-05					**2.0E+00**

TABLE 7.4.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater (Cont)	Air	Water Vapors from Showerhead	Inhalation	1,2-Dichloroethane	4.10E-03	mg/L	1.3E-06	mg/kg-day	9.1E-02	1/(mg/kg-day)	1.1E-07	1.3E-05	mg/kg-day	7.0E-01	mg/kg-day	1.8E-05
				Benzene	2.20E-01	mg/L	9.0E-05	mg/kg-day	2.7E-02	1/(mg/kg-day)	2.4E-06	9.0E-04	mg/kg-day	8.6E-03	mg/kg-day	1.1E-01
				Iodomethane	5.80E-04	mg/L	1.8E-07	mg/kg-day	NA	--	--	1.8E-06	mg/kg-day	NA	--	--
			Inhalation Total								2.6E-06					1.1E-01
		Exposure Point Total									2.6E-06					1.1E-01
	Exposure Medium Total										2.6E-06					1.1E-01
Groundwater Total											9.3E-05					**2.1E+00**
										Total of Receptor Risks Across All Media	9.9E-05	Total of Receptor Hazards Across All Media				**3.2E+00**

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	6.7E-09	mg/kg-day	NA	--	--	7.8E-08	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	3.3E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.4E-06	3.8E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	6.3E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	4.6E-05	7.3E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	9.9E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.2E-06	1.2E-04	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	2.5E-06	mg/kg-day	7.3E-02	1/(mg/kg-day)	1.8E-07	2.9E-05	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	3.9E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	2.9E-08	4.6E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	9.7E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	7.1E-06	1.1E-05	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	4.3E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.2E-06	5.0E-05	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	3.1E-04	mg/kg-day	NA	--	--	3.6E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	3.8E-06	mg/kg-day	NA	--	--	4.4E-05	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.4E-06	mg/kg-day	1.5E+00	1/(mg/kg-day)	5.1E-06	4.0E-05	mg/kg-day	3.0E-04	mg/kg-day	1.3E-01
				Chromium	6.97E+01	mg/kg	7.6E-05	mg/kg-day	NA	--	--	8.9E-04	mg/kg-day	3.0E-03	mg/kg-day	3.0E-01
				Thallium	7.94E-01	mg/kg	8.7E-07	mg/kg-day	NA	--	--	1.0E-05	mg/kg-day	7.0E-05	mg/kg-day	1.5E-01
				Vanadium	3.28E+02	mg/kg	3.6E-04	mg/kg-day	NA	--	--	4.2E-03	mg/kg-day	1.0E-03	mg/kg-day	**4.2E+00**
			Ingestion Total								7.1E-05					**4.8E+00**
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	5.6E-10	mg/kg-day	NA	--	--	6.6E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.2E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	8.6E-07	1.4E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.3E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.7E-05	2.7E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.6E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.6E-06	4.2E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	9.1E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	6.6E-08	1.1E-05	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.4E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.0E-08	1.7E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.5E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.6E-06	4.1E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.6E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.1E-06	1.8E-05	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	8.6E-05	mg/kg-day	NA	--	--	1.0E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.1E-06	mg/kg-day	NA	--	--	1.2E-05	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	2.9E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	4.3E-07	3.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1.1E-02
				Chromium	6.97E+01	mg/kg	2.1E-06	mg/kg-day	NA	--	--	2.5E-05	mg/kg-day	7.5E-05	mg/kg-day	3.3E-01
				Thallium	7.94E-01	mg/kg	2.4E-08	mg/kg-day	NA	--	--	2.8E-07	mg/kg-day	7.0E-05	mg/kg-day	4.1E-03
				Vanadium	3.28E+02	mg/kg	1.0E-05	mg/kg-day	NA	--	--	1.2E-04	mg/kg-day	2.6E-05	mg/kg-day	**4.5E+00**
			Dermal Total								2.4E-05					**4.9E+00**
		Exposure Point Total									9.6E-05					**9.6E+00**
	Exposure Medium Total										9.6E-05					**9.6E+00**

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	4.2E-13	mg/kg-day	NA	--	--	4.9E-12	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.5E-08	mg/kg-day	NA	--	--	1.8E-07	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	1.5E-08	mg/kg-day	3.1E+00	1/(mg/kg-day)	4.7E-08	1.8E-07	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.9E-08	mg/kg-day	NA	--	--	4.6E-07	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	4.7E-09	mg/kg-day	NA	--	--	5.5E-08	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.2E-07	mg/kg-day	NA	--	--	1.4E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	9.9E-10	mg/kg-day	NA	--	--	1.2E-08	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	4.6E-09	mg/kg-day	NA	--	--	5.4E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.9E-08	mg/kg-day	NA	--	--	2.2E-07	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	2.4E-10	mg/kg-day	NA	--	--	2.8E-09	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	2.1E-10	mg/kg-day	1.5E+01	1/(mg/kg-day)	3.2E-09	2.5E-09	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	4.8E-09	mg/kg-day	4.1E+01	1/(mg/kg-day)	2.0E-07	5.6E-08	mg/kg-day	3.0E-05	mg/kg-day	1.9E-03
				Thallium	7.94E-01	mg/kg	5.5E-11	mg/kg-day	NA	--	--	6.4E-10	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	2.3E-08	mg/kg-day	NA	--	--	2.6E-07	mg/kg-day	NA	--	--
			Inhalation Total								2.5E-07					1.9E-03
		Exposure Point Total									2.5E-07					1.9E-03
	Exposure Medium Total										2.5E-07					1.9E-03
Surface Soil Total											9.6E-05					**9.6E+00**

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.4E-09	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.1E-06	1.6E-08	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.3E-08	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.9E-06	1.5E-07	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	2.4E-03	mg/kg-day	NA	--	--	2.8E-02	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	5.6E-06	mg/kg-day	NA	--	--	6.5E-05	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	4.2E-06	mg/kg-day	1.5E+00	1/(mg/kg-day)	6.2E-06	4.8E-05	mg/kg-day	3.0E-04	mg/kg-day	1.6E-01
				Chromium	3.68E+01	mg/kg	4.0E-05	mg/kg-day	NA	--	--	4.7E-04	mg/kg-day	3.0E-03	mg/kg-day	1.6E-01
				Vanadium	2.78E+02	mg/kg	3.0E-04	mg/kg-day	NA	--	--	3.6E-03	mg/kg-day	1.0E-03	mg/kg-day	**3.6E+00**
			Ingestion Total								1.0E-05					**3.9E+00**
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.2E-10	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.8E-07	1.4E-09	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.1E-09	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.6E-07	1.2E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	6.8E-04	mg/kg-day	NA	--	--	7.9E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	1.6E-06	mg/kg-day	NA	--	--	1.8E-05	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	3.5E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	5.2E-07	4.1E-06	mg/kg-day	3.0E-04	mg/kg-day	1.4E-02
				Chromium	3.68E+01	mg/kg	1.1E-06	mg/kg-day	NA	--	--	1.3E-05	mg/kg-day	7.5E-05	mg/kg-day	1.8E-01
				Vanadium	2.78E+02	mg/kg	8.5E-06	mg/kg-day	NA	--	--	9.9E-05	mg/kg-day	2.6E-05	mg/kg-day	**3.8E+00**
			Dermal Total								8.6E-07					**4.0E+00**
		Exposure Point Total									1.1E-05					**7.9E+00**
	Exposure Medium Total										1.1E-05					**7.9E+00**
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	8.7E-14	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.3E-10	1.0E-12	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	8.0E-13	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.2E-10	9.3E-12	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.5E-07	mg/kg-day	NA	--	--	1.8E-06	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	3.5E-10	mg/kg-day	NA	--	--	4.1E-09	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	2.6E-10	mg/kg-day	1.5E+01	1/(mg/kg-day)	3.9E-09	3.0E-09	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	2.5E-09	mg/kg-day	4.1E+01	1/(mg/kg-day)	1.0E-07	3.0E-08	mg/kg-day	3.0E-05	mg/kg-day	9.8E-04
				Vanadium	2.78E+02	mg/kg	1.9E-08	mg/kg-day	NA	--	--	2.2E-07	mg/kg-day	NA	--	--
			Inhalation Total								1.1E-07					9.8E-04
		Exposure Point Total									1.1E-07					9.8E-04
	Exposure Medium Total										1.1E-07					9.8E-04
Subsurface Soil Total											1.1E-05					**7.9E+00**

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap	Ingestion													
				1,2-Dichloroethane	4.10E-03	mg/L	2.2E-05	mg/kg-day	9.1E-02	1/(mg/kg-day)	2.0E-06	2.6E-04	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	1.2E-03	mg/kg-day	5.5E-02	1/(mg/kg-day)	6.6E-05	1.4E-02	mg/kg-day	4.0E-03	mg/kg-day	**3.5E+00**
				Iodomethane	5.80E-04	mg/L	3.2E-06	mg/kg-day	NA	--	--	3.7E-05	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	1.0E-05	mg/kg-day	NA	--	--	1.2E-04	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	5.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.8E-07	6.1E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	4.6E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.4E-06	5.4E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	4.5E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.3E-07	5.3E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	5.1E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	3.7E-08	5.9E-06	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	4.3E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	3.1E-09	5.0E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	5.3E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.9E-06	6.2E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	6.0E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	4.4E-07	7.0E-06	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	7.7E-05	mg/kg-day	NA	--	--	8.9E-04	mg/kg-day	2.0E-02	mg/kg-day	4.5E-02
				Diesel Range Organics (D	1.80E-03	mg/L	9.9E-06	mg/kg-day	NA	--	--	1.2E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	4.7E-06	mg/kg-day	NA	--	--	5.5E-05	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	1.5E-04	mg/kg-day	NA	--	--	1.8E-03	mg/kg-day	3.0E-03	mg/kg-day	5.9E-01
				Vanadium	7.40E-02	mg/L	4.1E-04	mg/kg-day	NA	--	--	4.7E-03	mg/kg-day	1.0E-03	mg/kg-day	**4.7E+00**
			Ingestion Total								7.7E-05					**8.9E+00**
			Dermal													
				1,2-Dichloroethane	4.10E-03	mg/L	1.1E-06	mg/kg-day	9.1E-02	1/(mg/kg-day)	1.0E-07	1.3E-05	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	1.8E-04	mg/kg-day	5.5E-02	1/(mg/kg-day)	1.0E-05	2.1E-03	mg/kg-day	4.0E-03	mg/kg-day	5.4E-01
				Iodomethane	5.80E-04	mg/L	1.2E-07	mg/kg-day	NA	--	--	1.4E-06	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	1.3E-05	mg/kg-day	NA	--	--	1.5E-04	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	6.4E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	4.6E-06	7.4E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	9.6E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	7.0E-05	1.1E-04	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	9.7E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.1E-06	1.1E-04	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	1.1E-05	mg/kg-day	7.3E-02	1/(mg/kg-day)	7.8E-07	1.2E-04	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	5.2E-06	mg/kg-day	7.3E-03	1/(mg/kg-day)	3.8E-08	6.1E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	2.9E-05	mg/kg-day	7.3E+00	1/(mg/kg-day)	**2.1E-04**	3.3E-04	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	2.1E-05	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.6E-05	2.5E-04	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	4.9E-05	mg/kg-day	NA	--	--	5.7E-04	mg/kg-day	2.0E-02	mg/kg-day	2.9E-02
				Diesel Range Organics (D	1.80E-03	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	8.1E-07	mg/kg-day	NA	--	--	9.5E-06	mg/kg-day	7.5E-05	mg/kg-day	1.3E-01
				Vanadium	7.40E-02	mg/L	2.2E-06	mg/kg-day	NA	--	--	2.6E-05	mg/kg-day	2.6E-05	mg/kg-day	9.9E-01
			Dermal Total								**3.2E-04**					**1.7E+00**
		Exposure Point Total									**3.9E-04**					**1.1E+01**
	Exposure Medium Total										**3.9E-04**					**1.1E+01**
Groundwater Total											**3.9E-04**					**1.1E+01**
										Total of Receptor Risks Across All Media	**5.0E-04**	Total of Receptor Hazards Across All Media				**2.8E+01**

TABLE 7.5.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	7.5E-10	mg/kg-day	NA	--	--	2.6E-08	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	3.6E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.6E-07	1.3E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	7.0E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	5.1E-06	2.5E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	1.1E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	8.0E-07	3.8E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	2.8E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	2.0E-08	9.7E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	4.4E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	3.2E-09	1.5E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	1.1E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	7.9E-07	3.8E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	4.8E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.5E-07	1.7E-05	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	3.4E-05	mg/kg-day	NA	--	--	1.2E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	4.2E-07	mg/kg-day	NA	--	--	1.5E-05	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.8E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	5.7E-07	1.3E-05	mg/kg-day	3.0E-04	mg/kg-day	4.4E-02
				Chromium	6.97E+01	mg/kg	8.5E-06	mg/kg-day	NA	--	--	3.0E-04	mg/kg-day	3.0E-03	mg/kg-day	9.9E-02
				Thallium	7.94E-01	mg/kg	9.7E-08	mg/kg-day	NA	--	--	3.4E-06	mg/kg-day	7.0E-05	mg/kg-day	4.8E-02
				Vanadium	3.28E+02	mg/kg	4.0E-05	mg/kg-day	NA	--	--	1.4E-03	mg/kg-day	1.0E-03	mg/kg-day	**1.4E+00**
			Ingestion Total								7.9E-06					**1.6E+00**
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	9.0E-11	mg/kg-day	NA	--	--	3.1E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.9E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.4E-07	6.6E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	3.6E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.7E-06	1.3E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	5.7E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	4.2E-07	2.0E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.4E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	1.1E-08	5.1E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	2.3E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.7E-09	7.9E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	5.6E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	4.1E-07	2.0E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	2.5E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.8E-07	8.8E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.4E-05	mg/kg-day	NA	--	--	4.8E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.7E-07	mg/kg-day	NA	--	--	5.9E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	4.6E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	6.9E-08	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	5.3E-03
				Chromium	6.97E+01	mg/kg	3.4E-07	mg/kg-day	NA	--	--	1.2E-05	mg/kg-day	7.5E-05	mg/kg-day	1.6E-01
				Thallium	7.94E-01	mg/kg	3.9E-09	mg/kg-day	NA	--	--	1.4E-07	mg/kg-day	7.0E-05	mg/kg-day	1.9E-03
				Vanadium	3.28E+02	mg/kg	1.6E-06	mg/kg-day	NA	--	--	5.6E-05	mg/kg-day	2.6E-05	mg/kg-day	**2.2E+00**
			Dermal Total								3.9E-06					**2.3E+00**
		Exposure Point Total									1.2E-05					**3.9E+00**
	Exposure Medium Total										1.2E-05					**3.9E+00**

TABLE 7.5.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	9.4E-14	mg/kg-day	NA	--	--	3.3E-12	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	3.4E-09	mg/kg-day	NA	--	--	1.2E-07	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	3.4E-09	mg/kg-day	3.1E+00	1/(mg/kg-day)	1.0E-08	1.2E-07	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	8.7E-09	mg/kg-day	NA	--	--	3.1E-07	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.1E-09	mg/kg-day	NA	--	--	3.7E-08	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	2.7E-08	mg/kg-day	NA	--	--	9.3E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	2.2E-10	mg/kg-day	NA	--	--	7.7E-09	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.0E-09	mg/kg-day	NA	--	--	3.6E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	4.3E-09	mg/kg-day	NA	--	--	1.5E-07	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	5.3E-11	mg/kg-day	NA	--	--	1.8E-09	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	4.8E-11	mg/kg-day	1.5E+01	1/(mg/kg-day)	7.2E-10	1.7E-09	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	1.1E-09	mg/kg-day	4.1E+01	1/(mg/kg-day)	4.4E-08	3.7E-08	mg/kg-day	3.0E-05	mg/kg-day	1.2E-03
				Thallium	7.94E-01	mg/kg	1.2E-11	mg/kg-day	NA	--	--	4.3E-10	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	5.0E-09	mg/kg-day	NA	--	--	1.8E-07	mg/kg-day	NA	--	--
			Inhalation Total								5.5E-08					1.2E-03
		Exposure Point Total									5.5E-08					1.2E-03
	Exposure Medium Total										5.5E-08					1.2E-03
Surface Soil Total											1.2E-05					**3.9E+00**

TABLE 7.5.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.6E-10	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.3E-07	5.4E-09	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.4E-09	mg/kg-day	1.5E+02	1/(mg/kg-day)	2.1E-07	5.0E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	2.7E-04	mg/kg-day	NA	--	--	9.5E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	6.2E-07	mg/kg-day	NA	--	--	2.2E-05	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	4.6E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	6.9E-07	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	5.4E-02
				Chromium	3.68E+01	mg/kg	4.5E-06	mg/kg-day	NA	--	--	1.6E-04	mg/kg-day	3.0E-03	mg/kg-day	5.2E-02
				Vanadium	2.78E+02	mg/kg	3.4E-05	mg/kg-day	NA	--	--	1.2E-03	mg/kg-day	1.0E-03	mg/kg-day	**1.2E+00**
			Ingestion Total								1.1E-06					**1.3E+00**
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.9E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.8E-08	6.5E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.7E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	2.5E-08	5.9E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.1E-04	mg/kg-day	NA	--	--	3.8E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	2.5E-07	mg/kg-day	NA	--	--	8.7E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	5.6E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	8.3E-08	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	6.5E-03
				Chromium	3.68E+01	mg/kg	1.8E-07	mg/kg-day	NA	--	--	6.3E-06	mg/kg-day	7.5E-05	mg/kg-day	8.4E-02
				Vanadium	2.78E+02	mg/kg	1.4E-06	mg/kg-day	NA	--	--	4.8E-05	mg/kg-day	2.6E-05	mg/kg-day	**1.8E+00**
			Dermal Total								1.4E-07					**1.9E+00**
		Exposure Point Total									1.3E-06					**3.2E+00**
	Exposure Medium Total										1.3E-06					**3.2E+00**
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.9E-14	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.9E-11	6.8E-13	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.8E-13	mg/kg-day	1.5E+02	1/(mg/kg-day)	2.7E-11	6.2E-12	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	3.4E-08	mg/kg-day	NA	--	--	1.2E-06	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	7.8E-11	mg/kg-day	NA	--	--	2.7E-09	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	5.8E-11	mg/kg-day	1.5E+01	1/(mg/kg-day)	8.8E-10	2.0E-09	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	5.6E-10	mg/kg-day	4.1E+01	1/(mg/kg-day)	2.3E-08	2.0E-08	mg/kg-day	3.0E-05	mg/kg-day	6.6E-04
				Vanadium	2.78E+02	mg/kg	4.3E-09	mg/kg-day	NA	--	--	1.5E-07	mg/kg-day	NA	--	--
			Inhalation Total								2.4E-08					6.6E-04
		Exposure Point Total									2.4E-08					6.6E-04
	Exposure Medium Total										2.4E-08					6.6E-04
Subsurface Soil Total											1.3E-06					**3.2E+00**

TABLE 7.5.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young 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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap	Ingestion													
				1,2-Dichloroethane	4.10E-03	mg/L	5.0E-06	mg/kg-day	9.1E-02	1/(mg/kg-day)	4.6E-07	1.8E-04	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	2.7E-04	mg/kg-day	5.5E-02	1/(mg/kg-day)	1.5E-05	9.4E-03	mg/kg-day	4.0E-03	mg/kg-day	**2.4E+00**
				Iodomethane	5.80E-04	mg/L	7.1E-07	mg/kg-day	NA	--	--	2.5E-05	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	2.3E-06	mg/kg-day	NA	--	--	8.1E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	1.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	8.5E-08	4.1E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	1.0E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	7.5E-07	3.6E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	1.0E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.4E-08	3.5E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	1.1E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	8.3E-09	4.0E-06	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	9.5E-08	mg/kg-day	7.3E-03	1/(mg/kg-day)	7.0E-10	3.3E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	1.2E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	8.6E-07	4.1E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	1.3E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.8E-08	4.7E-06	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	1.7E-05	mg/kg-day	NA	--	--	6.0E-04	mg/kg-day	2.0E-02	mg/kg-day	3.0E-02
				Diesel Range Organics (D	1.80E-03	mg/L	2.2E-06	mg/kg-day	NA	--	--	7.7E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	1.1E-06	mg/kg-day	NA	--	--	3.7E-05	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	3.4E-05	mg/kg-day	NA	--	--	1.2E-03	mg/kg-day	3.0E-03	mg/kg-day	4.0E-01
				Vanadium	7.40E-02	mg/L	9.0E-05	mg/kg-day	NA	--	--	3.2E-03	mg/kg-day	1.0E-03	mg/kg-day	**3.2E+00**
			Ingestion Total								1.7E-05					**5.9E+00**
			Dermal													
				1,2-Dichloroethane	4.10E-03	mg/L	1.4E-07	mg/kg-day	9.1E-02	1/(mg/kg-day)	1.2E-08	4.8E-06	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	2.3E-05	mg/kg-day	5.5E-02	1/(mg/kg-day)	1.3E-06	8.0E-04	mg/kg-day	4.0E-03	mg/kg-day	2.0E-01
				Iodomethane	5.80E-04	mg/L	1.5E-08	mg/kg-day	NA	--	--	5.3E-07	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	1.7E-06	mg/kg-day	NA	--	--	5.8E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	8.1E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	5.9E-07	2.8E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	1.2E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	9.0E-06	4.3E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	1.2E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.0E-07	4.3E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	1.4E-06	mg/kg-day	7.3E-02	1/(mg/kg-day)	1.0E-07	4.8E-05	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	6.7E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	4.9E-09	2.3E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	3.7E-06	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.7E-05	1.3E-04	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	2.7E-06	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.0E-06	9.6E-05	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	6.3E-06	mg/kg-day	NA	--	--	2.2E-04	mg/kg-day	2.0E-02	mg/kg-day	1.1E-02
				Diesel Range Organics (D	1.80E-03	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	6.0E-08	mg/kg-day	NA	--	--	2.1E-06	mg/kg-day	7.5E-05	mg/kg-day	2.8E-02
				Vanadium	7.40E-02	mg/L	1.6E-07	mg/kg-day	NA	--	--	5.7E-06	mg/kg-day	2.6E-05	mg/kg-day	2.2E-01
			Dermal Total								4.1E-05					4.6E-01
		Exposure Point Total									5.8E-05					**6.4E+00**
	Exposure Medium Total										5.8E-05					**6.4E+00**
Groundwater Total											5.8E-05					**6.4E+00**
										Total of Receptor Risks Across All Media	7.1E-05	Total of Receptor Hazards Across All Media				**1.4E+01**

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	3.0E-10	mg/kg-day	NA	--	--	2.1E-08	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.4E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.0E-07	1.0E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.8E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.0E-06	1.9E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	4.3E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.2E-07	3.0E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	1.1E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	8.0E-09	7.7E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.7E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.3E-09	1.2E-05	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	4.3E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.1E-07	3.0E-06	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.9E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.4E-07	1.3E-05	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.4E-05	mg/kg-day	NA	--	--	9.5E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.7E-07	mg/kg-day	NA	--	--	1.2E-05	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.5E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.3E-07	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	3.5E-02
				Chromium	6.97E+01	mg/kg	3.4E-06	mg/kg-day	NA	--	--	2.4E-04	mg/kg-day	3.0E-03	mg/kg-day	7.9E-02
				Thallium	7.94E-01	mg/kg	3.8E-08	mg/kg-day	NA	--	--	2.7E-06	mg/kg-day	7.0E-05	mg/kg-day	3.8E-02
				Vanadium	3.28E+02	mg/kg	1.6E-05	mg/kg-day	NA	--	--	1.1E-03	mg/kg-day	1.0E-03	mg/kg-day	**1.1E+00**
			Ingestion Total								3.1E-06					**1.3E+00**
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	1.2E-11	mg/kg-day	NA	--	--	8.5E-10	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	2.6E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.9E-08	1.8E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	5.0E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	3.6E-07	3.5E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	7.8E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	5.7E-08	5.4E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	2.0E-08	mg/kg-day	7.3E-02	1/(mg/kg-day)	1.4E-09	1.4E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	3.1E-08	mg/kg-day	7.3E-03	1/(mg/kg-day)	2.3E-10	2.2E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	7.7E-09	mg/kg-day	7.3E+00	1/(mg/kg-day)	5.6E-08	5.4E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	3.4E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.5E-08	2.4E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.9E-06	mg/kg-day	NA	--	--	1.3E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	2.3E-08	mg/kg-day	NA	--	--	1.6E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	6.2E-09	mg/kg-day	1.5E+00	1/(mg/kg-day)	9.3E-09	4.4E-07	mg/kg-day	3.0E-04	mg/kg-day	1.5E-03
				Chromium	6.97E+01	mg/kg	4.6E-08	mg/kg-day	NA	--	--	3.2E-06	mg/kg-day	7.5E-05	mg/kg-day	4.3E-02
				Thallium	7.94E-01	mg/kg	5.3E-10	mg/kg-day	NA	--	--	3.7E-08	mg/kg-day	7.0E-05	mg/kg-day	5.3E-04
				Vanadium	3.28E+02	mg/kg	2.2E-07	mg/kg-day	NA	--	--	1.5E-05	mg/kg-day	2.6E-05	mg/kg-day	5.9E-01
			Dermal Total								5.3E-07					6.3E-01
		Exposure Point Total									3.7E-06					**1.9E+00**
	Exposure Medium Total										3.7E-06					**1.9E+00**

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	7.5E-15	mg/kg-day	NA	--	--	5.2E-13	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	2.7E-10	mg/kg-day	NA	--	--	1.9E-08	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.7E-10	mg/kg-day	3.1E+00	1/(mg/kg-day)	8.3E-10	1.9E-08	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	7.0E-10	mg/kg-day	NA	--	--	4.9E-08	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	8.4E-11	mg/kg-day	NA	--	--	5.9E-09	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	2.1E-09	mg/kg-day	NA	--	--	1.5E-07	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	1.8E-11	mg/kg-day	NA	--	--	1.2E-09	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	8.2E-11	mg/kg-day	NA	--	--	5.8E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	3.4E-10	mg/kg-day	NA	--	--	2.4E-08	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	4.2E-12	mg/kg-day	NA	--	--	2.9E-10	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.8E-12	mg/kg-day	1.5E+01	1/(mg/kg-day)	5.8E-11	2.7E-10	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	8.5E-11	mg/kg-day	4.1E+01	1/(mg/kg-day)	3.5E-09	6.0E-09	mg/kg-day	3.0E-05	mg/kg-day	2.0E-04
				Thallium	7.94E-01	mg/kg	9.7E-13	mg/kg-day	NA	--	--	6.8E-11	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	4.0E-10	mg/kg-day	NA	--	--	2.8E-08	mg/kg-day	NA	--	--
			Inhalation Total								4.4E-09					2.0E-04
		Exposure Point Total									4.4E-09					2.0E-04
	Exposure Medium Total										4.4E-09					2.0E-04
Surface Soil Total											3.7E-06					**1.9E+00**

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	6.1E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	9.2E-08	4.3E-09	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	5.6E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	8.4E-08	3.9E-08	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.1E-04	mg/kg-day	NA	--	--	7.5E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	2.5E-07	mg/kg-day	NA	--	--	1.7E-05	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	1.8E-07	mg/kg-day	1.5E+00	1/(mg/kg-day)	2.7E-07	1.3E-05	mg/kg-day	3.0E-04	mg/kg-day	4.3E-02
				Chromium	3.68E+01	mg/kg	1.8E-06	mg/kg-day	NA	--	--	1.2E-04	mg/kg-day	3.0E-03	mg/kg-day	4.1E-02
				Vanadium	2.78E+02	mg/kg	1.3E-05	mg/kg-day	NA	--	--	9.4E-04	mg/kg-day	1.0E-03	mg/kg-day	9.4E-01
			Ingestion Total								4.5E-07					**1.0E+00**
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	2.5E-12	mg/kg-day	1.5E+03	1/(mg/kg-day)	3.8E-09	1.8E-10	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	2.3E-11	mg/kg-day	1.5E+02	1/(mg/kg-day)	3.5E-09	1.6E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.5E-05	mg/kg-day	NA	--	--	1.0E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	3.4E-08	mg/kg-day	NA	--	--	2.4E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	7.6E-09	mg/kg-day	1.5E+00	1/(mg/kg-day)	1.1E-08	5.3E-07	mg/kg-day	3.0E-04	mg/kg-day	1.8E-03
				Chromium	3.68E+01	mg/kg	2.4E-08	mg/kg-day	NA	--	--	1.7E-06	mg/kg-day	7.5E-05	mg/kg-day	2.3E-02
				Vanadium	2.78E+02	mg/kg	1.8E-07	mg/kg-day	NA	--	--	1.3E-05	mg/kg-day	2.6E-05	mg/kg-day	5.0E-01
			Dermal Total								1.9E-08					5.2E-01
		Exposure Point Total									4.7E-07					**1.5E+00**
	Exposure Medium Total										4.7E-07					**1.5E+00**
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.5E-15	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.3E-12	1.1E-13	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.4E-14	mg/kg-day	1.5E+02	1/(mg/kg-day)	2.1E-12	9.9E-13	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	2.7E-09	mg/kg-day	NA	--	--	1.9E-07	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	6.2E-12	mg/kg-day	NA	--	--	4.4E-10	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	4.6E-12	mg/kg-day	1.5E+01	1/(mg/kg-day)	7.0E-11	3.2E-10	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	4.5E-11	mg/kg-day	4.1E+01	1/(mg/kg-day)	1.8E-09	3.1E-09	mg/kg-day	3.0E-05	mg/kg-day	1.0E-04
				Vanadium	2.78E+02	mg/kg	3.4E-10	mg/kg-day	NA	--	--	2.4E-08	mg/kg-day	NA	--	--
			Inhalation Total								1.9E-09					1.0E-04
		Exposure Point Total									1.9E-09					1.0E-04
	Exposure Medium Total										1.9E-09					1.0E-04
Subsurface Soil Total											4.7E-07					**1.5E+00**

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap	Dermal													
				1,2-Dichloroethane	4.10E-03	mg/L	5.0E-08	mg/kg-day	9.1E-02	1/(mg/kg-day)	4.5E-09	3.5E-06	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	8.7E-06	mg/kg-day	5.5E-02	1/(mg/kg-day)	4.8E-07	6.1E-04	mg/kg-day	4.0E-03	mg/kg-day	1.5E-01
				Iodomethane	5.80E-04	mg/L	4.5E-09	mg/kg-day	NA	--	--	3.1E-07	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	4.5E-07	mg/kg-day	NA	--	--	3.2E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	1.7E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.2E-07	1.2E-05	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	2.5E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.8E-06	1.8E-05	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	2.5E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.8E-07	1.8E-05	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	2.8E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	2.0E-08	1.9E-05	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	1.4E-07	mg/kg-day	7.3E-03	1/(mg/kg-day)	9.9E-10	9.5E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	7.4E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	5.4E-06	5.2E-05	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	5.6E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	4.1E-07	3.9E-05	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	1.7E-06	mg/kg-day	NA	--	--	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	6.1E-03
				Diesel Range Organics (D	1.80E-03	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	6.0E-08	mg/kg-day	NA	--	--	4.2E-06	mg/kg-day	7.5E-05	mg/kg-day	5.6E-02
				Vanadium	7.40E-02	mg/L	1.6E-07	mg/kg-day	NA	--	--	1.1E-05	mg/kg-day	2.6E-05	mg/kg-day	4.3E-01
			Dermal Total								8.5E-06					6.5E-01
		Exposure Point Total									8.5E-06					6.5E-01
	Exposure Medium Total										8.5E-06					6.5E-01
Groundwater Total											8.5E-06					6.5E-01
										Total of Receptor Risks Across All Media	1.3E-05	Total of Receptor Hazards Across All Media				**4.1E+00**

TABLE 7.6.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion													
				2-Hexanone (MBK)	6.12E-03	mg/kg	7.4E-11	mg/kg-day	NA	--	--	5.2E-09	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	3.6E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.6E-08	2.5E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	6.9E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	5.1E-07	4.9E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	1.1E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	7.9E-08	7.6E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	2.7E-08	mg/kg-day	7.3E-02	1/(mg/kg-day)	2.0E-09	1.9E-06	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	4.3E-08	mg/kg-day	7.3E-03	1/(mg/kg-day)	3.1E-10	3.0E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	1.1E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	7.8E-08	7.5E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	4.8E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	3.5E-08	3.3E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	3.4E-06	mg/kg-day	NA	--	--	2.4E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	4.1E-08	mg/kg-day	NA	--	--	2.9E-06	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.8E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	5.7E-08	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	8.8E-03
				Chromium	6.97E+01	mg/kg	8.4E-07	mg/kg-day	NA	--	--	5.9E-05	mg/kg-day	3.0E-03	mg/kg-day	2.0E-02
				Thallium	7.94E-01	mg/kg	9.6E-09	mg/kg-day	NA	--	--	6.7E-07	mg/kg-day	7.0E-05	mg/kg-day	9.6E-03
				Vanadium	3.28E+02	mg/kg	4.0E-06	mg/kg-day	NA	--	--	2.8E-04	mg/kg-day	1.0E-03	mg/kg-day	2.8E-01
			Ingestion Total								7.8E-07					3.2E-01
			Dermal													
				2-Hexanone (MBK)	6.12E-03	mg/kg	6.0E-12	mg/kg-day	NA	--	--	4.2E-10	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.3E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.2E-09	8.8E-07	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	2.4E-08	mg/kg-day	7.3E+00	1/(mg/kg-day)	1.8E-07	1.7E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.8E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.8E-08	2.7E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	9.6E-09	mg/kg-day	7.3E-02	1/(mg/kg-day)	7.0E-10	6.7E-07	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.5E-08	mg/kg-day	7.3E-03	1/(mg/kg-day)	1.1E-10	1.1E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	3.8E-09	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.7E-08	2.6E-07	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	1.7E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	1.2E-08	1.2E-06	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	9.1E-07	mg/kg-day	NA	--	--	6.4E-05	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	1.1E-08	mg/kg-day	NA	--	--	7.8E-07	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	3.0E-09	mg/kg-day	1.5E+00	1/(mg/kg-day)	4.6E-09	2.1E-07	mg/kg-day	3.0E-04	mg/kg-day	7.1E-04
				Chromium	6.97E+01	mg/kg	2.3E-08	mg/kg-day	NA	--	--	1.6E-06	mg/kg-day	7.5E-05	mg/kg-day	2.1E-02
				Thallium	7.94E-01	mg/kg	2.6E-10	mg/kg-day	NA	--	--	1.8E-08	mg/kg-day	7.0E-05	mg/kg-day	2.6E-04
				Vanadium	3.28E+02	mg/kg	1.1E-07	mg/kg-day	NA	--	--	7.5E-06	mg/kg-day	2.6E-05	mg/kg-day	2.9E-01
			Dermal Total								2.6E-07					3.1E-01
		Exposure Point Total									1.0E-06					6.2E-01
	Exposure Medium Total										1.0E-06					6.2E-01

TABLE 7.6.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil (Cont)	Air	Fugative Dust	Inhalation													
				2-Hexanone (MBK)	6.12E-03	mg/kg	3.7E-15	mg/kg-day	NA	--	--	2.6E-13	mg/kg-day	NA	--	--
				Benzo(a)anthracene	2.97E+00	mg/kg	1.3E-10	mg/kg-day	NA	--	--	9.4E-09	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	5.74E+00	mg/kg	1.3E-10	mg/kg-day	3.1E+00	1/(mg/kg-day)	4.2E-10	9.4E-09	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	9.00E+00	mg/kg	3.5E-10	mg/kg-day	NA	--	--	2.4E-08	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	2.27E+00	mg/kg	4.2E-11	mg/kg-day	NA	--	--	2.9E-09	mg/kg-day	NA	--	--
				Chrysene	3.57E+00	mg/kg	1.1E-09	mg/kg-day	NA	--	--	7.4E-08	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	8.88E-01	mg/kg	8.8E-12	mg/kg-day	NA	--	--	6.2E-10	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	3.95E+00	mg/kg	4.1E-11	mg/kg-day	NA	--	--	2.9E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.80E+02	mg/kg	1.7E-10	mg/kg-day	NA	--	--	1.2E-08	mg/kg-day	NA	--	--
				Gasoline Range Organics (	3.43E+00	mg/kg	2.1E-12	mg/kg-day	NA	--	--	1.5E-10	mg/kg-day	NA	--	--
				Arsenic	3.12E+00	mg/kg	1.9E-12	mg/kg-day	1.5E+01	1/(mg/kg-day)	2.9E-11	1.3E-10	mg/kg-day	NA	--	--
				Chromium	6.97E+01	mg/kg	4.3E-11	mg/kg-day	4.1E+01	1/(mg/kg-day)	1.7E-09	3.0E-09	mg/kg-day	3.0E-05	mg/kg-day	9.9E-05
				Thallium	7.94E-01	mg/kg	4.8E-13	mg/kg-day	NA	--	--	3.4E-11	mg/kg-day	NA	--	--
				Vanadium	3.28E+02	mg/kg	2.0E-10	mg/kg-day	NA	--	--	1.4E-08	mg/kg-day	NA	--	--
			Inhalation Total								2.2E-09					9.9E-05
		Exposure Point Total									2.2E-09					9.9E-05
	Exposure Medium Total										2.2E-09					9.9E-05
Surface Soil Total											1.0E-06					6.2E-01

TABLE 7.6.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.5E-11	mg/kg-day	1.5E+03	1/(mg/kg-day)	2.3E-08	1.1E-09	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.4E-10	mg/kg-day	1.5E+02	1/(mg/kg-day)	2.1E-08	9.8E-09	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	2.7E-05	mg/kg-day	NA	--	--	1.9E-03	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	6.2E-08	mg/kg-day	NA	--	--	4.3E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	4.6E-08	mg/kg-day	1.5E+00	1/(mg/kg-day)	6.9E-08	3.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1.1E-02
				Chromium	3.68E+01	mg/kg	4.4E-07	mg/kg-day	NA	--	--	3.1E-05	mg/kg-day	3.0E-03	mg/kg-day	1.0E-02
				Vanadium	2.78E+02	mg/kg	3.4E-06	mg/kg-day	NA	--	--	2.3E-04	mg/kg-day	1.0E-03	mg/kg-day	2.3E-01
			Ingestion Total								1.1E-07					2.6E-01
			Dermal													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	1.2E-12	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.9E-09	8.7E-11	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	1.1E-11	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.7E-09	7.9E-10	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	7.2E-06	mg/kg-day	NA	--	--	5.0E-04	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	1.7E-08	mg/kg-day	NA	--	--	1.2E-06	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	3.7E-09	mg/kg-day	1.5E+00	1/(mg/kg-day)	5.5E-09	2.6E-07	mg/kg-day	3.0E-04	mg/kg-day	8.6E-04
				Chromium	3.68E+01	mg/kg	1.2E-08	mg/kg-day	NA	--	--	8.4E-07	mg/kg-day	7.5E-05	mg/kg-day	1.1E-02
				Vanadium	2.78E+02	mg/kg	9.0E-08	mg/kg-day	NA	--	--	6.3E-06	mg/kg-day	2.6E-05	mg/kg-day	2.4E-01
			Dermal Total								9.1E-09					2.6E-01
		Exposure Point Total									1.2E-07					5.1E-01
	Exposure Medium Total										1.2E-07					5.1E-01
	Air	Fugative Dust	Inhalation													
				HpCDD, 1,2,3,4,6,7,8-	1.27E-03	mg/kg	7.7E-16	mg/kg-day	1.5E+03	1/(mg/kg-day)	1.2E-12	5.4E-14	mg/kg-day	NA	--	--
				OCDD	1.16E-02	mg/kg	7.1E-15	mg/kg-day	1.5E+02	1/(mg/kg-day)	1.1E-12	5.0E-13	mg/kg-day	NA	--	--
				Diesel Range Organics (D	2.22E+03	mg/kg	1.4E-09	mg/kg-day	NA	--	--	9.5E-08	mg/kg-day	NA	--	--
				Gasoline Range Organics (	5.11E+00	mg/kg	3.1E-12	mg/kg-day	NA	--	--	2.2E-10	mg/kg-day	NA	--	--
				Arsenic	3.79E+00	mg/kg	2.3E-12	mg/kg-day	1.5E+01	1/(mg/kg-day)	3.5E-11	1.6E-10	mg/kg-day	NA	--	--
				Chromium	3.68E+01	mg/kg	2.2E-11	mg/kg-day	4.1E+01	1/(mg/kg-day)	9.2E-10	1.6E-09	mg/kg-day	3.0E-05	mg/kg-day	5.2E-05
				Vanadium	2.78E+02	mg/kg	1.7E-10	mg/kg-day	NA	--	--	1.2E-08	mg/kg-day	NA	--	--
			Inhalation Total								9.6E-10					5.2E-05
		Exposure Point Total									9.6E-10					5.2E-05
	Exposure Medium Total										9.6E-10					5.2E-05
Subsurface Soil Total											1.2E-07					5.1E-01

TABLE 7.6.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Construction Workers
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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap	Dermal													
				1,2-Dichloroethane	4.10E-03	mg/L	2.4E-08	mg/kg-day	9.1E-02	1/(mg/kg-day)	2.2E-09	1.7E-06	mg/kg-day	NA	--	--
				Benzene	2.20E-01	mg/L	4.2E-06	mg/kg-day	5.5E-02	1/(mg/kg-day)	2.3E-07	3.0E-04	mg/kg-day	4.0E-03	mg/kg-day	7.4E-02
				Iodomethane	5.80E-04	mg/L	2.2E-09	mg/kg-day	NA	--	--	1.5E-07	mg/kg-day	NA	--	--
				1-Methylnaphthalene	1.90E-03	mg/L	2.2E-07	mg/kg-day	NA	--	--	1.6E-05	mg/kg-day	NA	--	--
				Benzo(a)anthracene	9.50E-05	mg/L	8.1E-08	mg/kg-day	7.3E-01	1/(mg/kg-day)	5.9E-08	5.7E-06	mg/kg-day	NA	--	--
				Benzo(a)pyrene (BaP)	8.40E-05	mg/L	1.2E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	8.9E-07	8.6E-06	mg/kg-day	NA	--	--
				Benzo(b)fluoranthene	8.30E-05	mg/L	1.2E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	9.0E-08	8.6E-06	mg/kg-day	NA	--	--
				Benzo(k)fluoranthene	9.30E-05	mg/L	1.4E-07	mg/kg-day	7.3E-02	1/(mg/kg-day)	9.9E-09	9.5E-06	mg/kg-day	NA	--	--
				Chrysene	7.80E-05	mg/L	6.6E-08	mg/kg-day	7.3E-03	1/(mg/kg-day)	4.8E-10	4.6E-06	mg/kg-day	NA	--	--
				Dibenz(a,h)anthracene	9.70E-05	mg/L	3.6E-07	mg/kg-day	7.3E+00	1/(mg/kg-day)	2.7E-06	2.5E-05	mg/kg-day	NA	--	--
				Indeno(1,2,3-cd)pyrene	1.10E-04	mg/L	2.7E-07	mg/kg-day	7.3E-01	1/(mg/kg-day)	2.0E-07	1.9E-05	mg/kg-day	NA	--	--
				Naphthalene	1.40E-02	mg/L	8.5E-07	mg/kg-day	NA	--	--	5.9E-05	mg/kg-day	2.0E-02	mg/kg-day	3.0E-03
				Diesel Range Organics (D	1.80E-03	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Gasoline Range Organics (	8.60E-04	mg/L	--	mg/kg-day	NA	--	--	--	mg/kg-day	NA	--	--
				Chromium	2.78E-02	mg/L	2.9E-08	mg/kg-day	NA	--	--	2.1E-06	mg/kg-day	7.5E-05	mg/kg-day	2.7E-02
				Vanadium	7.40E-02	mg/L	7.9E-08	mg/kg-day	NA	--	--	5.5E-06	mg/kg-day	2.6E-05	mg/kg-day	2.1E-01
			Dermal Total								4.1E-06					3.2E-01
		Exposure Point Total									4.1E-06					3.2E-01
	Exposure Medium Total										4.1E-06					3.2E-01
Groundwater Total											4.1E-06					3.2E-01
										Total of Receptor Risks Across All Media	5.3E-06	Total of Receptor Hazards Across All Media				**1.5E+00**

TABLE 8.1.RME
CALCULATION OF RADIATION CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe:
Receptor Population:
Receptor Age:

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		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Total													
NOT APPLICABLE																
			Total													
		Exposure Point Total														
	Exposure Medium Total															
			Total													
		Exposure Point Total														
	Exposure Medium Total															
Total																
Total of Receptor Risks Across All Media												Total of Receptor Hazards Across All Media				

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.5E-07	--	7.8E-08	--	2.30E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.9E-06	--	1.5E-06	--	4.44E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	4.6E-07	--	2.4E-07	--	6.96E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	1.2E-08	--	6.0E-09	--	1.76E-08	NA	--	--	--	--
			Chrysene	1.8E-09	--	9.4E-10	--	2.76E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	4.5E-07	--	2.3E-07	--	6.87E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2.0E-07	--	1.0E-07	--	3.05E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	3.3E-07	--	3.9E-08	--	3.66E-07	Skin / CVS	0.00	--	0.00	0.00
			Chromium	--	--	--	--	--	NOEL	0.00	--	0.01	0.01
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.00	--	0.00	0.00
			Vanadium	--	--	--	--	--	GIS / Kidney	0.07	--	0.10	0.17
			Chemical Total	4.5E-06	--	2.2E-06		6.74E-06		0.08	--	0.11	0.19
		Exposure Point Total						6.74E-06					0.19
	Exposure Medium Total							6.74E-06					0.19

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (Cont)	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	9.2E-10	--	--	9.19E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	6.3E-11	--	--	6.33E-11	NA	--	--	--	--
			Chromium	--	3.8E-09	--	--	3.84E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	4.8E-09	--		4.82E-09		--	0.00	--	0.00
		Exposure Point Total						4.82E-09					0.00
	Exposure Medium Total							4.82E-09					0.00
Surface Soil Total								**6.75E-06**					**0.19**
Adult Trespassers Total								**6.75E-06**					**0.19**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	6.7E-06
Total Risk Across All Media and All Exposure Routes	6.7E-06

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Total Hazard Index Across Surface Soil	0.2
Total Hazard Index Across All Media and All Exposure Routes	0.2

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.2
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	0.2
Oral / Dermal Liver HI =	0.0

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	8.8E-08	--	7.3E-08	--	1.62E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	1.7E-06	--	1.4E-06	--	3.12E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	2.7E-07	--	2.2E-07	--	4.90E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	6.8E-09	--	5.6E-09	--	1.24E-08	NA	--	--	--	--
			Chrysene	1.1E-09	--	8.8E-10	--	1.94E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	2.6E-07	--	2.2E-07	--	4.83E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.2E-07	--	9.8E-08	--	2.15E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	1.9E-07	--	3.7E-08	--	2.27E-07	Skin / CVS	0.00	--	0.00	0.00
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.02	0.03
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.00	--	0.00	0.00
			Vanadium	--	--	--	--	--	GIS / Kidney	0.10	--	0.26	0.36
			Chemical Total	2.6E-06	--	2.1E-06		4.71E-06		0.12	--	0.28	0.39
		Exposure Point Total						4.71E-06					0.39
	Exposure Medium Total							4.71E-06					0.39

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (Cont)	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	2.9E-10	--	--	2.91E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	2.0E-11	--	--	2.01E-11	NA	--	--	--	--
			Chromium	--	1.2E-09	--	--	1.22E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.5E-09	--		1.53E-09		--	0.00	--	0.00
		Exposure Point Total						1.53E-09					0.00
	Exposure Medium Total							1.53E-09					0.00
Surface Soil Total								**4.72E-06**					**0.39**
Adolescent Trespassers Total								**4.72E-06**					**0.39**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	4.7E-06
Total Risk Across All Media and All Exposure Routes	4.7E-06

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Total Hazard Index Across Surface Soil	0.4
Total Hazard Index Across All Media and All Exposure Routes	0.4

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.4
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	0.4
Oral / Dermal Liver HI =	0.0

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	7.6E-07	--	1.1E-06	--	1.88E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	1.5E-05	--	2.2E-05	--	3.63E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	2.3E-06	--	3.4E-06	--	5.70E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	5.8E-08	--	8.6E-08	--	1.44E-07	NA	--	--	--	--
			Chrysene	9.1E-09	--	1.4E-08	--	2.26E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	2.3E-06	--	3.4E-06	--	5.62E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.0E-06	--	1.5E-06	--	2.50E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	1.6E-06	--	5.6E-07	--	2.20E-06	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.02	--	0.10	0.13
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.01	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.32	--	1.41	**1.73**
			Chemical Total	2.3E-05	--	3.2E-05		5.44E-05		0.36	--	1.52	**1.88**
		Exposure Point Total						5.44E-05					**1.88**
	Exposure Medium Total							5.44E-05					**1.88**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	1.8E-08	--	--	1.84E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.3E-09	--	--	1.27E-09	NA	--	--	--	--
			Chromium	--	7.7E-08	--	--	7.68E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	9.7E-08	--		9.65E-08		--	0.00	--	0.00
		Exposure Point Total						9.65E-08					0.00
	Exposure Medium Total							9.65E-08					0.00
Surface Soil Total								**5.45E-05**					**1.88**

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	6.7E-07	--	2.3E-07	--	8.93E-07	NA	--	--	--	--
			OCDD	6.1E-07	--	2.1E-07	--	8.16E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.0E-06	--	6.8E-07	--	2.67E-06	Skin / CVS	0.01	--	0.00	0.02
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.05	0.07
			Vanadium	--	--	--	--	--	GIS / Kidney	0.27	--	1.19	**1.46**
			Chemical Total	3.3E-06	--	1.1E-06		4.38E-06		0.30	--	1.25	**1.55**
		Exposure Point Total						4.38E-06					**1.55**
	Exposure Medium Total							4.38E-06					**1.55**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	5.1E-11	--	--	5.12E-11	NA	--	--	--	--
			OCDD	--	4.7E-11	--	--	4.68E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.5E-09	--	--	1.54E-09	NA	--	--	--	--
			Chromium	--	4.1E-08	--	--	4.06E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	4.2E-08	--		4.22E-08		--	0.00	--	0.00
		Exposure Point Total						4.22E-08					0.00
	Exposure Medium Total							4.22E-08					0.00
Subsurface Soil Total								**4.42E-06**					**1.55**
On-Site Workers Total								**5.89E-05**					**3.43**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	5.4E-05	Total Hazard Index Across Surface Soil	**1.9**
Total Risk Across Subsurface Soil	4.4E-06	Total Hazard Index Across Subsurface Soil	**1.5**
Total Risk Across All Media and All Exposure Routes	5.9E-05	Total Hazard Index Across All Media and All Exposure Routes	**3.4**

Inhalation Exposure Routes:
Inhalation Respiratory System HI = 0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**3.2**
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	**3.2**
Oral / Dermal Liver HI =	0.0

TABLE 9.3.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.2E-07	--	3.1E-07	--	4.30E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.3E-06	--	6.0E-06	--	8.31E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	3.6E-07	--	9.4E-07	--	1.30E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	9.1E-09	--	2.4E-08	--	3.29E-08	NA	--	--	--	--
			Chrysene	1.4E-09	--	3.7E-09	--	5.17E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.6E-07	--	9.3E-07	--	1.29E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.6E-07	--	4.1E-07	--	5.72E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.6E-07	--	1.5E-07	--	4.13E-07	Skin / CVS	0.00	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.08	0.09
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.00	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.14	--	1.08	**1.22**
			Chemical Total	3.6E-06	--	8.8E-06		1.23E-05		0.16	--	1.16	**1.32**
		Exposure Point Total						1.23E-05					**1.32**
	Exposure Medium Total							1.23E-05					**1.32**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	5.8E-09	--	--	5.80E-09	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	4.0E-10	--	--	4.00E-10	NA	--	--	--	--
			Chromium	--	2.4E-08	--	--	2.42E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3.0E-08	--		3.04E-08		--	0.00	--	0.00
		Exposure Point Total						3.04E-08					0.00
	Exposure Medium Total							3.04E-08					0.00
Surface Soil Total								**1.24E-05**					**1.32**

TABLE 9.3.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	1.0E-07	--	6.3E-08	--	1.68E-07	NA	--	--	--	--
			OCDD	9.6E-08	--	5.8E-08	--	1.53E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	3.1E-07	--	1.9E-07	--	5.02E-07	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.04	0.05
			Vanadium	--	--	--	--	--	GIS / Kidney	0.12	--	0.92	**1.04**
			Chemical Total	5.1E-07	--	3.1E-07		8.23E-07		0.13	--	0.96	**1.09**
		Exposure Point Total						8.23E-07					**1.09**
	Exposure Medium Total							8.23E-07					**1.09**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	1.6E-11	--	--	1.62E-11	NA	--	--	--	--
			OCDD	--	1.5E-11	--	--	1.48E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	4.9E-10	--	--	4.86E-10	NA	--	--	--	--
			Chromium	--	1.3E-08	--	--	1.28E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.3E-08	--		1.33E-08		--	0.00	--	0.00
		Exposure Point Total						1.33E-08					0.00
	Exposure Medium Total							1.33E-08					0.00
Subsurface Soil Total								**8.36E-07**					**1.09**
On-Site Workers Total								**1.32E-05**					**2.42**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	1.2E-05	Total Hazard Index Across Surface Soil	**1.3**
Total Risk Across Subsurface Soil	8.4E-07	Total Hazard Index Across Subsurface Soil	**1.1**
Total Risk Across All Media and All Exposure Routes	1.3E-05	Total Hazard Index Across All Media and All Exposure Routes	**2.4**

Inhalation Exposure Routes:
Inhalation Respiratory System HI = 0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**2.3**
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	**2.3**
Oral / Dermal Liver HI =	0.0

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.0E-06	--	5.3E-07	--	1.54E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.0E-05	--	1.0E-05	--	2.99E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	3.1E-06	--	1.6E-06	--	4.69E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	7.8E-08	--	4.0E-08	--	1.18E-07	NA	--	--	--	--
			Chrysene	1.2E-08	--	6.4E-09	--	1.86E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.0E-06	--	1.6E-06	--	4.62E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.4E-06	--	7.0E-07	--	2.06E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.2E-06	--	2.6E-07	--	2.46E-06	Skin / CVS	0.01	--	0.00	0.02
			Chromium	--	--	--	--	--	NOEL	0.03	--	0.05	0.08
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.02	--	0.00	0.02
			Vanadium	--	--	--	--	--	GIS / Kidney	0.45	--	0.69	**1.14**
			Chemical Total	3.0E-05	--	1.5E-05		4.54E-05		0.51	--	0.74	**1.25**
		Exposure Point Total						4.54E-05					**1.25**
	Exposure Medium Total							4.54E-05					**1.25**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	7.4E-08	--	--	7.42E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	5.1E-09	--	--	5.11E-09	NA	--	--	--	--
			Chromium	--	3.1E-07	--	--	3.10E-07	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3.9E-07	--		3.89E-07		--	0.00	--	0.00
		Exposure Point Total						3.89E-07					0.00
	Exposure Medium Total							3.89E-07					0.00
Surface Soil Total								**4.58E-05**					**1.25**

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	8.9E-07	--	1.1E-07	--	1.00E-06	NA	--	--	--	--
			OCDD	8.2E-07	--	9.8E-08	--	9.15E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.7E-06	--	3.2E-07	--	2.99E-06	Skin / CVS	0.02	--	0.00	0.02
			Chromium	--	--	--	--	--	NOEL	0.02	--	0.03	0.04
			Vanadium	--	--	--	--	--	GIS / Kidney	0.38	--	0.58	0.96
			Chemical Total	4.4E-06	--	5.2E-07		4.91E-06		0.41	--	0.61	**1.03**
		Exposure Point Total						4.91E-06					**1.03**
	Exposure Medium Total							4.91E-06					**1.03**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	2.1E-10	--	--	2.07E-10	NA	--	--	--	--
			OCDD	--	1.9E-10	--	--	1.89E-10	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	6.2E-09	--	--	6.21E-09	NA	--	--	--	--
			Chromium	--	1.6E-07	--	--	1.64E-07	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.7E-07	--		1.70E-07		--	0.00	--	0.00
		Exposure Point Total						1.70E-07					0.00
	Exposure Medium Total							1.70E-07					0.00
Subsurface Soil Total								**5.08E-06**					**1.03**

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	3.5E-06	--	1.7E-07	--	3.68E-06	NA	--	--	--	--
			Benzene	1.1E-04	--	1.7E-05	--	**1.31E-04**	CVS	1.51	--	0.23	**1.74**
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	6.5E-07	--	8.3E-06	--	8.92E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	5.8E-06	--	1.3E-04	--	**1.31E-04**	NA	--	--	--	--
			Benzo(b)fluoranthene	5.7E-07	--	1.3E-05	--	1.31E-05	NA	--	--	--	--
			Benzo(k)fluoranthene	6.4E-08	--	1.4E-06	--	1.45E-06	NA	--	--	--	--
			Chrysene	5.3E-09	--	6.8E-08	--	7.32E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	6.7E-06	--	3.7E-04	--	**3.79E-04**	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	7.5E-07	--	2.8E-05	--	2.85E-05	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.02	--	0.01	0.03
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.25	--	0.04	0.30
			Vanadium	--	--	--	--	--	GIS / Kidney	2.03	--	0.33	**2.36**
			Chemical Total	1.3E-04	--	5.7E-04		**6.97E-04**		3.81	--	0.62	**4.43**
		Exposure Point Total						**6.97E-04**					**4.43**
	Exposure Medium Total							**6.97E-04**					**4.43**

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater (Cont)	Air	Water Vapors from Showerhead	1,2-Dichloroethane	--	3.4E-06	--	--	3.43E-06	GIS / Liver / Kidney	--	0.00	--	0.00
			Benzene	--	7.3E-05	--	--	7.31E-05	CVS	--	0.92	--	0.92
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	7.7E-05	--		7.66E-05		--	0.92	--	0.92
		Exposure Point Total						7.66E-05					0.92
	Exposure Medium Total							7.66E-05					0.92
Groundwater Total								**7.73E-04**					**5.35**
Adult Residents Total								**8.24E-04**					**7.63**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	4.6E-05	ıtal Hazard Index Across Surface Soil	**1.3**
Total Risk Across Subsurface Soil	5.1E-06	Hazard Index Across Subsurface Soil	**1.0**
Total Risk Across Groundwater	**7.7E-04**	:al Hazard Index Across Groundwater	**5.3**
Total Risk Across All Media and All Exposure Routes	**8.2E-04**	ıss All Media and All Exposure Routes	**7.6**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	**2.7**

Inhalation Exposure Routes:

Inhalation Gastrointestinal System HI =	0.0
Inhalation Kidney HI =	0.0
Inhalation Liver HI =	0.0
Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**4.5**
Oral / Dermal Cardiovascular System HI =	0.1
Oral / Dermal Skin HI =	0.1
Oral / Dermal Kidney HI =	**4.5**
Oral / Dermal Liver HI =	0.0

TABLE 9.4.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	9.9E-08	--	9.0E-08	--	1.89E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	1.9E-06	--	1.7E-06	--	3.66E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	3.0E-07	--	2.7E-07	--	5.75E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	7.6E-09	--	6.9E-09	--	1.45E-08	NA	--	--	--	--
			Chrysene	1.2E-09	--	1.1E-09	--	2.28E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.0E-07	--	2.7E-07	--	5.67E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.3E-07	--	1.2E-07	--	2.52E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.1E-07	--	4.5E-08	--	2.59E-07	Skin / CVS	0.00	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.03	0.04
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.01	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.15	--	0.40	0.55
			Chemical Total	3.0E-06	--	2.6E-06		5.52E-06		0.17	--	0.44	0.61
		Exposure Point Total						5.52E-06					0.61
	Exposure Medium Total							5.52E-06					0.61
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	1.4E-08	--	--	1.45E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.0E-09	--	--	9.97E-10	NA	--	--	--	--
			Chromium	--	6.0E-08	--	--	6.04E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	7.6E-08	--		7.59E-08		--	0.00	--	0.00
		Exposure Point Total						7.59E-08					0.00
	Exposure Medium Total							7.59E-08					0.00
Surface Soil Total								**5.60E-06**					**0.61**

TABLE 9.4.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	8.7E-08	--	1.8E-08	--	1.06E-07	NA	--	--	--	--
			OCDD	8.0E-08	--	1.7E-08	--	9.64E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.6E-07	--	5.5E-08	--	3.15E-07	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.02	0.02
			Vanadium	--	--	--	--	--	GIS / Kidney	0.13	--	0.34	0.47
			Chemical Total	4.3E-07	--	9.0E-08		5.17E-07		0.14	--	0.36	0.50
		Exposure Point Total						5.17E-07					0.50
	Exposure Medium Total							5.17E-07					0.50
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	4.0E-11	--	--	4.03E-11	NA	--	--	--	--
			OCDD	--	3.7E-11	--	--	3.68E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	1.2E-09	--	--	1.21E-09	NA	--	--	--	--
			Chromium	--	3.2E-08	--	--	3.19E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3.3E-08	--		3.32E-08		--	0.00	--	0.00
		Exposure Point Total						3.32E-08					0.00
	Exposure Medium Total							3.32E-08					0.00
Subsurface Soil Total								**5.50E-07**					**0.50**

TABLE 9.4.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	4.8E-07	--	2.2E-08	--	5.00E-07	NA	--	--	--	--
			Benzene	1.6E-05	--	2.2E-06	--	1.77E-05	CVS	0.71	--	0.10	0.81
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	8.9E-08	--	1.1E-06	--	1.15E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	7.9E-07	--	1.6E-05	--	1.68E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	7.8E-08	--	1.6E-06	--	1.69E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	8.7E-09	--	1.8E-07	--	1.86E-07	NA	--	--	--	--
			Chrysene	7.3E-10	--	8.7E-09	--	9.42E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	9.1E-07	--	4.8E-05	--	4.86E-05	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.0E-07	--	3.6E-06	--	3.66E-06	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.01	--	0.01	0.01
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.12	--	0.01	0.13
			Vanadium	--	--	--	--	--	GIS / Kidney	0.95	--	0.10	**1.05**
			Chemical Total	1.8E-05	--	7.2E-05		9.03E-05		1.78	--	0.22	**2.00**
		Exposure Point Total						9.03E-05					**2.00**
	Exposure Medium Total							9.03E-05					**2.00**

TABLE 9.4.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater (Cont)	Air	Water Vapors from Showerhead	1,2-Dichloroethane	--	1.1E-07	--	--	1.14E-07	GIS / Liver / Kidney	--	0.00	--	0.00
			Benzene	--	2.4E-06	--	--	2.44E-06	CVS	--	0.11	--	0.11
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.6E-06	--		2.56E-06		--	0.11	--	0.11
		Exposure Point Total						2.56E-06					0.11
	Exposure Medium Total							2.56E-06					0.11
Groundwater Total								**9.29E-05**					**2.10**
Adult Residents Total								**9.90E-05**					**3.21**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	5.6E-06	ıtal Hazard Index Across Surface Soil	0.6
Total Risk Across Subsurface Soil	5.5E-07	Hazard Index Across Subsurface Soil	0.5
Total Risk Across Groundwater	9.3E-05	:al Hazard Index Across Groundwater	**2.1**
Total Risk Across All Media and All Exposure Routes	9.9E-05	ıss All Media and All Exposure Routes	**3.2**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	0.9

Inhalation Exposure Routes:

Inhalation Gastrointestinal System HI =	0.0
Inhalation Kidney HI =	0.0
Inhalation Liver HI =	0.0
Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**2.1**
Oral / Dermal Cardiovascular System HI =	0.0
Oral / Dermal Skin HI =	0.0
Oral / Dermal Kidney HI =	**2.1**
Oral / Dermal Liver HI =	0.0

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	2.4E-06	--	8.6E-07	--	3.24E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	4.6E-05	--	1.7E-05	--	6.26E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	7.2E-06	--	2.6E-06	--	9.82E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	1.8E-07	--	6.6E-08	--	2.48E-07	NA	--	--	--	--
			Chrysene	2.9E-08	--	1.0E-08	--	3.90E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	7.1E-06	--	2.6E-06	--	9.69E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.2E-06	--	1.1E-06	--	4.31E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	5.1E-06	--	4.3E-07	--	5.56E-06	Skin / CVS	0.13	--	0.01	0.14
			Chromium	--	--	--	--	--	NOEL	0.30	--	0.33	0.63
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.15	--	0.00	0.15
			Vanadium	--	--	--	--	--	GIS / Kidney	4.19	--	4.52	**8.71**
			Chemical Total	7.1E-05	--	2.4E-05		9.55E-05		4.77	--	4.86	**9.63**
		Exposure Point Total						9.55E-05					**9.63**
	Exposure Medium Total							9.55E-05					**9.63**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	4.7E-08	--	--	4.70E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	3.2E-09	--	--	3.24E-09	NA	--	--	--	--
			Chromium	--	2.0E-07	--	--	1.96E-07	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.5E-07	--		2.47E-07		--	0.00	--	0.00
		Exposure Point Total						2.47E-07					0.00
	Exposure Medium Total							2.47E-07					0.00
Surface Soil Total								**9.58E-05**					**9.63**

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	2.1E-06	--	1.8E-07	--	2.26E-06	NA	--	--	--	--
			OCDD	1.9E-06	--	1.6E-07	--	2.07E-06	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	6.2E-06	--	5.2E-07	--	6.76E-06	Skin / CVS	0.16	--	0.01	0.18
			Chromium	--	--	--	--	--	NOEL	0.16	--	0.18	0.33
			Vanadium	--	--	--	--	--	GIS / Kidney	3.55	--	3.83	**7.38**
			Chemical Total	1.0E-05	--	8.6E-07		1.11E-05		3.87	--	4.02	**7.89**
		Exposure Point Total						1.11E-05					**7.89**
	Exposure Medium Total							1.11E-05					**7.89**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	1.3E-10	--	--	1.31E-10	NA	--	--	--	--
			OCDD	--	1.2E-10	--	--	1.20E-10	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	3.9E-09	--	--	3.94E-09	NA	--	--	--	--
			Chromium	--	1.0E-07	--	--	1.04E-07	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.1E-07	--		1.08E-07		--	0.00	--	0.00
		Exposure Point Total						1.08E-07					0.00
	Exposure Medium Total							1.08E-07					0.00
Subsurface Soil Total								**1.12E-05**					**7.89**

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	2.0E-06	--	1.0E-07	--	2.14E-06	NA	--	--	--	--
			Benzene	6.6E-05	--	1.0E-05	--	7.64E-05	CVS	3.52	--	0.54	**4.05**
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	3.8E-07	--	4.6E-06	--	5.02E-06	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	3.4E-06	--	7.0E-05	--	7.37E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	3.3E-07	--	7.1E-06	--	7.39E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	3.7E-08	--	7.8E-07	--	8.16E-07	NA	--	--	--	--
			Chrysene	3.1E-09	--	3.8E-08	--	4.12E-08	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.9E-06	--	2.1E-04	--	**2.13E-04**	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4.4E-07	--	1.6E-05	--	1.60E-05	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.04	--	0.03	0.07
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.59	--	0.13	0.72
			Vanadium	--	--	--	--	--	GIS / Kidney	4.73	--	0.99	**5.72**
			Chemical Total	7.7E-05	--	3.2E-04		**3.95E-04**		8.88	--	1.68	**10.56**
		Exposure Point Total						**3.95E-04**					**10.56**
	Exposure Medium Total							**3.95E-04**					**10.56**
Groundwater Total								**3.95E-04**					**10.56**
Young Child Residents Total								**5.02E-04**					**28.08**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	9.6E-05	Total Hazard Index Across Surface Soil	**9.6**
Total Risk Across Subsurface Soil	1.1E-05	Total Hazard Index Across Subsurface Soil	**7.9**
Total Risk Across Groundwater	**3.9E-04**	Total Hazard Index Across Groundwater	**10.6**
Total Risk Across All Media and All Exposure Routes	**5.0E-04**	Across All Media and All Exposure Routes	**28.1**

All Exposure Routes:		**Oral and Dermal Exposure Routes:**	
Total Whole Body HI =	0.1	Oral / Dermal Gastrointestinal System HI =	**21.8**
Total Cardiovascular System HI =	**4.1**	Oral / Dermal Cardiovascular System HI =	0.5
		Oral / Dermal Skin HI =	0.5
Inhalation Exposure Routes:		Oral / Dermal Kidney HI =	**21.8**
Inhalation Respiratory System HI =	0.0	Oral / Dermal Liver HI =	0.1

TABLE 9.5.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	2.6E-07	--	1.4E-07	--	4.02E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	5.1E-06	--	2.7E-06	--	7.77E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	8.0E-07	--	4.2E-07	--	1.22E-06	NA	--	--	--	--
			Benzo(k)fluoranthene	2.0E-08	--	1.1E-08	--	3.08E-08	NA	--	--	--	--
			Chrysene	3.2E-09	--	1.7E-09	--	4.84E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	7.9E-07	--	4.1E-07	--	1.20E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.5E-07	--	1.8E-07	--	5.35E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	5.7E-07	--	6.9E-08	--	6.40E-07	Skin / CVS	0.04	--	0.01	0.05
			Chromium	--	--	--	--	--	NOEL	0.10	--	0.16	0.26
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.05	--	0.00	0.05
			Vanadium	--	--	--	--	--	GIS / Kidney	1.40	--	2.16	**3.56**
			Chemical Total	7.9E-06	--	3.9E-06		1.18E-05		1.59	--	2.32	**3.92**
		Exposure Point Total						1.18E-05					**3.92**
	Exposure Medium Total							1.18E-05					**3.92**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	1.0E-08	--	--	1.05E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	7.2E-10	--	--	7.22E-10	NA	--	--	--	--
			Chromium	--	4.4E-08	--	--	4.38E-08	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	5.5E-08	--		5.50E-08		--	0.00	--	0.00
		Exposure Point Total						5.50E-08					0.00
	Exposure Medium Total							5.50E-08					0.00
Surface Soil Total								**1.19E-05**					**3.92**

TABLE 9.5.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	2.3E-07	--	2.8E-08	--	2.61E-07	NA	--	--	--	--
			OCDD	2.1E-07	--	2.5E-08	--	2.38E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	6.9E-07	--	8.3E-08	--	7.78E-07	Skin / CVS	0.05	--	0.01	0.06
			Chromium	--	--	--	--	--	NOEL	0.05	--	0.08	0.14
			Vanadium	--	--	--	--	--	GIS / Kidney	1.19	--	1.83	**3.02**
			Chemical Total	1.1E-06	--	1.4E-07		1.28E-06		1.29	--	1.92	**3.21**
		Exposure Point Total						1.28E-06					**3.21**
	Exposure Medium Total							1.28E-06					**3.21**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	2.9E-11	--	--	2.92E-11	NA	--	--	--	--
			OCDD	--	2.7E-11	--	--	2.67E-11	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	8.8E-10	--	--	8.77E-10	NA	--	--	--	--
			Chromium	--	2.3E-08	--	--	2.31E-08	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.4E-08	--		2.41E-08		--	0.00	--	0.00
		Exposure Point Total						2.41E-08					0.00
	Exposure Medium Total							2.41E-08					0.00
Subsurface Soil Total								**1.30E-06**					**3.21**

TABLE 9.5.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	4.6E-07	--	1.2E-08	--	4.68E-07	NA	--	--	--	--
			Benzene	1.5E-05	--	1.3E-06	--	1.60E-05	CVS	2.35	--	0.20	**2.55**
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	8.5E-08	--	5.9E-07	--	6.79E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	7.5E-07	--	9.0E-06	--	9.76E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	7.4E-08	--	9.0E-07	--	9.77E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	8.3E-09	--	1.0E-07	--	1.08E-07	NA	--	--	--	--
			Chrysene	7.0E-10	--	4.9E-09	--	5.57E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	8.6E-07	--	2.7E-05	--	2.76E-05	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	9.8E-08	--	2.0E-06	--	2.10E-06	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	0.03	--	0.01	0.04
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	0.40	--	0.03	0.42
			Vanadium	--	--	--	--	--	GIS / Kidney	3.16	--	0.22	**3.38**
			Chemical Total	1.7E-05	--	4.1E-05		5.78E-05		5.94	--	0.46	**6.40**
		Exposure Point Total						5.78E-05					**6.40**
	Exposure Medium Total							5.78E-05					**6.40**
Groundwater Total								**5.78E-05**					**6.40**
Young Child Residents Total								**7.09E-05**					**13.53**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	1.2E-05	ıtal Hazard Index Across Surface Soil	**3.9**
Total Risk Across Subsurface Soil	1.3E-06	Hazard Index Across Subsurface Soil	**3.2**
Total Risk Across Groundwater	5.8E-05	:al Hazard Index Across Groundwater	**6.4**
Total Risk Across All Media and All Exposure Routes	7.1E-05	ıss All Media and All Exposure Routes	**13.5**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	**2.5**

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**10.0**
Oral / Dermal Cardiovascular System HI =	0.2
Oral / Dermal Skin HI =	0.2
Oral / Dermal Kidney HI =	**10.0**
Oral / Dermal Liver HI =	0.1

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	1.0E-07	--	1.9E-08	--	1.23E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	2.0E-06	--	3.6E-07	--	2.38E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	3.2E-07	--	5.7E-08	--	3.74E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	8.0E-09	--	1.4E-09	--	9.45E-09	NA	--	--	--	--
			Chrysene	1.3E-09	--	2.3E-10	--	1.48E-09	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.1E-07	--	5.6E-08	--	3.69E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.4E-07	--	2.5E-08	--	1.64E-07	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.3E-07	--	9.3E-09	--	2.36E-07	Skin / CVS	0.04	--	0.00	0.04
			Chromium	--	--	--	--	--	NOEL	0.08	--	0.04	0.12
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.04	--	0.00	0.04
			Vanadium	--	--	--	--	--	GIS / Kidney	1.11	--	0.59	**1.70**
			Chemical Total	3.1E-06	--	5.3E-07		3.66E-06		1.26	--	0.63	**1.89**
		Exposure Point Total						3.66E-06					**1.89**
	Exposure Medium Total							3.66E-06					**1.89**
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	8.3E-10	--	--	8.35E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	5.8E-11	--	--	5.75E-11	NA	--	--	--	--
			Chromium	--	3.5E-09	--	--	3.49E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	4.4E-09	--		4.38E-09		--	0.00	--	0.00
		Exposure Point Total						4.38E-09					0.00
	Exposure Medium Total							4.38E-09					0.00
Surface Soil Total								**3.67E-06**					**1.89**

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	9.2E-08	--	3.8E-09	--	9.58E-08	NA	--	--	--	--
			OCDD	8.4E-08	--	3.5E-09	--	8.75E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	2.7E-07	--	1.1E-08	--	2.86E-07	Skin / CVS	0.04	--	0.00	0.04
			Chromium	--	--	--	--	--	NOEL	0.04	--	0.02	0.06
			Vanadium	--	--	--	--	--	GIS / Kidney	0.94	--	0.50	**1.44**
			Chemical Total	4.5E-07	--	1.9E-08		4.70E-07		1.02	--	0.52	**1.55**
		Exposure Point Total						4.70E-07					**1.55**
	Exposure Medium Total							4.70E-07					**1.55**
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	2.3E-12	--	--	2.32E-12	NA	--	--	--	--
			OCDD	--	2.1E-12	--	--	2.12E-12	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	7.0E-11	--	--	6.99E-11	NA	--	--	--	--
			Chromium	--	1.8E-09	--	--	1.84E-09	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	1.9E-09	--		1.92E-09		--	0.00	--	0.00
		Exposure Point Total						1.92E-09					0.00
	Exposure Medium Total							1.92E-09					0.00
Subsurface Soil Total								**4.71E-07**					**1.55**

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	--	--	4.5E-09	--	4.55E-09	NA	--	--	--	--
			Benzene	--	--	4.8E-07	--	4.76E-07	CVS	--	--	0.15	0.15
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	1.2E-07	--	1.21E-07	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	--	1.8E-06	--	1.83E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	1.8E-07	--	1.83E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	2.0E-08	--	2.02E-08	NA	--	--	--	--
			Chrysene	--	--	9.9E-10	--	9.90E-10	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	5.4E-06	--	5.43E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	4.1E-07	--	4.05E-07	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	--	--	0.01	0.01
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	--	--	0.06	0.06
			Vanadium	--	--	--	--	--	GIS / Kidney	--	--	0.43	0.43
			Chemical Total	--	--	8.5E-06		8.47E-06		--	--	0.65	0.65
		Exposure Point Total						8.47E-06					0.65
	Exposure Medium Total							8.47E-06					0.65
Groundwater Total								**8.47E-06**					**0.65**
Construction Workers Total								**1.26E-05**					**4.09**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	3.7E-06	ɔtal Hazard Index Across Surface Soil	**1.9**
Total Risk Across Subsurface Soil	4.7E-07	Hazard Index Across Subsurface Soil	**1.5**
Total Risk Across Groundwater	8.5E-06	:al Hazard Index Across Groundwater	0.6
Total Risk Across All Media and All Exposure Routes	1.3E-05	ɔss All Media and All Exposure Routes	**4.1**

All Exposure Routes:

Total Whole Body HI =	0.0
Total Cardiovascular System HI =	0.2

Inhalation Exposure Routes:

Inhalation Respiratory System HI =	0.0

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**3.6**
Oral / Dermal Cardiovascular System HI =	0.1
Oral / Dermal Skin HI =	0.1
Oral / Dermal Kidney HI =	**3.6**
Oral / Dermal Liver HI =	0.0

TABLE 9.6.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	2.6E-08	--	9.2E-09	--	3.53E-08	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	5.1E-07	--	1.8E-07	--	6.83E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	7.9E-08	--	2.8E-08	--	1.07E-07	NA	--	--	--	--
			Benzo(k)fluoranthene	2.0E-09	--	7.0E-10	--	2.71E-09	NA	--	--	--	--
			Chrysene	3.1E-10	--	1.1E-10	--	4.25E-10	NA	--	--	--	--
			Dibenz(a,h)anthracene	7.8E-08	--	2.7E-08	--	1.06E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.5E-08	--	1.2E-08	--	4.70E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	5.7E-08	--	4.6E-09	--	6.11E-08	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.02	--	0.02	0.04
			Thallium	--	--	--	--	--	Liver / CVS / Skin	0.01	--	0.00	0.01
			Vanadium	--	--	--	--	--	GIS / Kidney	0.28	--	0.29	0.56
			Chemical Total	7.8E-07	--	2.6E-07		1.04E-06		0.32	--	0.31	0.62
		Exposure Point Total						1.04E-06					0.62
	Exposure Medium Total							1.04E-06					0.62
	Air	Fugative Dust											
			2-Hexanone (MBK)	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	4.2E-10	--	--	4.17E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	--	NA	--	--	--	--
			Chrysene	--	--	--	--	--	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	2.9E-11	--	--	2.88E-11	NA	--	--	--	--
			Chromium	--	1.7E-09	--	--	1.74E-09	RsS	--	0.00	--	0.00
			Thallium	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2.2E-09	--		2.19E-09		--	0.00	--	0.00
		Exposure Point Total						2.19E-09					0.00
	Exposure Medium Total							2.19E-09					0.00
Surface Soil Total								**1.04E-06**					**0.62**

TABLE 9.6.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			HpCDD, 1,2,3,4,6,7,8-	2.3E-08	--	1.9E-09	--	2.49E-08	NA	--	--	--	--
			OCDD	2.1E-08	--	1.7E-09	--	2.27E-08	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	6.9E-08	--	5.5E-09	--	7.43E-08	Skin / CVS	0.01	--	0.00	0.01
			Chromium	--	--	--	--	--	NOEL	0.01	--	0.01	0.02
			Vanadium	--	--	--	--	--	GIS / Kidney	0.23	--	0.24	0.48
			Chemical Total	1.1E-07	--	9.1E-09		1.22E-07		0.26	--	0.26	0.51
		Exposure Point Total						1.22E-07					0.51
	Exposure Medium Total							1.22E-07					0.51
	Air	Fugative Dust											
			HpCDD, 1,2,3,4,6,7,8-	--	1.2E-12	--	--	1.16E-12	NA	--	--	--	--
			OCDD	--	1.1E-12	--	--	1.06E-12	NA	--	--	--	--
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	3.5E-11	--	--	3.49E-11	NA	--	--	--	--
			Chromium	--	9.2E-10	--	--	9.21E-10	RsS	--	0.00	--	0.00
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	9.6E-10	--		9.58E-10		--	0.00	--	0.00
		Exposure Point Total						9.58E-10					0.00
	Exposure Medium Total							9.58E-10					0.00
Subsurface Soil Total								**1.23E-07**					**0.51**

TABLE 9.6.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC:
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			1,2-Dichloroethane	--	--	2.2E-09	--	2.23E-09	NA	--	--	--	--
			Benzene	--	--	2.3E-07	--	2.33E-07	CVS	--	--	0.07	0.07
			Iodomethane	--	--	--	--	--	NA	--	--	--	--
			1-Methylnaphthalene	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)anthracene	--	--	5.9E-08	--	5.90E-08	NA	--	--	--	--
			Benzo(a)pyrene (BaP)	--	--	8.9E-07	--	8.95E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	--	--	9.0E-08	--	8.97E-08	NA	--	--	--	--
			Benzo(k)fluoranthene	--	--	9.9E-09	--	9.91E-09	NA	--	--	--	--
			Chrysene	--	--	4.8E-10	--	4.85E-10	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	2.7E-06	--	2.66E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	2.0E-07	--	1.98E-07	NA	--	--	--	--
			Naphthalene	--	--	--	--	--	Whole Body	--	--	0.00	0.00
			Diesel Range Organics (DRO)	--	--	--	--	--	NA	--	--	--	--
			Gasoline Range Organics (GRO)	--	--	--	--	--	NA	--	--	--	--
			Chromium	--	--	--	--	--	NOEL	--	--	0.03	0.03
			Vanadium	--	--	--	--	--	GIS / Kidney	--	--	0.21	0.21
			Chemical Total	--	--	4.1E-06		4.15E-06		--	--	0.32	0.32
		Exposure Point Total						4.15E-06					0.32
	Exposure Medium Total							4.15E-06					0.32
Groundwater Total								**4.15E-06**					**0.32**
Construction Workers Total								**5.31E-06**					**1.45**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
RsS = Respiratory System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	1.0E-06	›tal Hazard Index Across Surface Soil	0.6
Total Risk Across Subsurface Soil	1.2E-07	Hazard Index Across Subsurface Soil	0.5
Total Risk Across Groundwater	4.1E-06	:al Hazard Index Across Groundwater	0.3
Total Risk Across All Media and All Exposure Routes	5.3E-06	›ss All Media and All Exposure Routes	**1.5**

All Exposure Routes:		**Oral and Dermal Exposure Routes:**	
Total Whole Body HI =	0.0	Oral / Dermal Gastrointestinal System HI =	**1.3**
Total Cardiovascular System HI =	0.1	Oral / Dermal Cardiovascular System HI =	0.0
		Oral / Dermal Skin HI =	0.0
Inhalation Exposure Routes:		Oral / Dermal Kidney HI =	**1.3**
Inhalation Respiratory System HI =	0.0	Oral / Dermal Liver HI =	0.0

TABLE 10.1.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Vanadium						GIS / Kidney	0.32	--	1.41	**1.73**
			Chemical Total							0.32	--	1.41	**1.73**
		Exposure Point Total											**1.73**
	Exposure Medium Total												**1.73**
Surface Soil Total													**1.73**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	0.27	--	1.19	**1.46**
			Chemical Total							0.27	--	1.19	**1.46**
		Exposure Point Total											**1.46**
	Exposure Medium Total												**1.46**
Subsurface Soil Total													**1.46**
On-Site Workers Total													**3.19**

Notes:
Target Organ Abbreviations:
GIS = Gastrointestinal System

Total Hazard Index Across Surface Soil	**1.7**
Total Hazard Index Across Subsurface Soil	**1.5**
Total Hazard Index Across All Media and All Exposure Routes	**3.2**

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**3.2**
Oral / Dermal Kidney HI =	**3.2**

TABLE 10.1.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Current, Future
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Vanadium						GIS / Kidney	0.14	--	1.08	**1.22**
			Chemical Total							0.14	--	1.08	**1.22**
		Exposure Point Total											**1.22**
	Exposure Medium Total												**1.22**
Surface Soil Total													**1.22**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	0.12	--	0.92	**1.04**
			Chemical Total							0.12	--	0.92	**1.04**
		Exposure Point Total											**1.04**
	Exposure Medium Total												**1.04**
Subsurface Soil Total													**1.04**
On-Site Workers Total													**2.26**

Notes:
Target Organ Abbreviations:
GIS = Gastrointestinal System

Total Hazard Index Across Surface Soil	**1.2**
Total Hazard Index Across Subsurface Soil	**1.0**
Total Hazard Index Across All Media and All Exposure Routes	**2.3**

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**2.3**
Oral / Dermal Kidney HI =	**2.3**

TABLE 10.2.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Vanadium						GIS / Kidney	0.45	--	0.69	**1.14**
			Chemical Total							0.45	--	0.69	**1.14**
		Exposure Point Total											**1.14**
	Exposure Medium Total												**1.14**
Surface Soil Total													**1.14**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	0.38	--	0.58	0.96
			Chemical Total							0.38	--	0.58	0.96
		Exposure Point Total											0.96
	Exposure Medium Total												0.96
Subsurface Soil Total													**0.96**

TABLE 10.2.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap	Benzene	1.1E-04	--	1.7E-05	--	**1.31E-04**	CVS	1.51	--	0.23	**1.74**
			Benzo(a)pyrene (BaP)	5.8E-06	--	1.3E-04	--	**1.31E-04**					
			Dibenz(a,h)anthracene	6.7E-06	--	3.7E-04	--	**3.79E-04**					
			Vanadium						GIS / Kidney	2.03	--	0.33	**2.36**
			Chemical Total	1.3E-04	--	5.1E-04		**6.41E-04**		3.53	--	0.57	**4.10**
		Exposure Point Total						**6.41E-04**					**4.10**
	Exposure Medium Total							**6.41E-04**					**4.10**
	Air	Water Vapors from Showerhead	Benzene						CVS	--	0.92	--	0.92
			Chemical Total							--	0.92	--	0.92
		Exposure Point Total											0.92
	Exposure Medium Total												0.92
Groundwater Total								**6.41E-04**					**5.02**
Adult Residents Total								**6.41E-04**					**7.12**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System

Total Risk Across Groundwater	**6.4E-04**
Total Risk Across All Media and All Exposure Routes	**6.4E-04**

Total Hazard Index Across Surface Soil	**1.1**
Total Hazard Index Across Subsurface Soil	1.0
Total Hazard Index Across Groundwater	**5.0**
Total Hazard Index Across All Media and All Exposure Routes	**7.1**

All Exposure Routes:
Total Cardiovascular System HI = **2.7**

Oral and Dermal Exposure Routes:
Oral / Dermal Gastrointestinal System HI = **4.5**
Oral / Dermal Kidney HI = **4.5**

TABLE 10.2.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Vanadium						GIS / Kidney	0.15	--	0.40	0.55
			Chemical Total							0.15	--	0.40	0.55
		Exposure Point Total											0.55
	Exposure Medium Total												0.55
Surface Soil Total													**0.55**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	0.13	--	0.34	0.47
			Chemical Total							0.13	--	0.34	0.47
		Exposure Point Total											0.47
	Exposure Medium Total												0.47
Subsurface Soil Total													**0.47**

TABLE 10.2.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap	Benzene	1.6E-05	--	2.2E-06	--	1.77E-05	CVS	0.71	--	0.10	0.81
			Benzo(a)pyrene (BaP)	7.9E-07	--	1.6E-05	--	1.68E-05					
			Dibenz(a,h)anthracene	9.1E-07	--	4.8E-05	--	4.86E-05					
			Vanadium						GIS / Kidney	0.95	--	0.10	**1.05**
			Chemical Total	1.7E-05	--	6.6E-05		8.31E-05		1.65	--	0.20	**1.85**
		Exposure Point Total						8.31E-05					**1.85**
	Exposure Medium Total							8.31E-05					**1.85**
	Air	Water Vapors from Showerhead	Benzene						CVS	--	0.11	--	0.11
			Chemical Total							--	0.11	--	0.11
		Exposure Point Total											0.11
	Exposure Medium Total												0.11
Groundwater Total								**8.31E-05**					**1.96**
Adult Residents Total								**8.31E-05**					**2.98**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System

Total Risk Across Groundwater	8.3E-05
Total Risk Across All Media and All Exposure Routes	8.3E-05

Total Hazard Index Across Surface Soil	0.6
Total Hazard Index Across Subsurface Soil	0.5
Total Hazard Index Across Groundwater	**2.0**
Total Hazard Index Across All Media and All Exposure Routes	**3.0**

All Exposure Routes:
Total Cardiovascular System HI = 0.9

Oral and Dermal Exposure Routes:
Oral / Dermal Gastrointestinal System HI = **2.1**
Oral / Dermal Kidney HI = **2.1**

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Benzo(a)pyrene (BaP)	4.6E-05	--	1.7E-05	--	6.26E-05					
			Chromium						NOEL	0.30	--	0.33	0.63
			Vanadium						GIS / Kidney	4.19	--	4.52	**8.71**
			Chemical Total	4.6E-05	--	1.7E-05		6.26E-05		4.49	--	4.85	**9.34**
		Exposure Point Total						6.26E-05					**9.34**
	Exposure Medium Total							6.26E-05					**9.34**
Surface Soil Total								**6.26E-05**					**9.34**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	3.55	--	3.83	**7.38**
			Chemical Total							3.55	--	3.83	**7.38**
		Exposure Point Total											**7.38**
	Exposure Medium Total												**7.38**
Subsurface Soil Total													**7.38**

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			Benzene	6.6E-05	--	1.0E-05	--	7.64E-05	CVS	3.52	--	0.54	**4.05**
			Benzo(a)pyrene (BaP)	3.4E-06	--	7.0E-05	--	7.37E-05					
			Dibenz(a,h)anthracene	3.9E-06	--	2.1E-04	--	**2.13E-04**					
			Chromium						NOEL	0.59	--	0.13	0.72
			Vanadium						GIS / Kidney	4.73	--	0.99	**5.72**
			Chemical Total	7.4E-05	--	2.9E-04		**3.63E-04**		8.84	--	1.65	**10.49**
		Exposure Point Total						**3.63E-04**					**10.49**
	Exposure Medium Total							**3.63E-04**					**10.49**
Groundwater Total								**3.63E-04**					**10.49**
Young Child Residents Total								**4.26E-04**					**27.21**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	6.3E-05
Total Risk Across Groundwater	**3.6E-04**
Total Risk Across All Media and All Exposure Routes	**4.3E-04**

Total Hazard Index Across Surface Soil	**9.3**
Total Hazard Index Across Subsurface Soil	**7.4**
Total Hazard Index Across Groundwater	**10.5**
Total Hazard Index Across All Media and All Exposure Routes	**27.2**

All Exposure Routes:
Total Cardiovascular System HI = **4.1**

Oral and Dermal Exposure Routes:
Oral / Dermal Gastrointestinal System HI = **21.8**
Oral / Dermal Kidney HI = **21.8**

TABLE 10.3.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Benzo(a)pyrene (BaP)	5.1E-06	--	2.7E-06	--	7.77E-06					
			Chromium						NOEL	0.10	--	0.16	0.26
			Vanadium						GIS / Kidney	1.40	--	2.16	**3.56**
			Chemical Total	5.1E-06	--	2.7E-06		7.77E-06		1.50	--	2.32	**3.82**
		Exposure Point Total						7.77E-06					**3.82**
	Exposure Medium Total							7.77E-06					**3.82**
Surface Soil Total								**7.77E-06**					**3.82**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	1.19	--	1.83	**3.02**
			Chemical Total							1.19	--	1.83	**3.02**
		Exposure Point Total											**3.02**
	Exposure Medium Total												**3.02**
Subsurface Soil Total													**3.02**

TABLE 10.3.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap											
			Benzene	1.5E-05	--	1.3E-06	--	1.60E-05	CVS	2.35	--	0.20	**2.55**
			Benzo(a)pyrene (BaP)	7.5E-07	--	9.0E-06	--	9.76E-06					
			Dibenz(a,h)anthracene	8.6E-07	--	2.7E-05	--	2.76E-05					
			Chromium						NOEL	0.40	--	0.03	0.42
			Vanadium						GIS / Kidney	3.16	--	0.22	**3.38**
			Chemical Total	1.6E-05	--	3.7E-05		5.34E-05		5.91	--	0.44	**6.35**
		Exposure Point Total						5.34E-05					**6.35**
	Exposure Medium Total							5.34E-05					**6.35**
Groundwater Total								**5.34E-05**					**6.35**
Young Child Residents Total								**6.12E-05**					**13.19**

Notes:
Target Organ Abbreviations:
CVS = Cardiovascular System
GIS = Gastrointestinal System
NOEL = No Observed Effect Level

Total Risk Across Surface Soil	7.8E-06
Total Risk Across Groundwater	5.3E-05
Total Risk Across All Media and All Exposure Routes	6.1E-05

Total Hazard Index Across Surface Soil	**3.8**
Total Hazard Index Across Subsurface Soil	**3.0**
Total Hazard Index Across Groundwater	**6.4**
Total Hazard Index Across All Media and All Exposure Routes	**13.2**

All Exposure Routes:
Total Cardiovascular System HI = **2.5**

Oral and Dermal Exposure Routes:
Oral / Dermal Gastrointestinal System HI = **10.0**
Oral / Dermal Kidney HI = **10.0**

TABLE 10.4.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Vanadium						GIS / Kidney	1.11	--	0.59	**1.70**
			Chemical Total							1.11	--	0.59	**1.70**
		Exposure Point Total											**1.70**
	Exposure Medium Total												**1.70**
Surface Soil Total													**1.70**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	0.94	--	0.50	**1.44**
			Chemical Total							0.94	--	0.50	**1.44**
		Exposure Point Total											**1.44**
	Exposure Medium Total												**1.44**
Subsurface Soil Total													**1.44**
Construction Workers Total													**3.13**

Notes:
Target Organ Abbreviations:
GIS = Gastrointestinal System

Total Hazard Index Across Surface Soil	**1.7**
Total Hazard Index Across Subsurface Soil	**1.4**
Total Hazard Index Across All Media and All Exposure Routes	**3.1**

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**3.1**
Oral / Dermal Kidney HI =	**3.1**

TABLE 10.4.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICC

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Vanadium						GIS / Kidney	0.28	--	0.29	0.56
			Chemical Total							0.28	--	0.29	0.56
		Exposure Point Total											0.56
	Exposure Medium Total												0.56
Surface Soil Total													**0.56**
Subsurface Soil	Subsurface Soil	Subsurface Soil	Vanadium						GIS / Kidney	0.23	--	0.24	0.48
			Chemical Total							0.23	--	0.24	0.48
		Exposure Point Total											0.48
	Exposure Medium Total												0.48
Subsurface Soil Total													**0.48**
Construction Workers Total													**1.04**

Notes:
Target Organ Abbreviations:
GIS = Gastrointestinal System

Total Hazard Index Across Surface Soil	0.6
Total Hazard Index Across Subsurface Soil	0.5
Total Hazard Index Across All Media and All Exposure Routes	**1.0**

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	**1.0**
Oral / Dermal Kidney HI =	**1.0**

APPENDIX I
IDENTIFICATION OF BIOACCUMULATIVE CHEMICALS

APPENDIX I

IDENTIFICATION OF BIOACCUMULATIVE CHEMICALS

Only those organic chemicals with a log octanol-water partition coefficient (K_{ow}) value greater than or equal to 3.0 will be considered a bioaccumulative chemical. Justification for defining bioaccumulative organic chemicals as those with log K_{ow} values greater than or equal to 3.0 is provided below.

- The potential for organic chemicals to accumulate in organisms has been shown to correlate well with the K_{ow}. USEPA (1985), as sited in USEPA/ACOE (1998), recommends that only chemicals for which the log K_{ow} is greater than 3.5 be considered for evaluation of bioaccumulation potential since chemicals with log K_{ow} values less than 3.5 are not likely to bioaccumulate to a significant degree.

- Although organic chemicals with log K_{ow} values in the 2 to 7 range have at least some potential to bioconcentrate (Connell 1990), significant bioconcentration does not generally occur for chemicals with log K_{ow} values less than 3.0 (Maki and Duthie 1978) to 5.0 (Gobas and Mackay 1990). Most work with bioconcentration (uptake from the surrounding medium, such as water) and bioaccumulation (uptake from all exposure routes, including via food) of organic chemicals has concerned chemicals with log K_{ow} values of 3.0 or more (USEPA 1995a), since organic chemicals with lower log K_{ow} values generally have little potential for significant bioaccumulation.

- The USEPA has developed a number of scoring algorithms to evaluate the relative hazard of chemicals to human or ecological receptors. All of these algorithms have a component that addresses bioaccumulation potential. The evaluation of bioaccumulation potential is generally based on measured or estimated (using log K_{ow} values) BCFs or BAFs, or less commonly using log K_{ow} itself. For example, USEPA (1980) developed a bioaccumulation potential scoring system that considered organics with BCF values of less than 100 (equivalent to a log K_{ow} of approximately 3.0) to have negligible potential to bioaccumulate in aquatic food webs, while organic chemicals with BCFs in the 100 to 1,000 range (equivalent to log K_{ow} values of about 3.0 to 4.3) are considered to have low bioaccumulation potential. The more recent Scoring and Ranking Assessment Model (SCRAM), developed by EPA Region 5 for the Great Lakes, has similar bioaccumulation scoring cut-offs (USEPA 2000).

- The proposed categorization of persistent, bioaccumulative, and toxic (PBT) chemicals under the Toxic Substances Control Act (TSCA) defines chemicals with a tendency to accumulate in organisms as those with a BCF or BAF of greater than 1,000 (Federal Register 63(192):53417; 10/5/98). Using the equation listed below (USEPA 1995b), a BCF/BAF of 1,000 equates to a log K_{ow} value of approximately 4.3.

$$Log\ BCF = [(0.79)(\log K_{ow}) - 0.40] \qquad \text{(Equation I-1)}$$

- The Beta Test Version 1.0 of the EPA Waste Minimization Prioritization Tool (WMPT), used to develop a list of PBTs for the Resource Conservation and Recovery Act (RCRA) program, defined organic chemicals with a low potential to bioaccumulate as those with log K_{ow} values of less than 3.5 and those with a high potential to bioaccumulate as those with log K_{ow} values greater than 5.0 (USEPA 1998). The 1998 version of the EPA WMPT defines bioaccumulation potential based on BCF or BAF values (rather than on log K_{ow} values directly), with a scoring "fenceline" for organic chemicals with a low

bioaccumulation potential defined as a BCF or BAF of less than 250. Although the tool no longer uses log K_{ow} directly, log K_{ow} values can be used to estimate a BCF or BAF value. Using Equation I-1, a BCF/BAF of 250 equates to a log K_{ow} value of approximately 3.5.

- Garten and Trabalka (1983) have reviewed terrestrial food web data and concluded that only organic chemicals with log K_{ow} values greater than 3.5 have the potential to significantly bioaccumulate from food to birds to mammals.

The information listed above indicates that a log K_{ow} of 3.0 to 3.5 is a reasonable, non-arbitrary parameter value to use in defining an organic chemical with the potential to bioaccumulate. For conservatism, the low end (3.0) of this log K_{ow} range will be used to define a bioaccumulative organic chemical. Section 4.0, Table 4-6 lists log K_{ow} values (range and recommended value) for volatile and semi-volatile organic chemicals that have been or will be analyzed surface water, sediment, and surface soil collected from SWMU 45. Log K_{ow} values were primarily obtained from the USEPA (1995c and 1996). The recommended value from these sources generally represents a "high-end" or best estimate from empirical data. The organic chemicals that will be evaluated in the dietary intake models are those with a log K_{ow} value of greater than or equal to 3.0. For conservatism, the maximum value in the log K_{ow} range is used for this determination not the recommended value.

Inorganic chemicals were not quantitatively screened for bioaccumulation potential since log K_{ow} values are not available for these chemicals. However, cyanide was eliminated from the list since it is readily metabolized and is not known to bioaccumulate (Eisler 1991). Although all Appendix IX metals are retained for evaluation in the upper trophic level food chain models, only mercury and selenium are known to biomagnify in food chains (in organic forms; Suter 1993) and only cadmium, copper, and zinc generally have the potential to bioaccumulate significantly. The other metals are retained by default.

References

Connell, D.W. 1990. Bioaccumulation of Xenobiotic Compounds. CRC Press, Inc., Boca Raton, Florida. 219 pp.

Eisler, R. 1991. Cyanide Hazards to Fish, Wildlife, and Invertebrates: a Synoptic Review. U.S. Fish and Wildlife Service Biological Report 85(1.23), Contaminant Hazard Reviews Report No. 23. 55 pp.

U.S. Environmental Protection Agency (USEPA). 2000. Defining Persistent, Bioaccumulative and Toxic Great Lakes Contaminants and Research Need. EPA Region 5 web page. http://www.epa.gov/grtlakes/toxteam/pbtrept/index.html.

USEPA. 1998. Waste Minimization Prioritization Tool Spreadsheet Document for the RCRA Waste Minimization PBT Chemical List. Docket Number F-98-MMLP-FFFFF. November 9, 1998. http://www.epa.gov/epaoswer/hazwaste/minimize/chemlist/index.htm

USEPA. 1996. Superfund Chemical Data Matrix. EPA/540/R-96/028.

USEPA. 1995a. Great Lakes Water Quality Initiative Technical Support Document for the Procedure to Determine Bioaccumulation Factors. EPA/820/B-95/005.

USEPA. 1995b. Water Quality Guidance for the Great Lakes System: Supplementary Information Document (SID). Office of Water. EPA/820/B-95/001.

USEPA. 1995c. Internal Report on Summary of Measured, Calculated and Recommended log K_{ow} Values. Environmental Research Laboratory, Athens, GA.

USEPA. 1985. Technical Support Document for Water Quality-Based Toxics Control. EPA/440/4-85/032.

USEPA. 1980. Proceedings of the EPA Workshop on the Environmental Scoring of Chemicals. EPA/560/11-80/010.

USEPA/ACOE. 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (Inland Testing Manual). EPA/823/B-98/004.

Garten, C.T. Jr. and J.R. Trabalka. 1983. Evaluation of Models for Predicting Terrestrial Food Chain Behavior of Xenobiotics. Environmental Science and Technology. 17:590-595.

Gobas, F. and D. Mackay. 1990. Biosorption, Bioaccumulation and Food Chain Transfer of Organic Chemicals. Ontario Ministry of the Environment. ISBN 0-7729-6823-3.

Maki, A.W. and J.R. Duthie. 1978. Summary of Proposed Procedures for the Evaluation of Aquatic Hazard. Pages 153-163 IN Cairns, J., Jr., K.L. Dickson, and A.W. Maki (eds). Estimating the Hazard of Chemical Substances to Aquatic Life. ASTM STP 657.

Suter, G.W. II. 1993. Ecological Risk Assessment. Lewis Publishers, Boca Raton, FL. 538 pp.